Consciousness and Cognition 74 (2019) 102773

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Perspective taking and emotion: The case of disgust and sadness

Limor Binyamin-Suissa[a,*,1], Natali Moyal[a,b,1], Alona Naim[c], Avishai Henik[a,b]

[a] Department of Psychology, Ben-Gurion University of the Negev, Israel
[b] The Zlotowski Center for Neuroscience, Ben-Gurion University of the Negev, Israel
[c] Department of Brain and Cognitive Sciences, Ben-Gurion University of the Negev, Israel

ARTICLE INFO

Keywords:
Perspective taking
Distinct emotions
Valence
Disgust
Sadness

ABSTRACT

In a recent study (Gilead et al., 2016), perspective taking (PT) was found to have a significant effect on affect ratings of negative pictures compared to neutrals. The current study explores the question whether PT would be affected equally by distinct negative emotions. We used neutral pictures and pictures classified as provoking sadness or disgust, matched for their intensity and arousal. Participants were asked to rate the pictures (on a scale from 1—no emotional reaction, to 5—very strong reaction) from 3 different perspectives - tough, sensitive, or their own – "me". In Experiment 1, all pictures were mixed in the same blocks. In Experiment 2, the sad and disgust pictures were separated into two different blocks (each including neutrals). Both experiments showed significant interaction between PT and emotion. PT was found to be influenced by valence; however, distinct negative emotions were found to affect PT similarly.

1. Introduction

Knowing the other's mind—what drives him, what explains her behaviors, what do they think, want, believe, and so forth—is crucial in order to get along in the social world. This ability is based on a complex social cognitive process named perspective taking (PT). PT is considered to be the cognitive component of empathy (Lamm, Batson, & Decety, 2007) and is also studied as "theory of mind" (ToM) (Premack & Woodruff, 1978) and "mentalizing" (Frith & Frith, 2003), terms that are often used interchangeably. PT involves imagining how another is affected by his or her situation without confusing between the experience of the self and the experience of the other person (Davis, Conklin, Smith, & Luce, 1996). Failing to do so sets the stage for varied potential misunderstandings and conflicts (Ross & Ward, 1996).

Various factors have been found to affect the ability to take the perspective of others, thereby diminishing the egocentric perspective. For instance, egocentrism tends to be greater with others who are considered to be close and those perceived as being more similar to oneself than with strangers (Krienen, Tu, & Buckner, 2010) or others who are dissimilar (Ames, 2004; Todd, Hanko, Galinsky, & Mussweiler, 2011). People also tend to be more egocentric when they are under pressure to respond quickly (Epley, Keysar, Van Boven, & Gilovich, 2004), they are distracted by a concurrent task (Schneider, Lam, Bayliss, & Dux, 2012) or when they are members of individualistic cultures (Wu, Barr, Gann, & Keysar, 2013).

The relationship between emotion and PT or whether or not emotion is another factor that influences PT is a question that has been addressed recently by a few scholars. In a neuroimaging and behavioral study, Gilead et al. (2016) found an interaction between PT and valence, such that subjects' ratings of emotional reactions from two different perspectives were significantly different in the

* Corresponding author at: Department of Psychology, Ben-Gurion University of the Negev, P.O.B. 653, Beer-Sheva, Israel.
E-mail address: limorbin@post.bgu.ac.il (L. Binyamin-Suissa).
[1] Authors contributed equally.

https://doi.org/10.1016/j.concog.2019.102773
Received 12 August 2018; Received in revised form 5 June 2019; Accepted 20 June 2019

negative valence condition compared to the neutral one. The researchers interpreted this finding as illuminating the influence of PT on emotion. However, in the context of factors that influence PT, one can conclude that valence is another influencing factor that has not yet been investigated enough. In another study, Todd, Forstmann, Burgmer, Brooks, and Galinsky (2015) investigated the influence of distinct emotions on PT. One of the central findings of this study was that distinct negative emotions influence PT differently. For example, they showed that anxiety compared to anger can increase egocentrism while performing a conceptual PT task.

