Visuospatial and affective perspective-taking: Similarities and differences

Original Article

Visuospatial and Affective Perspective-Taking

Similarities and Differences

Thorsten M. Erle[1] and Friederike Funk[2]

[1]Department of Social Psychology, Tilburg University, Tilburg, The Netherlands
[2]Faculty of Arts and Sciences, NYU Shanghai, Shanghai, PR China

Abstract. Perspective-taking is the ability to intuit another person's mental state. Historically, cognitive and affective perspective-taking are distinguished from visuospatial perspective-taking because the content these processes operate on is too dissimilar. However, all three share functional similarities. Following recent research showing relations between cognitive and visuospatial perspective-taking, this article explores links between visuospatial and affective perspective-taking. Data of three preregistered experiments suggest that visuospatial perspective-taking does not improve emotion recognition speed and only slightly increases emotion recognition accuracy (Experiment 1), yet visuospatial perspective-taking increases the perceived intensity of emotional expressions (Experiment 2), as well as the emotional contagiousness of negative emotions (Experiment 3). The implications of these findings for content-based, cognitive, and functional taxonomies of perspective-taking and related processes are discussed.

Keywords: perspective-taking, empathy, emotion perception, emotional contagion, emotion recognition

While empathy is often touted as one of the most important human social cognitions, it is notoriously difficult to define (Batson, 2009). Empathy is achieved by many different processes, some of which operate automatically and some of which are more deliberate (Batson, 2009; Davis, 1994). The best known of these deliberate processes is perspective-taking, "the ability to intuit another person's thoughts, feelings, and inner mental states" (Epley & Caruso, 2009, p. 297). More functional definitions (De Houwer, 2011) emphasize the importance of overcoming one's egocentrism for achieving such intuitions. For example, Davis (1994) states that perspective-taking "is typically an effortful process, involving both the suppression of one's own egocentric perspective on events and the active entertaining of someone else's" (p. 17).

Irrespective of its exact definition, research has shown that perspective-taking leads to a plethora of beneficial (and some detrimental) outcomes (Ku et al., 2015). For example, within the perspective-taker, it causes enhanced feelings of similarity to the target of the process (Davis et al., 2004). These intrapersonal outcomes can subsequently also affect interpersonal judgments and behaviors, and, for example, perspective-taking reduces expressions of prejudices (Todd & Galinsky, 2014), increases prosociality (Adida et al., 2018; Myers et al., 2014), or predicts feedback-seeking in the workplace (Sherf & Morrison, 2020). These benefits make understanding perspective-taking, and how it works, an important research question.

Perspective-Taking: A Matter of Content?

Historically, three types of perspective-taking are recognized in the literature, namely cognitive (CPT), affective (APT), and visuospatial perspective-taking (VPT). Ever since then, these have been treated as independent constructs (Ford, 1979), and in a largely content-driven manner, perspective-taking tasks were described as "cognitive," "affective," or "visuospatial."

However, there are also functional commonalities between them, such as the idea that all kinds of perspective-taking (aim to) overcome a person's egocentrism (Davis, 1994). Thus, an alternative to organizing different kinds of perspective-taking around the content they operate on would be to consider their underlying mechanisms as the primary definitional feature. Based on this idea, the present paper examines the relationship between APT and VPT. What unites these two kinds of perspective-taking and where do they differ? Should they be considered as independent based on the different content their processes operate on? Or should they be considered as a unitary construct based on their shared functional characteristics and underlying mechanisms?

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Perspective-Taking: Underlying Mechanisms

The underlying mechanisms of perspective-taking have been discussed in the literatures on empathy (Batson, 2009; Davis et al., 2004), Theory of Mind (ToM; Mahy et al., 2014), social psychology (Galinsky et al., 2005), and spatial cognition (Kessler & Rutherford, 2010; Surtees et al., 2013). While there are common themes across these lines of inquiry, until recently dialog between them was lacking and especially VPT research has been isolated from research on APT and CPT.

APT and CPT

Both empathy and ToM researchers have established two main mechanisms by which both APT and CPT operate. The first mechanism, labeled "imagine-other perspective-taking" in empathy research (Batson, 2009) or "theory theory" in ToM research (Gopnik & Meltzoff, 1997) describes noetic attempts at understanding another person's mental state. Perspective-takers use their personal knowledge based on which they make predictions about the (cognitive or affective) state of another person. This mechanism only fulfills the criteria of (arguably) being effortful and aiming at intuiting another person's mental state, but it is egocentric since it involves projecting personal knowledge onto another person.

The second mechanism, labeled "imagine-self perspective-taking" in empathy research (Batson, 2009) or simulation theory in ToM research (Goldman, 2006), proposes a more experiential route toward perspective-taking. Here, it is assumed that perspective-takers actively imagine being in another person's situation, which causes an experience that serves as the basis for subsequent judgments about the to-be-adopted mental state. Thus, this mechanism can be considered also as overcoming one's egocentrism.

Both mechanisms can operate on cognitive and affective content (Davis, 1994), which questions the feasibility of content-based taxonomies of perspective-taking. In addition, quite similar principles have been discussed in the VPT literature.

