Reward encourages reactive, goal-directed suppression of attention: Supplementary materials

Daniel Pearson & Mike E. Le Pelley

School of Psychology, UNSW Sydney

Experiment 1

Time course of oculomotor capture on low-choice trials

On low-choice trials (Figure S1A), there was a significant main effect of quartile, $F(2.57, 92.42) = 52.10$, $p < .001$, $\eta_p^2 = .591$, with percentage of first saccades directed towards either distractor decreasing as saccade latency increased. Both the main effect of contingency, $F(1, 36) = 3.67$, $p = .064$, $\eta_p^2 = .092$, and quartile × contingency interaction, $F(2.07, 74.48) = 2.48$, $p = .089$, $\eta_p^2 = .064$, were non-significant. Paired-samples *t*-tests for the fastest and slowest quartiles of saccades revealed no significant difference in the percentage of first saccades towards the low-omission versus low-safe distractor: fastest quartile, $t(36) = 0.01$, $p = .990$, $d_z = .002$, $BF_{01} = 5.66$ (one-tailed: $BF_{0+} = 5.60$); slowest quartile, $t(36) = 0.51$, $p = .614$, $d_z = .084$, $BF_{01} = 5.01$ (one-tailed: $BF_{0+} = 8.02$).

Fixation duration on low-choice trials

There was no significant difference in the duration of fixations following saccades to the omission distractor versus the safe distractor on low-choice trials (Figure S1B), $t(34) = 0.42$, $p = .680$, $d_z = 0.07$, $BF_{01} = 5.09$.

Distribution of first saccade direction

Figures S2 and S3 show the distribution of first saccade direction for each trial type when the angular deviation between the target and distractor(s) was 60° and 120°, respectively. Notably, these distributions are bimodal on single-distractor trials (with first saccades most likely to go towards either the distractor or the target), and

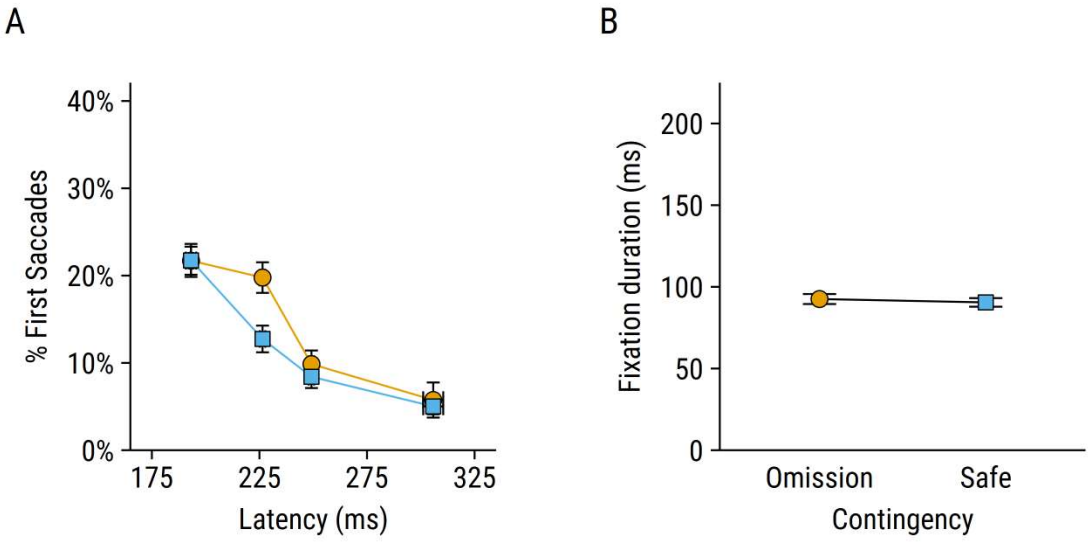

Figure S1. Supplementary results of Experiment 1. (A) Percentage of first saccades in the direction of each type of distractor (omission and safe) as a function of saccade latency on low-choice trials. (B) Fixation duration following first saccades to the omission and safe distractor on low-choice trials. Error bars in all figures represent within-subjects SEM (Morey, 2008).

