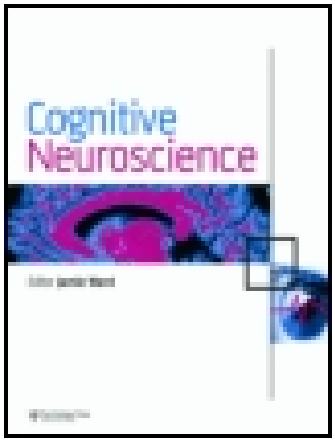

Cognitive Neuroscience
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/pcns20

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Published online: 15 May 2015.

To cite this article: Henryk Bukowski & Dana Samson (2015): Can emotions influence level-1 visual perspective taking?, Cognitive Neuroscience, DOI: 10.1080/17588928.2015.1043879

To link to this article: http://dx.doi.org/10.1080/17588928.2015.1043879

COGNITIVE NEUROSCIENCE, 2015, http://dx.doi.org/10.1080/17588928.2015.1043879

Can emotions influence level-1 visual perspective taking?

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Emotions and perspective-taking are ubiquitous in our daily social interactions, but little is known about the relation between the two. This study examined *whether* and *how* emotions can influence even the most basic forms of perspective-taking. Experiment 1 showed that guilt made participants more other-centered in a simple visual perspective-taking task while anger tended to make them more self-centered. These two emotions had, however, no effect on the ability to handle conflicting perspectives. Since the guilt induction method used in Experiment 1 also induced feelings of self-incompetence and shame, Experiment 2 aimed at isolating the effects of these concomitant feelings. Self-incompetence/shame reduced participants' ability to handle conflicting perspectives but did not influence attention allocation. In sum, these results highlight that emotions can affect even the simplest form of perspective-taking and that such influence can be brought about by the modulation of different cognitive mechanisms.

Keywords: Guilt; Anger; Shame; Perspective-taking; Theory of mind; Empathy.

The direction of another person's gaze provides useful information during social interactions. It helps to infer what someone else is looking at (an ability hereafter referred to as level-1 visual perspective-taking, VPT; Flavell, Everett, Croft, & Flavell, 1981) and it also helps to infer other socially relevant information such as what another person wants, intends to do, or is talking about. Level-1 VPT is therefore an important building block of perspective-taking. The current study aimed to investigate to what extent this basic perspective-taking ability can be modulated by the perspective-taker's emotional state.

Emotions are ubiquitous in social interactions and there is some evidence that our emotional state influences our perspective-taking abilities. For example, guilt has been found to facilitate perspective-taking (Leith & Baumeister, 1998; Yang, Yang, & Chiou, 2010), shame has been found to have either no effect (Leith & Baumeister, 1998) or a detrimental effect on perspective-taking (Yang et al., 2010), and happiness has been found to reduce perspective-taking performance (Converse, Lin, Keysar, & Epley, 2008).

However, until now the effect of the perspective-taker's emotional state has been demonstrated on more complex perspective-taking

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We thank the SPRING lab members for their advice and support.

No potential conflict of interest was reported by the authors.

This work was supported by the Experimental Psychology Society (Small Grant scheme that allowed piloting the emotional induction method). During the completion of this study, H.B. was a Research Fellow of the Fonds de la Recherche Scientifique-FNRS.

tasks than level-1 VPT[1] Furthermore, while perspective-taking is usually described as the ease with which one can take into account another person's point of view, it can be hypothesized that what is measured may result from the workings of several underlying cognitive processes (cf. Apperly, 2012; Ramsey, Hansen, Apperly, & Samson, 2013; Samson et al., 2010). A further step in our understanding of how emotions affect perspective-taking would be to demonstrate which underlying processes are affected. For the current study, we focused on two processes relevant to level-1 VPT.

On the one hand, there is the relative weight given to our own perspective and that of another person which will influence the focus of attention and the priority given to the information related to the self or the other. For example, information associated with the self has been shown to be processed more efficiently than information associated to another person in perceptual (Sui, He, & Humphreys, 2012), memory (Cunningham, Turk, Macdonald, & Macrae, 2008), and perspective-taking tasks (Mattan, Quinn, Apperly, Sui, & Rotshtein, 2014). Moreover, many studies have shown that negative emotions are associated with increased self-focus (for a meta-analysis, see Mor & Winquist, 2002). It is possible, therefore, that the priority given to the self during perspective-taking varies depending on the perspective-taker's emotional state.