VPT

Research into the mechanisms underlying VPT initially suffered from the fact that the process was unclearly defined, also in terms of its functionality (Hass, 1984; Stephenson & Wicklund, 1984). Hass (1984), for example, investigated from which perspective participants drew a capital "E" on their forehead (i.e., readable for the self or an external observer). The authors induced a "self-focus," for example, by placing a camera within the lab that ostensibly recorded the participant. While the direction in which the "E" was drawn indeed was affected by self-focus, given that the camera was placed to the side of the participant (Experiment 1) or even behind the participant (Experiment 2) and that no actual interaction partner was present, it is unlikely that participants engaged in VPT, as the E would be unreadable to the camera either way it was drawn. This research also conflated multiple functions that VPT can fulfill: Is an object visible for another person and how does it appear to that person? Finally, it blurs the line between VPT and more symbolic forms of perspective-taking.

Another research program overcame these limitations by establishing the distinction between Level-1 and Level-2 VPT (Flavell et al., 1981). Level-1 VPT serves the purpose of imagining *what* another person sees, whereas Level-2 VPT helps us imagine *how* another person sees something. Level-1 VPT is achieved by mentally drawing a line from a target object until the line is judged to be visible from the target person (Kessler & Rutherford, 2010). Since this line is drawn from the vantage point of the perspective-taker, Level-1 VPT can also be characterized as an egocentric projection.

The underlying mechanisms of Level-2 VPT, on the other hand, come remarkably close to the definition of the simulation-based accounts for APT and CPT discussed above (Erle, 2019; Kessler & Thomson, 2010; Surtees et al., 2013). During Level-2 VPT, perspective-takers mentally simulate moving their body schema into the physical location of another person to imagine the world from this new vantage point (Kessler & Thomson, 2010). Indeed, Level-2 VPT can lead participants to confuse the perspectives of the self and the other and to momentarily displace the self (Samuel et al., 2020).

However, the mechanisms underlying Level-2 VPT are far from fully understood. For example, whether this mental simulation also involves a visual representation of another person's perspective remains unclear (Samuel et al., 2021). Also, participants can solve some Level-2 VPT problems by employing egocentric strategies (Samuel et al., 2022). What seems established with a higher degree of certainty, however, is the fact that Level-2 VPT involves an embodied simulation of moving one's body schema into the physical location of another person, which again suggests functional similarities to simulation-based APT and CPT.

Different Kinds of Perspective-Taking: Same, Related, or Different?

Of course, functional, and procedural similarities do not imply that APT, CPT, and VPT are identical. Level-1 and Level-2 VPT judgments differ tremendously from, for example, judgments about another person's feelings or thoughts. What is similar between these categories, however, is that both Level-1 VPT and imagine-other perspective-taking (be it about affective or cognitive content) operate based on an egocentric projection, whereas both Level-2 VPT and imagine-self perspective-taking operate based on imaging yourself in another person's situation. It is unclear why previous taxonomies of perspective-taking allowed for organizing APT and CPT, but not VPT, along these dimensions. Indeed, there is also empirical evidence questioning the independence of VPT and APT/CPT.

For example, performance on CPT and VPT tasks is related (Brunyé et al., 2012; Bukowski & Samson, 2017; Erle et al., 2019; Hamilton et al., 2009). Furthermore, recent research has tested whether there is a causal relation between VPT and CPT. Erle and Topolinski (2017) hypothesized that the perceived psychological similarity that is reported in studies on APT and CPT is grounded (Barsalou, 2008) in the physical similarity created during Level-2 VPT. That is, the simulation of uniting one's body schema in space with another person contributes to the experiential sensations during simulative APT/CPT. In line with this, engaging in VPT causally affected common empathic outcomes such as feelings of sympathy, similarity, trust, and cooperation (Erle et al., 2018; Erle & Topolinski, 2017; Experiments 4–5), as well as ToM-related outcomes, such as the adoption of foreign thoughts (Erle & Topolinski, 2017; Experiments 1–3). While these findings support the idea that physical self-other merging is involved in both CPT and VPT, this previous work does not speak to potential links between VPT and APT.

Current Research and Hypotheses

The present report aims to fill this gap by examining the effects of Level-2 VPT on three indicators of APT: emotion recognition (Experiment 1), perceived intensity of emotional expressions (Experiment 2), and emotional contagion (Experiment 3).

First, under the assumption of a shared mechanism between different kinds of perspective-taking, we predicted that inducing Level-2 VPT also facilitates the recognition of another person's affective state. Following the logic of simulation-based accounts, perspective-taking creates a merging between the self and the other, and the experiences resulting from this help the perspective-taker to intuit the other's affective state even if the merging is induced via VPT. Under the assumption of a content-free taxonomy of perspective-taking, we furthermore predicted that VPT would exert these effects independently of the specific affective state (e.g., which specific emotion) one seeks to intuit. This hypothesis was tested in Experiment 1, assessing speed and accuracy as two indicators of emotion recognition.

Second, Level-2 VPT should also affect intrapersonal and interpersonal outcomes that have been associated with perspective-taking before. The most immediate intrapersonal outcome after recognizing an affective state in another person is an evaluation of this state, for example, regarding its valence, meaning, or intensity. Since we implemented an array of well-known emotional states in our studies, we focused on intensity, rather than meaning or valence, as our dependent variable to test this. Here, we predicted that the experiential consequences of merging with another person via Level-2 VPT bias judgments of an affective state's intensity because after VPT, these judgments are no longer based on (affect-less) egocentric experiences, but rather (affect-laden) altercentric experiences. Again, we predicted increased perceived intensity for all affective states included in our Experiment 2, which tested this hypothesis.