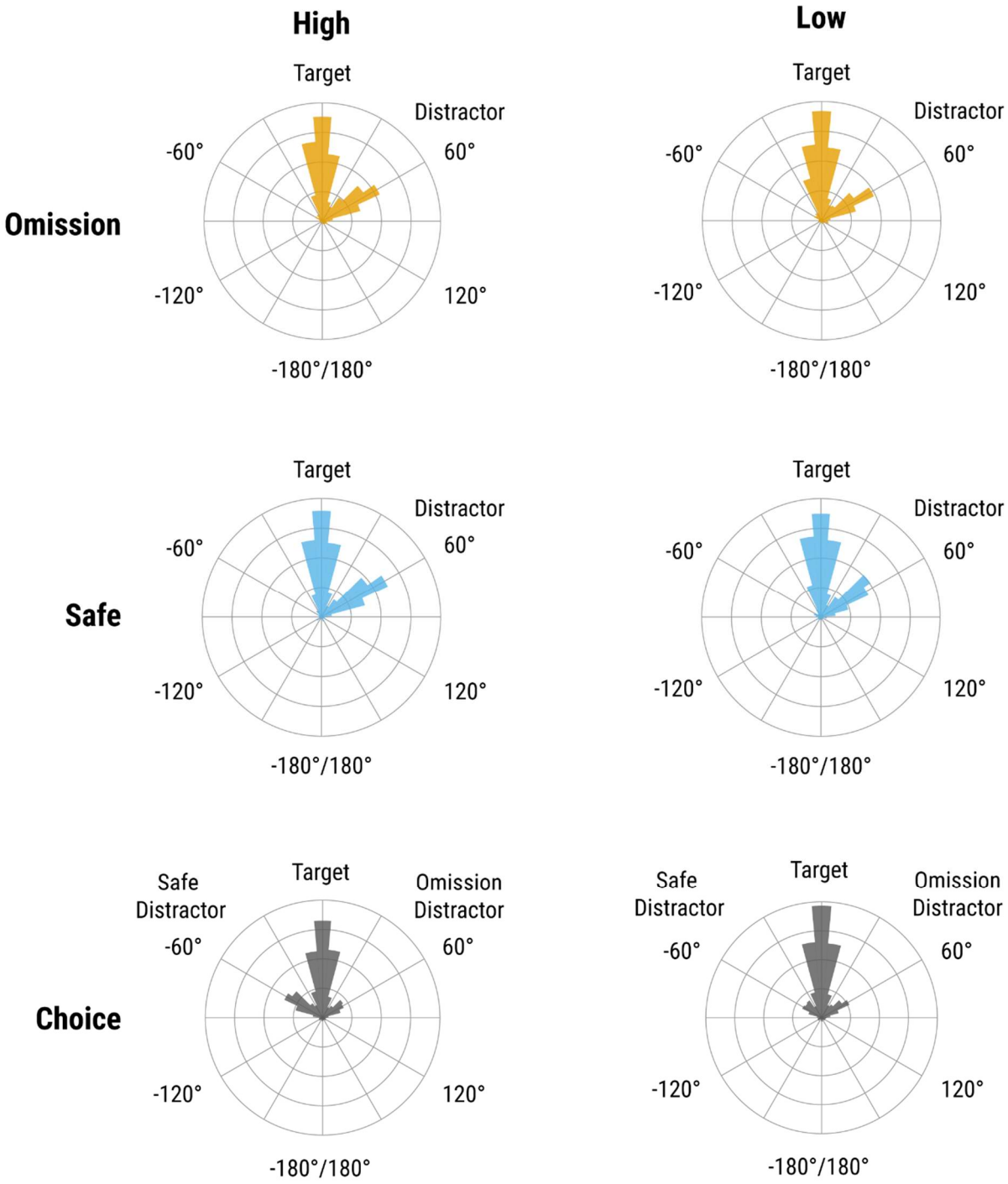

Figure S2. Relative frequency histogram of first saccade direction in Experiment 1 on trials where the angular deviation between the target and distractor(s) was 60˚. The length of each bar indicates the proportion of trials in which participants' first saccade had a given angular deviation relative to the target. The width of the angular deviation bins is 10˚. Each concentric ring indicates 5% of trials. Saccade direction is normalised as though the distractor was positioned at +60˚ relative to the target on each single-distractor trial (in reality, the distractor could be positioned at +60˚ or -60˚ relative to the target). On choice trials, saccade direction is normalised as though the omission distractor was positioned at +60˚ and the safe distractor was positioned at -60˚ (in reality, the distractors could be positioned in the opposite configuration).

