

Feature based templates-for-rejection are ineffective at suppressing threat-related distractors in visual search

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BACKGROUND

Earlier research has found that when participants are cued with the distractor feature on each trial, they are faster to identify the target compared to when they were given no information about the upcoming target or distractor features (Woodman & Luck, 2007; Arita et al., 2012).

This has been taken as evidence that individuals can utilise a representation in working memory to suppress stimuli matching this feature in the environment. Though some contradictory evidence suggests that this could be counter-productive and actually exacerbate attentional capture by these distractors depending on the task-context (Moher & Egeth, 2012).

In this investigation we investigated what pattern of attentional inhibition or capture emerged for real-world threat-related stimuli which individuals would be motivated to avoid and ignore (Koster et al., 2006).

- **Successful inhibition hypothesis:** The distractor cost (vs no distractor baseline) will be *decreased* after being cued with the distractor feature vs when given no prior information.
- **Unsuccessful inhibition hypothesis:** There will be no difference in distractor cost (vs no distractor baseline) when the distractor is cued vs when given no prior information.
- **Elevated capture hypothesis:** The distractor costs (vs no distractor baseline) will be *increased* when cued with the distractor feature vs when a non-informative cue is presented.

METHODS

Participants (N = 40)

- Aged 18 – 38, mean = 25 (SD = 4.88)
- 26 Female; 14 Male
- Trait anxiety: $M = 42.45$, $SD = 9.64$

Design and task

- 3 x 3 design
 - Stimulus cue: distractor cue, target cue, non-informative cue
 - Distractor: no distractor, neutral hand distractor, threat distractor
- Randomised within each block

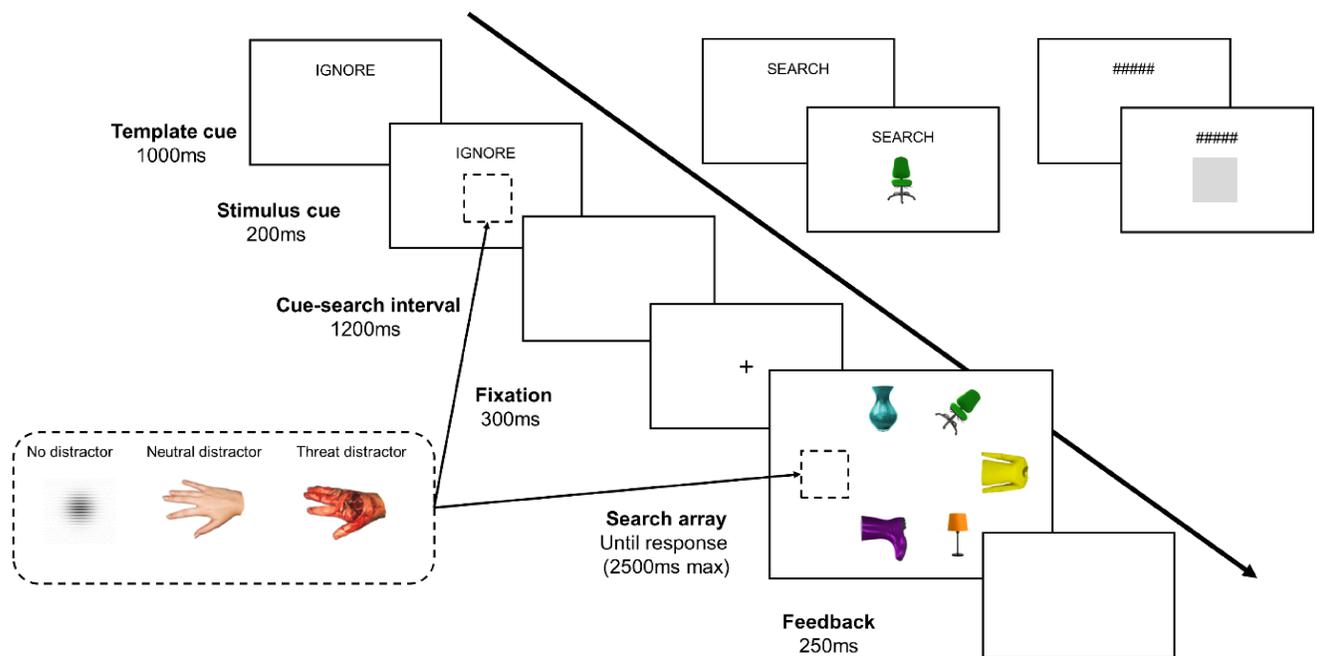
- Participants were instructed to identify the stimulus rotated 45° (responding either left or right) amongst upright and horizontal objects. The target object was randomly selected each trial.