In the field of emotion research, there is a continued debate concerning the question whether the research of emotion influences on cognition should be limited only to the *dimensions* of emotions—mainly valence and arousal—or whether the exploration of the influences of *distinct emotions* could broaden our understanding of this issue in valuable ways (DeSteno, Petty, Wegener, & Rucker, 2000; Keltner, Ellsworth, & Edwards, 1993; Niedenthal & Halberstadt, 1995). In the case of PT judgments, Todd et al. (2015) finding suggests that it might be of importance to explore further the specific influences of distinct emotions. While Todd et al.'s study concerns conceptual PT (subjects had to predict what the target would *think*), Gilead et al. (2016) study concerns emotional PT (subjects had to predict how strong the target would *feel*). Building on these two lines of investigation, the present study uses Gilead et al.'s task in order to explore whether negative valence is affected differently by distinct emotions. Namely, we examined whether two distinct negative emotions would affect emotional PT differently. We used sadness and disgust, two of the four most empirically established negative emotions (Ekman, 2016).

We conducted two experiments in which we used neutral pictures as well as pictures that were classified in a previous study (Moyal, Henik, & Anholt, 2018) as provoking sadness or disgust, which were matched for their emotional intensity and arousal. We asked participants to rate the pictures from three different perspectives - tough, sensitive, or their own – "me". In Experiment 1, all pictures were mixed in the same blocks. In Experiment 2, based on the results of Experiment 1 (discussed in more detail below), the sadness and disgust pictures were separated into two different blocks (each including neutrals).

2. Experiment 1

We hypothesized that the results would replicate Gilead et al. (2016) study; meaning, the difference between the ratings in the tough perspective and the sensitive perspective would be larger in negative valence conditions (sadness and disgust) than the difference between these perspectives in the neutral condition. The second hypothesis involved the negative emotions exclusively. We hypothesized that the differences between the perspectives would differ across the two negative valence conditions. We did not have a specific prediction as to the direction of that difference.

2.1. Method

2.1.1. Participants

Eighteen undergraduate students from Ben-Gurion University of the Negev were recruited for the experiment for monetary compensation (13 females; average age, 23.83 years; $SD = 1.38$). All were native Hebrew speakers, had normal or corrected-to-normal vision and none reported a history of attention deficit disorder or learning disability. One of them was removed from the analysis (detailed in the 'Results' section), leaving seventeen participants overall.

A power analysis using G-Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007), based on the effect size reported in Gilead et al. (2016) study ($\eta_p^2 = 0.89$), indicated that the current sample ($N = 17$) allowed for examination of group differences of ratings at a power > 80% with a Type I error ($\alpha < 0.05$).

2.1.2. Apparatus

The experiment was run on a DELL OptiPlex 9020MT computer with a 23–inch color screen monitor. E-Prime 2.0 (Psychology Software Tools) was used for programming, presentation of stimuli, and timing operations. Responses were collected through the computer keyboard.

2.1.3. Materials

2.1.3.1. Target description questionnaire. We used two filled-in target description questionnaires. These questionnaires were taken from Gilead et al. (2016) study and translated into Hebrew. As in their study, the descriptions of the sensitive and tough targets (i.e., supposed responders) were given in the form of responses in printed questionnaires that the participants were led to believe were filled out by two other participants. A hand-written name appeared at the top of each of the two questionnaires. Both of the names were matched to the current participant's gender. Each questionnaire included demographic details and answers to personal questions (e.g., food preferences, favorite movie). The main differences between the targets emerged from the manner each one had ostensibly responded to certain questions. The targets' answers were pretested to evoke the impressions that one target was sensitive and the other was tough. For instance, the sensitive figure liked drama and romantic films and his/her preferred food was quinoa. By contrast, the tough figure enjoyed horror and action movies and his/her preferred food was an entrecote steak. Moreover, in a free response item, the sensitive figure defined himself/herself as being rather sensitive, whereas the tough target defined himself/herself as being rather resilient. These features were entrenched within more ordinary details to strengthen the believability of the experiment (p. 10041).

2.1.3.2. Affective stimuli. Twenty-four negative pictures were taken from the Categorized Affective Pictures Database (CAP-D; Moyal et al., 2018) of which twelve were sad pictures (mean normative intensity = 5.12, mean normative arousal = 4.34, on scales ranging from 1—very low intensity, to 9—highly intense, and 1—very low arousing, to 9—highly arousing, respectively) and twelve were disgust pictures (mean normative intensity = 4.65, mean normative arousal = 4.87). Both groups of pictures had greater than 48% agreement level regarding the emotion they elicited and were matched for arousal and intensity between the two emotions. Twelve neutral pictures (mean normative valence = 5.41, mean normative arousal = 3.37, on a scales ranging from 1—very unhappy, to 9—very happy, and 1—not arousing, to 9—highly arousing, respectively) were taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2001).[2] An additional set of six pictures (two for each emotional category: sadness, disgust, neutral) were used during training.

