The Grounded Nature of Psychological Perspective-Taking

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Psychological perspective-taking is a powerful social cognition that helps us to understand other people. It creates feelings of closeness and sympathy, motivates us to help others, and is important for positive social relationships. In contrast to the impressive knowledge about its consequences, relatively little is known about how exactly people achieve them. The present paper addresses this question from a grounded cognition perspective, drawing on recent findings on the embodiment of visuospatial perspective-taking. Visuospatial perspective-taking involves a mental transformation of one's body schema into the physical location of another person. We argue that when people psychologically "put themselves in another person's shoes," this simulation of physical proximity happens, too, and is one source of perceived closeness. In five experiments (total N = 1067), participants completed a visuospatial perspective-taking task. During half of the trials, angular disparity between the target person and the participant was high and participants had to adopt the target's visual perspective (which involves an embodied simulation). During the remaining trials, angular disparity was low and participants could solve the task egocentrically. Taking another's perspective led participants to adopt the thoughts of the target person more strongly (Experiments 1–3) and increased the perceived similarity of that person to the self (Experiment 4) and participants' liking of that person (Experiment 5). These effects were independent of task difficulty (Experiment 2), and only present during trials where an embodied transformation happened (i.e., at high angular disparities; Experiment 3). Implications for psychological and visuospatial perspective-taking research and related phenomena are discussed.

Keywords: embodied cognition, empathy, grounded cognition, perspective-taking, theory of mind

> "If you can learn a simple trick, Scout, you'll get along better with all kinds of folks. You never really understand a person until you consider things from his point of view—until you climb into his skin and walk around in it."

Doesn't this advice, given by Atticus Finch to his daughter in *To Kill a Mockingbird*, sound fantastic? Improving social relations with a simple trick! It is mentioned after Atticus' daughter, Scout, had an argument with her new teacher, Miss Caroline. The reason for their quarrel was that Scout assumed her new teacher to already possess intimate knowledge of the county she just moved to. Because this was not the case, Scout's presupposition was deemed offensive and Miss Caroline consequently whacks her repeatedly with a ruler across the hand. Everybody would agree that it is indeed desirable to avoid such punishments with just a simple trick. Psychologists call this "climbing into the skin of a person" *perspective-taking* and define it as "the ability to intuit another person's thoughts, feelings, and inner mental states" (Epley & Caruso, 2009, p. 297). But contrary to Atticus' claim, we are yet far from learning how it works.

Classically, three kinds of perspective-taking are dissociated in the literature, namely, perceptual or visuospatial, cognitive, and affective perspective-taking (see, e.g., Davis, 1994; Enright & Lapsley, 1980; Ford, 1979). Recently, both affective and cognitive dependent variables were studied using the same approach and the boundaries between these two kinds disappeared more and more. Thus, based on the literature, these two kinds could be summarized as "psychological perspective-taking." Irrespective of their content, all kinds of perspective-taking hinge on the same set of abilities: (a) ascertaining that other social agents actually possess mental states, (b) recognizing that these mental states are not necessarily identical to our own, and (c) overcoming our innate egocentrism in favor of such a different literal (visuospatial) or

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metaphorical (psychological) point of view (for a review, see Epley & Caruso, 2009). In Scout Finch's case, for instance, the process was already disrupted at the second stage.

Psychologists investigate psychological perspective-taking by having participants read a vignette or watch a video (most often about a person in distress) and by instructing them to engage in perspective-taking (e.g., "imagine that you are actually the person in the videotape") or to remain objective (e.g., "try to take a neutral perspective, being as objective as possible about the situation") among other control conditions (for an overview over these so-called instructional sets, see Davis et al., 2004, p. 1628). Ample research has shown that these instructions are powerful tools to evoke empathic reactions. For instance, such inductions of perspective-taking lead to a psychological merging of the self and the other (e.g., Davis, Conklin, Smith, & Luce, 1996; Davis et al., 2004), which in turn leads to other positive social–cognitive outcomes, such as lesser expressions of prejudices and stereotypes (Galinsky & Moskowitz, 2000; Todd, Bodenhausen, Richeson, & Galinsky, 2011; Vorauer & Sasaki, 2014), prosocial motivation (e.g., Batson et al., 1991; Batson, Chang, Orr, & Rowland, 2002), and more positive attitudes toward the other person (Batson et al., 1997).

