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Try to see it my way: Embodied perspective enhances self and friend-biases in perceptual matching

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ABSTRACT

Four experiments tested whether self- and friend-biases in perceptual matching are modulated by whether stimuli are presented aligned with the participant's body and seen from the same perspective (the embodied perspective). Participants associated three colours (blue, green, and red) with three people (self, friend, and stranger) and then judged if a pairing of a colour and a personal label matched. The colour was painted on the T-shirt of an avatar. We modulated the perspective of the avatar along with its alignment with the participant's body. In Experiment 1 a single avatar appeared. In Experiments 2–4 there were two avatars, and we varied the social communicative environment between the two avatars (social vs. non-social in Experiments 2/4 vs. 3) and the distance between the two avatars and fixation (close, far, or equal in Experiment 2, 3 or 4). With a single avatar, performance on friend-match trials selectively improved when the avatar was aligned with patient's body and viewed from the participant's (first-person) perspective. The self-bias effect was unaffected by the perspective/embodiment manipulation and it was strong across all conditions. However with two avatars performance on both self- and friend-match trials improved when the target stimulus appeared on the avatar adopting a first person perspective and aligned with the participant's body, when two avatars were shown in a social-communicative context. These selective improvements disappeared when two avatars turned their back on one another in a non-communicative setting. The data indicate that self- and friend-biases in perceptual matching are modulated by both how strongly stimuli align with the participant's perspective and body, and the social communicative situation. We suggest that self-biases can reflect an embodied representation of the self coded from a first-person perspectives.

1. Introduction

People show biased responses towards stimuli relating to themselves and people/groups relating to them rather than to other people. These effects are pervasive and modulate performance on a wide range of tasks including recall and recognition (Cunningham, Turk, & Macrae, 2008; Moradi, Sui, Hewstone, & Humphreys, 2015; Rogers, Kuiper, & Kirker, 1977; Sui & Humphreys, 2013), trait judgments (Klein, Loftus, & Burton, 1989; Rogers et al., 1977) and face discrimination (Ma & Han, 2010; Sui, Zhu, & Han, 2006). The factors that underlie these biases, however, remain poorly understood. In the present study we report novel data which show that these biases in simple perceptual matching tasks reflect an embodied, first-person perspective based representation, with performance being boosted by seeing stimuli from the perspective aligned with the participant's body (Tsakiris, 2010;Vogeley & Fink, 2003). The data indicate that the biases draw on domain-specific information (an embodied self-representation) that qualitatively distinguishes ourselves from other people, but which can be applied also to people close to us (e.g., our best friend). This idea differs from prior work emphasizing the role of domain-general factors such as reward and emotion (basic behavioural drivers) in self-bias (Northoff & Hayes, 2011; Sui, He, & Humphreys, 2012). We consider below potential candidate factors that could contribute to biases to ourselves and close others by contrasting prior research focusing on domain-general factors (e.g., attention, reward, emotion) to the current study focusing on domain-specific biases.

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1.1. Factors contributing to self biases

There is evidence that self-related information recruits attention more strongly than other types of information, and this leads to enhanced processing of self-related stimuli (Humphreys & Sui, 2015; Sui & Humphreys, 2015). For example, Sui, Liu, Mevorach, and Humphreys (2013) used a shape association procedure that we will exploit also in the current study. They first had participants associate a shape with either themselves, their best friend or a stranger. Subsequently they presented the shapes in hierarchical (local-global) figures and had participants discriminate whether the shapes at one level (e.g., the local forms) were either (i) the self or the stranger or (ii) the friend or the stranger. There were strong interference effects from the distractor level (e.g., the global shape for local targets) when it corresponded to the self relative to when it corresponded to the friend, consistent with self-related distractors automatically attracting attention. The behavioural effects were similar to those found when the perceptual saliency of the target and distractor levels is varied (e.g., by blurring to make the global shape more salient; see Mevorach, Shalev, Allen, & Humphreys, 2009). Moreover, the neural structures involved in rejecting self-related distractor shapes overlapped with those involved in rejecting perceptually salient distractors (Sui et al., 2013), suggesting that self-related stimuli had enhanced salience - though this was related to their social significance rather than having distinctive perceptual properties.