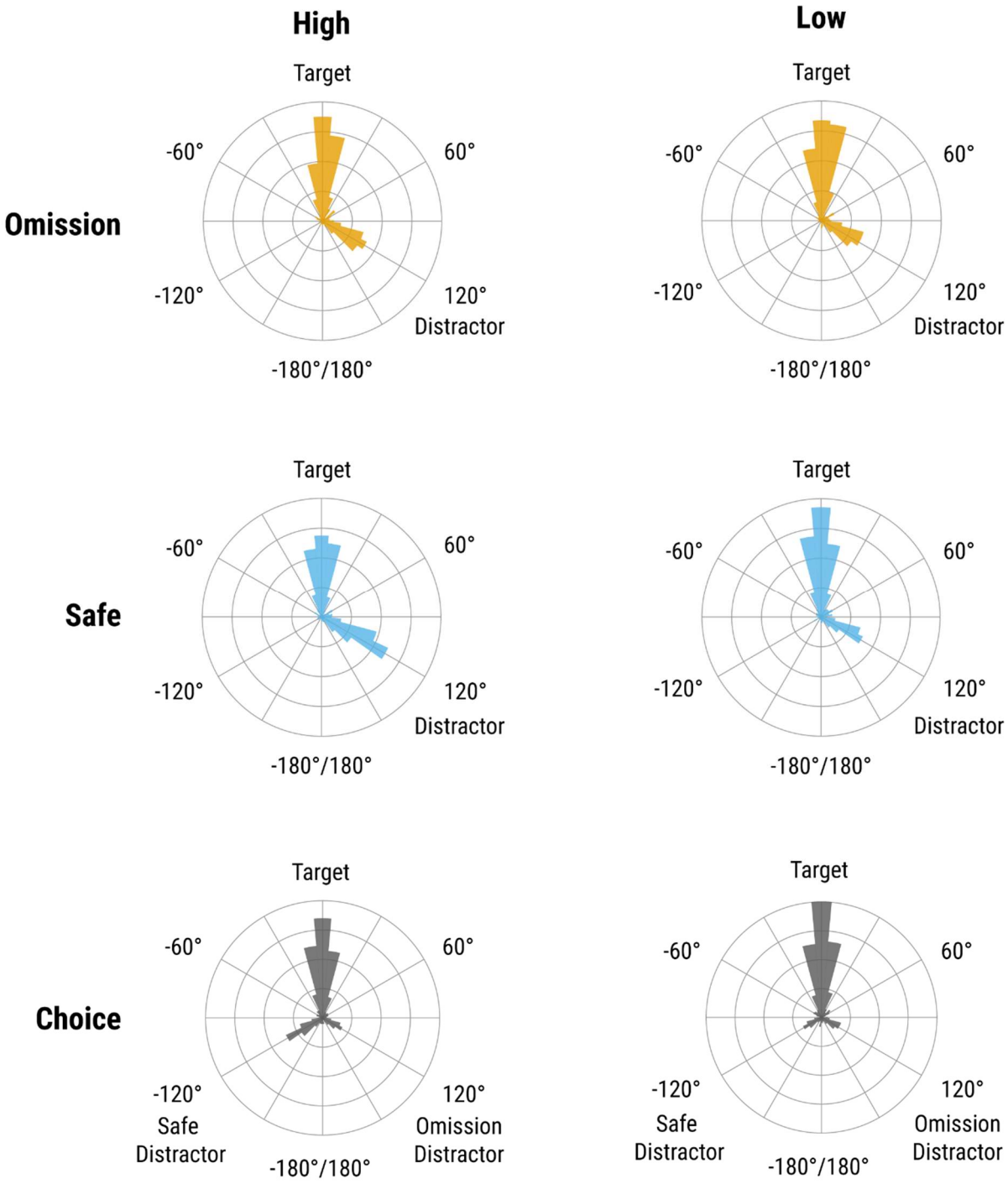

Figure S3. Relative frequency histogram of first saccade direction in Experiment 1 on trials where the angular deviation between the target and distractor(s) was 120˚. Saccade direction is normalised as though the distractor was positioned at +120˚ relative to the target on each single-distractor trial. On choice trials, saccade direction is normalised as though the omission distractor was positioned at +120˚ and the safe distractor was positioned at -120˚.

trimodal on choice trials (with first saccades most likely to go towards the target, the safe distractor, or the omission distractor).