Stimuli

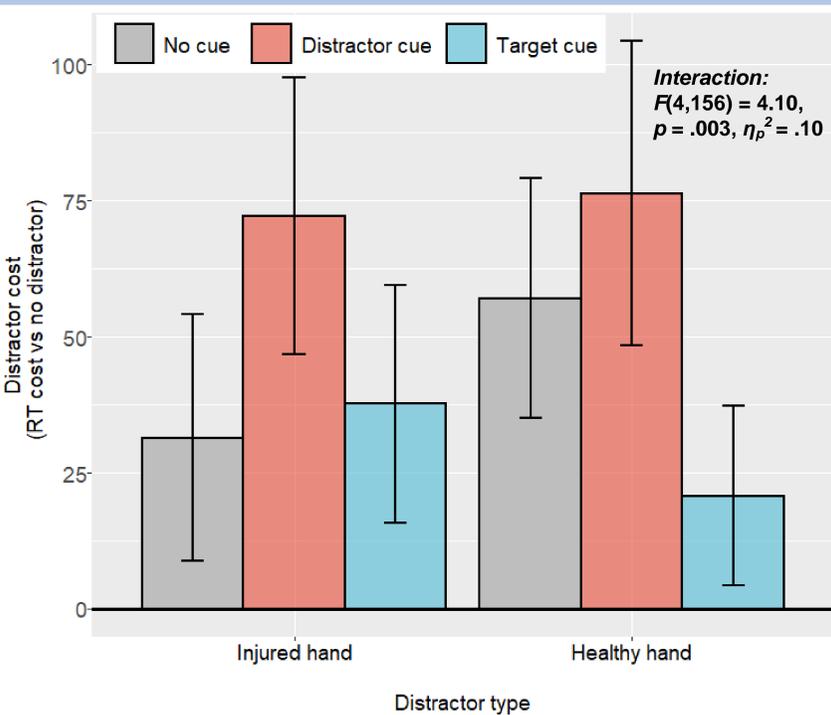
- Targets and filler stimuli: all coloured real-world images
- Object categories: chairs, shirts, shoes, lamps, vases, umbrellas, shoes
- Colours: blue, green, yellow, orange, turquoise, and purple
- Colours, target position, and stimulus category were all counterbalanced. All stimuli resized to 2.3° squares in a 10.1° circle comprised of 6 equidistant positions.

Distractors: Hand images

- 12 threat-related injured hand exemplars (e.g., frost-bite, burns, lacerations)
- 12 neutral healthy hand exemplar - matched for posture



RESULTS



Specific Bayesian priors

- Successful inhibition of distractor costs below no cue baseline: -42ms decrease (from Cunningham & Egeth (2016; Expt 1, Block 4))
 - Elevated attentional capture cost above no cue baseline: 40ms increase (from Cunningham & Egeth (2016; Expt 1, Block 1))
- Calculate as a half-normal distribution centred on zero - reflecting the null (Dienes, 2014)

Bayes factor interpretation:

- $BF > 3$ = Favours experimental hypothesis
- $BF \sim 1$ = Inconclusive
- $BF < .33$ = Favours the null hypothesis

KEY BAYESIAN PAIR-WISE COMPARISONS

Distractor cue conditions

Evidence suggested evidence against inhibition, and inconclusive evidence for capture, by neutral distractors when comparing cue vs no cue: $t(39) = 1.04$, $p = .305$, $g_z = .16$.

