



Guilt in the eyes: Eye movement and physiological evidence for guilt-induced social avoidance



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ABSTRACT

Guilt is widely acknowledged as an exemplary social emotion that is unpleasant but has positive interpersonal consequences. Previous empirical research focuses largely on documenting the behavioral consequences of guilt; less is known about the psychophysiology of experiencing guilt. Here we designed an interactive paradigm and asked participants to play multiple rounds of a dot-estimation task with two partners. Failure in the task, either due to the participant or due to the partner, would cause electric shocks to the partner. In Experiment 1, we asked the participant to watch video clips depicting the partner's facial expressions while the partner was receiving pain stimulation. Eye movement recording showed that the participant fixated less on the partner's eyes but more on the nose region in the participant-caused pain (high guilt) condition than in the partner-caused pain (low guilt) condition, an indication of social avoidance. In Experiment 2, we asked the participant to either fixate on the eye (Eye Group) or the nose region (Nose group) of the partner and recorded their skin conductance during the viewing. We found that the Eye Group exhibited higher skin conductance response in the high guilt condition than in the low guilt condition and such a difference was absent for the Nose Group, indicating that the forced eye contact with the victim enhanced the emotional arousal of guilt. The life-like interactive paradigm is thus able to demonstrate the mutual dependence between eye contact and social emotions: eye contact both elicits and is regulated by emotional content in social interaction.

It was this eye contact with “the Jew” that humanized him and made this scene unbearable to Zakis. The intimacy of locking eyes with a dying person overwhelmed him emotionally. No other perpetrator in my sample spoke of making eye contact and such an intimate recognition of shared humanity.¹Katharina von Kellenbach *The Mark of Cain*

1. Introduction

Why do perpetrators try to avoid direct eye contact with their victims? One possibility is that eye contact may trigger feelings of being judged and accused, which is particularly salient for those who are

guilty about their acts. This conjecture is in line with a large body of field studies and laboratory experiments showing that the presence of eye or eye-like images increases people's concern about morality and altruism (Ekström, 2012; Powell, Roberts, & Nettle, 2012). Although a large number of empirical studies have demonstrated the interpersonal nature and behavioral motivations of guilt (Baumeister, Stillwell, & Heatherton, 1994; Giner-Sorolla, 2013; Tangney, Stuewig, & Mashek, 2007; Xu, Begue, & Shankland, 2011), none has identified physiological responses of guilt during social interaction and its impact on social communicative behavior. Thus, we have not achieved an empirically examined account of the bodily expressions or gestures of interpersonal guilt during social interaction. To this end, it is important to elicit guilt in a naturalistic, life-like social context (Hari, Henriksson, Malinen, & Parkkonen, 2015; Schilbach et al., 2013;

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¹ Von Kellenbach, K. (2013). *The mark of Cain: Guilt and denial in the post-war lives of Nazi perpetrators*. New York NY: Oxford University Press.

Schilbach, 2014), which is missing in most of the previous laboratory-based studies of guilt. The aim of the current study is to test the hypothesis in a naturalistic, life-like context that interpersonal guilt leads to social avoidance of eye contact and that eye contact with the victim induces emotional arousal in transgressors.

Eyes are often compared to the “windows of soul” (e.g., “These lovely lamps, these windows of the soul” in Du Bartas' *La Semaine*), especially in the context of social interaction (Emery, 2000; Guillon, Hadjikhani, Baduel, & Rogé, 2014; Khalid, Deska, & Hugenberg, 2016; Pfeiffer, Vogeley, & Schilbach, 2013; Senju & Johnson, 2009). Just like information can go in and out through a window, this metaphorical comparison to eyes is also bidirectional. On the one hand, the pattern of eye gaze (e.g., direct vs. averted) reflects the cognitive and affective states (e.g., aggressive vs. submissive) of the agent, and is an integral part of facial expression (Adams & Kleck, 2005; Bolmont, Cacioppo, & Cacioppo, 2014; Frith, 2009; Jack, Blais, Scheepers, Schyns, & Caldara, 2009). On the other hand, the eyes bring in important information to the agent during social interaction and communication, such as another person's identity, emotional state, and even focus of visual attention. Appropriate use of gaze to gather information in social contexts is an important social skill that plays a crucial role in social cognition and interpersonal interaction (Emery, 2000). In real-time face-to-face social interaction, the most important source of information concerning the interactive partner's mental states is his/her eyes. Reduction or failure in fixating on the interactive partner's eyes (i.e., making eye contact), a type of social avoidance, may lead to difficulty and distortion in recognizing other's emotional and cognitive states. This has been demonstrated in people with social communicative problems, such as individuals with autism spectrum conditions (Baron-Cohen, Campbell, Karmiloff-Smith, Grant, & Walker, 1995; Batson, Fultz, & Schoenrade, 1987; Pelphrey et al., 2002; Wang et al., 2016), alexithymia (Bird, Press, & Richardson, 2011), and amygdala lesions (Adolphs, Baron-Cohen, & Tranel, 2002; Adolphs et al., 2005; Spezio, Huang, Castelli, & Adolphs, 2007). During natural vision these two aspects of eye gaze are mutually and dynamically related: the pattern of eye gaze both modulates and is modulated by the input visual information. Neurally, it has been shown that neurons in primate amygdala are responsive both when the eye of another individual falls on the fovea and when the primate direct its fixation away from the another individual's eye region, indicating the close link between the perception of and response to other's eyes at the neurobiological level (Mosher, Zimmerman, & Gothard, 2014; for human neuroimaging study, see Gamer & Büchel, 2009).