On the other hand, perspective-taking often involves situations where the self and the other hold different points of view. In those situations, efficient perspective-taking requires the ability to tease apart and select the information pertaining to another person's perspective (Decety & Sommerville, 2003). Handling conflicting perspectives has been shown to be largely dependent on cognitive control abilities, such as monitoring and inhibition (e.g., Fizke, Barthel, Peters, & Rakoczy, 2014). Several studies reported the influence of emotions on executive performance (e.g., Padmala, Bauer, & Pessoa, 2011; Phillips, Bull, Adams, & Fraser, 2002). The perspective-taker's emotional state may therefore affect the efficiency with which s/he handles conflicting perspectives.

To clarify whether emotions influence level-1 VPT and identify the mechanisms through which such influence may operate, we used the level-1 VPT task designed by Samson et al. (2010), in which participants are asked to judge their own and someone else's visual perspective, in situations where both perspectives are either consistent or inconsistent. By independently manipulating the perspective to be judged and the level of conflict between perspectives, this design allowed disentangling whether the emotional state affects (1) the orientation of attention towards oneself versus another person, or (2) the cognitive control processes necessary to handle conflicting perspectives.

Aiming to select social emotions which have been shown to have opposite impacts on social behavior, we decided to focus on the effects of anger and guilt. Anger and guilt promote respectively punitive and reparative actions towards others (e.g., De Hooge, Zeelenberg, & Breugelmans, 2007; Hopfensitz & Reuben, 2009). We were thus interested in whether the opposite social goals promoted by anger and guilt would translate into opposite effects on perspective-taking as well.

To our knowledge, there is so far no direct evidence of the potential effect of anger on perspective-taking (or "cognitive" empathy, i.e., the ability to infer someone's mental state). However, Singer, and colleagues (2006) have shown reduced aversive emotional neural responses and increased hedonic neural responses to the pain inflicted to another person when participants were angry at this person, compared to when they were not angry at this person. It is thus possible that anger also reduces cognitive empathy and has detrimental effects on perspective-taking performance. It is, however, unclear through which pathway (self/other salience or reduced cognitive control abilities) such detrimental effect would occur. Indirect evidence from studies highlighting the natural tendency to regulate the feeling of anger and the cognitive cost of this regulation (e.g., DeWall, Baumeister, Stillman, & Gailliot, 2007; Wilkowski & Robinson, 2008) suggests that feeling angry might diminish the cognitive resources available to handle conflicting perspectives. On the other hand, studies have shown that anger induces rumination (e.g., Denson, 2009; Sukhodolsky, Golub, & Cromwell, 2001), which indirectly suggests that anger might increase the orientation of attention to oneself.

Concerning guilt, Yang et al. (2010) showed that guilt facilitates perspective-taking performance. Given that guilt is often found to promote prosocial goals and described as a relationship-oriented emotion (Baumeister, Stillwell, & Heatherton, 1994), one could expect that the effect of guilt on perspective-taking results from more attention being allocated to the other person than to oneself. However, several studies have suggested that guilt is in fact a self-focused emotion aiming at repairing one's own misdeed rather than reducing the suffering of others

[1]Note however that in one of their experiments, Converse et al., (2008) used a perspective-taking task tapping partly on level-1 VPT.

(e.g., Iyer, Leach, & Crosby, 2003; for a review, see Iyer & Leach, 2009). The enhanced perspective-taking abilities may thus not be related to the relative weight given to oneself and the other person but rather to the cognitive control pathway, by increasing the ability to handle conflicting perspectives. This alternative hypothesis is in line with some studies that have shown that guilt increases cognitive control and depth of cognitive processing (Gangemi & Mancini, 2007; Lassiter, 2012). Altogether, we are still missing clear and direct evidence about the pathway through which guilt affects perspective-taking.

Given our independent manipulation of the perspective to judge (Perspective: Self vs. other) and the demands in terms of conflict handling (Consistency between perspectives: Consistent vs. inconsistent), an influence of emotion on perspective-taking performance through the cognitive control pathway should result in a modulation of the consistency effect with either a smaller consistency effect compared to baseline if the emotion increases the ability to handle conflict, or a larger consistency effect compared to baseline if the emotion reduces the ability to handle conflict. On the other hand, an influence of emotion on perspective-taking performance through the attention allocation pathway should result in modulation of the perspective effect, with better performances in either self-perspective or other-perspective judgments, depending on whether attention is allocated more to the self or the other compared to baseline.

