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From face to hand: Attentional bias towards expressive hands in social anxiety

Mariska E. Kret[a,b,*], Jeroen J. Stekelenburg[c], Beatrice de Gelder[d], Karin Roelofs[e]

[a] Leiden University, Institute of Psychology, The Cognitive Psychology Unit, The Netherlands
[b] Leiden Institute for Brain and Cognition (LIBC), The Netherlands
[c] Department of Social and Behavioral Sciences, Cognitive Neuropsychology, Tilburg University, Tilburg, The Netherlands
[d] Cognitive Neuroscience, Maastricht University, Maastricht, The Netherlands
[e] Radboud University Nijmegen: Behavioural Science Institute & Donders Institute for Brain Cognition and Behaviour, The Netherlands

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ABSTRACT

The eye-region conveys important emotional information that we spontaneously attend to. Socially submissive individuals avoid other's gaze which is regarded as avoidance of others' emotional face expressions. But this interpretation ignores the fact that there are other sources of emotional information besides the face. Here we investigate whether gaze-aversion is associated with increased attention to emotional signals from the hands. We used eye-tracking to compare eye-fixations of pre-selected high and low socially anxious students when labeling bodily expressions (Experiment 1) with (non)-matching facial expressions (Experiment 2) and passively viewed (Experiment 3). High compared to low socially anxious individuals attended more to hand-regions. Our findings demonstrate that socially anxious individuals do attend to emotions, albeit to different signals than the eyes and the face. Our findings call for a closer investigation of alternative viewing patterns explaining gaze-avoidance and underscore that other signals besides the eyes and face must be considered to reach conclusions about social anxiety.

1. Introduction

The eyes play a very important role in social interactions. Infants as well as adults spontaneously look at the eyes, they grasp emotion signals provided by the eyes and they follow the others' gaze (Farroni, Csibra, Simion, & Johnson, 2002; Tomasello, Hare, Lehmann, & Call, 2007). The human eye is not just designed for seeing, but also to be seen and to communicate, fostering smooth social interactions (Kobayashi & Kohshima, 1997; Kret, Tomonaga, & Matsuzawa, 2014; Kret, Fischer, & de Dreu, 2015). Eye contact is important for establishing secure attachment between mothers and infants (Robson, 1967), it positively impacts on the quality of social interactions later in life (Scherer, 1974), yet it also increases bodily self-awareness (Baltazar et al., 2014) and arousal (Hietanen, Leppanen, Peltola, Linna-Aho, & Ruuhiala, 2008).

Despite the importance of eye contact, research has shown large individual differences in how much attention is drawn towards the eye-region. For example, patients with social anxiety disorders *avoid* others' facial expressions during social interactions more than non-anxious individuals (Garner, Mogg, & Bradley, 2006; Horley, Williams, Gonsalvez, & Gordon, 2003, Horley, Williams, Gonsalvez, & Gordon, 2003; Moukheiber et al., 2010; Terburg, Aarts, & van Honk, 2012; Weeks, Howell, & Goldin, 2013). It is thought that this avoidance is caused by a heightened self-focus during social interactions due to expectations that others will evaluate them negatively (Alden & Mellings, 2004; Clark & Wells, 1995; Mellings & Alden, 2000; Rapee & Heimberg, 1997). How then do these individuals gather insight into another's emotions? The hypothesis we put forward here is that they attend to information sources other than the face as well. Socially anxious individuals may attend to "safe", "non-monitoring" information sources such as other body parts, for instance the hands, more than non-anxious individuals do, and this may serve as a compensatory mechanism for the information missed from the face. Testing this hypothesis requires rethinking about how socially anxious people, and possibly individuals with other disorders as well, process emotions and specifically asks for experiments with stimulus material other than facial expressions. We here test this in a group of participants who are known to avoid eye contact and we study fixation patterns on stimulus material

* Corresponding author at: Leiden University, Cognitive Psychology Department Wassenaarseweg 52, 2333 AK Leiden, The Netherlands.
E-mail address: m.e.kret@fsw.leidenuniv.nl (M.E. Kret).

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Table 1
Participant characteristics.

