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Authors

Vella, Ashleigh
Rangelov, Dragan
Sewell, David K
[et al.](#)

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Self-relevance Facilitates Attention to Self-associated Targets on Feature-based Selective Attention Tasks

Ashleigh S. Vella (ashleigh.vella1@uqconnect.edu.au)
School of Psychology, University of Queensland, Brisbane, Australia

Dragan Rangelov (d.rangelov@uq.edu.au)
Queensland Brain Institute, University of Queensland, Brisbane, Australia

David K. Sewell (d.sewell@uq.edu.au)
School of Psychology, University of Queensland, Brisbane, Australia

Timothy Ballard (t.ballard@uq.edu.au)
School of Psychology, University of Queensland, Brisbane, Australia

Ada Kritikos (a.kritikos@uq.edu.au)
School of Psychology, University of Queensland, Brisbane, Australia

Abstract

The ‘Self’ has a prioritized cognitive status, attributed to an automatic bottom-up attentional enhancement for self-relevant stimuli. Two predictions follow if self-relevant information is automatically boosted. First, processing should be enhanced for self- compared to other-relevant targets. Second, interference should be greater for self- compared to other-relevant distractors. To investigate these predictions, we adapted a motion reproduction task. Participants first learned to associate a colour (blue, pink) with themselves and a stranger (other), then viewed a label (YOU or OTHER) and two different coloured superimposed random dot kinematograms (RDKs; blue, pink). A response dial recorded participants’ reproduced direction of motion for the coloured RDK associated with the presented label. Facilitation and interference for self- and other-labelled features was assessed by the angular difference between the reported and true direction of motion (signed error magnitude). There was a small, but reliable response bias in direction of distractor motion showing that attentional selection was imperfect. Further regression-based analyses quantified the degree to which self and other-related stimuli influenced responses (decision weights). As predicted, decision weights for target stimuli showed a significant advantage for self- compared with other-relevant motions. By contrast distractor weights did not differ significantly between self- and other-relevant features, suggesting self-relevance did not modulate the degree of interference and self-relevant stimuli did not automatically capture attention. Overall, we show that feature-based attention is enhanced for self-associated sensory input, but only when task-relevant.

Keywords: Self-biased cognition; feature-based selective attention; ‘the Self’

Introduction

Relating information to ‘the Self’ can enhance cognitive processing. For example, self-relevant stimuli are automatically afforded perceptual judgement benefits, with faster and more accurate processing for self- than other-relevant information (my car vs Sally’s car; Sui, He, &

Humphreys, 2012). This self-bias is found even when arbitrary stimuli with no prior personal relevance (e.g., colour, line orientation, and shape), are associated temporarily with ‘the Self’ in a single trial (Siebold, Weaver, Donk, & van Zoest, 2015; Sui, et al., 2012; Yin, Sui, Chiu, Chen, & Egner, 2019).

A long-standing assumption is that attention automatically interacts with brain regions that are activated by self-associated information to enhance stimulus processing, underpinning these self-relevant advantages (Shapiro, Caldwell & Sorensen, 1997; Sui et al., 2012; Sui & Rotshtein, 2019). It is unclear, however, if attention amplifies proactively or protects selectively self-relevant targets from interference. Understanding the interplay between attention and self-associated stimuli when they are both relevant and irrelevant is critical to answering this question.

According to the attentional bias account, attention is directed automatically (bottom-up) to self-referential information irrespective of its relevance to task performance (Dignath, Eder, Herbert, & Kiesel, 2022). Illustrating the Self’s prioritized attentional status is Moray’s (1959) dichotic listening task, where the participant’s own name automatically captured and directed attention to unattended auditory information in one ear, at the expense of task-relevant material in the other ear. Hence, self-relevant stimuli can serve as salient distractors when participants attend to target information. Evidence for the attentional bias account is mixed, however. For example, Dignath et al. (2022), in an adapted Stroop task found a reduced congruency effect when identifying coloured print in the possessive pronoun (i.e., my green) compared with control conditions (i.e., the green). This provides evidence against the attentional bias account, because possessive pronouns (self-relevant words) did not increase Stroop interference. Nevertheless, selective attention paradigms can address these mixed results.