Finally, as an example of a common interpersonal outcome of perspective-taking, we hypothesized that VPT would also increase the degree to which another person's emotional state induces emotional contagion (Hatfield et al., 1993), that is, the degree to which participants "catch" these states themselves. If another person's emotional state is perceived as more intense due to VPT, the likelihood that this stronger affective signal is transmitted to the perspective-taker also increases. Thus, we predicted that for positive affective Level-2 VPT would lead to participants reporting feeling more positive themselves. For negative states, on the other hand, we predicted that they would feel worse. Thus, in Experiment 3, we predicted that VPT would interact with the valence of another's affective state to predict how participants report feeling themselves, as an indicator of emotional contagion.

Open Practices, Power Analyses, and Data Handling

The presented analyses correspond to the preregistrations of our studies, except for Experiment 1. Here, we preregistered a Bayesian (power) analysis approach. During the review process, we were encouraged to report Frequentist statistics also for this experiment, to ensure consistency across the results sections. We thus report Frequentist statistics in-text and Bayesian statistics in footnotes. We were also encouraged to replace post hoc *t*-tests with contrasts, which we now report instead. Preregistrations, data, and materials for all studies are available at https://osf.io/pqa87/ (Erle & Funk, 2020).

For the costly and elaborate Experiment 1, we adopted a sequential Bayesian approach to our power analysis because this allows for flexible data inspections and a timely termination of the data collection campaign. Following the preregistration protocols, Study 1 was terminated as soon as a Bayes factor (BF) of 10 (conventionally "strong" evidence; Jeffreys, 1961, p. 432) was surpassed in favor of either hypothesis. For Experiments 2–3, sample sizes were set to achieve a power of $(1 - \beta) = .89$ for two planned comparisons, resulting in a total power of $.89 * .89 = .80$. Final sample sizes were $N = 162$, $N = 257$, and $N = 223$ for Experiments 1, 2, and 3, respectively.

As preregistered, participants who were unable to discriminate between the colors blue and yellow were excluded from all analyses. Trials with reaction times (RTs) > 10,000 ms were excluded from all analyses. Participants with missing data in any cell of the design were list-wise deleted. No other exclusion criteria were applied. All studies, measures, and manipulations are reported. All studies were conducted in adherence to ethical guidelines.

Experiment 1

Experiment 1 investigated the effects of Level-2 VPT on emotion recognition speed and accuracy. We predicted that VPT would increase both the speed and the accuracy with which people identify another person's affective state, irrespective of its specific nature.

Methods

Sample

One-hundred-sixty-two participants ($n = 127$ female, $n = 32$ male, $n = 3$ diverse; age: $M = 23.26$, $SD = 4.92$, range: 18–48) were approached on the campus of the University of Cologne and asked to participate in a 20-min lab study for a compensation of € 3. $N = 4$ participants were excluded from the analyses because they could not discriminate the colors yellow and blue, resulting in a final sample of $N = 158$ for all analyses.

Materials and Procedure

Participants completed two tasks in succession during every trial. First, they completed a VPT task adapted from Erle and Topolinski (2017). During this task, participants saw a person displaying a neutral facial expression. The stimuli were taken from the Amsterdam Dynamic Facial Expression Set (van der Schalk et al., 2011; for details on the stimuli and pilot studies, see Electronic Supplementary Material, ESM 1 and https://osf.io/pqa87/; Erle & Funk, 2020). To the left and the right of the person, a yellow circle and a blue circle were presented. For every trial, one of these circles was the target object. Level-2 VPT was manipulated by instructing participants to locate the target object either from their egocentric perspective or the perspective of the person. They responded with the two CTRL keys with the right key indicating that the target circle was on the right side [from the target's or the participant's perspective] and the left key indicating that the target was on the left side [from either perspective]. Since the displayed person was facing the participant, during egocentric trials, the task was completed from an egocentric perspective and during perspective-taking trials, it required engaging in Level-2 VPT. An exemplary sequence of a trial of the VPT task used in all experiments is depicted in Figure 1. Note that participants saw the face of an actual human model in our studies, which was not reproduced here due to copyright and privacy concerns. Which identities and emotional expressions were exhibited by the models in each study is explained in the respective methodology sections.

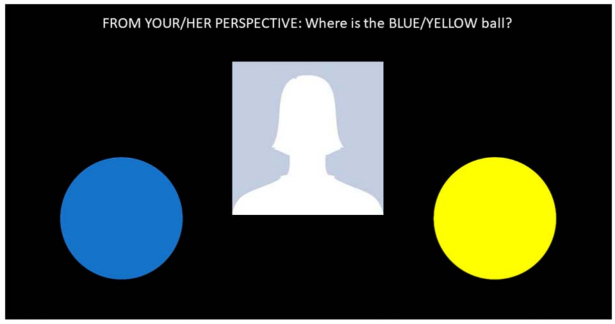

Figure 1. Exemplary trial of the visuospatial perspective-taking task.

In Experiment 1, the targets of the VPT task had neutral facial expressions. But immediately after participants responded to the VPT task (i.e., located the target circle as left or right), this facial expression started to dynamically change into one of four emotional facial expression (disgust, joy, sadness, or surprise). Thus, for the emotion recognition data, participants were instructed to press the space bar as soon as they recognized the displayed emotion. Then, they had to select that emotion from a list of 10. The two dependent variables of this experiment were thus the time participants took to indicate that they perceived an affective state during the emotional multimorph task (emotion recognition speed) and the number of correct classifications in this task (emotion recognition accuracy).