A key finding of this study was that participants were more likely to look at the safe distractor than the omission distractor on high-choice trials (see Figure 3B in the main text). In the main text, we interpreted this pattern as a consequence of participants *preferentially directing their gaze towards* the high-safe distractor. Here we consider the alternative possibility that this finding might instead reflect a saccadic bias *away from* the high-omission distractor due to its suppression (e.g., Sheliga et al., 1994). If participants directed their eyes away from the omission distractor on high-choice trials, this might take them towards the location of the safe distractor: in the terms of Figures S2 and S3, might result in a negative angular deviation from the target. However, if this were the case then we should expect to see a similar pattern on single-distractor trials, with gaze moving away from the location of the high-omission distractor and towards the location in which a safe distractor would have been presented on a choice trial (even though on a single-distractor trial this location was occupied by a non-salient grey circle). Figures S2 and S3 clearly show that this is not the case. Whereas there is a clear peak in the distribution of saccade direction over the location of the safe distractor on high-choice trials, no such peak occurs over the equivalent location on high-omission single distractor trials. The implication is that the bias to the safe distractor is not a reflection of participants strategically directing their saccades away from the distractor, or an 'overshoot' in suppression.

Experiment 2

Time course of oculomotor capture on low-choice trials

On low-choice trials (Figure S2A), there was a significant main effect of quartile, $F(2.00, 108.12) = 87.28$, $p < .001$, $\eta_p^2 = .618$, indicating that the percentage of first saccades to the distractor decreased as saccade latency increased. There was no significant main effect of contingency, $F(1, 54) = 0.03$, $p = .869$, $\eta_p^2 < .001$, and no significant contingency × quartile interaction, $F(2.62, 141.64) = 1.41$, $p = .246$, $\eta_p^2 = .246$. Paired-samples *t*-tests for the fastest and slowest quartiles of saccades revealed no significant differences in the percentage of first saccades towards the low-omission versus low-safe distractor: fastest quartile, $t(54) = 0.93$, $p = .357$, $d_z = .13$, $BF_{01} = 4.52$ (one-tailed: $BF_{0+} = 12.26$); slowest quartile, $t(54) = 0.47$, $p = .640$, $d_z = .06$, $BF_{01} = 6.11$ (one-tailed: $BF_{0+} = 4.52$).

Fixation duration on low-choice trials

There was no significant difference in the duration of fixations following saccades to the omission versus the safe distractors (Figure S2B), $t(50) = 0.97$, $p = .338$, $d_z = 0.14$, $BF_{01} = 4.22$.

Distribution of first saccade direction

Figures S5 and S6 show the distribution of first saccade direction for each trial type when the angular deviation between the target and the distractor(s) was 60° and 120°, respectively. While there were overall fewer saccades directed towards the distractors in Experiment 2 compared to Experiment 1, the distributions are similarly bimodal on single-distractor trials, and trimodal on choice trials.

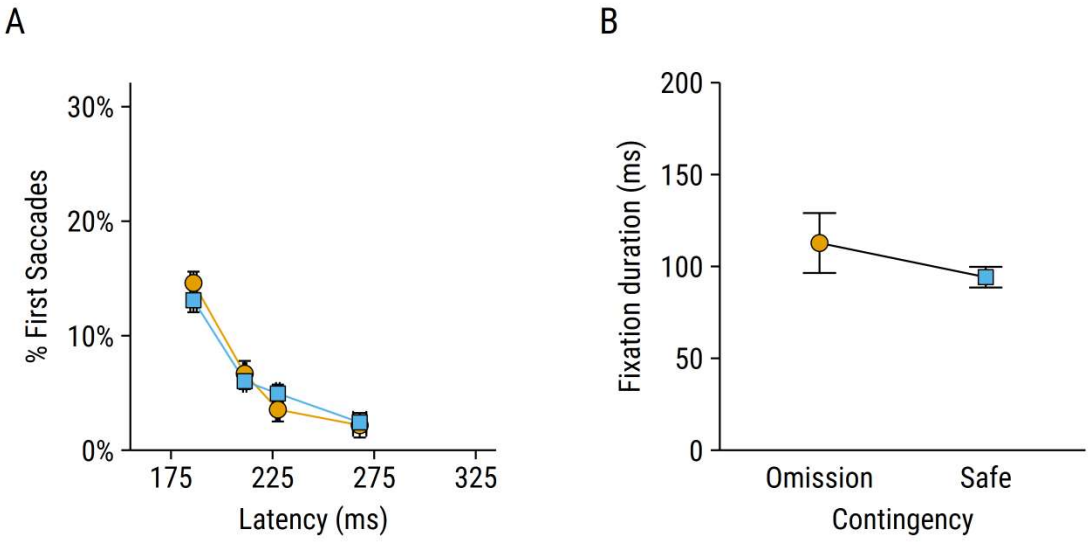

Figure S4. Supplementary results of Experiment 2. (A) Percentage of first saccades in the direction of each type of distractor (omission and safe) as a function of saccade latency on low-choice trials. (B) Fixation duration following first saccades to the omission and safe distractor on low-choice trials.