Finally, because anger and guilt are known to influence prosocial behavior, we added a prosocial behavior measure following the perspective-taking task in order to verify whether the targeted feelings were successfully induced. Previous studies suggest that anger should reduce prosocial behavior (e.g., Chow, Tiedens, & Govan, 2008; Hopfensitz & Reuben, 2009) while guilt should increase prosocial behavior (e.g., Ketelaar, Tung Au, & Au, 2003; Nelissen, Dijker, & Devries, 2007).

In Experiment 1, participants played an interactive game with another person in order to induce contrasting emotional feelings (guilt vs. anger vs. control). We then measured participants' perspective-taking performance with a level-1 VPT task. Experiment 2 aimed to isolate the effect of shame and self-incompetence (which were concomitantly induced with guilt in Experiment 1) in order to ensure that the effects of guilt observed in Experiment 1 were truly due to guilt and not a confounding emotion. Both experiments were approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

EXPERIMENT 1

Method

Participants

Fifty-one healthy individuals were randomly assigned to one of the three conditions (guilt: $N = 17$, anger: $N = 16$, control: $N = 17$). Four participants in the anger condition did not feel anger following the induction procedure and were thus replaced by four additional participants who reported anger feelings (27 females, mean age: 21.50, age range: 18–31 years).

Material and procedure

Dispositional empathy and perspective-taking. Participants were first asked to complete the Interpersonal Reactivity Index (Davis, 1983), a questionnaire measuring participants' self-reported tendencies to show empathic concern, perspective-taking, fantasy (i.e., self-absorption in fictions), and personal distress.

Emotion induction procedure. Participants played a computerized pseudo-interactive card game with a female confederate. Participants were led to believe that their score would determine the confederate's money earnings and vice versa. During the game, the confederate also received as a bonus a small amount of money that she could either share with the participant or keep for herself.

In the anger condition, participants played first, had a perfect score (the game outcome was fixed, see supplementary information S1) and they thus made the confederate earn a considerable amount of money. Then the confederate played and achieved a poor score which meant that participants received almost no earnings. The confederate decided to keep the bonus all to herself.

In the guilt condition, the confederate played first, had a perfect score which meant that participants earned a considerable amount of money and she shared the bonus with participants in a fair manner. Then participants played, their score was poor (the game outcome was fixed) which meant that participants could not reciprocate the earnings to the confederate.

In the control condition, the order of playing was counter-balanced across participants, both the participant and the confederate partner had a perfect score, and there was no bonus.

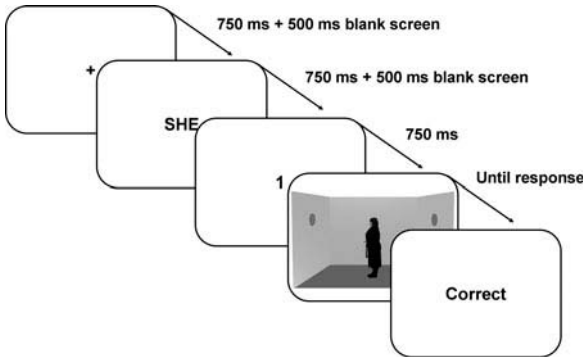

Figure 1. Illustration of a trial of the inconsistent perspectives/other perspective condition in the visual perspective-taking task. In this trial, participants had to judge whether the game partner did or did not see 1 disc. The last screen displayed the feedback about participant's accuracy of response.

VPT task. Immediately following the card game, participants completed a VPT task (Samson et al., 2010). In the task, participants saw pictures of their game partner positioned in the center of a room with discs displayed on one or two of the side walls (see Figure 1). The game partner was seen sideways facing either the left or the right wall. The principle of the task was to judge whether a prompted number (ranging from 0 to 3) matched the number of discs visible from a prompted target perspective, which could be either the participant's perspective (self-perspective condition) or the game partner's perspective (other-perspective condition; i.e., what the confederate partner depicted in middle of the room sees). The number of discs visible could be the same for both perspectives (consistent perspectives condition) or different (inconsistent perspectives condition). Reaction time (RT) and error rates (ER) were collected but, like in the original study by Samson et al. (2010), only matching responses were taken into account in all analyses. This was done because mismatching trials ("no" response) were unbalanced in terms of ease to process (i.e., prompted numbers in consistent trials can never match any perspective and are particularly easy to respond "no" to) which leads to artificially inflate the consistency effect.