Through selective attention we direct processing resources and select task relevant features such as colour, orientation,

and direction of motion, while simultaneously ignoring irrelevant competing distractor features (Andersen, Müller, & Hillyard, 2009; Rangelov & Mattingley, 2020). Nevertheless, distractor information can attract attention, producing interference effects (Andersen et al., 2009). Typically, perceptual self-relevance paradigms present static task-relevant self- or other-associated stimuli separately on successive trials and require dichotomous responses (Cunningham, Turk, Macdonald, & Macrae, 2008; Golubickis, Falbèn, Ho, Sui, Cunningham, & Macrae, 2020; Yin et al., 2019). Hence, it is unknown if self-relevant stimuli modulate feature-based selective attention for concurrently presented and moving self- and other-associated stimuli. Presenting two stimulus types concurrently potentially increases sensitivity to self-referential bias and the salience of distractors in feature-based selective attention (in contrast to Dignath et al., 2022).

Investigating the interference of self-relevant distractors on selective attention and responses to other-relevant targets Sui, Lui, Mevorach, and Humphreys (2015) employed a novel global-local paradigm. Participants associated familiar static shapes with themselves, a friend or stranger, and then were presented with a global shape comprised of a different local shape. Participants identified, by button press, the shape at both global and local levels faster for self-associated shapes when task-relevant compared with trials where the self-shape was a distractor, indicating that self-relevant stimuli act as salient distractors that interfere with selective attention (Sui et al., 2015). Another explanation, however, is that global-local tasks could recruit different perceptual strategies shifting the attentional spotlight (Eriksen & Hoffman, 1972; Posner, 1980). Previous research has shown self-relevance can modulate the expansion, contraction, or shifting of the attentional spotlight on spatial-based flanker tasks (Golubickis & Macrae, 2022). Understanding if self-reference enhances feature-based attention without modulating the attentional spotlight will disambiguate the attentional mechanisms underlying self-bias.

The typically used dichotomous (categorical) ‘correct’ and ‘error’ response judgements, however, do not capture the precision of sensory representations informing behavior on feature-based selective attention tasks (Nanay, 2022; Rangelov & Mattingley, 2020). One way to probe the influence of self-relevant distractors on feature-based selective attention is through continuous reproduction tasks (Prinzmetal, Amiri, Allen, & Edwards, 1998). Reproduction tasks present random dot kinematograms (RDK: circular cluster of moving dots) where a proportion of target dots move in a coherent direction, while distractor dots move randomly. This produces the percept of a global trajectory corresponding to real-world motion detection (Liu, & Hou, 2011). Participants reproduce the direction of the target dots, allowing measurement of the magnitude, direction, and variability of errors (Prinzmetal et al., 1998; Rangelov & Mattingley, 2020). To measure the effectiveness of selective attention, signed error magnitudes (i.e., angular difference between target and response) are computed from the

continuous responses. If selective attention is effective, responses will be close to the target motion and the error magnitude will be small. If selective attention is poor, however, responses should be directed away from the target and towards the distractor features. Additionally, attention increases precision for reproduced target features, therefore self-relevant targets should enhance attention decreasing variability on continuous responses (Prinzmetal et al., 1998).

Furthermore, enhanced feature-based selective attention for self-relevant stimuli is potentially due to an enhancement of self-relevant targets, interference from self-relevant distractors, or both, as described in the attentional bias account. A reproduction task can address this issue because the continuous measure lends itself to a regression analysis of decision weights, reflecting the relative influence of target and distractor stimuli on responding (Rangelov, West, & Mattingley, 2020). Rangelov and Mattingley (2020) had participants reproduce the average direction of the two consecutive target-coloured RDKs, ignoring the spatially overlapping distractor RDK direction. Analysis of decision weights showed both targets and distractors influenced decisions, with targets more influential than distractors. We postulate that if self-relevant information is automatically boosted, as stated in the attentional bias account, it will act as a highly salient stimulus enhancing self-relevant target and distractor weights compared with other-relevant stimuli.

To date, Sui et al. (2015), using a dichotomous response format, is the only study that has investigated selective attention with self-relevant stimuli serving as both target and distractor. To build on this work, the current study aims to firstly, determine the variability and degree of interference introduced by self-relevant versus other-relevant distractors, generalizing self-biased feature-based selective attention to global motion direction. Secondly, we aimed to investigate if self-biased feature-based selective attention is underpinned by facilitation of self-relevant targets, increased interference from self-relevant distractors, or both.