- Inhibition: $B_{H[0, -.42]} = .22$
- Capture: $B_{H[0, .40]} = 1.09$

Evidence suggested evidence against inhibition, and evidence for capture, by neutral distractors when comparing cue vs no cue: $t(39) = 2.18$, $p = .035$, $g_z = .34$.

- Inhibition: $B_{H[0, -.42]} = .14$
- Capture: $B_{H[0, .40]} = 5.79$

Target search cue conditions

• When cued with a target prior to neutral distractors, the neutral distractor cost was non-significantly lower versus the no cue condition: $t(39) = 2.75$, $p = .009$, $g_z = -.43$.

• When cued with a target prior to threat-related distractors, the neutral distractor cost was lower versus the no cue condition: $t(39) = .38$, $p = .707$, $g_z = .06$.

Exploratory block analysis (3 blocks)

There was no significant interaction between cue type, distractor, and block, $F(4, 78) = .86$, $p = .492$, $\eta^2_p = .02$. Suggests no difference depending on experience or practice.

SUMMARY

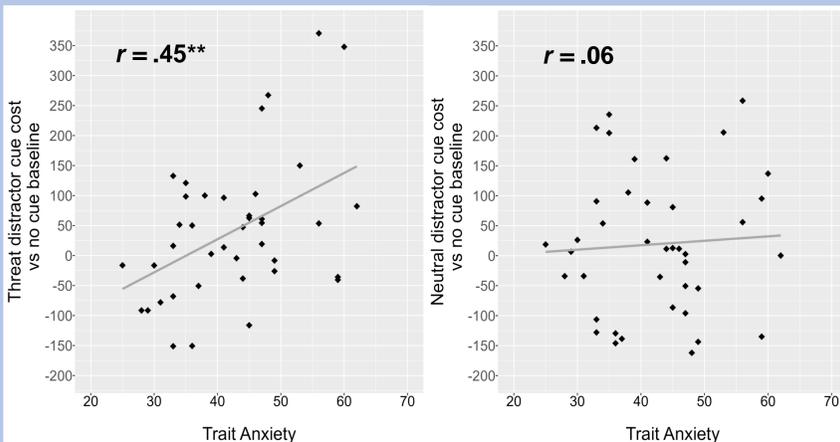
- Templates-for-rejections were ineffective at reducing attentional capture by both neutral and threat-related distractors and actually increased attentional capture by threat-related stimuli.
- Trait anxious individuals were more distracted by threat-related stimuli when they were cued beforehand with this stimulus features.
 - Disruption of attentional control? (Berggren et al., 2017)
 - Priming automatic detection goals? (Brown et al., 2020)
- Despite this there was no evidence of overall attentional capture by threat-related stimuli.
- Searching for specific target features did appear to reduce attentional capture, though this was only significant for neutral stimuli.
- Conventionally, attentional capture then avoidance of threat has been thought to reflect a *vigilance-avoidance* pattern (Mogg & Bradley, 1998), the current data suggest that actually deliberate avoidance may induce automatic vigilance/capture by threat.

Limitations

- Search goals and avoidance goals may disrupt one another when within the same block. Distractor cued distractor costs correlated with target cued distractor costs, $r = .60^{***}$ consistent with this (Stilwell & Vecera, 2019).
- Filler colours may have greater colour overlap with threat-distractor (i.e., red blood) meaning this may have been exposed to greater passive suppression. May explain lack of overall threat attentional capture.

Future research

- Contrast the ability of templates-for-rejection to suppress real-world vs novel/abstract shapes
- Explore template-for-rejection effects and target cued effects in isolation.



References

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