What is less understood is how this seemingly simple trick works. Although a lot of research has addressed the downstream psychological consequences of perspective-taking, only little is known about the psychological mechanisms that enable perspective taking in the first place. For instance, it is well-known that perspective-taking creates a feeling of self-other-overlap either by projecting the self onto the other person or by incorporating the other person in the self (for a detailed discussion of this, see, e.g., Galinsky, Ku, & Wang, 2005; see also Epley, Keysar, Van Boven, & Gilovich, 2004) and there is also ample research on specific consequences and moderators of this merging (see, e.g., Davis et al., 1996, 2004; Galinsky & Ku, 2004; Galinsky, Wang, & Ku, 2008; Galinsky, Magee, Inesi, & Gruenfeld, 2006; for a recent detailed review, see Ku, Wang, & Galinsky, 2015).

Of course the above-mentioned work also gives us important insights into how perspective-taking works. But it focused on mechanisms that are engaged only *after* perspective-taking has already occurred while leaving the important question of what happens *during* perspective-taking relatively open. In one seminal chapter, for instance, Epley and Caruso (2009) describe this initial step simply as "activating perspective-taking" (p. 298). Although the authors discuss factors that determine when or why people engage in perspective-taking, the chapter is silent on the issue of *how* we adopt the psychological perspective of another person. So what happens when we are given the instruction to "imagine that [we] are actually the person in [a vignette]" (Davis et al., 2004, p. 1628)? How do these instructions cause self-other-merging? Or in other words: how do we "consider a different point of view"? How do we "climb into the skin" of another person?

In contrast to psychological perspective-taking research, the related area of visuospatial perspective-taking recently made great strides to answer this question by specifically pinpointing the processes that happen during visuospatial perspective-taking (Kessler & Rutherford, 2010; Kessler & Thomson, 2010; Surtees, Apperly, & Samson, 2013a, 2013b). Visuospatial perspective-taking is necessary whenever our egocentric visuospatial frame of reference differs from that of another person (Michelon & Zacks, 2006; Zacks & Michelon, 2005; Zacks, Vettel, & Michelon, 2003). Researchers further distinguish level-1 and level-2 perspective-taking (Flavell, Everett, Croft, & Flavell, 1981; Kessler & Rutherford, 2010; Surtees et al., 2013a). Level-1 perspective-taking is concerned with the visibility of objects from a certain point of view. Because this process operates independently of another person's frame of reference (Kessler & Rutherford, 2010), it does not map well on the idea of "climbing into the skin of another person." Level-2 perspective-taking, on the other hand, describes attempts of imagining how the world looks for another person and thus comes very close to this.

Recent research has found that level-2 perspective-taking comes incredibly close to the idea of literally putting oneself in another person's place (Kessler & Rutherford, 2010; Kessler & Thomson, 2010; Surtees et al., 2013a, 2013b). In these studies, participants see a person (an avatar) sitting at a table with two objects. The angular disparity between this target person and the participant is varied. Participants judge which hand the avatar would use to grab one of two target objects. It was found that RTs (reaction time (RT)) increase with angular disparity (see also, Janczyk, 2013; Roberts & Aman, 1993). Most importantly, Kessler and Thomson (2010) manipulated participants' body posture, too. Participants were either sitting straight or were turned 60° in a clockwise or counterclockwise direction. The crucial finding of these studies was that reducing the angular disparity between participant and target by turning participants toward the avatar facilitated perspective-taking, whereas turning them away increased RT. The authors concluded that level-2 perspective-taking is an embodied process where the perspective-taker rotates his or her own body schema into the position of the target, thus literally imagining putting him- or herself into the position of the target (Kessler & Rutherford, 2010; Kessler & Thomson, 2010; see also Kessler, Cao, O'Shea, & Wang, 2014).

Here, we reconcile the two conceptually strongly related but empirically as of yet isolated areas of psychological and visuospatial perspective-taking to answer the question how perspective-taking works from a grounded cognition perspective (for overviews, see Semin & Smith, 2008a, 2008b). Grounded or embodied cognition states that bodily experiences and mental representations are intricately linked (Barsalou, 1999, 2008; Myachykov, Scheepers, Fischer, & Kessler, 2014; Semin & Smith, 2002, 2013; Smith & Semin, 2004). This approach goes beyond mere representation and it has been shown that sensorimotor inductions can affect attitudes (e.g., Leder, Bär, & Topolinski, 2012; Topolinski, 2010, 2011; Topolinski & Boecker, 2016; Topolinski, Boecker, Erle, Bakhtiari, & Pecher, 2017; Topolinski, Lindner, & Freudenberg, 2014; Topolinski, Maschmann, Pecher, & Winkielman, 2014; Topolinski & Sparenberg, 2012; Topolinski & Strack, 2009; Topolinski, Zürn, & Schneider, 2015), memory (Topolinski, 2012; Topolinski & Strack, 2010), and other important social–cognitive outcomes (for reviews, see Körner, Topolinski, & Strack, 2015; Meier, Schnall, Schwarz, & Bargh, 2012; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Schubert & Semin, 2009).