We use a RDK task to investigate self-biased feature-based selective attention without shifting spatial attention. Participants associated colours with themselves and an other-referent, and then completed an adapted version of the RDK task, where two differently coloured and spatially overlapping RDKs were presented at fixation (thereby controlling for spatial attention). RDK colors corresponded to the self- and other-associated colors. On each trial, participants were cued by either a self or other label and reproduced the direction of motion of the cued dots with a response dial. We hypothesized that self-relevant trials would show a significantly smaller mean signed error magnitude than other-relevant trials, due to increased interference from self-relevant distractor dots. Based on Prinzmetal et al. (1998), a significantly larger standard deviation of signed error magnitudes was predicted for other- than self-relevant trials. If self-information is automatically boosted, we predict self-relevant trials will show significantly larger target weights and smaller distractor weights, than other-relevant trials.

Method

Participants

One hundred and four (Female: 66, *M*: 23.53 years, *SD*: 4.66, range: 18-62 years) participants recruited from the on-line SONA system voluntarily completed the experiment for course credit or monetary payment of \$20.00. Three participants self-reported being colour-blind and were removed from the analysis. Five reported being left-handed and five were ambidextrous. All participants were Caucasian who had lived in Australia for more than five years and spoke English. The study complied with the University of Queensland Human Research Ethics Committee and COVID safety plan, Ethics approval number: 2019001662.

Materials & Apparatus

During the task, a white label (Calibri font; 140 px × 52 px), either YOU or SAM, appeared 160 px from the screen's top edge and 328 px from centre (horizontally centred). Two different coloured, blue (RGB: 0, 153, 255) and pink (RGB: 255, 51, 153), spatially overlapping RDKs, consisting of a circular patch (200 px diameter) of both distractor and target dots, were presented centrally on a black background. One served as the target and the other as the distractor RDK. The target RDK consisted of coloured dots associated with the presented label, moving along either 45-, 135-, 225- and 315-degree vectors. The distractor RDK consisted of coloured dots in the non-presented label's associated colour, moving along either 0/360-, 90-, 180- and 270-degree vectors. Both target and distractor RDKs contained dot size: 4 px (radius), dot persistence: 100 ms (dot-life), dot period: 3000 ms (theoretical time to traverse the RDK diameter), dot count: 40 per RDK, and an 80% dot coherence (20% random movement). To prevent a depth illusion, dots from the two RDKs never overlapped.

The response dial was 200 px in diameter and centrally positioned with a pointer that rotated around the circumference of the dial from a central fixation point (See Figure 1). The pointer contained smaller moving arrows that drifted towards the circumference in the response dial. The perimeter of the response dial was the same colour (blue, pink) as the target dots, serving as a prompt.

A standard Apache web server hosted by the University of Queensland ran the experimental script from participants' web-browsers. Participants could not complete the experiment on an iPad or smartphone. The program resized screens to fit a 800 × 600 px box, irrespective of the computers set resolution.

Procedure

After providing informed consent, participants commenced the online experiment consisting of four phases: pre-test questionnaire, learning association phase, motion reproduction task, and post-test questionnaire.

Pre-test Questionnaire Participants indicated their gender and were introduced to an other-referent named Sam (a fictitious stranger – the other referent in the task). Sam's gender matched the participants to control for out-group gender effects which can modulate self-biased cognition (Golubickis et al., 2020; Johnson, Gadon, Carlson, Southwick, Faith, & Chalfin, 2002; Payne, Lavan, Knight, & McGettigan, 2022). A photo (male or female) and short description detailing Sam's favourite TV show and music preferences were presented. Lastly, participants' age, colour-blindness status, handedness and language were recorded.

Learning Association Task Next, participants were instructed they and Sam would be represented by the colour blue and pink respectively (counterbalanced across participants). On each trial, a label SAM or YOU were centrally presented, with two response boxes on the left and right side of a black screen. One box was pink the other was blue. SAM and YOU labelled trials were presented in a randomly determined order. To learn the association between the label (YOU or SAM) and associated colour (blue or pink), participants clicked the blue or pink response box associated with the presented label. For example, if Sam is associated with the colour pink and the SAM label was shown, participants needed to click the pink response box. Instant feedback (red cross) indicated an incorrect selection, participants then reselected the correct colour associated with the presented label. Each trial was displayed until a correct response was made, followed by a blank black screen with an ISI of 250 ms. The learning association task terminated once five consecutive correct mouse responses (five trials) were completed.