2.1.4. Procedure

Our procedure was similar to that in Gilead et al. (2016) study. After signing an informed consent form, participants filled out a questionnaire describing some personal and demographic details. They were told that in the task to be performed, they would be asked to speculate on the emotional reactions of previous participants. They were also informed that their approval was needed to use their questionnaire pseudonymously for future participants. In fact, this questionnaire was rendered only to strengthen the credibility of the experiment, and was not used subsequently. After participants filled out the questionnaire, they were given the target description questionnaires, which were identical in format to the one they filled. They were encouraged to read the responses of each previous participant thoroughly and keep in mind the impressions they formed of them. In order to make sure participants knew the target descriptions well enough, they were asked to recall the target description questionnaires, and the experiment began only once participants had correctly answered all the description questions. Then, participants were told they would be presented with pictures and that each picture would be preceded by a cue with the name of the participant whose perspective they were supposed to take, or alternatively, by a cue instructing them to take their own perspective. Each picture was followed by a screen guiding them to rate the emotional response (of themselves or of the target perspective) the picture elicited. They were told that their ratings would be compared with the previous participants' actual ratings and that trials in which they provided the rating from their own perspective would be used for subsequent participants (in fact, these trials were used as a measure of spontaneous emotional response). The participants' goal was to speculate on what the previous participants' responses would be, as accurately as possible. Participants were then asked to perform a brief training on the task (p. 10041).

Each experimental trial began with the presentation of a cue with the name of the participant whose perspective the current participant should take, or a cue asking them to take their own perspective, exposed for 2000 ms. Then, a fixation of 1000 ms was presented, followed by a picture for 6000 ms. The image was replaced by a screen that appeared for 3000 ms, asking the participant to rate the emotional reaction to the picture from the perspective they were asked to adopt (1 = no emotional reaction at all, 5 = very strong emotional reaction). The trial concluded with a fixation of 3000 ms (see Fig. 1). After completing the task, participants were thanked and debriefed.

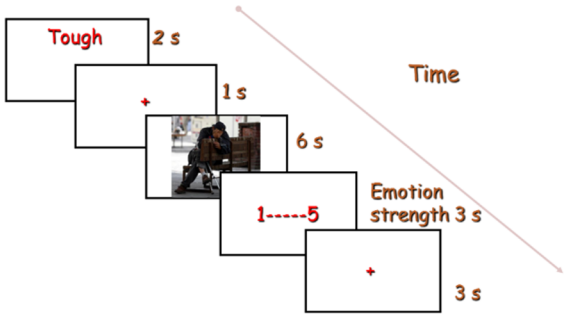

Fig. 1. An example for a trial in the tough/sadness condition (note that in the experiment, the cue appeared as a name of allegedly former participant).

2.1.5. Design

There were two within-subject factors: emotional category (sadness, disgust, neutral) and perspective (tough, sensitive, me), creating altogether 9 experimental conditions. The task consisted of 108 trials (12 pictures for each of the 3 emotional categories, each picture presented three times, once for each of the 3 perspectives), which were divided equally into two blocks. Trials were presented in a random order for each participant.

[2] Note that the IAPS database does not include an intensity measure.

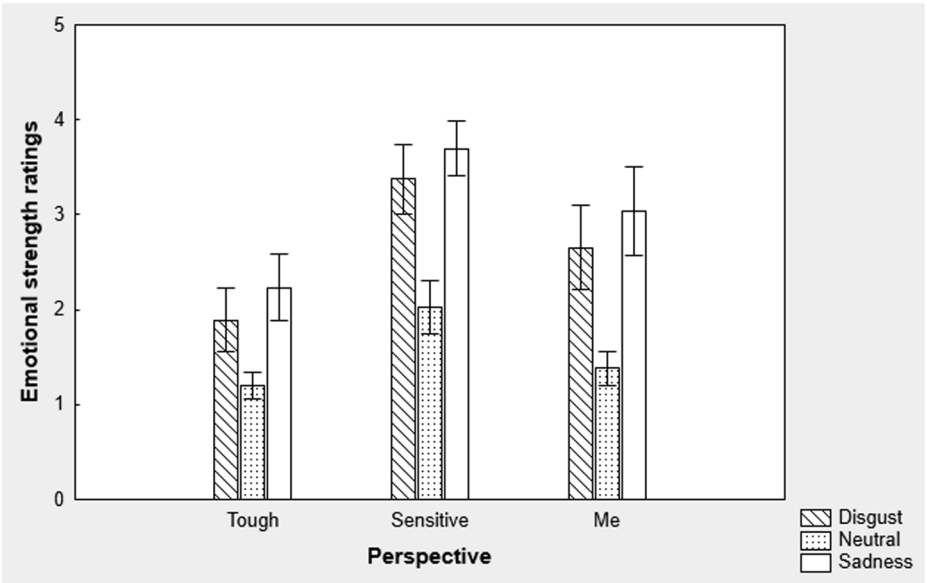

Fig. 2. Experiment 1 results for the perspective × emotion interaction. Error bars represent the standard error.