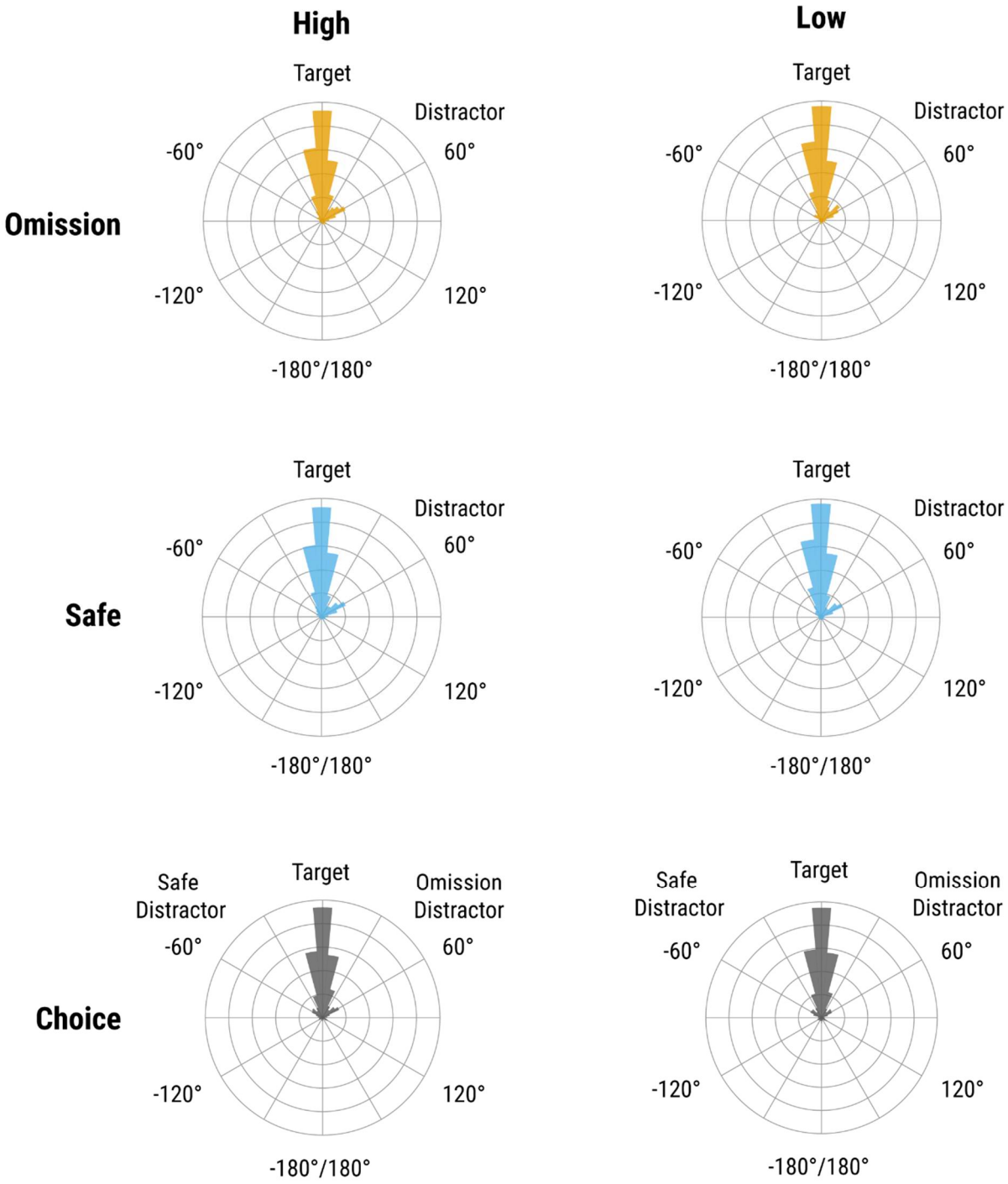

Figure S5. Relative frequency histogram of saccade direction in Experiment 2 on trials where the angular deviation between the target and distractor(s) was 60˚. The length of each bar indicates the proportion of trials in which participants' first saccade had a given angular deviation relative to the target. The width of the angular deviation bins is 10˚. Each concentric ring indicates 5% of trials. Saccade direction is normalised as though the distractor was positioned at +60˚ relative to the target on each single-distractor trial. On choice trials, saccade direction is normalised as though the omission distractor was positioned at +60˚ and the safe distractor was positioned at -60˚.