In the learning association task, blue and pink, response boxes (275 px × 205 px), appeared 305 px below centre and 408 px to the left and right sides. A white YOU or SAM label in (Calibri; 178 px × 65 px) appeared 450 px from the screen's top edge and 25 px above centre (horizontally centred). A red (RGB: 255, 0, 1) cross (155 px, × 143 px) appeared 265 px below centre and 133 px from the bottom of the screen (horizontally centred).

Motion Reproduction Task During this phase, participants reproduced the direction of motion for the coloured dots associated with the presented label. Each trial started with an initial 500 ms during which a blank black screen was shown, followed by showing a white fixation cross for 260 ms at the centre. Next, two overlapping RDKs in different colours appeared together with a label indicating the target colour (i.e., written words "YOU" or "SAM") and remained on screen for 2000 ms (See Figure 1). The response dial appeared thereafter comprising a vertical pointer (starting at 0 degrees) within a circle and participants adjust the pointer orientation to match the motion direction shown in the target-coloured RDK. For example, if Sam was associated with pink, then on SAM-label trials, participants needed to reproduce the motion direction of the pink RDK while ignoring the motion direction in the blue RDK. Once the

response dial was adjusted, participants clicked the mouse to submit the response, terminating the trial. Participants completed three blocks of 96 trials each with 32 different motion direction combinations randomly displayed. Between experimental blocks, task instructions were re-stated. Completing all three blocks ended the motion reproduction task.

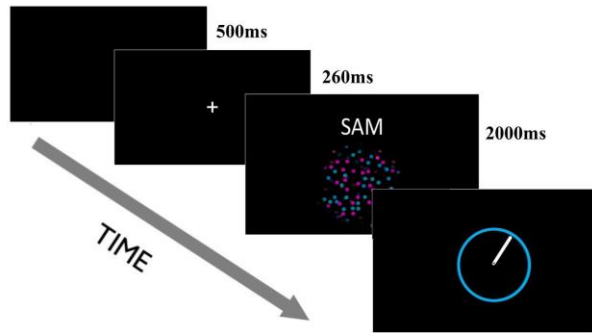


Figure 1: Stimulus sequence in a typical trial of the motion reproduction task. The dial pointer started at zero degrees, and a mouse click submitted the reproduced angle. For illustrative purposes, the figure is not to scale.

Post-test Questionnaire A manipulation check confirmed participants' memory of their associated colour (i.e., 'what colour were YOU assigned'). Participants selected either 'blue' or 'pink' with the mouse, from a two-alternatives forced-choice response box. Finally, participants were thanked and debriefed.

Results

Inclusion criteria

From the 104 participants who completed the study, 88 passed the preliminary inclusion criteria. Preliminary inclusion criteria were as follows: did not indicate to be colour-blind at the pre-test questionnaire and correctly indicated their assigned colour at the post-test questionnaire. Anticipatory responses faster than 200 ms, and non-stimulus driven responses longer than 10000 ms (sufficient time to complete task) were excluded, eliminating 1.6% of trials from the analysis. Additionally, trials where participants did not adjust the response dial (did not move the mouse/dial just clicked) were excluded from the analysis, eliminating 5% of trials. To detect participants who guessed on most trials, the distribution of error magnitudes (angular difference between response and target) was compared to a uniform distribution. The probability of participants distribution given the null hypothesis (i.e., uniform distribution = pure guessing) was tested using a chi-squared test, if participants p -value exceeding 0.001 they were eliminated. Eleven participants were unable to complete the task ($p > .001$) and were subsequently removed, leaving data from 77 participants to be analysed.

Signed Error Magnitude

Error magnitude, expressed in pi-radians, is the angular difference between reproduced response and target angle. Small absolute error magnitudes suggest less deviation from the target and more efficient selective attention. Large absolute error magnitudes indicate more deviation from the target and less efficient selective attention. Signed error magnitudes indicate the direction of the error either towards the distractor direction of motion (positive sign) or away from the distractor direction of motion (negative sign). Circular standard deviation (SD) of signed error magnitudes measured the variability in reproduction responses, estimating response precision.

