Supplementary Materials

to accompany

Effects of instructed and experienced uncertainty on attentional priority

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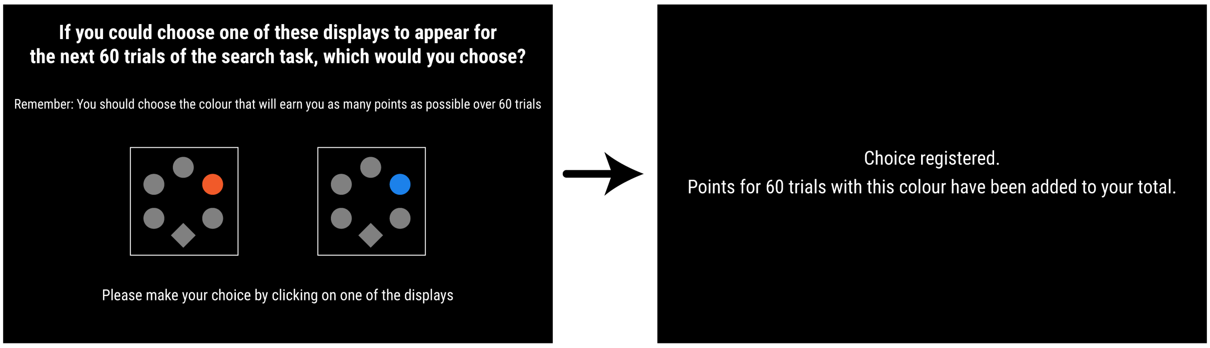
This document has three sections:

1. Figure illustrating examples of trials of the choice task and estimation task.
2. Granular analysis of search data from epoch 1 of Experiment 1.
3. Sequential analysis of search data for trials with the noninformative distractor as a function of the run length of previous rewarded / nonrewarded trials, pooled across the current Experiment 1 and prior research (Le Pelley et al., 2019; Pearson et al., 2024).

1. Examples of the choice task and estimation task

Figure S1.1 shows examples of trials of the choice task (panel a) and estimation task (panel b) that followed the search task in Experiments 1 and 2.

a. Choice task



b. Estimation task

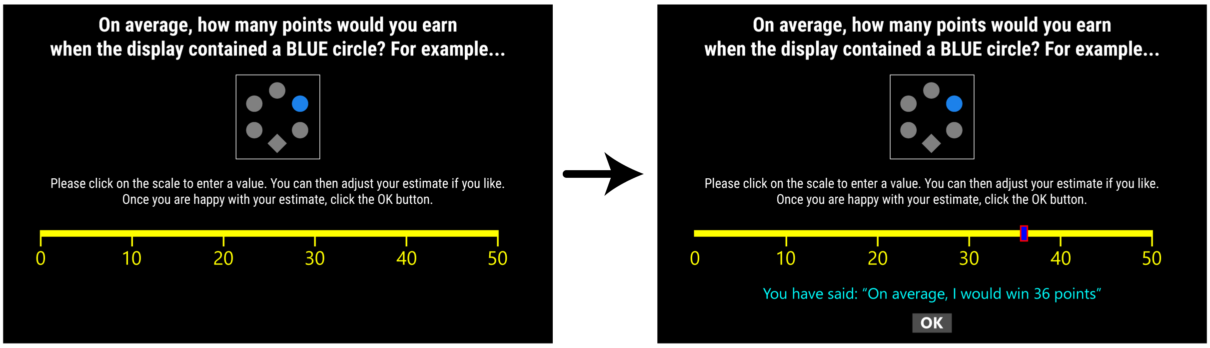


Figure S1.1. Schematic illustration of trials of the choice task and estimation task that followed the search task in Experiments 1 and 2. (a) In the choice task, participants chose one of the two search displays and were then given feedback stating that their choice had been registered (but were not told how many points they had won as a consequence of their choice). (b) In the estimation task, participants entered their value estimate for each distractor by clicking the appropriate position on a sliding scale – as they moved the slider, text appeared below to confirm the value that the participant was choosing. They then clicked an "OK" button to finalise their estimate (no further feedback was provided). Stimuli are not shown accurately to scale.

2. Granular analysis of epoch 1 of Experiment 1

Analyses of the search data of Experiment 1 reported in the main text revealed a significant effect of distractor type—i.e., a significant uncertainty-modulated attentional capture (UMAC) effect—in epoch 1 for the Instructed group, but not for the Uninstructed group. However, a direct contrast of data from the two groups did not find a significant difference in the magnitude of this UMAC effect – though Bayesian analysis suggested only anecdotal support for the null hypothesis.

Here we report post hoc analyses exploring the early emergence of the UMAC effect at a finer level of detail. For these analyses, we decomposed the first epoch (containing 64 trials with each type of distractor) into four sub-blocks (each containing 16 trials with each distractor). We note that while this approach allows for finer-grained analysis, the reduction in the number of trials per unit of analysis results in a lower signal-to-noise ratio in the analysed data.

