



## Eye contact elicits bodily self-awareness in human adults



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### ABSTRACT

Eye contact is a typical human behaviour known to impact concurrent or subsequent cognitive processing. In particular, it has been suggested that eye contact induces self-awareness, though this has never been formally proven. Here, we show that the perception of a face with a direct gaze (that establishes eye contact), as compared to either a face with averted gaze or a mere fixation cross, led adult participants to rate more accurately the intensity of their physiological reactions induced by emotional pictures. Our data support the view that bodily self-awareness becomes more acute when one is subjected to another's gaze. Importantly, this effect was not related to a particular arousal state induced by eye contact perception. Rejecting the arousal hypothesis, we suggest that eye contact elicits a self-awareness process by enhancing self-focused attention in humans. We further discuss the implications of this proposal.

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### 1. Introduction

Eye contact effects are attracting growing interest among the humanities and social sciences. Perceiving a face with a direct gaze (i.e. establishing eye contact) has the power to modulate concurrent or subsequent cognitive processing or behaviour in humans (Senju & Johnson, 2009). Among these effects, an attentional capture by eye contact is consistently observed in humans from two days of life to adulthood (Conty, Gimmig, Belletier, George, & Huguët, 2010; Farroni, Menon, & Johnson, 2006; Senju & Hasegawa, 2005). Eye contact is also well known to implicitly influence the perception that we have of other people (Kuzmanovic et al., 2009), to enhance our memory for faces (Mason, Hood, & Macrae, 2004) and discourses (Fullwood & Doherty-Sneddon, 2006) and to favour cooperative behaviours (Bateson, Nettle, & Roberts, 2006; Ernest-Jones, Nettle, & Bateson, 2011).

All these effects have been mainly ascribed to the high communicative value of eye contact in humans. Yet, current research on eye contact effects often overlooks a basic feature of eye contact: it addresses the self. Beyond initiating communication, eye contact indicates first that we are the object of the other's attention. As pointed out by Argyle (1975), a fundamental effect of eye contact should thus be to induce self-awareness. Self-awareness is indeed presumed to increase whenever a person confronts a stimulus that reminds him of himself (Carver & Scheier, 1978). Reddy (2003) also argues that, by experiencing the self as the object of others' directed attention, eye contact elicits self-awareness as early as the first weeks of human development. Reddy (2003) even suggests that such a self-awareness effect of eye contact could play a fundamental role in the acquisition of conceptual representations of self, of others and of the environment. However, this effect has been very little investigated. Here, we aimed to explore whether direct gaze perception enhances self-awareness in human adults.

To our knowledge, only one study has investigated a potential self-awareness effect of eye contact

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(Pönkänen, Peltola, & Hietanen, 2011). The authors reported that direct gaze perception enhances public self-awareness, the feeling of how one is perceived by others (e.g. “Right now, I am concerned about the way I present myself”), as measured by the Situational Self-Awareness Scale (Govern & Marsch, 2001). According to the authors, this effect is likely mediated by self-focused attention. This shift of attention toward the self can be accomplished by placing someone in front of his/her own reflection (Ainley, Tajadura-Jimenez, Fotopoulou, & Tsakiris, 2012; Carver & Scheier, 1978; Scheier & Carver, 1977), a camera directed towards the self (Auzoult, 2013; Davis & Brock, 1975) or by the presence of an observer (Carver & Scheier, 1978). As at least the latter two manipulations involve a “being watched” component (either by a camera or by individuals), the perception of a direct gaze may indeed be another way to turn someone’s focus of attention to him/herself.