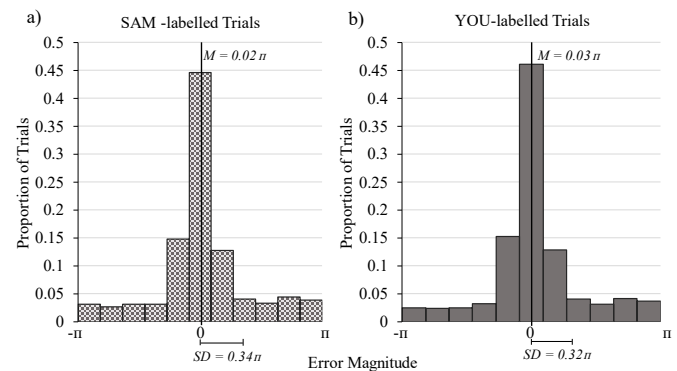


Figure 2: Label-level histogram (bars) of the Signed Error Magnitude [pi-radians] for all SAM- (a) and YOU-labelled trials (b), pooled across all participants. Mean (M) and circular Standard Deviation (SD) are displayed. Bar heights reflect the proportion of trials found within each signed error magnitude bin. Negative π error magnitude indicates responses away from the distractor motion directions, positive π reflect responses towards distractor motions.

Signed Error Magnitude Results We initially calculated the mean and circular SD of the Signed Error Magnitudes across participants for each label condition. One-sample t -tests of the mean signed error magnitude against zero revealed a small but highly significant shift towards the distractor motion for both SAM- ($M = 0.02$), $t(76) = 3.21$, $p = .002$, $d = 0.37$, and YOU-labelled trials ($M = 0.03$), $t(76) = 4.30$, $p < .001$, $d = 0.49$. However, a paired samples t -test revealed the mean signed error magnitudes shift towards distractors did not differ significantly between SAM- and YOU-labelled trials $t(76) = -1.04$, $p = .301$, $d = 0.119$. Circular SD for signed error magnitude differed significantly between labelled conditions $t(76) = 2.64$, $p = .01$, $d = 0.30$, such that error magnitude was smaller (i.e., responses were more precise) for YOU- ($SD = 0.32$) than for SAM-labelled trials ($SD = 0.34$; See Figure 2).

Linear Regression Analysis [Ordinary Least Squares]

To quantify decision-weights on how much each signal influenced the reproduced direction of motion, a complex-

valued linear regression analysis [ordinary least squares (OLS)] was conducted on the target and distractor motion direction. Two regressions, one for SAM-labelled trials (Equation 1) and one for YOU-labelled trials (Equation 2) were conducted separately per participant. For each label condition target (T) and distractor motions (D), expressed as complex numbers, with some error (e), were regressed to reproduced response angles (R).

$$R = f(T_{SAM}, D_{YOU}) + e \quad (1)$$

$$R = f(T_{YOU}, D_{SAM}) + e \quad (2)$$

Complex numbers for the target and distractor (T & D) are a vector comprised of the length and the angle (see Rangelov & Mattingley, 2020, for the rationale and technical details). The length of the complex-valued weights reflects the influence of predictors on responses or decision weights (ω_{Target} & $\omega_{Distractor}$). The angle of the regression weight reflects the direction of influence, and it is referred to as the weight angle (θ_{Target} & $\theta_{Distractor}$). To linearise the direction of influence, the estimated angles were cosine-transformed into a linear variable ranging between -1 and 1 (\cos_{Target} & $\cos_{Distractor}$). Finally, decision weights (i.e., ω_{Target}) and cosine values (i.e., \cos_{Target}) were multiplied to produce the final decision weight for analysis (i.e., $\omega_{Target} = \omega_{Target} \times \cos_{Target}$). Hypothetically, effective selective attention should show target weights (ω_{Target}) distinct from zero, and distractor weights ($\omega_{Distractor}$) near zero (Rangelov & Mattingley, 2020). Difference between decision weights for YOU and SAM-labelled trials reflect target facilitation, and / or distractor interference. All analyses were conducted on final decision weights (i.e., ω_{Target} & $\omega_{Distractor}$).