Manipulation checks. After the VPT task, participants' prosocial behavior was measured. They received 12 raffle tickets, each giving one chance out of 720 to win €150. For each raffle ticket, participants were asked to choose among three options for the course of action to follow in case the ticket is the winning one: Keep the prize for themselves, give it to their game partner, or give it to the Red Cross.

Participants then completed a questionnaire asking about how they felt after the card game. The participants rated to what extent they felt on a series of 12 emotions, 13 body sensations, and 11 action tendencies (adapted from Izard, Libero, Putnam, & Haynes, 1993; Wallbot & Scherer, 1986; Youngstrom & Green, 2003).

Finally, at the end of the experient, participants were asked whether they noticed anything suspicious. Then, after being debriefed and compensated for their participation, participants rated and commented on the extent to which the deceptive aspects (confederate, card game, and raffle ticket sharing) were credible.

Results

Group characteristics

Participants were not significantly different between the emotion conditions in terms of age, gender, or scores on the IRI (*p*s > .195).

Induction efficacy

The ANOVAs conducted on the raffle ticket allocations across the three emotion conditions revealed a significant difference across emotion conditions only for the number of tickets allocated to the partner, $F(2, 48) = 8.921$, $p < .001$, $d = 0.95$. Planned contrast analyses on the Raffle task revealed that participants allocated more tickets to their partner in the guilt condition, $M = 2.765$, $SD = 2.488$, than in the anger condition, $M = 0$, $SD = 0$, $t(48) = 4.224$, $p < .001$, $d = 1.52$, and the control condition, $M = 1.444$, $SD = 2.036$, $t(48) = 2.077$, $p = .043$, $d = 0.72$. Moreover, participants in the anger condition allocated less tickets to their partner than the participants in the control condition, $t(48) = 2.237$, $p = .030$, $d = 0.79$. Thus, in line with previous studies, participants in the guilt and anger conditions were more and less prosocial, respectively, than those in the control condition.

Furthermore, the MANOVA conducted on the ratings of the 12 emotion items revealed a statistically significant difference across the three emotion conditions, $F(24, 76) = 19.11$, $p < .001$, $\eta_p^2 = .858$. The following post-hoc analyses were corrected for multiple comparisons according to Šidák's method. Participants in the guilt condition felt significantly more guilt than those in the anger condition, $p < .001$, and the control condition, $p < .001$ (see Table 1). Participants in the guilt condition felt significantly more guilt than any other emotions (*p*s < .05), except for attention, anxiety, and shame, with shame being the emotion for which the reported intensity was the least

TABLE 1
Means (*SD*) of self-reported emotion ratings as a function of the emotion condition in experiments 1 and 2

	Exp 1			*Exp R*	*Exp 2*	
Emotion	*Anger*	*Control*	*Guilt*	*Guilt*	*Shame*	*Control*
Guilt	0.25 (0.19)	0.06 (0.06)	**4.82 (0.26)**	**4.72 (0.31)**	1.18 (0.37)	0.18 (0.13)
Shame	1.31 (0.51)	0.06 (0.06)	3.76 (0.39)	3.61 (0.48)	**3.35 (0.26)**	0 (0)
Anger	**4 (0.35)**	0.06 (0.06)	2.53 (0.53)	1.67 (0.47)	2.24 (0.38)	0.35 (0.3)
Happiness	1.06 (0.35)	3.72 (0.24)	1.53 (0.33)	2 (0.42)	1.53 (0.24)	4.41 (0.23)
Joy	0.75 (0.31)	3.33 (0.28)	1.35 (0.33)	1.22 (0.27)	2.18 (0.35)	3.65 (0.34)
Anxiety	1.88 (0.55)	0.83 (0.27)	3.94 (0.38)	3.61 (0.43)	2.47 (0.4)	0.94 (0.35)
Sadness	2.19 (0.52)	0.17 (0.09)	2.82 (0.5)	2.67 (0.45)	1.88 (0.34)	0.24 (0.18)
Fear	0.5 (0.24)	0.22 (0.17)	1.65 (0.41)	1 (0.36)	0.53 (0.24)	0 (0)
Disgust	3.63 (0.52)	0.11 (0.08)	1.76 (0.42)	2.39 (0.54)	1.82 (0.44)	0.29 (0.21)
Disdain	2.38 (0.55)	0 (0)	0.35 (0.24)	0.56 (0.32)	0.76 (0.3)	0.06 (0.06)
Attention	2.25 (0.46)	3.56 (0.28)	3.18 (0.45)	4.17 (0.37)	3.35 (0.37)	3.71 (0.48)
Surprise	3.75 (0.36)	1.17 (0.35)	3.12 (0.36)	2.56 (0.47)	3.76 (0.37)	2.29 (0.46)