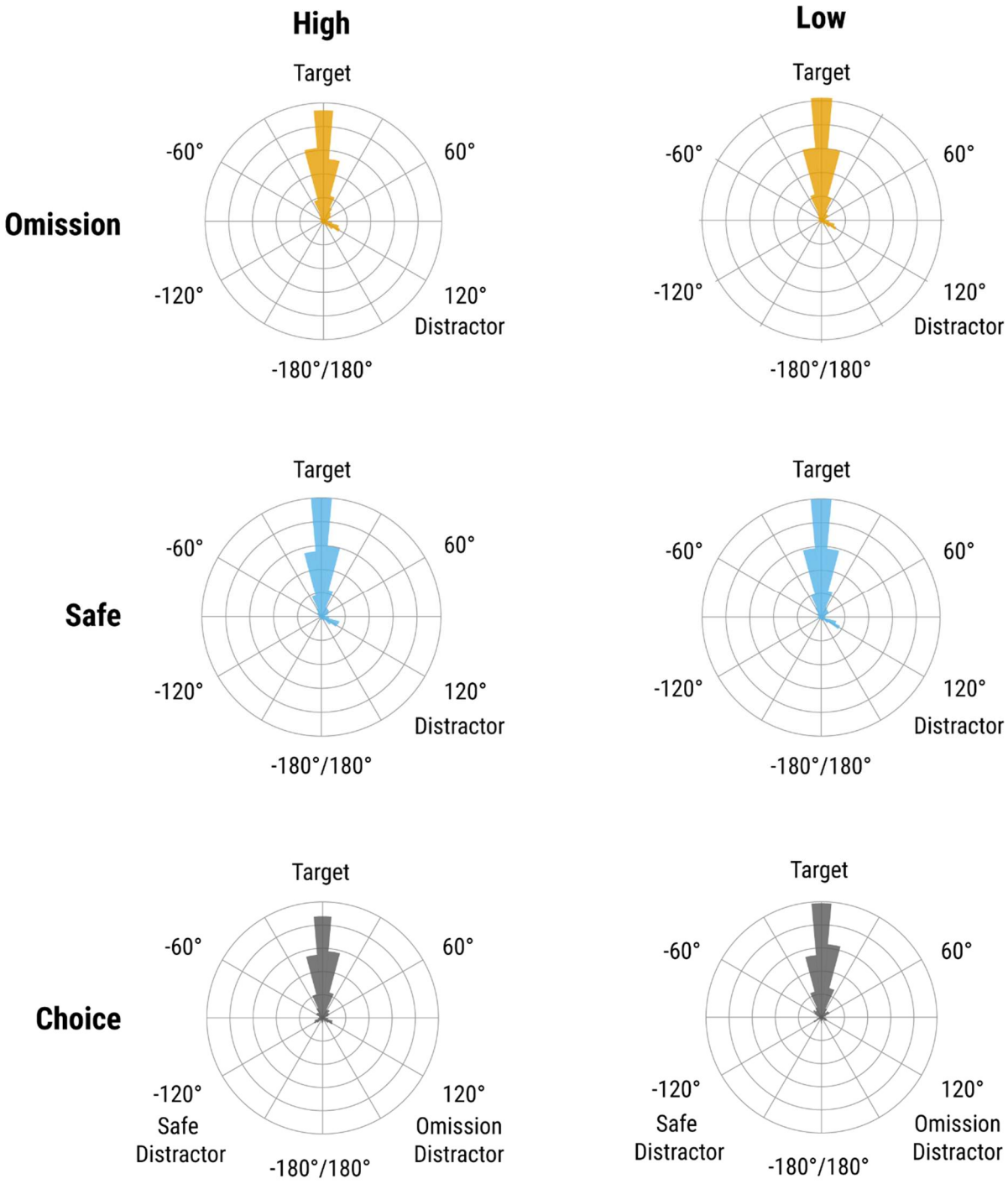

Figure S6. Relative frequency histogram of saccade direction in Experiment 2 on trials where the angular deviation between the target and distractor(s) was 120˚. Saccade direction is normalised as though the distractor was positioned at +120˚ relative to the target on each single-distractor trial. On choice trials, saccade direction is normalised as though the omission distractor was positioned at +120˚ and the safe distractor was positioned at -120˚.

References

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