2.2. Results

Analyses were based on ratings whose reaction time was above 200 ms, so as to exclude ratings that were automatic and not deliberated. Means of ratings in the various conditions were computed. One subject was excluded for confusing the tough and sensitive targets (as evident by a reverse pattern of expected ratings). In addition, trials exceeding ± 2.5 standard deviations from the mean (that was computed for each participant in each condition) were excluded from the analysis. This procedure resulted in exclusion of 2.5% of the trials. A two-way within subject analysis of variance (ANOVA) was carried out. Emotion (neutral/disgust/sadness) and perspective (tough/sensitive/me) were independent variables and emotion rating was a dependent variable. There was a significant interaction between emotion and perspective [$F(4, 64) = 8.11$, $p < .001$, $\eta_p^2 = 0.33$], and two main effects [$F(2, 32) = 49.92$, $p < .001$, $\eta_p^2 = 0.75$] and [$F(2, 32) = 43.88$ $p < .001$, $\eta_p^2 = 0.73$] for emotional category and perspective, respectively (see Fig. 2). To examine our first hypothesis, we contrasted the difference between the tough and sensitive perspectives in the neutral condition with the same difference in the sadness and disgust conditions taken together. This resulted in a significant difference [$F(1, 16) = 30.96$, $p < .001$, $\eta_p^2 = 0.65$], which as we hypothesized, replicates Gilead et al. (2016) finding. This result indicated that the difference between the ratings of the sensitive perspective and the tough perspective was larger for the negative compared with the neutral pictures. To examine our second hypothesis, we conducted three more contrasts, each time contrasting the differences between two of the three perspectives (between tough and sensitive, tough and me, sensitive and me) in the sadness condition with those in the disgust condition. The results of these contrasts did not support our prediction as none of them were significant [$F(1, 16) = 0.02$, $p = .87$], [$F(1, 16) = 0.14$, $p = .70$] and [$F(1, 16) = 0.24$, $p = .62$], respectively. Namely, there was no difference between the two negative emotions in terms of how PT influenced the ratings of emotional intensity. This lack of differences was repeatedly obtained with Bayesian analysis [$BF_{01} = 3.22$], [$BF_{01} = 3.03$], [$BF_{01} = 3.02$], respectively.

In order to correct for a potential confound of a floor effect that might occur due to a curtailed range in the neutral condition, we conducted a coefficient of variation (CV) analysis as well. For each participant in each condition, we computed a CV score—standard deviation divided by the mean of ratings— and we used these scores to repeat the same two-way within subject ANOVA. Both the interaction (emotion*perspective) and the contrast of the difference between the tough and sensitive perspectives in the neutral condition with the same difference in the sadness and disgust conditions taken together were found to be significant [$F(4, 64) = 3.57$, $p = .01$, $\eta_p^2 = 0.18$] and [$F(1, 16) = 10.32$, $p < .005$, $\eta_p^2 = 0.39$], respectively.

2.3. Discussion

As discussed above, the findings indicate that the difference between the tough perspective and the sensitive perspective was larger in the negative valence conditions (sadness and disgust taken together) than the same difference in the neutral condition. These findings repeat themselves in the CV analysis, thereby reducing the possibility that this difference reflects a floor effect due to a curtailed range in the neutral condition. This result confirms our first hypothesis and replicates Gilead et al. (2016) findings, validating the interaction that was found there between PT and valence. When subjects were triggered to feel negative valence as in sadness or disgust, the ratings they gave from the different perspectives were more remote from one another, compared to the times they were not triggered to feel anything (i.e., neutral condition). The second hypothesis concerned the negative emotions only. It was