Participants completed $K = 64$ trials of this task sequence, $k = 16$ per emotion, $k = 8$ of which were egocentric or perspective-taking trials, respectively. Which colored circle was the target object, the arrangement of the circles, and the frequency of the two response keys were counterbalanced across trials. After all trials, basic demographic data were assessed (as well as whether participants were able to discriminate the colors yellow and blue).

Results

All dependent variables (VPT and emotion recognition RTs/error rates) were subjected to 2 (Perspective: Egocentric vs. Perspective-Taking) × 4 (Emotion: Disgust vs. Joy vs. Sadness vs. Surprise) repeated-measures ANOVAs. For all analyses, we predicted a Perspective main effect. For the VPT task (locating the target circle as left or right), we predicted that participants would react more slowly and less accurately after VPT compared to egocentric trials. For the emotion recognition data, we predicted increased recognition speed (RT) as well as improved recognition accuracy (correct emotion selections) after VPT trials compared to egocentric trials.

VPT Performance

For both RTs, $F(1,153) = 191.55$, $p < .001$, $\eta_p^2 = .56$, and error rates, $F(1,153) = 54.83$, $p < .001$, $\eta_p^2 = .26$, the ANOVAs yielded significant main effects of Perspective. As expected, responses about the circle locations were slower during VPT (M = 1,061.91, SD = 488.55) and less accurate (M = 86.61, SD = 12.75) than during egocentric trials (RTs: M = 768.17, SD = 330.92; correct responses: M = 93.43, SD = 6.54). The BFs corresponding to our preregistered analysis constituted *extreme evidence* (Jeffreys, 1961, p. 432) in favor of our hypotheses (RTs: BF_{10} = 6.872e+27; errors: BF_{10} = 1.496e+08). For RTs, there was a main effect of Emotion, $F(3,459) = 2.84$, $p = .040$, $\eta_p^2 = .05$, indicating that participants reacted faster on joy compared to all other trials, $F(1,153) = 8.04$, $p = .005$, $\eta_p^2 = .05$. However, since the emotional expression was always neutral during the VPT task, this effect is not meaningful. Finally, in both analyses, there were no significant interactions, both $F < 0.55$, $p \geq .651$, $\eta_p^2 < .02$. Overall, this suggests that participants completed the VPT task as intended.

Emotion Recognition Speed

The ANOVA yielded only a significant main effect of Emotion, $F(1,154) = 63.69$, $p < .001$, $\eta_p^2 = .29$ (all other effects $F < 0.26$, $p \geq .859$, $\eta_p^2 < .01$). As can be seen in Figure 2, participants reacted more quickly to sad compared to all other emotional expressions. Most importantly and contrary to our hypothesis, emotion recognition speed after VPT trials did not differ from emotion recognition speed after egocentric trials (Bayesian analysis: BF_{10} = 0.09; *strong evidence* against our hypothesis).

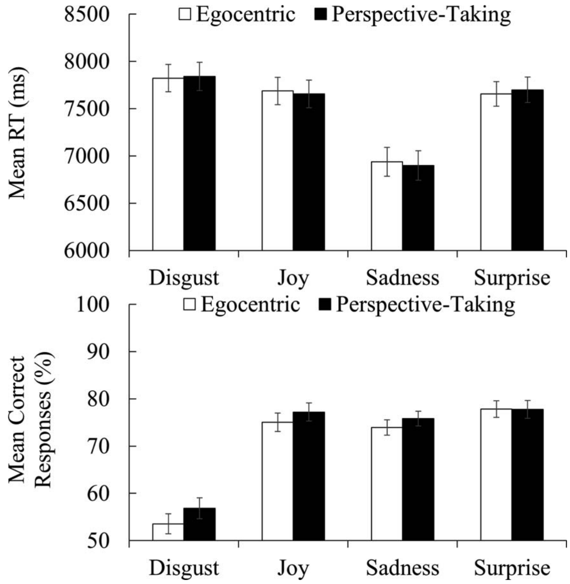

Figure 2. Mean RTs (top) and accuracy (bottom) for emotion recognition by Emotion and Perspective in Experiment 1. Error bars represent ± 1 standard error of the mean (SEM).

Emotion Recognition Accuracy

The ANOVA yielded significant main effects of Emotion, $F(3,459) = 41.64$, $p < .001$, $\eta_p^2 = .56$, and Perspective, $F(1,153) = 4.42$, $p = .037$, $\eta_p^2 = .03$ (Bayesian analysis: BF_{10} = 1.41; *anecdotal evidence* for our hypothesis). The interaction was not significant, $F(3,459) = 0.31$, $p = .821$, $\eta_p^2 < .01$. As can be seen in Figure 2, participants were less accurate at identifying disgust compared to all other emotional expressions. Furthermore, participants more often recognized the correct emotion after VPT (M = 0.72, SD = 0.17) than during egocentric trials (M = 0.70, SD = 0.17).

Discussion

There was no significant effect of VPT on emotion recognition speed. And although a statistically significant improvement in emotion recognition accuracy after VPT was observed, this effect only provided weak evidence for our hypothesis (see preregistration). Thus, Experiment 1 largely did not support our hypotheses. The much stronger predictor of accurate emotion recognition in this experiment was the displayed emotion, with disgust being identified less accurately, and sadness being identified more quickly, than all other emotions. Thus, VPT does not seem to play a large role for intuiting affective states from facial expressions.