Specifically, we make the very simple assumption that an embodied simulation of physical proximity is the modal grounding of feelings of closeness during psychological perspective-taking (for other bodily inductions of feelings of self-other-merging, see, e.g., Mazzurega, Pavani, Paladino, & Schubert, 2011; Paladino, Mazzurega, Pavani, & Schubert, 2010). Therefore, a purely visuospatial induction of perspective-taking should be able to cause psychological outcomes, too.

There already exists correlational evidence for the idea that different kinds of perspective-taking are related (see, e.g., Brunyé et al., 2012; Erle & Topolinski, 2015; Kessler & Wang, 2012), but evidence for a shared causal mechanism is lacking as of yet. For instance, clinical populations with deficits in empathy (which also involves psychological perspective-taking—among other processes, cf. Batson, 2009; Davis, 1994), such as people within the autism spectrum (Hamilton, Brindley, & Frith, 2009), also exhibit deficits in visuospatial perspective-taking. One previous paper even already assumed that the dispositional correlation between visuospatial and empathic perspective-taking might be driven by the fact that embodied self-other-merging is involved in both processes (Erle & Topolinski, 2015). But using purely correlational approach, these studies could not test this idea directly. The present paper fills this gap and is the first to empirically demonstrate a shared causal mechanism between the two kinds of perspective-taking using experimental methods.

Data Analysis and Data Preparation

Experiment 1 was attached to a larger battery of studies for which the desired sample size was set to $N = 100$. Based on the effect size of the relevant interaction observed in that experiment ($\eta_p^2 = .068$), sample sizes to achieve a power of $(1 - \beta) = .95$ (conservatively assuming a correlation of $r = 0$ of the repeated measures) were computed using g*Power (Faul, Erdfelder, Lang, & Buchner, 2007). The median observed power of the reported significant results is approximately $(1 - \beta) = 1$. Trials with errors on the visual perspective-taking task were excluded from all analyses. Additionally, trials with RT >10000 ms were removed from the RT analyses. Implausible and very extreme answers such as likely typos (e.g., "Leonardo da Vinci was born in 145" instead of "[. . .] in 1452") were removed before the remaining analyses. For the analyses of the anchoring effect and the differences between participants' and the target's judgments, answers were *z*-standardized (cf. Strack & Mussweiler, 1997) and subjects with extreme responses to the trivia questions ($|z| > 3$) in any cell of the design were excluded. All data and materials can be found at https://osf.io/m92rv.

Experiment 1

The first experiment tested the main hypothesis that visuospatial perspective-taking can produce social–cognitive outcomes. To this end, participants first completed a visuospatial perspective-taking task (cf. Kessler & Rutherford, 2010; Kessler & Thomson, 2010; Surtees et al., 2013a, 2013b) followed by a measure of psychological perspective-taking. During half of the visuospatial perspective-taking trials embodied self-rotation was necessary to solve the task (and hence perspective-taking occurred), whereas on the remaining trials the task could be solved egocentrically without transposing the body schema into the target's position.

Immediately after this visuospatial perspective-taking induction, a thought of the other person was presented and it was measured to which extent participants adopted it. As a measure of psychological perspective-taking, a modified version of the anchoring heuristic (Tversky & Kahneman, 1974) was used. The classical anchoring paradigm involves a comparative question about some trivia (e.g., "Was Leonardo da Vinci born before or after [Anchor]?"). The so-called anchor is a numeric value that is either set to be high or low and that biases information search and numerical judgments under uncertainty. It is well-known that high anchors lead to higher estimations than low anchors (Tversky & Kahneman, 1974; Mussweiler & Strack, 1999a, 1999b; Strack & Mussweiler, 1997). For instance, on average people will report that Leonardo da Vinci was born later when the year 1698 is given as an anchor than when the anchor is 1391. In the present paradigm, the anchor was provided by the target person of the visuospatial perspective-taking task. Because the anchor is tied to a person rather than delivered as part of a comparative question, this paradigm is referred to as the "personalized anchoring paradigm."