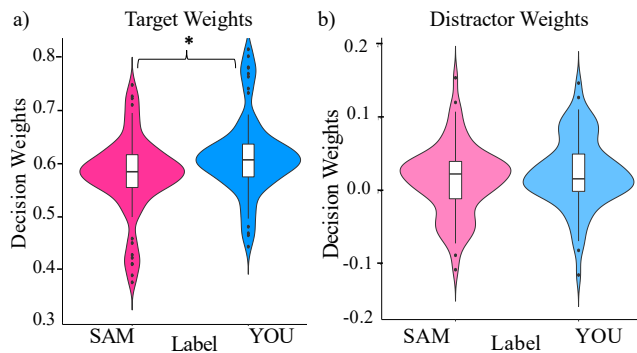


Figure 3: Box plots show decision weights median and interquartile range for target (a), and distractor motions (b) on SAM- and separately YOU-labelled trials (pink & blue, respectively). Violin plots show individual normalized (participant-specific variance removed) scores as specified in Morey (2008). YOU-labelled targets were significantly larger than SAM-labelled targets ($*p < .05$). No significant difference was found between distractors. Note the difference in y-axis scale between panels a & b.

Decision Weight Results A one-sample Wilcoxon Signed-Ranked test showed distractor weights on YOU- ($Mdn = -0.001$, $SD = 0.12$) and SAM-Labelled trials ($Mdn = 0.008$, $SD = 0.13$), were not significantly different from zero, $z(77) = 1.22$, $p = .224$, $r = 0.14$; $z(77) = 0.98$, $p = .328$, $r = 0.11$ (YOU and SAM respectively). A paired-samples, Wilcoxon Signed-Ranked test showed no significant difference between YOU- and SAM- median distractor weights, $z(77) = -0.55$, $p = .578$, $r = -0.04$. A one-sample Wilcoxon Signed-Ranked test showed YOU- ($Mdn = 0.65$, $SD = 0.27$) and SAM- ($Mdn = 0.52$, $SD = 0.26$) targets were significantly different from zero, $z(77) = 7.62$, $p < .001$, $r = 0.87$; $z(77) = 7.62$, $p < .001$, $r = 0.87$. A paired-samples Wilcoxon Signed-Ranked test indicated YOU- had a significantly higher median target weight than SAM-labelled trials, $z(77) = -2.14$, $p = .033$, $r = -0.17$ (See Figure 3). From our sample, 61% (47 out of 77) of participants showed a larger weight for YOU- compared with SAM-targets. Hence, participants relied more strongly on the target motion direction when it was self- than other-relevant.

Discussion

Using continuous measures to characterize response variability, and decision weights to assess the relative contribution of target and distractor motion signals (Rangelov & Mattingley, 2020), we investigated the interference for motion direction by self-relevant distractors on other-relevant targets, and vice versa. We also investigated if self-biased effects were due to target enhancement, distractor interference or both. Participants associated a colour (blue, pink) with themselves and a stranger (Sam), then reproduced the direction of motion for the presented label's coloured RDK, ignoring the superimposed distractor coloured RDK.

We hypothesized the mean signed error magnitude would be significantly larger for other- than self-associated target trials. Contrary to predictions, we found no significant mean signed error magnitude difference when reproducing motion directions for self- and other-associated targets. Therefore, with no observable difference, distractors may equally influence the reproduction of motion direction in responses to self and other-relevant targets, regardless of the distractor's self- or other-association. Alternatively, our paradigm might not be sufficiently sensitive enough to see self-biased distractor effects. Notably, on self- and other-relevant target trials participants' mean signed error magnitudes were positive and significantly different from zero. Thus, while self- and other-relevant distractors did not differ in the degree of interference, overall distractors interfered with responses to targets. Consistent with predictions, there was a significantly lower circular standard deviation/higher precision in responses for self- compared with other-relevant targets. Similarly, Prinzmetal et al. (1998), reported higher precision for reproducing attended orientation and colour features. Therefore, these results potentially reflect enhanced feature-based attention for self-relevant targets, leading to more precise mental imagery (mental representations without direct sensory input; Nanay, 2022) for self-relevant motions.

Prior to this study it was unclear whether self-biased performance on feature-based selective attention tasks is due to enhanced processing of self-relevant targets, interference from self-relevant distractors, or both. To probe this question decision weights were analyzed. We hypothesized, a significantly larger distractor weight for self- compared with other-relevant distractors. Contrary to the hypothesis and attentional bias account, there was no significant difference in decision weights for self- and other-relevant distractors, indicating self-relevant advantages of feature-based selective attention may not be attributable to distractor interference. However, consistent with predictions, self-relevant targets had a significantly larger decision weight than other-relevant targets. This suggests that when it is task relevant, self-associated information is enhanced, indicating target facilitation underpins self-biases in feature-based selective attention. Overall, decision weight results suggest participants actively selected targets and ignored concurrently presented distractors, rather than passively attending to all stimuli.