The resulting data (shown in Figure S2.1) were analysed using a 2 (instruction group) × 2 (distractor type) × 4 (sub-block) ANOVA. This analysis revealed a main effect of distractor type, $F(1,38) = 6.54$, $p = .007$ (one-tailed), $\eta_p^2 = .147$, $BF_{10} = 47.7$, indicating an overall UMAC effect. More importantly for current purposes, instruction group did not exert a main effect, $F(1,38) = 0.97$, $p = .332$, $\eta_p^2 = .025$, $BF_{10} = 0.42$, or interact with any other factor(s), all Fs < 1, all $BF_{10} \leq 0.28$. The three-way interaction is of particular note here since it indexes the change in the UMAC effect across sub-blocks; for this interaction we observed $BF_{10} = .095$, suggesting moderate support for the null hypothesis.

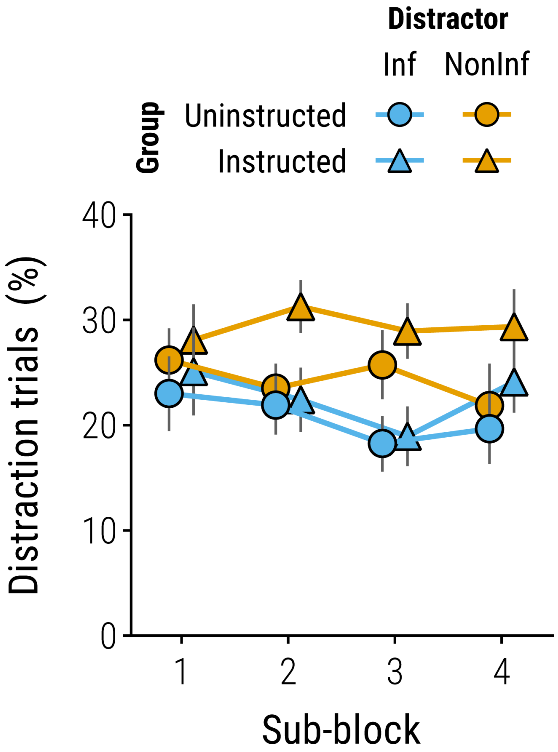


Figure S2.1. Percentage of distraction trials across the first epoch of the search task of Experiment 1. The first epoch has been split into four sub-blocks, with each sub-block containing 16 trials with each type of distractor: informative (Inf) and non-informative (NonInf). Data are shown separately for groups Uninstructed and Instructed. Error bars show within-subjects *SEM* (Morey, 2008) since the key contrasts are within-subjects.

Follow-up analyses used ANOVA with factors of instruction group and distractor type to investigate the UMAC effect within each sub-block considered separately. Results of these analyses are reported in Table S2.1; no correction for multiple comparisons has been applied here, so these should be considered as very liberal tests. This analysis found evidence consistent with the idea that the overall UMAC effect (main effect of distractor type) emerged as early as the second or third sub-block (though data were noisy, and no significant effect was observed in the fourth sub-block). However, the magnitude of this effect did not differ significantly between instruction groups – though Bayes factors for these somewhat noisy analyses were typically in the anecdotal range.

Table S2.1. ANOVA analysis of data from each sub-block of epoch 1 of Experiment 1.

Sub-block	***Effect***	***F***	***p***	***BF_{10}***
Sub-block 1	distract	1.26	.135	0.41
	instruct	0.18	.677	0.38
	distract × instruct	< 0.001	.978	0.31
Sub-block 2	**distract**	**5.27**	**.013**	**1.89**
	instruct	0.79	.379	0.51
	distract × instruct	2.54	.119	0.82
Sub-block 3	**distract**	**9.54**	**.002**	**13.5**
	instruct	0.23	.631	0.35
	distract × instruct	0.20	.659	0.33
Sub-block 4	distract	1.15	.145	0.39
	instruct	1.93	.173	0.58
	distract × instruct	0.19	.663	0.35

Note: "distract" = effect of distractor type; "instruct" = effect of instruction group. *p*-values for the main effect of distractor type are one-tailed (since we were testing for the presence of a UMAC effect wherein the noninformative distractor was more likely to capture attention than the informative distractor); other *p*-values are two-tailed. Rows highlighted in bold show effects with $p < .05$.

3. Pooled sequential analysis

Here we report findings of an exploratory analysis examining attention to a non-informative (NonInf) distractor as a function of the run length of the most recent outcome with which it was paired, pooling data across recent studies in order to increase power. In each of these studies, for reward was available on a random half of the trials featuring a NonInf distractor in the search display, and no reward was available on the other half of trials. The search task itself was very similar to that described in the main text of the current article, and each of the studies demonstrated an uncertainty-modulated attentional capture (UMAC) effect; i.e., greater attentional by the NonInf distractor than by an informative distractor. The studies included in this analysis are shown in Table S3.1 (total pooled N = 205).

Table S3.1. Studies included in pooled sequential analysis.