Note: Exp R corresponds to a replication study. The targeted emotion is in bold. Intensity of felt emotion ranges from 0, meaning "not at all", to 6, meaning "strongly".

significantly different from the reported intensity of guilt. Moreover, the participants in the guilt condition felt more shame than the participants in the anger condition, $p < .001$, and the control condition, $p < .001$. Participants in the anger condition felt more anger than those in the guilt condition, $p < .05$, and in the control condition, $p < .001$. Within the anger condition, participants felt significantly more anger than any other emotion ($ps < .05$), except for disgust, surprise, and attention. Within the control condition, participants felt significantly more happiness than any other emotion ($ps < .05$), except for amusement and attention.

For both the guilt and the anger conditions, participants felt significantly more body sensations and action tendencies than participants in the control condition, indicating that the manipulation succeeded in inducing emotional "responses" (see supplementary information S2).

Finally, all deceptive components averaged above 5 on a scale from 0, meaning "Not at all convincing", to 6, meaning "Strongly convincing."

VPT task

RT for correct responses and error rates (ER) were merged into an inverse efficiency score (IES = RT/(1-ER); Townsend & Ashby, 1978). The IES allows homogenizing the different patterns of speed-accuracy trade-offs within a group of individuals and comparing several groups via a unique measure. However, the IES presents the disadvantage that the RTs are quasi-exponentially multiplied as the ERs increase, which led Bruyer and Brysbaert (2011) to recommend not to use the IES if the average ER exceeds .10. The mean ERs were lower than .10 in all three groups of participants. Results for the RT and ER analyses are reported in the supplementary information S3.

A 2(Consistency: Consistent vs. inconsistent perspectives) x 2(Perspective: Self vs. other perspective) x 3(Emotion: Anger vs. guilt vs. control) ANOVA was conducted on the mean IES. In line with the original study (Samson et al., 2010), the ANOVA revealed a significant main effect of Consistency, $F(1, 48) = 65.876$, $p < .001$, $\eta_p^2 = .578$, no significant main effect of Perspective, $F(1, 48) < 1$, $p = .894$, $\eta_p^2 = .000$, and a significant Consistency x Perspective interaction, $F(1, 48) = 23.659$, $p < .001$, $\eta_p^2 = .338$, with a larger Consistency effect when participants judged the other person's perspective rather than their own perspective.

Most critical was any effect of Emotion. As a reminder, our main interest was to examine whether Emotion would interact with Perspective (signaling that at least one of the emotions affects how attention is allocated to oneself and someone else) or with Consistency (signaling that at least one of the emotions affects the ease with which the conflict between perspectives is handled). The main effect of Emotion was not significant, $F(2, 48) = 1.331$, $p = .274$, $\eta_p^2 = .053$. However, the Perspective x Emotion interaction was significant, $F(2, 48) = 4.291$, $p = .019$, $\eta_p^2 = .152$ (see Figure 2a). No other interaction was significant ($ps > .123$).

Planned contrast analyses revealed a significant effect of Perspective in the guilt condition, $t(16) = 2.326$, $p = .033$, $d = 0.56$, with a better performance at taking the other-perspective. There was a marginal effect of Perspective in the anger condition, $t(15) = 1.909$, $p = .076$, $d = 0.43$, with a better performance at taking the self-perspective.