The idea behind this was that the anchor is understood as a mental state of the target person. Based on the idea that visuospatial and psychological perspective-taking share a common simulation-based mechanism it was hypothesized that the mental state of the other person should be endorsed more strongly after embodied self-rotation compared with when no such rotation occurred. The physical merging of the self and the other that happens during visuospatial perspective-taking leads to a psychological merging, too, which then leads to shared mental states. In other words, participants not only simulate putting themselves in the place of the target person perceptually and physically but also psychologically.

An anchoring-based paradigm seemed feasible to assess perspective-taking effects, because (a) the other person is imbued with a mental state in a rather natural fashion and (b) prior research has already demonstrated that priming similarity can affect the anchoring effect (Mussweiler, 2002), and specifically lead to assimilation toward the provided anchors (Mussweiler, 2001). There also exist studies that show that perspective-taking can specifically affect anchoring effects (e.g., in a negotiation context, Galinsky & Mussweiler, 2001). Because we assumed that visuospatial perspective-taking causes an embodied self-other-merging that is the modal grounding of psychological self-other-merging, we predicted that this would enhance the anchoring effect specifically because participants assimilate to the mental state of the other person.

Method

Visuospatial perspective-taking task. During the visuospatial perspective-taking paradigm, participants always saw one of two target persons (a young woman and a man) sitting at a table with two objects, a book and a banana (see Figure 1; for all stimuli, see https://osf.io/m92rv). One of the objects was the target object and participants had to indicate which hand the target person would use to grab it from his or her perspective. Participants indicated their responses with the two Ctrl keys. The target person always sat either at 40° or 160° of angular disparity. At 40° of angular disparity the visuospatial frame of reference between the target and the participants is identical. Therefore, at this level of angular disparity no embodied transformation into the target perspective was necessary and the task could be solved from an egocentric perspective (Kessler & Rutherford, 2010; Kessler & Thomson, 2010). At 160° of angular disparity, on the other hand,

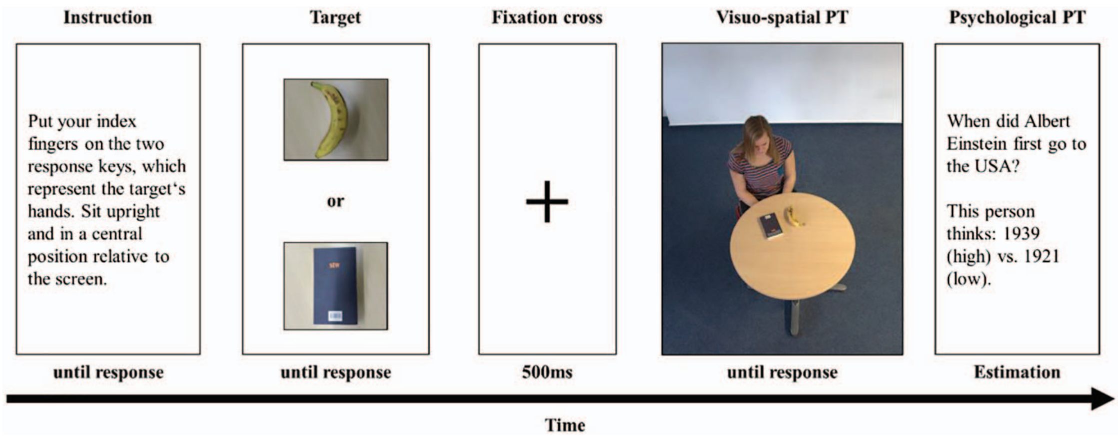

Figure 1. Temporal sequence of events for one exemplary trial. PT = Perspective-taking. See the online article for the color version of this figure.

participants had to engage in perspective-taking to solve the task correctly.

On every trial, participants first were instructed to sit upright and centrally in front of the screen and to put their index fingers on the two response keys. This instruction was displayed until they pressed either response key and then was replaced by an image of the trial's target object (i.e., either a book or a banana) and the instruction "Target object: which hand grabs the banana (book)?" Once the participant again pressed either response key, a fixation cross was presented at the center of the screen for 500 milliseconds, followed by a picture of the target person at the table. As soon as participants indicated which hand the target person would use to grab the target object the psychological perspective-taking task commenced.

There was a total of eight trials: four trials depicting the female and male target person, respectively. Both target persons were presented twice at 40° and 160° of angular disparity; once rotated clockwise and once rotated counterclockwise from the participant. For both target persons, the banana and the book were the target object once per angular disparity and whether the target object was displayed to the left or the right of the target person was counterbalanced.