Study	*n*	NonInf trials	Outcomes	Notes
Chow et al. (current study) Exp 1	40	256	40 / 0	Pooling across uninstructed and instructed participants.
Le Pelley et al. (2019) Exp 2	38	384	100 / 0	All participants uninstructed. Later blocks had occasional trials with two distractors.
Pearson et al. (in press) Exp 1	31	208	100 / 0	All participants uninstructed. Later blocks had occasional trials with two distractors.
Pearson et al. (in press) Exp 2	36	208	100 / 0	All participants uninstructed. Later blocks had occasional trials with two distractors.
Pearson et al. (in press) Exp 3	60	208	100 / 0	All participants uninstructed. Later blocks had occasional trials with two distractors.

Note: 'NonInf trials' shows the total number of trials with a single non-informative distractor experienced by each participant (i.e., number of trials included in sequential analysis). 'Outcomes' shows the reward values (points) that were paired with that distractor (e.g., '40 / 0' indicates that the distractor was paired with 40 points on half of trials, and 0 points on the other half).

For each of these studies, we analysed the likelihood of distraction on each NonInf trial (defined as looking at the distractor) as a function of the length of the preceding run of rewarded (R) or non-rewarded (N) NonInf trials. Run lengths were defined as described in the main text. Figure S3.1 shows the resulting data for runs of up to 4 repetitions of the same outcome, averaging across all of the NonInf trials in each study. These data were analysed using a 5 (experiment) × 8 (run length) ANOVA. This revealed a significant main effect of experiment, $F(4,200) = 3.62$, $p = .007$, $\eta_p^2 = .068$, $BF_{10} = 3.89$, with overall levels of distraction differing somewhat between experiments. More importantly, run length did not exert a main effect, $F(7,1400) = 0.82$, $p = .57$, $\eta_p^2 = .004$, $BF_{10} < 0.001$, or interact with experiment, $F(28,1400) = 0.87$, $p = .66$, $\eta_p^2 = .017$, $BF_{10} < 0.001$, with Bayes factors indicating overwhelming support for the null. Table S3.2 shows results of separate one-way ANOVA analysis of each study: in each case, the main effect of run length is non-significant, with strong support for the null.

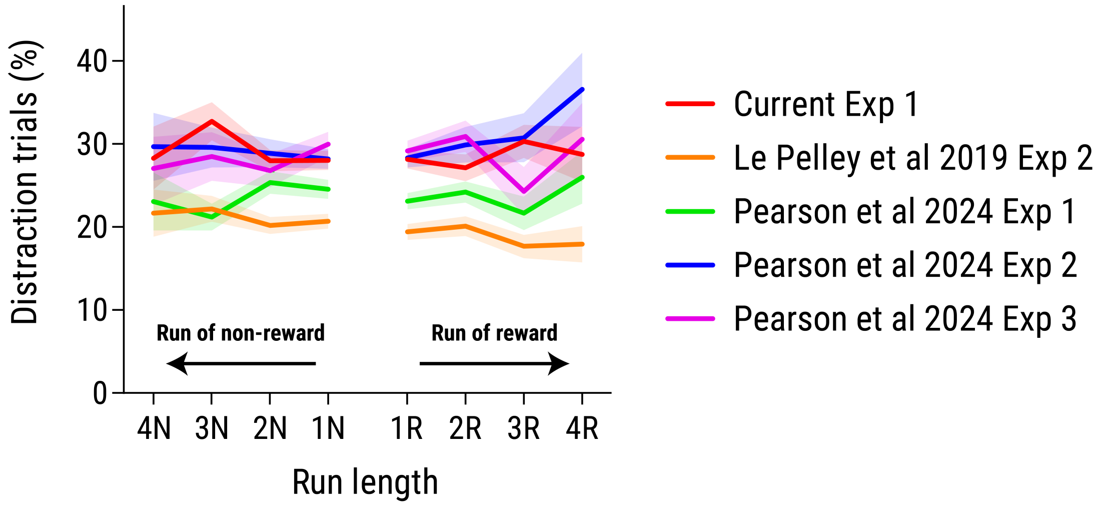


Figure S3.1. Percentage of distraction trials (i.e., trials in which participants looked at the coloured distractor) for trials featuring a non-informative (NonInf) distractor as a function of the run length of preceding non-rewarded (N) or rewarded (R) trials with the NonInf distractor. See main text for explanation of coding of run length. Data are shown for five representative studies. Shaded regions show within-subjects *SEM* (Morey, 2008).

Table S3.2. One-way ANOVA analysis of effect of run length in each study.

Study	***df***	***F***	***p***	***BF₁₀***
Chow et al. (current study) Exp 1	7, 273	0.71	.66	0.012
Le Pelley et al. (2019) Exp 2	7, 259	1.11	.36	0.034
Pearson et al. (in press) Exp 1	7, 210	0.74	.64	0.021
Pearson et al. (in press) Exp 2	7, 245	1.10	.36	0.036
Pearson et al. (in press) Exp 3	7, 413	0.76	.62	0.006

References

Le Pelley, M.E., Pearson, D., Porter, A., Yee, H., & Luque, D. (2019). Oculomotor capture is influenced by expected reward value but (maybe) not predictiveness. *Quarterly Journal of Experimental Psychology, 72*, 168-181.

Morey, R.D. (2008). Confidence intervals from normalized data: A correction to Cousineau (2005). *Tutorial in Quantitative Methods for Psychology, 4*, 61-64.

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