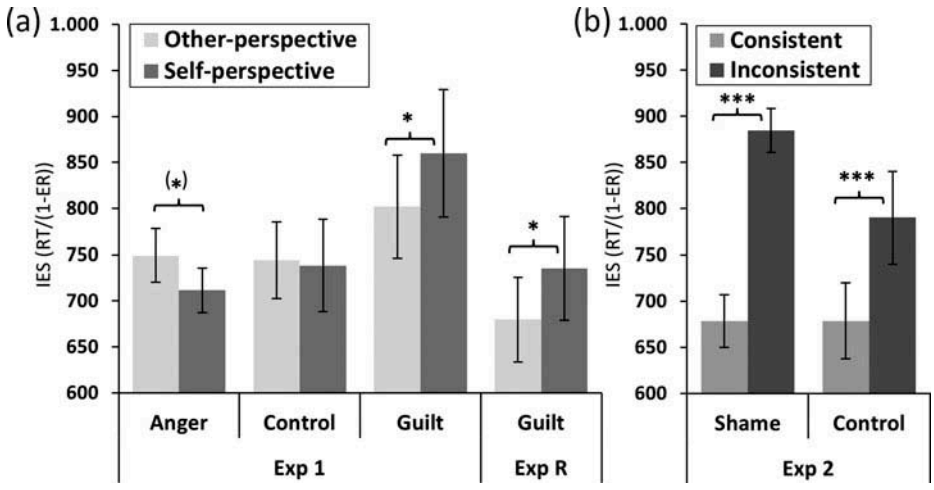

Figure 2. (a) Mean IES for self-perspective vs. other-perspective judgments as a function of the emotional condition in experiment 1 (Exp R corresponds to a replication study); and (b) Mean IES for inconsistent perspectives vs. consistent perspectives judgments as a function of the emotional condition in experiment 2. Error bars represent 95% confidence intervals. (*) = $p < .10$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

There was no significant effect of Perspective in the control condition, $t(17) < 1$, $p = .798$, $d = 0.06$.

To compare the Perspective effects between the emotion conditions, a one-way ANOVA was conducted on the Perspective differences (i.e., mean IES of self-perspective trials minus mean IES of other-perspective trials) with the Emotion as a between-subjects variable. A positive perspective difference indicates an advantage at judging the partner's perspective. There was a significant effect of Emotion on the perspective differences, $F(2, 48) = 4.591$, $p = .015$, $\eta^2 = .161$. Planned contrasts revealed that the mean IES perspective difference was higher in the guilt condition than in the anger condition, $t(48) = 2.962$, $p = .005$, $d = 1.06$, and the control condition, $t(48) = 2.033$, $p = .048$, $d = 0.71$. The mean IES perspective difference was not significantly different between the anger and control conditions, $t(48) = 1.001$, $p = .322$, $d = 0.35$.

Intermediary discussion

Participants in the guilt condition showed an other-perspective advantage while a trend for a self-perspective advantage was observed in the anger condition.

While the guilt induction procedure successfully induced guilt, it also induced a high level of shame. We hypothesized that the high level of shame originated from participants feeling less competent compared to their partner. We had, however, no measure of self-competence to support this hypothesis. A replication of the guilt induction in a new set of 18 participants confirmed that the high level of shame was associated with low self-competence ($r(18) = -.407$, $p = .094$) while guilt was not associated with low self-competence ($r(18) = .000$, $p = 1$). (In addition, the effect of guilt on the perspective-taking task was replicated; see Figure 2 and supplementary information S4.)

It is therefore unclear whether the other-centered perspective-taking performance in the guilt condition found in our study was driven by guilt or rather shame/self-incompetence feelings. Experiment 2 aimed to clarify this issue by specifically inducing feelings of shame/self-incompetence without feelings of guilt.

EXPERIMENT 2

Method

Participants

Thirty-four healthy individuals were randomly assigned to one of the two conditions (shame: $N = 17$, control: $N = 17$). Five participants in the shame condition did not feel shame following the induction procedure and were thus replaced by five additional participants who reported shame feelings (19 females, mean age: 21.00, age range: 18–25 years).

Material and procedure

The critical change from Experiment 1 was that participants' earnings were no longer dependent on their game partner's score at the card game and the bonus was removed. The other changes and the

detailed procedure are described in the supplementary information S1.

