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I know you can see me: Social attention influences bodily self-awareness

Nesrine Hazem[a,b,c,*], Nathalie George[b,c,d,e,f], Matias Baltazar[a], Laurence Conty[a]

[a] Laboratory of Human and Artificial Cognition (CHart-UPON EA4004), Paris 10 University, Nanterre, France
[b] Institut du Cerveau et de la Moelle épinière (ICM), Social and Affective Neuroscience Laboratory and Centre MEG-EEG, Paris, France
[c] Sorbonne Universités, UPMC Univ., Paris 06, UMR_S 1127, Paris, France
[d] CNRS, UMR 7225, Paris, France
[e] Inserm, U 1127, Paris, France
[f] ENS, Centre MEG-EEG, Paris, France

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ABSTRACT

It has recently been demonstrated that eye contact influences bodily self-awareness. Here, we investigated if the belief of being the target of another person's attention may also induce such influence. We created videos of an individual wearing two different pairs of sunglasses. We manipulated the participants to believe that they were in on-line connection with the individual and that one of the pairs of sunglasses was obstructed so that the individual could not see them through it. We demonstrated that the perception of an individual wearing see-through sunglasses, as compared to obstructed sunglasses or a low-level baseline condition, led to a greater correlation between the participants' rating of the intensity of their bodily reactions and their skin conductance response to emotional pictures. This shows that the belief to be watched by another social agent increases bodily self-awareness and further suggests that such belief is embedded in direct gaze perception.

1. Introduction

Perceiving another's gaze directed at the self (i.e. a 'direct gaze') has a powerful impact on human cognition and behaviour and direct gaze has been proposed to be processed by a specific brain network (Senju and Johnson, 2009). Besides capturing attention (Conty, Tijus, Hugueville, Coelho, & George, 2006; Senju and Hasegawa, 2005; Senju, Hasegawa, & Tojo, 2005), direct gaze perception facilitates memory for faces (Mason, Hood, & Macrae, 2004; Vuilleumier, George, Lister, Armony, & Driver, 2005) and discourses (Fullwood and Doherty-Sneddon, 2006), it influences the perception that the beholder has of the gazing individual (Napieralski, Brooks, & Droney, 1995), and it favours affiliative behaviours (Nettle et al., 2013; Wang, Newport, & Hamilton, 2011). Recently, another direct gaze effect on human cognition has attracted researchers' interest: direct gaze perception has been shown to increase self-awareness (Baltazar et al., 2014; Pönkänen, Peltola, & Hietanen, 2011).

Pönkänen et al. (2011) reported that, in live interaction, subjective ratings of "public self-awareness", which reflects how much one is concerned toward aspects of the self that are external and observable by others (Govern and Marsch, 2001), were higher when seen faces displayed direct compared to averted gaze. Furthermore, we recently showed that the perception of direct gaze – as compared to that of averted gaze or of a mere fixation cross – also increased a private aspect of self-awareness, that is, bodily self-awareness (Baltazar et al., 2014). In this experiment, bodily self-awareness was measured in the form of the correlation between the participants' ratings of the intensity of their bodily reactions in response to emotional pictures and their skin conductance response (SCR) to these pictures, which is associated with autonomic sympathetic activation and reflects bodily arousal (Mendes, 2009). Therefore, direct gaze perception induces greater sensitivity not only to aspects of the self readily perceived by others but also to private aspects of self-awareness, which are related to internal aspects of the self, not directly accessible to others' gaze (Auzoult, 2013), such as bodily self-awareness, i.e. the awareness of the afferent information that arises from within the body (Cameron, 2001).

* Corresponding author at: Social and Affective Neuroscience Laboratory, Institut du Cerveau et de la Moelle épinière (ICM), 47 bd de l'hôpital, 75013 Paris cedex 13, France.
E-mail address: Ness.hazem@gmail.com (N. Hazem).

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The idea that the perception of direct gaze may increase self-awareness is not new (see Argyle, 1975; Reddy, 2003). It has been proposed that this direct gaze effect emerges early during development and may play a fundamental role in the acquisition of conceptual representations of the self (Reddy, 2003). Yet, this effect still remains to be fully understood. In particular, the role played by the basic mentalistic belief of being the target of another person's attention (i.e. the belief to be watched), which is tightly associated with direct gaze perception, is unknown. Here, we aimed at testing whether such a belief may increase bodily self-awareness just as direct gaze does.

Recent studies have shown that mental state attribution plays an important role in gaze perception. Namely, the neural coding and the behavioural attention orienting effect of rightward and leftward averted gazes was reduced when participants believed that the stimulus faces they saw were blinded (Teufel et al., 2009; Teufel, Alexis, Clayton, & Davis, 2010). Moreover, believing that a robotic face reflected in live the intentional gaze movements of an experimenter influenced the attention orienting effect of averted gaze, as measured both at the behavioural level and at the level of attentional modulation of early visual electroencephalographic evoked responses (Wiese, Wykowska, Zwickel, & Müller, 2012; Wykowska, Wiese, Prosser, & Müller, 2014). Yet, the role of mental state attribution in the effects of direct gaze remains to be investigated.