Collectively, signed error magnitude and decision weight results indicate a significant benefit for self-relevant target trials. Consistent with previous literature showing enhanced cognition for self-relevant stimuli (i.e., perception, memory, attention; Cunningham et al., 2008; Sui et al., 2015; Sui, Sun, Peng, & Humphreys, 2014), our results show self-relevant advantages can be extended to continuous decisions.

Previous research has shown self-relevant distractors can automatically capture bottom-up attention at the expense of task-relevant information (Cherry, 1953; Moray, 1959; Sui et al., 2014). Self-relevant distractors, however, showed a similar weight as other-relevant distractors. This possibly suggests self- as well as other-relevant distractors may have been inhibited and did not interfere with selective attention of the target. While we do not deny self-relevant stimuli can capture attention, it does not seem to be driving self-biased feature-based selective attention on motion direction tasks. Notably, our results contradict the attentional bias account and align with Dignath et al. (2022), reporting a reduced Stroop interference for self-relevant compared with control distractors. Both self and separately other-relevant distractor weights showed minimal influence on target responses, however. Therefore, the lack of a self-other difference in distractor weights may be explained by ceiling effects, with targets displayed at 80% coherence making target selection easy. Ten percent coherence is the lower perceptual limit (Bischof, Reid, Wylie, & Spetch, 1999; Watanabe, Nanez & Sasaki, 2001); therefore, distractors might not be influential because they are easily inhibited. To eliminate this alternative explanations, future research should replicate the current paradigm at 10% coherence. This will clarify if self-relevant distractors interfere with selective attention.

Nevertheless, precision and target weights showed a self-relevant advantage, indicating that an enhancement of self-relevant targets underpins self-biased feature-based selective attention (Prinzmetal et al., 1998). The target facilitation effect supports the widely held assumption that an attentional

boost underpins self-biased cognition (Humphreys & Sui, 2016; Shapiro et al., 1997; Sui et al., 2012; Sui & Humphreys, 2017; Sui & Rotshtein, 2019). This self-biased facilitation effect only occurs when task relevant, however, suggesting the enhancement is under executive control; that is, a top-down attentional mechanism may contribute to self-biased cognition (Dignath et al., 2022; Sui & Rotshtein, 2019). Understanding if self-relevant advantages are top-down or bottom-up helps harness when these effects are adaptive or maladaptive (discussed below).

Rangelov and Mattingley (2020) found selective attention is an imperfect filter between sensory processing and decision-making, potentially modulating the evidence accumulation of sensory signals. Therefore, with target facilitation found on self-relevant trials it is possible a faster evidence accumulation rate for self-relevant decisions contributes to self-biased cognition. Future research should explore how feature-based selective attention for self-relevant targets influences perceptual decision-making mechanisms through evidence accumulation models. Combined with current results, this future direction will illuminate how self-relevant selective attention modulates evidence accumulation.

A key strength of this paradigm is the application of a continuous response measure to self-relevant literature which allows more fine-grained characterization of self/other effects, yielding measures of central tendency, variability, and response distribution (Prinzmetal et al., 1998). The self-relevance field is dominated by paradigms employing dichotomous responses and manipulating spatial attention (Cunningham et al., 2008; Golubickis et al., 2020; Sui et al., 2012; 2015; Yin et al., 2019). This novel paradigm creates a nuanced way to investigate what mechanisms underly self-biased cognition, and how the Self may affect hitherto unexplored cognitive processes such as integrative decision-making. Future research should replicate the current study but instruct participants to reproduce the average motion of self- and other-relevant dots. In our current task we found self-relevant target signals were more influential than other-relevant target trials. Therefore, potentially on integrative decisions self-relevant target signals might be more heavily weighted, biasing the average motion reproduction towards self-targets. This will clarify if self- and other-relevant targets can be combined with equal weighting, or whether self-relevant targets bias reproduction responses even when maladaptive.

In conclusion, target weights and precision showed an advantage for self-relevant stimuli, suggesting when task relevant self-associated motion directions are afforded an attention boost enhancing feature-based selective attention and broadly self-biased cognition. Conversely, mean signed error magnitude and distractor weights did not differ between self and other-relevant stimuli. This suggests self-relevance did not modulate the degree of interference, as proposed in the attentional bias account. Nevertheless, this novel paradigm provides a new way to investigate self-biased cognition.

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