In the shame/self-incompetence induction, participants were filmed (to be shown later to the confederate) while achieving a poor score (the game was fixed). They then watched a video showing the confederate partner making a perfect score.

In the control/self-competence induction, participants were filmed while achieving a perfect score. They then watched the video showing the confederate partner making a poor score.

Results

Group characteristics

Participants did not significantly differ across the emotion conditions in terms of age, gender, or scores on the IRI (*p*s > .260).

Induction efficacy

In line with De Hooge et al. (2007), there was no difference between the shame and control conditions in terms of prosocial behavior (in terms of tickets allocated to the game partner, $t(32) < 1$, $p = .489$, $d = 0.25$, to themselves, $t(32) = 1.008$, $p = .321$, $d = 0.36$, or to the Red Cross, $t(32) < 1$, $p = .858$, $d = 0.06$).

The MANOVA conducted on the ratings of the 12 emotion items revealed a statistically significant difference between the two emotion conditions, $F(12, 21) = 20.525$, $p < .001$, $\eta_p^2 = .921$. Simple effect analyses reveal that the participants in the shame condition reported a higher intensity of shame than those in the control condition, $t(32) = 13.077$, $p > .001$ (see Table 1). Within the shame condition, participants reported more shame than any other emotions (*p*s < .05), including guilt, $t(16) = 4.403$, $p > .001$, except for attention, $t(16) = 0$, $p = 1$, and surprise $t(16) = 0.941$, $p = .361$. Stronger body sensations and actions tendencies were also reported in the shame condition than in the control condition (see supplementary information S2).

Finally, credibility ratings averaged above 4.55 across all conditions and deceptive components.

VPT task

In line with Experiment 1, the 2(Perspective) x 2 (Consistency) x 2(Emotion) ANOVA was conducted on the IES and revealed a significant main effect of Consistency, $F(1, 32) = 65.593$, $p < .001$, $\eta_p^2 = .672$, no main effect of Perspective, $F(1, 32) = 2.663$, $p = .112$, $\eta_p^2 = .077$, and a significant Consistency x Perspective interaction, $F(1, 32) = 16.247$, $p < .001$, $\eta_p^2 = .337$. Results for the RT and ER analyses are reported in the supplementary information S3.

The main effect of Emotion was not significant, $F(1, 32) < 1$, $p = .498$, $\eta_p^2 = .015$. The Perspective x Emotion interaction was not significant, $F(1, 32) < 1$, $p = .404$, $\eta_p^2 = .022$, but the Consistency x Emotion interaction was significant, $F(1, 32) = 5.840$, $p = .022$, $\eta_p^2 = .154$ (see Figure 2b). Finally, the Perspective x Consistency x Emotion interaction was not significant, $F(1, 32) < 1$, $p = .519$, $\eta_p^2 = .013$.

Simple effect analyses revealed a significant effect of Consistency in the shame condition, $t(16) = 6.848$, $p < .001$, $d = 1.66$, and in the control condition, $t(16) = 4.687$, $p < .001$, $d = 1.14$, with a better performance on consistent perspective trials.

A *t*-test for independent samples was conducted on the Consistency differences (i.e., mean IES of inconsistent perspectives trials minus mean IES of consistent perspectives trials) with the Emotion as a between-subjects variable. There was a significant effect of Emotion on the consistency differences, $t(32) = 2.462$, $p = .019$, $d = 0.87$, with a higher interference in the shame condition than in the control condition.

GENERAL DISCUSSION

This study examined whether emotions can influence one of the most basic forms of perspective-taking, namely level-1 VPT and if so, whether emotions affect our attention by making us more or less self-centered or whether they affect the cognitive control processes necessary to handle conflicts between perspectives. Experiment 1 revealed that guilt made participants more other-centered while anger tended to make them more self-centered. Experiment 2 aimed at ruling out that the observed effects of guilt were due to the concomitant feelings of shame. Unlike guilt, shame did not make participants more other-centered but affected participants' ability to handle conflicting perspectives indicating that the effects observed in Experiment 1 were due to guilt and not shame.