	Low social anxiety		High social anxiety	
	Mean	SD	Mean	SD
Age	22.29	2.80	21.87	3.05
Sex*	$N = 11$ ♂; $N = 10$ ♀		$N = 4$ ♂; $N = 19$ ♀	
LSAS anxiety*	9.00	4.94	43.22	9.22
LSAS avoidance*	6.76	5.69	34.87	10.72
LSAS social interaction total*	7.10	5.20	36.65	10.66
LSAS performance total*	8.67	4.37	41.43	9.78
STAI state	50.62	2.20	50.91	2.61
STAI trait	51.57	2.13	51.57	3.57
Beck depression inventory*	2.86	3.12	11.61	6.91
STAXI	10.10	0.30	11.22	2.66
AVL (agression) total	62.43	16.80	65.78	16.00
AVL physical agression*	20.95	7.57	15.83	5.75
AVL verbal agression*	12.95	3.25	10.74	3.31
AVL anger	13.76	4.87	15.87	5.65
AVL hostility*	14.76	5.22	23.35	5.81
Social inhibition (Type D questionnaire)	5.95	4.75	15.52	6.18
Negative affectivity (Type D questionnaire)	5.86	5.11	14.39	4.90
Type D	$N = 1$		$N = 13$	
BIS*	18.71	3.38	12.35	4.89
BAS*	22.33	5.33	29.83	6.23
BAS drive*	7.67	2.50	10.00	2.24
BAS fun seeking*	6.76	2.02	9.91	2.37
Bas reward responsiveness*	7.90	2.00	9.91	3.23
VAS tense state*	3.90	2.98	8.04	5.29
VAS tired state	8.24	4.43	9.43	4.70
VAS gloomy state*	2.14	1.59	5.61	3.69
VAS anxious state*	1.38	0.74	5.30	4.77
VAS active state	10.10	4.57	9.83	4.55
Motivation state	13.48	3.31	13.43	4.13
Attention state	8.71	5.29	9.39	4.73

*$p < .05$; AVL = algemene vragenlijst (general questionnaire); BAS = behavioral activation scale; BIS = behavioral inhibition scale; STAXI = state trait anger expression inventory; Type D = distressed personality type; VAS = visual analogue scale.

that shows emotional expressions from the whole body including the face.

In everyday life, bodily postures and movements express our affective state, revealing it, in turn, to the observer. Clearly, in order to grasp another's emotion or intention, humans not only attend to the others' face but also attend to the others' whole body (Atkinson, Dittrich, Gemmell, & Young, 2004; Atkinson, Herberlein, & Adolphs, 2007; Aviezer, Trope, & Todorov, 2012; de Gelder, Snyder, Greve, Gerard, & Hadjikhani, 2004; Kret & de Gelder, 2010; Kret & de Gelder, 2013; Mondloch, Nelson, & Horner, 2013; for a review, see de Gelder et al., 2010). The hands are probably the most expressive components of the human body and provide a rich source of information for observers; the movements we make with our hands, our actions and gestures (Cartmill, Beilock, & Goldin-Meadow, 2012) and emotional expressions (Wallbott & Scherer, 1986; Grosbras & Paus, 2006; Hietanen, Leppänen & Lehtonen, 2004). Research has shown that the perception of facial expressions of emotions can be affected by the expressive qualities of hand movements (Hietanen & Leppänen, 2008). There is of course a striking difference between faces and hands in conveying emotion. When looking into someone's face, most attention goes to the eyes. In contrast to eyes that can see, hands disclose information without being able to judge. For that reason, for socially anxious individuals, attending to the hands may serve as an alternative source of information during interactions with others.

To test this hypothesis, we pre-selected high and low socially anxious university students based on their Liebowitz Social Anxiety Scale (LSAS) scores (Fresco et al., 2001). In three experimental paradigms, we investigated their fixation patterns on bodily expressions of anger, fear and happiness with the facial features blurred, or the combined percept from these emotions expressed by the body and the face simultaneously. We opted for these specific expressions for three reasons. First, these three emotions can be expressed equally well via the body and the face, contrary to surprise and disgust that are not well recognized from body expressions alone (de Gelder et al., 2010). Second, these three emotions are similarly arousing and contain a clear action component (in contrast to a sad body expression) (Pichon, de Gelder, & Grèzes, 2008; Kret, Pichon, Grèzes, & de Gelder, 2011a; Kret, Pichon, Grèzes, & de Gelder, 2011b). Third, by including these specific emotions, we included two negative emotions (fear and anger) and two approach-driven emotions (happiness and anger) and therewith take into account that the anxiety literature is somewhat inconclusive as to whether anger or fear show stronger gaze-avoidance than happiness or not (Adams & Kleck, 2003; Garner et al., 2006; Horley et al., 2004).

In the first experiment, participants viewed angry, fearful and happy bodily expressions with blurred face and labeled the emotions. The aim of this study was to investigate whether bodily expression of emotion, completely independent of any facial characteristics, could drive fixation patterns towards the face and hands. In the second experiment, participants labeled the bodily expressions that were part of face-body compounds consisting of emotionally congruent or incongruent signals of emotion. The reason for including emotionally incongruent combinations was to follow up on the previous experiment by investigating effects of the emotions anger, fear and happiness, and to pull apart the emotion effects from the source through which these emotions were expressed. The third experiment used the same stimuli as Experiment 2, but participants passively viewed the images. This experiment was included because it most closely reflects a real world scenario where individuals are being confronted with emotional others but are not asked to explicitly label emotions. Again, emotionally incongruent stimuli were included as these allow us to