Importantly, self-focusing manipulations have been proposed to induce self-awareness by enhancing accuracy of judgments regarding cognitive (e.g. attitudes) and somatic aspects (e.g. sensations, arousal, emotions) of the self (Silvia & Gendolla, 2001). Such a proposal has recently gained support from two studies in which confronting participants with their own reflection was demonstrated to sharpen interoceptive awareness (Ainley, Maister, Brokfeld, Farmer, & Tsakiris, 2013; Ainley et al., 2012), i.e. the perception of “the afferent information that arises from anywhere and everywhere within the body” (Cameron, 2001), which has been described as a fundamental aspect of the self (Craig, 2010; Damasio, 2010). It is noteworthy that exploring interoceptive awareness (or bodily self-awareness) has substantial advantages. It offers methods of investigating self-awareness without relying exclusively on self-reports, the reliability of which has been questioned (Silvia & Gendolla, 2001). Indeed, people may be poor judges of their self-knowledge, they may not always be willing to share it with others, and the related reports may be clouded by motivational concerns (Jones, 1990). Reviewing the literature on self-focused attention effects, Silvia and Gendolla (2001) thus recommended comparing self-reports to an objective physiological variable for an adequate test of interoceptive sensitivity. This consists of recording physiological signals of participants who are instructed to monitor and evaluate these signals. If the self-reports fit the physiological data, the participant may be considered to be accurately aware of his/her bodily states.

In parallel, measuring physiological signals allows one to test for arousal as a potential confound for self-awareness effect. Because it can form a strong internal cue arising from the body, arousal could intrinsically draw attention towards oneself as a relevant source of information (Pennebaker & Lightner, 1980). Accordingly, self-awareness-related effects have been claimed to be driven by the extra arousal induced by self-focusing manipulations (Silvia & Gendolla, 2001; Wegner & Giuliano, 1980). As pointed out by Silvia and Gendolla (2001), drawing conclusions about a pure self-awareness enhancement requires ruling out confounding variables such as changes in arousal. This concern is particularly relevant when using

eye contact, which has been robustly reported to increase arousal (Helminen, Kaasinen, & Hietanen, 2011; Nichols & Champness, 1971), though this effect may be restricted to “live” conditions only (i.e. when a real person is gazing at the participant [Hietanen, Leppänen, Peltola, Linna-aho, & Ruuhiala, 2008; Senju & Johnson, 2009]).

Most of the studies investigating bodily self-awareness used tasks focusing on the perception of internal signals in isolation from the environment (e.g. counting heartbeats [Schandry, 1981], monitoring blood pressure [Fahrenberg, Franck, Baas, & Jost, 1995]). However, one could argue that tasks requiring participants to monitor interoceptive signals without external stimulation or actual physiological changes to attend to are artificial. Indeed, physiological states indicate “particular kinds of relationships between self and environment” (Hull & Levy, 1979, p. 758). Monitoring bodily state is claimed to be a key mechanism for attributing value to external objects in order to adapt our decisions towards these objects and maximize outcomes (Damasio, 2010; Damasio & Carvalho, 2013). In this respect, confronting participants with objects from the outside world and requesting them to monitor their interoceptive reactions induced by these objects constitutes a more natural way of testing bodily self-awareness.

Here, we advance the hypothesis that eye contact has a self-reflective power. Beyond attracting one’s attention to the other’s face, eye contact should enhance self-focused attention and thus elicit bodily self-awareness in humans. If so, the monitoring of self-related ongoing processes, such as changes in bodily states, should be more efficient when a person is gazed at. To test this hypothesis, we asked volunteers to rate the intensity of their own physiological reactions induced by the presentation of emotional pictures (Lang, Bradley, & Cuthbert, 2008). Our objective was to investigate the influence of a contextual image preceding each emotional picture on participants’ behaviour. This image could be a cross, a face with averted eyes, or a face establishing eye contact. Crucially, we recorded participants’ physiological activity during their perception of the emotional pictures, and more particularly the skin conductance response (SCR), which is a good indicator of felt arousal (Bradley, Codispoti, Cuthbert, & Lang, 2001; Lang, Greenwald, Bradley, & Hamm, 1993). We computed the correlations obtained between the SCR magnitude and the ratings provided by the participants, trial by trial, in each context. We expected to find greater consistency between these two variables following the perception of eye contact as compared to other context conditions. We further expected that this effect would not be associated with a greater magnitude of SCRs induced by the eye contact context.

## 2. Method

### 2.1. Participants

Thirty-two healthy adults (mean age = 24.16 years,  $SD = 2.97$ ; 19 females) participated in the experiment. All participants had normal or corrected-to-normal vision, were right-handed, French speakers and naive to the aim

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