In retrospect, it might have been too optimistic to expect any experiential consequences of putting oneself in another's place given that many facial expressions of emotion are quite unambiguously understood (Cowen et al., 2021). A simple explanation for our findings thus is that emotion recognition can be achieved much more easily via different mechanisms (e.g., by applying one's knowledge about facial expressions), and effortful perspective-taking is not needed at this stage. In line with this reasoning, a similar pattern of results was observed for *imagine-self* and *imagine-other* perspective-taking, too (Israelashvili et al., 2020).

Arguably, the small significant effect of VPT on emotion recognition accuracy could stem from cases where such mechanisms cannot operate, for example, when the displayed emotion seemed ambiguous to the participant. APT might have been used to intuit the affective state of the target in such cases. This idea is also in line with an effect on emotion recognition accuracy, rather than speed, which always should be slow in such cases, but future research is needed to test this idea empirically.

Experiment 2

Experiment 1 showed that VPT only plays a minor role for recognizing the affective state of another person. However, while perspective-taking is closely linked to understanding another person, it is also associated with many intrapersonal and interpersonal outcomes. In Experiment 2, we tested whether VPT affects the subjective perception of affective states in others, specifically their perceived intensity. We predicted that the experiential consequences of merging with another person in a specific affective state would enhance the perceived intensity of this state, as this other-centric affective input overrides an egocentric input that otherwise would have been used to form this judgment.

Methods

Sample

Two-hundred-fifty-seven participants (n = 134 female, n = 120 male, n = 3 did not answer; age: M = 32.67, SD = 11.96, range: 18–70) were recruited via Prolific Academic (Damer & Bradley, 2014) for a 12-min online study for which they received a compensation of 1£. N = 10 participants were excluded from the analyses because they could not discriminate the colors yellow and blue, and data of n = 5 participants were missing, resulting in a final sample of N = 242 for all analyses.

Materials and Procedure

Participants again completed two tasks in succession during every trial. First, they completed the same VPT task as in Experiment 1 with the same counterbalancing factors in place. However, instead of being presented with neutral pictures that dynamically change into an emotional facial expression, participants saw target faces that immediately and statically displayed disgust, joy, sadness, or surprise. Immediately after indicating their response to the VPT task, participants were asked how intensely they perceived the emotional expression of the target face on a scale from 1 (= *not intense at all*) to 9 (= *very intense*). After completing all (K = 80) trials, basic demographic data were assessed.

Results

VPT RTs/error rates and emotional intensity ratings were subjected to 2 (Perspective: Egocentric vs. Perspective-Taking) × 4 (Emotion: Disgust vs. Joy vs. Sadness vs. Surprise) repeated-measures ANOVAs. For the VPT indicators, we expected the same effects as in Experiment 1. For the main analysis, we predicted a Perspective main effect, that is, enhanced perceived emotional intensity after VPT for all (i.e., positive and negative) emotions.

VPT Performance

For VPT RTs and error rates, there were significant Perspective main effects (error rates: $F(1,238) = 92.37$, $p < .001$, $\eta_p^2 = .28$; RTs: $F(1,238) = 286.12$, $p < .001$, $\eta_p^2 = .55$). Again, reactions during VPT were slower (M = 1,450.11, SD = 583.05) and less accurate (M = 80.12, SD = 15.43) than during egocentric trials (RTs: M = 1,099.57, SD = 428.41; correct responses: M = 87.84, SD = 10.52). For error rates, there was an unpredicted Emotion main effect, $F(3,708) = 52.69$, $p < .001$, $\eta_p^2 = .40$, with less correct responses during surprise trials compared to all other emotions. All other effects were not significant in both analyses (all $F < 2.13$, all $p \geq .098$, all $\eta_p^2 < .03$). While the effect of surprise on VPT error rates was unexpected, it did not disrupt the generally predicted pattern (lower accuracy for VPT compared to egocentric trials) for this emotion. Thus, the data again suggest that participants completed the VPT task as intended.

Perceived Emotion Intensity

The ANOVA confirmed the predicted main effect of Perspective, $F(1,238) = 18.26$, $p < .001$, $\eta_p^2 = .07$. Participants' perceived intensity of emotional expressions was enhanced after VPT (M = 6.01, SD = 1.16) compared to egocentric trials (M = 5.93, SD = 1.17). Post hoc contrasts revealed that this effect was evident for both positive, $F(1,238) = 5.85$, $p = .016$, $\eta_p^2 = .02$, and negative emotions, $F(1,238) = 11.41$, $p = .001$, $\eta_p^2 = .05$.