based on prior findings that showed that specific emotions influenced PT differently (Todd et al., 2015). This hypothesis was not supported by our results. Thus, the three differences between the three perspectives (tough-sensitive, tough-me and sensitive-me) in the disgust condition did not differ significantly from their parallels in the sadness condition. This lack of differences was supported by a Bayesian analysis as well and it might suggest that sadness and disgust influence PT similarly. However an alternative explanation could be that the method we used, that of presenting the distinct emotional pictures in the same block, blurred the distinct effect of each emotion. The enforcement of frequent switches from one emotional mood to the other might have resulted in a carryover effect. That is, effects that might have happened in one emotional step were carried over to the next different emotional step, mixing the two of them in a way that made it impossible to distinguish between them. This might not have happened with respect to the neutral stimuli because by definition, neutral pictures do not usually evoke any noticeable emotional reaction. Thus, when a neutral picture precedes a negative one, no emotional load is carried over from it to the next step. When, by contrast, a negative picture precedes a neutral one, the carryover effect is piled up on top of a very low if any emotional load (neutral) and so the differences between the two steps remain noticeable. Hence, the carryover effect might be relevant and exert enough influence to interfere with the result only with stimuli that are loaded emotionally in the first place. This alternative explanation will be explored in Experiment 2 (see below) in which we separated the two negative emotional stimuli into two different blocks.

3. Experiment 2

In order to investigate the possibility that separating the two negative emotional stimuli would reveal different effects of the distinct negative emotions on PT, we conducted Experiment 2. This experiment was identical to Experiment 1 but instead of mixed blocks, we created separate blocks for each negative emotion. This produced one block of mixed sad and neutral pictures and a separate second block of mixed disgust and neutral pictures. Our hypotheses remained the same as in Experiment 1. Hence, we first hypothesized that the results would replicate Gilead et al. (2016) study and our finding from Experiment 1, in the sense that the difference between the tough perspective and the sensitive perspective would be larger in the negative valence conditions (sadness and disgust taken together) than in the neutral condition. Second, we hypothesized that PT would differ between disgust and sadness conditions.

3.1. Method

3.1.1. Participants

Twenty undergraduate students from Ben-Gurion University of the Negev participated in the experiment for course credit (18 females; average age, 23.05 years; $SD = 0.99$). All were native Hebrew speakers, had normal or corrected vision, and no one reported a history of attention deficit disorder or other learning disorder.

A power analysis using G-Power 3.1 (Faul et al., 2007), based on the effect size reported in the previous experiment (Experiment 1, $\eta_p^2 = 0.33$), indicated that the current sample ($N = 20$) allowed for examination of group differences of ratings at a power > 80% with a Type I error ($\alpha < 0.05$).

3.1.2. Apparatus

The apparatus was the same as in Experiment 1.

3.1.3. Materials

3.1.3.1. Target description questionnaires. We used the same two target description questionnaires as in Experiment 1.

3.1.3.2. Affective stimuli. The affective stimuli were the same as in Experiment 1 except that we added another twelve neutral pictures (mean normative valence = 5.45, mean normative arousal = 3.31) taken from the IAPS. These twelve added neutral pictures were needed as a result of the separation of the negative stimuli into two blocks. This addition resulted in a total of 24 neutral pictures (mean normative valence = 5.43, mean normative arousal = 3.34).

3.1.4. Procedure

The procedure was the same as in Experiment 1 except that participants performed two short training sessions on the task, one before each block (instead of just one at the beginning of the first block). Each of the training sessions was adjusted to the block it preceded so as to include pictures of the relevant emotional category (disgust or sadness) only, mixed with neutral pictures.

3.1.5. Design

There were two within-subject factors: emotional category (sadness, disgust, neutral) and perspective (tough, sensitive, me). The task consisted of 144 trials, divided into two blocks. Each block had 72 trials: 12 pictures of one category of negative emotion—either disgust or sadness—plus 12 neutral pictures, each of them presented 3 times, one for each perspective. Trials were presented in a random order for each participant. The presenting order of the blocks was counterbalance across participants.