Psychological perspective-taking task. Immediately after every visuospatial perspective-taking trial, participants were presented with a trivia question (e.g., "How tall is the cathedral of Cologne?") and the estimation of the perspective-taking target (e.g., "This person estimates 60 (low anchor)/320 (high anchor) meters."). In one condition the target person always gave high estimations and in the other condition all estimations were low (the anchors were adopted from Mussweiler & Strack, 1999a, 1999b, and Strack & Mussweiler, 1997). It was hypothesized that after visuospatial perspective-taking these thoughts are endorsed more strongly by participants, too, thus resulting in a larger anchoring effect and smaller differences between participants' and the target's judgments at 160° compared with 40° of angular disparity. Figure 1 shows one exemplary trial sequence.

Sample. $N = 102$ students at the university of Würzburg ($n = 68$ female; $M_{age} = 27$, $SD = 9$) participated for €10. Experiment 1 was first in a 90-min battery of subsequent other unrelated tasks (nonsense word evaluations, Bakhtiari, Körner, & Topolinski, 2016; Topolinski & Boecker, 2016; mood inductions and mindfulness, Remmers, Topolinski, & Koole, 2016) and took about 5–10 min itself. No participants were excluded from the analyses, but $n = 3$ had to be excluded because of too many errors on the perspective-taking task.

Results

A 2 (Angular Disparity: 40° vs. 160°; within) × 2 (Anchor: high vs. low; between) mixed models ANOVA was computed for each dependent variable. These were, (a) the RT of the visual perspective-taking task, (b) participants' mean estimations on the personalized anchoring task, and (c) the difference between participants' and the target's estimations. Although the last two dependent measures were correlated, $r(97) > .38$, $p < .001$, for both levels of angular disparity in both conditions, it was important to inspect both of them because in principle the anchoring effect could be enhanced when participants generally give unrealistically high (low) estimations. Such a pattern of results would be visible only on the anchoring differences and would strongly speak against the idea that participants adopted the target's perspective.

Visuospatial perspective-taking. As in Kessler and Thomson (2010), RT should be higher for the 160° trials, because only there a mental self-rotation happens before the left-right judgment is made whereas at 40° of angular disparity this can be judged right away. This was confirmed by the ANOVA on RT, which yielded only a significant main effect of Angular Disparity, $F(1, 98) = 22.04$, $p < .001$, $\eta_p^2 = .18$ (all other effects, $F < 3.45$, $p \geq .067$, $\eta_p^2 = .03$). There was a small to medium-sized ($d_z = 0.46$) difference in RT between 160° ($M = 1483$ ms, $SD = 1217$) and 40° of angular disparity ($M = 1086$ ms, $SD = 722$), indicating that participants completed the visuospatial perspective-taking task as intended.

Anchoring effect. An increased anchoring effect after visual perspective-taking was expected because the mental self-rotation creates a merging of the self and the other, which also leads to a shared psychological perspective. Indeed, there was a significant anchoring effect, $F(1, 97) = 77.27$, $p < .001$, $\eta_p^2 = .44$, which was qualified by a significant two-way interaction between Anchor and Angular Disparity, $F(1, 97) = 7.11$, $p = .009$, $\eta_p^2 = .07$. The anchoring effect was larger for the 160° trials ($d = 1.61$) than for the 40° trials ($d = 0.76$), see Figure 2.

Anchoring differences. A smaller absolute difference between participants' judgments and the anchoring value after visual perspective-taking was expected. In addition to the stronger overall anchoring effect, this would indicate that participants specifically incorporated the target's mental state into their judgment. Corresponding to this hypothesis, the third analysis showed a significant main effect of Anchor, $F(1, 97) = 67.57$, $p < .001$, $\eta_p^2 = .41$, which was qualified by a significant two-way interaction, $F(1, 97) = 6.34$, $p = .013$, $\eta_p^2 = .06$. Participants provided estimations closer to the anchor on 160° trials than on 40° trials, see Figure 2.

Discussion

Taken together these results suggest that visual perspective-taking can lead to psychological perspective-taking as indicated by a personalized anchoring paradigm. Participants were not only more biased by the numerical anchors after adopting an allocentric visual perspective, but also gave judgments that numerically were closer to the actual anchor provided by the target of the visual perspective-taking task. This was theoretically predicted as the consequence of an embodied self-other-merging which caused participants to psychologically feel more similar to the target of the perspective-taking task, too.