Finally, there was an unpredicted main effect of Emotion, $F(3,714) = 126.08$, $p < .001$, $\eta_p^2 = .61$. As can be seen in Figure 3, the emotional intensity of disgust expressions

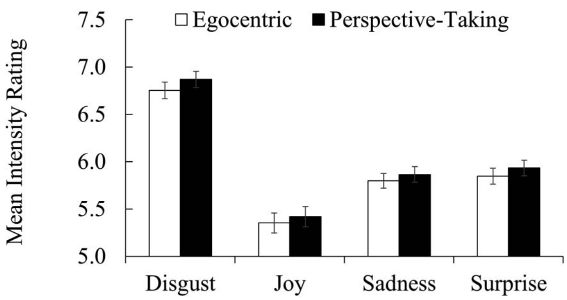

Figure 3. Mean intensity ratings by emotion and perspective in Experiment 2. Error bars represent ± 1 SEM.

was rated highest, followed by sadness and surprise, and finally joy. This pattern was surprising as it does not correspond to the original validation of the stimuli used in this study (van der Schalk et al., 2011). However, since this effect did not interact, $F(3,714) = 0.29$, $p = .831$, $\eta_p^2 < .01$, with our predicted focal effect of perspective-taking, it also did not affect its interpretation.

Discussion

The results of Experiment 2 confirmed that VPT increases how intensely another person's affective state is perceived, for both positive and negative states. This indicates that VPT affects intrapersonal outcomes, that is, judgments that ultimately reside only within the perspective-taker. However, it does not address whether VPT also has potential effects on interpersonal perspective-taking outcomes, that is, outcomes that concern the relation between perspective-taker and target. In the final experiment, we aimed to test whether VPT affects emotional contagion (Hatfield et al., 1993) as one common outcome from the APT literature.

Experiment 3

Experiment 3 investigated the effects of VPT on emotional contagion as an interpersonal outcome of perspective-taking. Emotional contagion describes the process by which an observer comes to exhibit the same emotional state as the person they observe (Hatfield et al., 1993). The likelihood of this process increases as the signal, that is, the emotional state of the observer, becomes stronger. Therefore, and based on the results of Experiment 2, we predicted that emotional contagion would be stronger after VPT compared to egocentric trials, as VPT led to higher emotion intensity perceptions, which we expected to be also more contagious.

Methods

Sample

Two-hundred-twenty-three participants (n = 120 female, n = 98 male, n = 5 did not answer; age: M = 29.83, SD = 10.97, range: 18–65) were recruited via Prolific Academic (Damer & Bradley, 2014) for a 9-min online study for a compensation of 0.75£. After exclusion (n = 13 people were unable to discriminate the colors blue and yellow) and removal of missing data (n = 5), a final sample of N = 205 remained for all analyses.

Materials and Procedure

Experiment 3 had the same setup as Experiment 2 with minor differences: this time only joyful and sad (static) facial expressions were presented as examples for positive and negative affective states, along with neutral facial expressions as a baseline condition. We did not include surprise because its affective nature is debated (Noordewier & Breugelmans, 2013; Topolinski & Strack, 2015), complicating assessments of emotional contagion. To balance the number of positive and negative affective facial expressions, disgust was also removed. Thus, participants completed K = 60 trials of the VPT task with the same counterbalancing factors in place as in Experiments 1–2. Immediately after their reactions to the VPT task, participants rated how they felt themselves on a scale from −4 (= *very negative*) to 4 (= *very positive*) as a measure of emotional contagion. After completing all trials, basic demographic data were assessed.

Results

VPT RTs/error rates and emotional contagion ratings were subjected to 2 (Perspective: Egocentric vs. Perspective-Taking) × 3 (Emotion: Joy vs. Sadness vs. Neutral) repeated-measures ANOVAs. For the VPT performance indicators, we expected the same Perspective main effect as before. For emotional contagion, a Perspective × Emotion interaction was predicted reflecting that VPT amplifies the contagiousness of positive expressions (leading to more positive affect) as well as negative expressions (leading to more negative affect). For neutral trials, we did not predict a difference between egocentric and VPT trials as no emotional state was displayed here. We used post hoc contrasts to test these predictions.

VPT Performance

For both VPT RTs, $F(1,203) = 72.05$, $p < .001$, $\eta_p^2 = .26$, and error rates, $F(1,203) = 151.70$, $p < .001$, $\eta_p^2 = .43$, there were significant Perspective main effects. Again, reactions during VPT were slower (M = 1,354.69, SD = 727.18) and less accurate (M = 76.36, SD = 20.48) than during

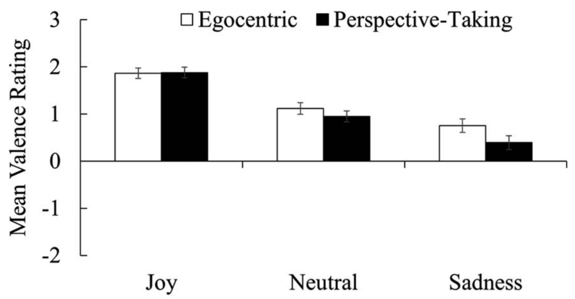

Figure 4. Mean valence ratings ("How do you feel right now?") by emotion and perspective in Experiment 3. Error bars represent ± 1 *SEM*.

egocentric trials (RTs: M = 1,024.39, SD = 519.06; correct responses: M = 87.17, SD = 13.99). No other effect was significant, all $F < 0.94$, $p \geq .395$, $\eta_p^2 < .01$, again suggesting that the VPT task (locating the circle as left or right) was completed as intended.