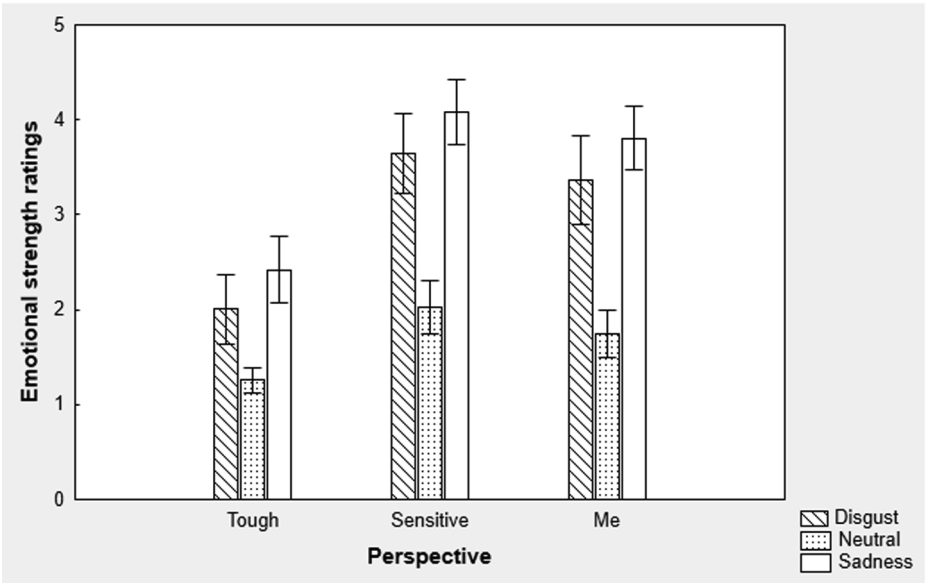

Fig. 3. Experiment 2 results for the perspective × emotion interaction. Error bars represent the standard error.

3.2. Results

Analyses were based on ratings whose reaction time was above 200 ms, so as to exclude ratings that were automatic and not deliberated. Means of ratings in the various conditions were computed. Trials exceeding ± 2.5 standard deviations from the mean (that was computed for each participant in each condition) were excluded from the analysis. This procedure resulted in exclusion of 3.5% of the trials. We first conducted a mixed three-way ANOVA in which order of blocks was a between-subject independent variable, emotion (neutral/disgust/sadness) and perspective (tough/sensitive/me) were within-subject independent variables and emotions ratings was a dependent variable. This resulted in a significant interaction between emotion and perspective [$F(4, 72) = 14.2$, $p < .001$, $\eta_p^2 = 0.44$], and two main effects [$F(2, 36) = 88.09$, $p < .001$, $\eta_p^2 = 0.83$] and [$F(2, 36) = 62.35$ $p < .001$, $\eta_p^2 = 0.77$], for emotional category and perspective, respectively (see Fig. 3). No effects were found for order of the blocks, therefore order was not included in the following analyses. To examine our first hypothesis, we contrasted the difference between the tough and sensitive perspectives in the neutral condition with the same difference in the sadness and disgust conditions taken together. This resulted in a significant difference [$F(1, 19) = 20.42$, $p < .001$, $\eta_p^2 = 0.51$], which as we hypothesized, replicated our Experiment 1 finding and Gilead et al. (2016) finding as well. To examine our second hypothesis, we conducted three more contrasts, each time contrasting the differences between two of the three perspectives (between tough and sensitive, tough and me, sensitive and me) in the sadness condition with those in the disgust condition. The results of these contrasts did not support our predictions as none of them were found to be significant [$F(1, 19) = 0.02$, $p = .87$], [$F(1, 19) = 0.02$, $p = .87$] and [$F(1, 19) = 0.006$, $p = .93$], respectively; meaning, there was no difference between the two negative emotions in terms of modulating PT. This lack of differences was repeatedly obtained with Bayesian analysis [$BF_{01} = 3.19$], [$BF_{01} = 3.28$], [$BF_{01} = 3.12$], respectively.

Similar to the results of the first experiment, in order to correct for a potential confound of a floor effect, we conducted a coefficient of variant analysis as well. Again, for each participant in each condition we computed CV scores and conducted a two-way within subject ANOVA. Both the interaction (emotion * perspective) and the contrast of the difference between the tough and sensitive perspectives in the neutral condition with the same difference in the sadness and disgust conditions taken together were found significant [$F(4, 76) = 10.17$, $p < .001$, $\eta_p^2 = 0.34$] and [$F(1, 19) = 18.06$, $p < .001$, $\eta_p^2 = 0.48$], respectively.

3.3. Discussion

The results of Experiment 2 replicated those of Experiment 1. Namely, as was found in Experiment 1, none of the three comparisons between the perspectives (tough-sensitive, tough-me, sensitive-me) in the disgust condition differed from their parallel in the sadness condition. Thus, the differences that were found between the perspectives in the disgust condition resembled those that were found in the sadness condition and this lack of differences was supported again by a Bayesian analysis as well. These results suggest that despite separating the two distinct negative emotions, giving them the opportunity to exert influence, free from supposable blurring influences, they did not show a distinct influence on PT. These findings weaken the notion that distinct emotions that share the same valence (i.e., negative) might have different effects on PT.