Alternatively, it is possible that visuospatial perspective-taking interfered with the processes preceding the generation of the judgment. For instance, based on the RT, perspective-taking trials (160° of angular disparity) seem to be cognitively more taxing than control trials (40° of angular disparity). It is possible that added task difficulty impedes the ability to generate hypothesis-confirming information. Prior research has shown that the magnitude of anchoring effects depends on the amount of available target-specific information (Chapman & Johnson, 1999). Similarly, applying time-pressure to an anchoring task attenuates anchoring effects (Mussweiler & Strack, 1999a, 1999b) because participants cannot generate the same amount of target-specific information in a shorter period of time (for a review, see Mussweiler, 2003).

However, it seems unlikely that the visual perspective-task affected the way in which participants generated their judgments. The RT needed for judgment generation was also recorded and subjected to a 2 (Anchor: high vs. low; between) × 2 (Angular Disparity: 40° vs. 160°; within) ANOVA, which yielded no significant effect (all Fs < 0.82, all ps $\geq .369$). There was no difference between the time participants took to render their judgment at 40° of angular disparity ($M = 11754$ ms, $SD = 4644$) and 160° of angular disparity ($M = 12100$ ms, $SD = 5000$).

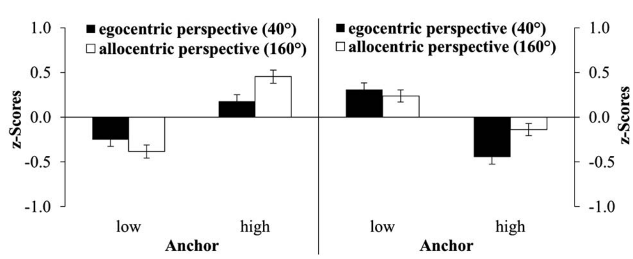

Figure 2. The anchoring effect (left) and anchoring differences (right) as a function of angular disparity and anchor. Error bars represent ±1 standard error of means (*SEM*).

In addition, the analysis of participants' differences to the provided anchors speaks against such explanations of the present results. The larger anchoring effect was driven by the fact that participants specifically endorsed the provided information more strongly after visuospatial perspective-taking (see Figure 2). This favors a merging-based perspective-taking explanation over alternative explanations based on judgmental biases. Nonetheless, the next two experiments sought to rule out task difficulty as an alternative explanation (Experiment 2) and to positively demonstrate that the pattern observed in Experiment 1 depends on the embodied transformation that happens during visuospatial perspective-taking (Experiment 3).

Experiment 2

The second experiment addressed the role of task difficulty for the observed effects. To this end, a "non social" control task was created. For this task, difficulty was also expected to differ between 40° and 160° of angular disparity. But in contrast to the previous study, no perspective-taking could occur. If the previous effects were attributable to task difficulty or downstream effects of task difficulty on the generation of participants' estimations, the nonsocial perspective-taking task should exhibit the same pattern of results as the previous study. If, however, the previous effects were a consequence of visuospatial perspective-taking, the anchoring effect should not differ between 40° and 160° of angular disparity for this task.

Method

Social perspective-taking task. The social perspective-taking task was completely identical to the paradigm of Experiment 1.

Nonsocial perspective-taking task. For the nonsocial task, the target person was removed from the pictures and instead an empty chair was displayed (see https://osf.io/m92rv for instructions and stimuli). In this nonsocial situation, no psychological perspective-taking can occur. Prior research has shown that also without a target person, spatial perspective-taking and embodied self-rotation happen (Kessler & Thomson, 2010; Zacks & Michelon, 2005). Furthermore, removing the avatar makes the task slightly more difficult (Kessler & Thomson, 2010, Experiment 2). The crucial difference between this condition and the prior experiments was that instead of embodied self-other-merging only embodied self-rotation occurs.

This procedural change furthermore made it necessary to provide the numerical anchor by a different means. Therefore, in the nonsocial condition the paradigm by Strack and Mussweiler (1997) was adopted. Here, participants first answer a comparative question (i.e., "Is the cathedral of Cologne taller or less tall than [Anchor] meters?"). This question provided the numerical anchor for participants' judgment in the absence of another social agent. Because the comparative statement was presented after the visuospatial perspective-taking task was completed, it could not increase or decrease task difficulty or the self-rotation per se.