Emotional Contagion

The ANOVA revealed significant main effects of Perspective, $F(1,203) = 5.29$, $p = .023$, $\eta_p^2 = .03$, and Emotion, $F(2,406) = 53.53$, $p < .001$, $\eta_p^2 = .35$. The latter supports the feasibility of our stimuli to induce emotional contagion as participants felt better during joy, compared to neutral and especially sadness trials. The main effect of Perspective was qualified by the predicted Perspective × Emotion interaction, $F(2,406) = 4.59$, $p = .011$, $\eta_p^2 = .04$. Post hoc contrasts revealed that VPT enhanced emotional contagion during sadness trials, as participants felt worse after engaging in VPT (M = 0.40, SD = 2.18) than after remaining egocentric (M = 0.76, SD = 2.11), $F(1,203) = 9.44$, $p = .002$, $\eta_p^2 = .04$. There was a significant difference in the same direction for neutral trials (M = 1.15, SD = 1.78 for egocentric; M = 0.97, SD = 1.73 for VPT trials), $F(1,203) = 4.69$, $p = .031$, $\eta_p^2 = .02$, which however did not provide strong support for the hypothesis that egocentric, and VPT trials differed for neutral facial expressions (Bayesian analysis: $BF_{10} = 0.47$; anecdotal evidence for the null hypothesis in the preregistered analysis). Unexpectedly, for joy, there was no difference between egocentric (M = 1.89, SD = 1.64) and VPT trials (M = 1.91, SD = 1.64), $F(1,203) = 0.40$, $p = .842$, $\eta_p^2 < .01$, which contradicts that VPT caused emotional contagion for joy. Figure 4 shows these results.

Discussion

The results of Experiment 3 partially supported the hypothesis that VPT affects how contagious foreign affective states are. While we found the predicted effect for negative affective states, there was no enhanced contagion of positive affective states. While this finding warrants replication, one explanation for it comes from research on symhedonia, showing that joy for another's good fortune develops primarily in close interpersonal relations (Royzman & Rozin, 2006). Since participants only saw strangers in Experiment 3, we might have limited our ability to detect emotional contagion for joy. Future research is needed to explore this further.

General Discussion

The present experiments show that VPT does not affect our ability to recognize another person's affective state (from facial expressions of emotion, Experiment 1). However, VPT does increase the perceived intensity of those affective states, and thus produces intrapersonal outcomes associated with APT and CPT (Experiment 2). Finally, VPT may enhance emotional contagion of other's affective states, but only for negative states (Experiment 3), showing that it also has effects on interpersonal outcomes, albeit less consistently so. While not fully conclusive, these findings bear implications for taxonomies of perspective-taking.

Perspective-Taking: Which and How Many Kinds Are There?

In line with previous research on CPT and VPT (Erle & Topolinski, 2017), our results suggest causal relations between VPT and APT, which contradicts their historical separation. However, the relations identified in the present research did not support a completely unitary perspective-taking construct, as we originally predicted.

Ideally, perspective-taking should be defined with respect to its functionality as well as its social-cognitive architecture (De Houwer, 2011). Even early theorizing about VPT recognized that the process involves the competence of decentering (Piaget & Inhelder, 1956), foreshadowing debates about the role of simulation-based and noetic processes. Thus, one aspect of previous taxonomies that we agree with is the difference between noetic and simulation-based attempts at understanding others (Davis et al., 2004). However, in contrast to previous researchers, we would only consider the simulative kind as perspective-taking, as only these judgments are based on an altercentric viewpoint. Note, however, that while (egocentric) noetic processes might not fulfill the functional definition of perspective-taking, this does not imply that they do not aim at understanding another person's mental state or that they are not empathic. Thus, we still believe perspective-taking to be a unitary construct that exists among an arsenal of other processes seeking to explain the same explandum (understanding others; De Houwer, 2011), but by different means.

Perspective-Taking: The Role of Content Revisited

It seems that contents might be unsuitable to classify different kinds of perspective-taking, yet contents and stimuli might very well affect how likely different processes are activated when we try to understand others. In the present research, we predicted relations between APT and VPT based on a shared embodied mechanism where the perspective-taker mentally simulates moving their body into the physical location of a target (Kessler & Thomson, 2010). This mental simulation of physical closeness is assumed to be the modal grounding of the psychological experience of similarity or self-other-merging (Erle & Topolinski, 2015; 2017) that is reported in studies on CPT or APT (Davis et al., 2004).

This embodied mechanism affects some judgments such as those of similarity to another person (Erle & Topolinski, 2017) or how intense the affective state of another person is (Experiment 2), but not others such as which emotion another person is displaying (Experiment 1). The crucial difference between those situations could be the feasibility of recruiting alternative mechanisms that enable making judgments related to another person. In the language of VPT, judgments of perceived similarity or emotional intensity do not start with a strong and systematic egocentric prior. Thus, decentering carries comparatively strong informative value. In comparison, recognizing an emotional facial expression seems to be guided by strong egocentric priors. For example, most individuals have strong associations between specific facial expressions and emotions. In such situations, it is much more likely that a person relies on a strong and informative egocentric prior (e.g., "smiling usually coincides with joy"), rather than engaging in an effortful attempt to arrive at the same conclusion.

Future researchers should capitalize on this and revisit the present hypotheses using different stimuli to test our hypotheses. For example, concerning the recognition of another person's affective state, future research could make use of verbal stimuli that are less prototypical for affective states or use more ambiguous facial expressions of emotion. Similarly, studies investigating the impact of VPT on emotional contagion of joy could manipulate the target's status (i.e., strangers vs. friends) to inspect whether VPT can affect emotional contagion also for joy, if an appropriate relationship script is given.