On the other hand, the interaction between valence and PT was another finding from Experiment 1 that was replicated in Experiment 2, that is, the interaction in which there was a larger difference between the sensitive and tough perspectives in the negative valence conditions (taken together) as compared to the neutral condition. Moreover, similar to the results of Experiment 1,

these findings repeated themselves in the CV analysis, thereby reducing the possibility that this difference reflects a floor effect due to a curtailed range in the neutral condition. Thus, the valence effect on PT gained repeated validation by the results. More specifically, once again the results showed that when triggered to feel negative valence, subjects took perspectives in a more profound way than when they were not triggered to feel any emotion at all (neutral).

4. Joint analysis of the two experiments

The analysis of the data of each of the two experiments separately suggests that PT is influenced by valence, regardless of the specific type of emotion. This suggestion seems to be pretty strong because when analyzing the data of the two experiments together, thereby enlarging the size of the sample (N = 37), the results follow the same pattern and are even more convincing. Thus, the two-way within subject ANOVA of emotion (neutral/disgust/sadness) and perspective (tough/sensitive/me) as independent variables and emotion rating as a dependent variable resulted in: a significant interaction between emotion and perspective [$F(4, 144) = 22.60$, $p < .001$, $\eta_p^2 = 0.38$], and two main effects [$F(2, 72) = 133.68$, $p < .001$, $\eta_p^2 = 0.78$] and [$F(2, 72) = 97.14p < .001$, $\eta_p^2 = 0.72$] for emotional category and perspective, respectively. The contrast of the difference between the tough and sensitive perspectives in the neutral condition with the same difference in the sadness and disgust conditions taken together resulted in a significant difference [$F(1, 36) = 43.27, p < .001, \eta_p^2 = 0.54$]. This result indicated that the difference between the ratings of the sensitive perspective and the tough perspective was larger for the negative compared with the neutral pictures. Lastly, the contrasts of the differences between each two of the three perspectives (between tough and sensitive, tough and me, sensitive and me) in the sadness condition with those in the disgust condition were again not significant [$F(1, 36) = 0.001$, $p = .96$], [$F(1, 36) = 0.12$, $p = .72$] and [$F(1, 36) = 0.19$, $p = .66$], respectively. Namely, again there was no difference between the two negative emotions in terms of how PT influenced the ratings of emotional intensity. This lack of differences was obtained again when conducting a Bayesian analysis as well [$BF_{01} = 3.73$, $BF_{01} = 4.31$, $BF_{01} = 4.29$].

5. General discussion

Overall our results suggest that PT is influenced by valence, regardless of the specific type of emotion. This was supported further by additional analyses: the coefficient of variation analysis, which reduced the possibility of a potential confound of a floor effect; the joint analysis of the two experiments, which enlarged the size of the sample; and the Bayesian analysis for each experiment and both of them together. These results deviate from Todd et al. (2015) findings that distinct negative emotions influence PT differently. One reason for the difference between our study and that of Todd and colleagues could be the different type of PT tasks used. Each of them might measure a different kind of PT—one is conceptual (predicts what the target thinks) as in Todd et al.'s study, whereas the other is emotional (predicts the target's emotional reaction) as in our study. A second reason could be that the specific emotion Todd et al. explored—anxiety—has a unique influence on PT that differs from most other negative emotions in general, as it has on various cognitive processes.

Another point that should be noted is that our study used categorized pictures (Moyal et al., 2018) to induce the two distinct emotions. As mentioned before, both groups of pictures (disgust and sadness) had greater than 48% agreement level regarding the emotion they elicited. Although this threshold is pretty high, it was a forced constraint (because of the need to control intensity and arousal). It might be that if the threshold was higher, the distinction between the two emotions would have been even more robust. Thus, in retrospect, future investigations might consider using another technique of eliciting distinct emotions, like standardized video clips, that reliably elicit different emotional reactions (see Lench, Flores, & Bench, 2011), or writing an emotional autobiographic memory. The latter was also used in Todd et al. (2015) study.

Relatedly, one could question the need to control for intensity and arousal altogether. Thus, it might be argued that as disgust is characteristically a more intense and arousing emotion than sadness, equating the two emotions on intensity and arousal might lose some of the distinctness of each of them. In a pilot study conducted in our laboratory, we used pictures that best matched the discrete emotional category, regardless of their intensity and arousal values. We found an effect for emotional category. Specifically, disgust was found to have a greater impact on PT than sadness. However, as each discrete emotion has varied levels of intensity and arousal, we wanted to control for this confound. The results of our current studies show that controlling for intensity and arousal eliminated the seeming effect of emotional category.