This is, to our knowledge, the first evidence that emotions affect such a basic form of perspective-taking as level-1 VPT. The facilitatory effect of guilt that we observed is in line with previous findings with more complex perspective-taking tasks (Leith & Baumeister, 1998; Yang et al., 2010) showing the wide spectrum of perspective-taking tasks that can be affected by guilt. Here, we also provide evidence as to *how* guilt affects perspective-taking, namely

through changing the weight given to the egocentric perspective compared to another person's perspective rather than affecting the cognitive resources required to inhibit a conflicting perspective. It is possible that this modulation of the relative self/other salience observed in level-1 VPT is the same mechanism through which guilt exerts an influence on more complex perspective-taking tasks.

Interestingly, shame (related to self-incompetence) seemed also to influence level-1 VPT abilities, but by operating through a different mechanism, i.e., by reducing the cognitive resources required to handle conflicting perspectives. Although shame and guilt are often confused lexically (Tangney, Miller, Flicker, & Barlow, 1996) and both arise from a violation of social expectations, shame promotes distinct cognitions and behaviors. When one feels ashamed, the blame is attributed to the self and is perceived as irreparable, whereas when one feels guilty, the blame is attributed to the action and is perceived as reparable. Hence, shame promotes a willingness to hide from and avoid others, whereas guilt promotes the willingness to amend and approach others (Baumeister et al., 1994; Tangney et al., 1996). It is therefore not surprising that shame and guilt affect perspective-taking performance differently.

Although no study has ever linked reduced executive control with shame, shame is described as a particularly debilitating and arousing emotion (Tangney et al., 1996). Hence, one could argue that a higher level of arousal in the shame condition might have driven the higher conflict-handling difficulties in perspective-taking. However, based on the analysis of body sensations (cf. supplementary information S2), there is no clear evidence that the participants in the shame condition were more aroused than those in the guilt and anger conditions. Thus, the depletion of cognitive control resources following shame cannot be explained by arousal alone but might be caused also by other factors, such as the need to suppress the unpleasant feelings (supported by the action tendencies to avoid and shelter) or the situational appraisals of being incapacitated or powerless usually associated with shame (Leith & Baumeister, 1998; Lewis, 1971; Wicker, Payne, & Morgan, 1983).

Among the previous studies investigating the link between shame and perspective-taking, no relation has been found when perspective-taking was assessed via self-reported measures which may not have put the emphasis on situations that require handling conflicting perspectives (Leith & Baumeister, 1998, Study 1). Interestingly, when a negative relation was found (Leith & Baumeister, 1998, Studies 2 & 3; Yang et al., 2010), the authors used a perspective-taking task in which the other person had a conflicting perspective. Effects of shame may thus only be observed in situations where the other person holds a conflicting perspective, while guilt may affect a broader set of perspective-taking situations (i.e., whether or not there are conflicts between points of view) by affecting attentional orienting towards the other person.

As for anger, our results showed that when participants were induced to feel anger, they tended to be more self-centered. However, the effect size of this self-perspective advantage was small (d = 0.35) despite the fact that (1) the mean reported anger intensity was as high as in previous studies (as reviewed by Lerner & Tiedens, 2006); (2) the direction of the self-perspective advantage was as homogenous within the sample as in the guilt and shame conditions; (3) the sample size was similar to the guilt and shame conditions; and (4) a significant effect of anger on prosocial behavior was found. All together, this indicates that anger had a much smaller effect on level-1 VPT than guilt and shame.

To conclude, we show that while anger tended to make participants more self-centered, guilt feelings clearly boosted participants' ability to take someone's perspective by making them more other-centered. These two emotions had an effect on how attention is allocated to oneself and the other person. Interestingly, a secondary finding from our control experiment is that this does not seem to be the only way emotions can affect perspective-taking. Feelings of shame and self-incompetence diminished participants' ability to take someone's perspective by reducing their cognitive control abilities. The differential effects of guilt and shame need at this stage to be interpreted cautiously given that they were observed across two different experiments with different set-ups (each optimized to yield the targeted emotion). Interestingly, however, our results suggest that there are two different cognitive pathways by which emotional states can affect one of the most basic forms of perspective-taking, paving the way for a more systematic investigation of not only *if* but also *how* different emotions affect perspective-taking. Identifying the neural correlates of these two types of modulation would also be an interesting avenue for future research.

Supplementary material

Supplemental data for this article can be accessed here.

Original manuscript received 30 November 2014
Revised manuscript received 13 April 2015
First published online 18 May 2015

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