However even if self-related stimuli are attentionally salient, what can bring about this effect? One argument is that self-biases emerge due to the influence of some 'domain general' factor which can apply to any stimulus but which happens to be more strongly linked to the self than to other people. A candidate factor here is reward, which can generally modulate the processing of many stimuli but perhaps particularly the self. For example, Northoff and Hayes (2011) have argued that self-related stimuli may be intrinsically rewarding, and so such stimuli might attract attention through their associated reward. There is evidence that differential reward values can modulate attention to visual displays. For example, Anderson and Yantis (2012) trained stimuli with different reward values and then presented them as distractors in a subsequent search task. Distractors associated with high reward attracted attention away from targets (see also Chelazzi et al., 2014; Chelazzi, Perlato, Santandrea, & Della Libera, 2013; Hickey, Chelazzi, & Theeuwes, 2010, 2014). There is also both neural and behavioural evidence indicating similarities between reward and self-processing. For example, self-related processing is associated with the activation of cortical midline structures (Northoff & Bermpohl, 2004; Schneider et al., 2008) which are also activated by reward (e.g., Izuma, Saito, & Sadato, 2008; Richards, Plate, & Ernst, 2013; Rushworth, Noonan, Boorman, Walton, & Behrens, 2011; Sescousse, Caldú, Segura, & Dreher, 2013). At a behavioural level, Sui et al. (2012) showed similar effects on perceptual matching from self- and reward-associations. Participants associated different shapes with either labels for the self, a friend or a stranger (see Sui et al., 2013, above) or with different reward values. After this the task was to decide if shape-label associations were as originally shown or re-paired. Matching performance was substantially better both for self- and for high-reward associated stimuli, relative to stimuli associated with other people or low reward. Furthermore, the self- and high reward-biases both increased when the shapes were degraded, consistent with both affecting perceptual processing of the shapes (though see Enzi, de Greck, Prösch, Tempelmann, & Northoff, 2009; Sui, Yankouskaya, & Humphreys, 2015).

We may consider a factor such as reward to be 'domain general', as it will modulate many aspects of learning and does not have any intrinsic aspect that specifically relates to the self. However, there may be 'domain specific' aspects of the self, that are particular to the self and not shared with other stimuli. One potential factor is that self-judgments recruit an embodied representation of the self that is not typically recruited by other stimuli. Decety and Grezes (2006) proposed that a domain-specific embodied representation of the self is one driver of social biases as well as any domain-general mechanisms (e.g., reward and emotion). Vogeley and Fink (2003) have similarly proposed that self-consciousness is dependent upon participants adopting an egocentric (first-person perspective) reference frame centered to the orientation of our own body. The importance of first-person perspective and embodiment for self-related judgments has been demonstrated in a number of paradigms. For example, the rubber hand illusion reflects a misattribution of body ownership to a rubber hand that is stimulated congruently with the participant's own hand (Maister, Slater, Sanchez-Vives, & Tsakiris, 2015; Tsakiris, 2010). However, the illusion can be abolished if the rubber hand is not aligned with a reference frame based on the position aligned with the participant's own hand (Costantini & Haggard, 2007). Vogeley and Fink (2003) also proposed that the orientation of the body reflects personal perspective taking, and the first personal perspective taking refers to the centeredness of one's own experiential space on one's own body, which reflects bodily self-consciousness. Also judgments about whether pairs of objects would be used together are affected by the spatial positioning of the objects (e.g., whether a knife is to the right or left of a fork), but only when the stimuli are seen from a first-person perspective and aligned with the participant's body (Yoon, Humphreys, & Riddoch, 2010). Similarly, the ability of patients with visual extinction[1] to be aware of two objects is affected by placing objects in the normal locations for action (e.g., a knife to the right of a fork), but primarily when the object locations are seen from a first-person perspective aligned with the patient's body (Humphreys, Wulff, Yoon, & Riddoch, 2010). Extinction is reduced when objects are typically used together and seen from this reference frame. Such results suggest that embodied representations of the self, specifying a first-person perspective, modulate self-related judgments.

On the other hand there is also evidence that perspectives other than our own can automatically be computed. Samson, Apperly, Braithwaite, Andrews, and Bodley Scott (2010) had participants make judgments about the number of targets that could be seen either from the participant's own perspective or from the perspective of an avatar present in the scene with the objects. They found effects of congruity (whether the avatar and the participant would see the same number of targets) not only on judgments made to the avatar but also on judgments made about the participant's own perspective. The former result would be expected if the participant's own perspective is computed automatically; however interference from the avatar's perspective suggests that the other person's perspective was also computed. Qureshi, Apperly, and Samson (2010) extended these results by showing that the effects of perspective incongruity (Samson et al., 2010) increased when participants carried out a secondary task, but this effect was constant for the self- and other-perspective judgments. The data indicate that the other's as well as the self perspective is computed automatically, affecting selection of whichever perspective is demanded for the task. There are constraints on these effects, however, Mattan, Quinn, Apperly, Sui, and Rotshtein (2015) had participants associate particular avatars with the self or with another person and then examined performance when two avatars were present (self and other person). The task was to decide on the number of dots seen by one of the avatars. Mattan reported an advan-

[1] Patients with visual extinction are able to report a single item presented in the visual field contralateral to their lesion but fail to notice the same stimulus when an item appears at the same time on the ipsilesional side.