Sample. $N = 218$ students at the university of Würzburg ($n = 139$ female, $n = 69$ male, $n = 10$ missing; $M_{age} = 21$, $SD = 4$) participated in Experiment 2. Because of technical problems, data of $n = 20$ participants were lost. Participants were recruited at the university cafeteria and participated in a separate room in sessions of up to 10 participants. As compensation, they received a candy bar. It took about 10 min to complete this and another experiment which was run after it in the same session (rating geometric shapes, Erle, Reber, & Topolinski, in press).

Results

A 2 (Anchor: high vs. low; between) × 2 (Task: social vs. nonsocial; between) × 2 (Angular Disparity: 40° vs. 160°; within) mixed models ANOVA was computed for all three dependent variables. $n = 11$ participants responded with letter strings instead of estimations and thus their data could not be analyzed. Anchoring effects and differences were again correlated, $rs > .60$, $ps < .001$, for both levels of angular disparity, both anchors, and in both tasks.

Visuospatial perspective-taking. As in the previous studies and as expected, the ANOVA on RT yielded only a significant main effect of Angular Disparity, $F(1, 194) = 12.89$, $p < .001$, $\eta_p^2 = .06$. All other effects were statistically not significant. Particularly effects involving the task manipulation were not significant, which shows that the two tasks were equal regarding their task difficulty and that the increase in task difficulty between 40° and 160° of angular disparity was equal as well (all $Fs < 2.26$, all $ps \geq .135$).

Anchoring effect. As expected, there was a significant anchoring effect, $F(1, 183) = 165.63$, $p < .001$, $\eta_p^2 = .48$, which was qualified by a significant three-way interaction, $F(1, 183) = 11.14$, $p = .001$, $\eta_p^2 = .06$. To specify this interaction, separate two-way ANOVAs were computed for the social and the nonsocial task. The social task replicated the results of the first studies: there was a significant anchoring effect in this condition, $F(1, 90) = 57.36$, $p < .001$, $\eta_p^2 = .39$, which was qualified by a two-way interaction, $F(1, 90) = 6.33$, $p = .014$, $\eta_p^2 = .07$. The anchoring effect was again enhanced at 160° ($d = 1.56$) compared with 40° of angular disparity ($d = 0.91$). Surprisingly, in the nonsocial anchoring task the opposite pattern was observed instead of a null-effect. There was also a significant anchoring effect in this condition, $F(1, 93) = 114.81$, $p < .001$, $\eta_p^2 = .55$, which was qualified by a two-way interaction, $F(1, 93) = 4.96$, $p = .028$, $\eta_p^2 = .05$. The anchoring effect was enhanced at 40° ($d = 1.93$) compared with 160° of angular disparity ($d = 1.27$). Although no significant difference was expected in this condition, this result still supports the idea that task difficulty cannot account for the enhancement of the anchoring effect after visuospatial perspective-taking because the anchoring effect was enhanced for the easier trials of the nonsocial task. Figure 3 depicts the three-way interaction.

Anchoring differences. In this analysis there was a only a significant main effect of anchor, $F(1, 183) = 83.70$, $p < .001$, $\eta_p^2 = .31$. The predicted three-way interaction was not significant, $F(1, 183) = 3.64$, $p = .058$, $\eta_p^2 = .02$. The difference between participants' and the target person's judgments was neither significantly modulated by visuospatial perspective-taking in the social task, $F(1, 90) = 3.44$, $p = .067$, $\eta_p^2 = .04$, nor the nonsocial task,

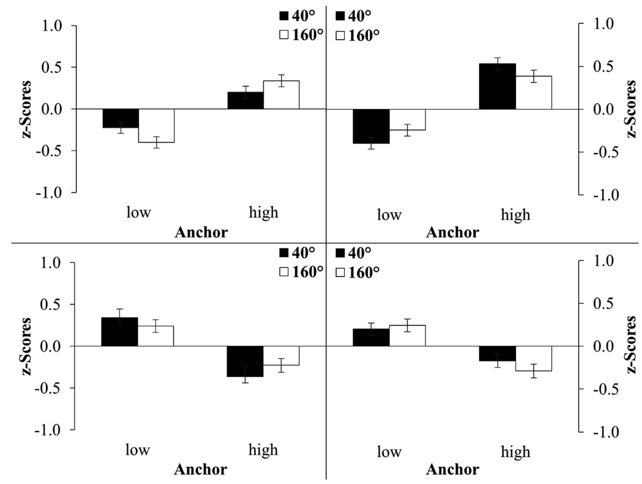

Figure 3. The anchoring effect (left) and anchoring differences (right) as a function of angular disparity and anchor for the social (top) and nonsocial task (bottom). Error bars represent ±1 *SEM*.