To date, most of the research has excluded the social interaction context from eye gaze and primarily treated the gaze as a modulator of face perception (for review, see Senju & Johnson, 2009). This line of research has consistently showed that compared with face images with averted gaze, face images with direct gaze towards the participants are detected faster in visual search (Senju, Kikuchi, Hasegawa, Tojo, & Osanai, 2008). Similarly, the identity (Macrae, Hood, Milne, Rowe, & Mason, 2002), gender (Hood, Macrae, Cole-Davies, & Dias, 2003), and emotional expression (Bindemann, Mike Burton, & Langton, 2008; Vuilleumier & Pourtois, 2007) of those images with direct gaze are more easily identified than images with averted gaze. A common issue for these studies is that the face stimuli are socially unrelated to the participants and there is no meaningful social interaction between the faces and the participants. The stimuli and tasks are to some extent artificial and decontextualized such that participants are in a position only to passively perceive the visual input and are less likely to engage in life-like social processes (Hari et al., 2015). Thus the psychological processes elicited by such stimuli and tasks may be different from those engaged in real life contexts (Birmingham & Kingstone, 2009; Kagan, in press; Kingstone, 2009; Lee & Siegle, 2014), an issue especially pressing for research on social emotions and social gaze, as they both have important interpersonal functions (Hess, Adams, & Kleck, 2008; Hess & Hareli, 2015) and can

only be assessed when the participants are (or at least believe themselves to be) in a social interactive mode (Schilbach et al., 2013).

To address this issue, we examined in two experiments the impact of interpersonal guilt on the pattern of eye gaze/contact (Experiment 1) and how eye contact modulates physiological responses to interpersonal guilt (Experiment 2), following the dichotomy outlined above. In other words, while Experiment 1 focused on the pattern of eye gaze/contact to reveal an exterior expression (cf. Terburg, Aarts, & van Honk, 2012) of the internal state of guilt (i.e., the expression side of the dichotomy), Experiment 2 went one step further to show the emotional arousal elicited by making eye contact in a guilt context (i.e., the perception side of the dichotomy). In other words, Experiment 1 focused on the pattern of eye gaze/contact to guilt-inducing stimuli to reveal an exterior expression (e.g., averted eye gaze; cf. Terburg et al., 2012) of the internal state of guilt (i.e., the expression side of the dichotomy). Going one step further, Experiment 2 analyzed the emotional arousal elicited by making eye contact in a guilt-inducing context (i.e., the perception side of the dichotomy). Specifically, Experiment 2 investigated how the position of eye fixation may serve as a gate to the perception and processing of socio-affective information and modulate physiological responses (i.e., arousal) in a social interactive context.

To summarize the theoretical background outlined above: 1) guilt stems specifically from social interaction with one's victim, over and above the information about the suffering of another individual; one's responsibility in causing the victim's suffering distinguishes guilt from general forms of empathy for suffering (cf. Clarke, 2016), and 2) eye contact is one of the most frequently adopted and straightforward channels of social interaction (Emery, 2000; Senju & Johnson, 2009; Wang & Adolphs, 2017). Based on this theoretical background and our experimental design, we hypothesized that, 1) when viewing the victim's face freely, the participants will fixate less on the victim's eye region in the guilt compared to the control condition (Experiment 1), and 2) the guilt-induced emotional arousal, as measured by skin conductance, should be higher for the participants required to fixate on the victim's eye region compared to participants required to fixate on the victim's nose region (Experiment 2).

2. General method

2.1. Stimuli

Eight silent video clips by four confederates (two females) were used in the two experiments. In each clip, the partner (confederate) of the interactive game placed his/her head on a chin-rest and made painful expressions while receiving electric shocks. Each clip consisted of four consecutive episodes, each lasting for 15 s. In the first 5 s of each episode the confederate had a neutral and static expression while in the last 10 s the confederate received continuous electric shocks and was asked to naturally express their painful feeling. The whole clip ended with additional 1 to 5 s of the neutral face of the confederate, such that the video did not end abruptly after the fourth painful episode. Thus, each video clip lasted a total of 61 to 65 s. Facial features were positioned approximately in the same place on the screen (Fig. 1B). Each confederate was videotaped in two instances, corresponding to the two blocks in which the partner (i.e., confederate) received pain stimulations (see below). The display resolution of videos was 600 × 400. The videos were played at a rate of 30 frames per second.

A full Latin-square procedure was used to assign the video stimuli into 4 test versions, in which the order of confederates (two male confederates for the male participants, or two female confederates for the female participants) and the order of conditions (guilt vs. control, see below) were counterbalanced across participants. Each participant encountered only one test version.

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