Importantly however, our findings are in accordance with those of Gilead et al. (2016) study, and in the context of the dispute between the valence approach versus the distinct emotions approach, it adds support to the former. Although of course, this conclusion should be further validated by examining other distinct emotions as well. This should be done in order to rule out the possibility that our finding was pre-determined by the selection of the specific emotions we chose.

One limitation of our study concerns the fact that the experiments did not refer to positive valence. We plan to extend the exploration of the valence-PT interaction to include positive valence as well.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

None.

References

Ames, D. R. (2004). Inside the mind reader's tool kit: Projection and stereotyping in mental state inference. *Journal of Personality and Social Psychology, 87*, 340–353.

Davis, M. H., Conklin, L., Smith, A., & Luce, C. (1996). Effect of perspective taking on the cognitive representation of persons: A merging of self and other. *Journal of Personality and Social Psychology, 70*, 713–726.

DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: The role of emotion specificity. *Journal of Personality and Social Psychology, 78*, 397–416.

Ekman, P. (2016). What scientists who study emotion agree about. *Perspectives on Psychological Science, 11*(1), 31–34.

Epley, N., Keysar, B., Van Boven, L., & Gilovich, T. (2004). Perspective taking as egocentric anchoring and adjustment. *Journal of Personality and Social Psychology, 87*, 327–339.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175–191.

Frith, U., & Frith, C. D. (2003). Development and neurophysiology of mentalizing. *Philosophical Transactions of the Royal Society of London B: Biological Sciences, 358*, 459–473.

Gilead, M., Boccagno, C., Silverman, M., Hassin, R. R., Weber, J., & Ochsner, K. N. (2016). Self-regulation via neural simulation. *Proceedings of the National Academy of Sciences, 113*, 10037–10042.

Keltner, D., Ellsworth, P. C., & Edwards, K. (1993). Beyond simple pessimism: Effects of sadness and anger on social perception. *Journal of Personality and Social Psychology, 64*, 740–752.

Krienen, F. M., Tu, P., & Buckner, R. L. (2010). Clan mentality: Evidence that the medial prefrontal cortex responds to close others. *Journal of Neuroscience, 30*, 13906–13915.

Lamm, C., Batson, C. D., & Decety, J. (2007). The neural substrate of human empathy: Effects of perspective-taking and cognitive appraisal. *Journal of Cognitive Neuroscience, 19*, 42–58.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2001). International Affective Picture System: Instruction manual and affective ratings (tech. rep. no. A-5). Gainesville, FL: Center for Research in Psychophysiology, University of Florida.

Lench, H. C., Flores, S. A., & Bench, S. W. (2011). Discrete emotions predict changes in cognition, judgment, experience, behavior, and physiology: A meta-analysis of experimental emotion elicitations. *Psychological Bulletin, 137*, 834–855.

Moyal, N., Henik, A., & Anholt, G. E. (2018). Categorized Affective Pictures Database (CAP-D). *Journal of Cognition, 1*, 41.

Niedenthal, P. M., & Halberstadt, J. B. (1995). The acquisition and structure of emotional response categories. In D. L. Medin (Vol. Ed.), *The psychology of learning and motivation: vol. 33*, (pp. 23–64). San Diego: Academic Press.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*, 515–526.

Ross, L., & Ward, A. (1996). Naive realism in everyday life: Implications for social conflict and misunderstanding. In E. S. Reed, E. Turiel, & T. Brown (Eds.). *The Jean Piaget symposium series. Values and knowledge* (pp. 103–135). Hillsdale, NJ, US: Lawrence: Erlbaum Associates Inc.

Schneider, D., Lam, R., Bayliss, A. P., & Dux, P. E. (2012). Cognitive load disrupts implicit theory-of-mind processing. *Psychological Science, 23*, 842–847.

Todd, A. R., Forstmann, M., Burgmer, P., Brooks, A. W., & Galinsky, A. D. (2015). Anxious and egocentric: How specific emotions influence perspective taking. *Journal of Experimental Psychology: General, 144*, 374–391.

Todd, A. R., Hanko, K., Galinsky, A. D., & Mussweiler, T. (2011). When focusing on differences leads to similar perspectives. *Psychological Science, 22*, 134–141.

Wu, S., Barr, D. J., Gann, T. M., & Keysar, B. (2013). How culture influences perspective taking: Differences in correction, not integration. *Frontiers in Human Neuroscience, 7*, 822.