Taken together, our results imply that content has an important role to play for perspective-taking research. We see this role, however, as more relevant for creating experimental situations that do or do not allow for the investigation of simulative or noetic mechanisms involved in perspective-taking.

Alternative Explanations and Simulation Inputs for APT

An open question concerns the embodiment involved in the present studies more generally. Whereas there is strong and direct evidence for the idea that Level-2 VPT involves transformations of the whole-body schema (Kessler & Thomson, 2010), we can only infer the operation of this process from the enhanced RTs during VPT compared to egocentric trials of the VPT task. However, this increase in RTs could affect the observed APT results in ways that are independent of VPT: For example, it is possible that participants' judgments on the affective tasks of the present studies were not affected by simulations of a body transformation, but rather by participants mimicking the facial expressions displayed by the targets (the facial feedback hypothesis; Strack et al., 1988; but see Wagenmakers et al., 2016). Coupled with the fact that the VPT trials took longer than the egocentric trials, the present results may thus result from longer facial reenactments during VPT trials, a different mechanism discussed in the empathy literature (Batson, 2009), rather than whole-body simulations during these trials.

However, additional analyses speak against the idea that longer processing times accounted for the observed results. First, we repeated the main analyses of Experiments 2–3 using the VPT RT as a covariate. In both of these analyses, the focal effects in support of our hypotheses remained significant, $F(1,237) = 8.23$, $p = .004$, $\eta_p^2 = .04$ for Experiment 2, and $F(2,438) = 3.44$, $p = .034$, $\eta_p^2 = .03$, for Experiment 3. Thus, longer processing times on the VPT tasks could not account for the present results. Second, we also tested whether RTs differed on the subsequent affective tasks by computing a 2 (Perspective: Egocentric vs. Perspective-Taking) × 4/3 (Emotion: Disgust vs. Sadness vs. Joy vs. Surprise for Experiment 2/Sadness vs. Neutral vs. Joy for Experiment 3) repeated-measures ANOVA on the RTs of these tasks. This was not the case in Experiment 1 (see main analysis) and Experiment 2, as indicated by a nonsignificant main effect of Perspective, $F(1,238) = 0.43$, $p = .514$, $\eta_p^2 < .01$. But we indeed observed longer RTs for the contagion ratings in Experiment 3 after VPT compared to egocentric trials, as indicated by a significant main effect of Perspective, $F(1,208) = 6.24$, $p = .013$, $\eta_p^2 = .03$. However, including this variable as a covariate for the main analysis also did not affect the observed interaction, $F(2,438) = 3.71$, $p = .025$, $\eta_p^2 = .02$.

To conclusively rule out this concern, future research could use facial electromyography. Based on a facial embodiment account, one would expect that stronger muscle activation in relevant facial muscles (i.e., enhanced activity of the m. zygomaticus major during joy trials) develops over time and that since VPT trials last longer than egocentric trials, muscle activation differs toward the end of a trial, when a judgment about an APT indicator is made. Based on a full-body simulation account, this would not be predicted.

Limitations

Finally, there are some limitations of our work that need to be acknowledged. First, the present results are only generalizable to the emotions that we assessed, and it is an open empirical question whether the results differ for other emotional expressions. The generalizability is also limited by the fact that we only used northern European models, albeit from a well-known database (van der Schalk et al., 2011). It needs to be established that the findings hold true in other cultural contexts and for different basic and social emotions, especially since prior research has shown that emotions differ tremendously regarding their empathic functionality (Sassenrath et al., 2017).

Furthermore, while we consider the perspective-taking manipulation by Erle and Topolinski (2017), a methodological asset that allows for repeated measurements and manipulations of perspective-taking and egocentrism, the direction of the observed effects is unclear. The present results could not only speak to the power of perspective-taking but also alternatively they could demonstrate the power of egocentrism. Future studies should triangulate the present findings with other manipulations of perspective-taking (e.g., Davis et al., 2004) that offer clearly defined control and experimental conditions. Further, it should be noted that these manipulations would require between-subjects designs and only single measurements of empathic outcomes, which in combination with the small effect sizes in the present experiments might prove a difficult proposition for future research endeavors.

Conclusion

The present research demonstrates that predominant taxonomies of perspective-taking which separate VPT from APT and CPT are hard to uphold empirically. Thus, this research speaks against purely content-based taxonomies of perspective-taking. However, due to the inconsistent nature of the observed results, it also serves as a cautionary note not to treat all kinds of perspective-taking as identical. The discrepancies to our hypotheses highlight that perspective-taking research needs to be precise about which mechanisms it considers as the relevant explanans and how a chosen research setting makes the operation of these (and other) mechanisms likely. Thus, we call for more precise theorizing and testing in perspective-taking research. Since taking on these challenges will ultimately contribute to the understanding of a construct that has been associated with a multitude of positive intrapersonal and interpersonal outcomes, this effort seems more than warranted.

Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at https://doi.org/10.1027/1864-9335/a000504

ESM 1. Pilot studies.

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Open Data
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ORCID
Thorsten M. Erle
https://orcid.org/0000-0003-3477-5106
Friederike Funk
https://orcid.org/0000-0002-6514-3235

Thorsten Michael Erle
Department of Social Psychology
School of Social and Behavioral Sciences
Tilburg University
PO Box 9015
5000 LE Tilburg
The Netherlands
t.m.erle@tilburguniversity.edu