Only one previous study examined this question. Myllyneva and Hietanen (2015b) have recently shown greater public self-awareness in participants believing that a person displaying direct gaze could see them, as compared to when they believed that this person could not see them. This result brought the first empirical evidence that the 'belief to be watched by another person' attached to direct gaze is essential to the influence of direct gaze on self-awareness. However, public self-awareness concerns external and observable aspects of the self that are directly relevant in a social context; it is the awareness of how we appear to others, which emerges especially in situations where people are at the centre of others' attention (Govern and Marsch, 2001). It is thus possible that the public dimension of self-awareness may be especially sensitive to the belief to be watched. Here, we investigated whether this belief can influence a private dimension of self-awareness, namely bodily awareness.

For this purpose, we amended the paradigm developed by Baltazar et al. (2014), introducing a deception procedure inspired by Teufel et al. (2009). We showed videos of an individual facing the participant and wearing either a red or a blue pair of mirrored sunglasses, so that the eyes of the seen individual were not visible. The participants were led to believe that they were in on-line connection with the individual, and that one of the pair of sunglasses was obstructed so that the individual could not see through it, by contrast to the other, see-through, pair of sunglasses. We thus created two conditions contrasted in terms of the associated belief to be watched by the other person or not, while maintaining identical low level visual properties of the stimuli. As mentioned above, previous studies have shown that the belief to be in live connection with another individual influences markedly the neural response to and the behavioural attention orienting effect of averted gaze (Teufel et al., 2013; Wiese et al., 2012). For this reason, we introduced a post-experiment debriefing interview, which allowed us to check if the participant had actually believed to be in online connection with another individual and to split the participants in two groups as a function of their belief in the deception procedure.

The rest of the procedure was analogous to Baltazar and colleagues (2014). The individual's videos were shown as context stimuli preceding the presentation of emotional pictures. We also introduced a low-level control condition, in which the picture of a fixation cross was displayed as context stimulus. Our objective was to investigate the influence of the context video preceding each emotional picture on participants' behaviour. We asked the participants to rate the intensity of their bodily reactions in response to the emotional pictures and we recorded concomitantly the participants' physiological activity during the perception of the emotional pictures in the form of the skin conductance response (SCR). SCR reflects sympathetic autonomic nervous system activity and has been shown to be a good indicator of felt arousal (Bradley, Codispoti, Cuthbert, & Lang, 2001; Lang, Greenwald, Bradley, & Hamm, 1993). We computed the correlation between the SCR magnitude and the participant's ratings of the intensity of their bodily reaction on a trial by trial basis, in each type of context, to measure interoceptive accuracy as an index of bodily self-awareness (Baltazar et al., 2014). If the self-reports fit the physiological data, the participants may be considered to be more accurately aware of their bodily states (Silvia and Gendolla, 2001). We expected to find greater correlation between SCR magnitude and participants' ratings when participants believed to be watched by the individual as compared to the other conditions.

2. Materials and methods

Materials and methods were similar to those of Baltazar et al. (2014), except that the context stimuli were constituted by videos of an individual wearing sunglasses and a procedure of deception was added in order to make the participants believe that they were in online interaction with this individual.

2.1. Participants

Thirty-five adults (mean age = 24 years, *SD* = 3.4; 14 men) participated in the experiment. All participants had normal or corrected-to-normal vision and no neurological or psychiatric history. All were right-handed, French speakers, and naïve to the aim of the experiment. Informed written consent was obtained from each participant, in accordance with the Declaration of Helsinki. Each participant received a payment of 20 Euros.

2.2. Stimuli

2.2.1. Emotional stimuli

The same forty-eight emotional pictures (24 positive and 24 negative) as in Baltazar et al. (2014) were selected from the International Affective Picture Systems (IAPS; Lang, Bradley, & Cuthbert, 2008) to induce emotional experience in our participants. These pictures were then selected according to three criteria: (i) The picture should not depict eye contact or frontal faces. (ii) Each picture should be consistently judged either positive or negative in an independent pretest that we realised on 28 participants (for the selected emotional pictures more than 75% of the participants agreed on the valence category provided by Lang et al., 2008). (iii) The final sample of 48 selected pictures should have a robust continuous distribution of arousal values from moderately to highly emotional (according to the values gathered in the pretest and those reported by Lang et al., 2008). The selected emotional pictures were then further divided in four sets of 12 stimuli: low positive, high positive, low negative, and high negative.

2.2.2. Context stimuli

As described in details in the Supplementary Material, sixty-four videos of 1.5 s duration featuring a man in 32 videos, and a female in the other 32 videos were created to generate the 'Observed' and 'Not-observed' contexts. The featured individual had a neutral expression and wore black sunglasses with a mirror effect to ensure that his/her eyes were not visible. The frame of the sunglasses was red in half of the videos, and blue in the other half, for both the male and the female individuals.