$F(1, 93) = 0.97$, $p = .327$, $\eta_p^2 = .01$, although the results patterned quite similarly as in Experiment 1, see Figure 3.

Discussion

The results of Experiment 2 were largely in line with its predictions. The social task replicated the anchoring effect results of the first experiment, but not the anchoring differences analysis, which yielded a statistically nonsignificant result. Descriptively, however, the reduction of the anchoring differences at 160° of angular disparity were similar as in Experiment 1, see Figure 3.

The nonsocial task exhibited diametrically different results. There was a strong anchoring effect in this condition, which unexpectedly was larger at 40° of angular disparity. The differences between participant and target judgments, on the other hand, were not affected at all by angular disparity. One possibility for the enhanced anchoring effect in this condition is that in a standard anchoring paradigm task difficulty indeed affects the anchoring effect (see, e.g., Epley & Gilovich, 2006). Possibly cognitive load created by the visuospatial perspective-taking task interfered with the generation of hypothesis confirming information. Therefore, judgmental biases were more pronounced at 40° of angular disparity where task difficulty was lower and more capacity for hypothesis confirmatory reasoning was available. Whatever the reason for this opposite effect, it still speaks against the idea that task difficulty causes the observed effects on the personalized anchoring paradigm because the two tasks were largely identical in terms of task difficulty.

Experiment 3

The third experiment went on to directly demonstrate that the anchoring effect and anchoring differences are only affected when embodied self-other-merging occurs during visuospatial perspective-taking. To this end, the angular disparity between participant and target was varied continuously rather than dichotomously. Based on prior research it is known that embodiment effects in visuospatial perspective-taking paradigms occur starting at 80° of angular disparity (Kessler & Rutherford, 2010; Kessler & Thomson, 2010). In these prior studies participants' body posture was manipulated orthogonally to angular disparity. This was done by either turning participants' body 60° toward or away from the target in the picture. By means of this, the angular disparity which the embodied transformation had to cover was increased or decreased, respectively. As a result, RT were modulated by congruence or incongruence of participants' body schema which the authors interpreted as embodiment effects (Kessler & Rutherford, 2010; Kessler & Thomson, 2010). This modulation happened only at angular disparities of 80° and higher because only for these angular disparities the visuospatial frames of reference between participant and target differ. No embodiment effects were observed below 80° because there, participants can use a direct matching strategy to locate the object from the target's point of view which matches their egocentric visual reference frame (Janczyk, 2013; Keehner, Guerin, Miller, Turk, & Hegarty, 2006; Kessler & Thomson, 2010). Extending these findings to psychological perspective-taking, increased anchoring effects and decreased differences to the provided anchors should only be observed at the higher levels of angular disparity (i.e., 80°–160°), but not at the lower levels (i.e., 0°–40°).

Method

Participants again completed the visuospatial perspective-taking task as in the previous experiments which was followed by the same personalized anchoring paradigm. Instead of using only 40° and 160° pictures, angular disparity was manipulated continuously in steps of 40° (see https://osf.io/m92rv for the stimuli). Participants completed four trials on every level of angular disparity with the same balancing rules as in Experiments 1 and 2, resulting in 20 total trials per participant. The anchor variable was again manipulated between participants. Thus, the study had a 2 (Anchor: low vs. high; between) × 5 (Angular Disparity: 0° vs. 40° vs. 80 vs. 120° vs. 160°; within) design.

Sample. $N = 227$ students at the university of Würzburg ($n = 160$ female, $M_{age} = 27$, $SD = 11$) participated for €7 in a 60 min battery including other unrelated tasks. The study took about 10 min.

Pilot test. Because the number of trials was increased to 20, new anchoring items had to be generated. Therefore, $N = 141$ participants ($n = 99$ female, $M_{\text{age}} = 27$, $SD = 9$) were recruited for a pilot study during which they answered 24 trivia questions on a variety of topics (see https://osf.io/m92rv for the items and complete results). For every question the 15th and 85th percentiles were calculated as potential judgmental anchors (cf. Mussweiler & Strack, 1999a; Mussweiler & Strack, 1999b; Strack & Mussweiler, 1997). Twelve items with appropriate distributions were selected and added to the eight existing items.

Hypotheses. We formulated specific contrasts to test the above-mentioned considerations: for the RT analyses, a jump of RT at 120° of angular disparity that is independent of the numerical anchors was assumed based on prior research on visuospatial perspective-taking (see, e.g., Janczyk, 2013; Kessler & Thomson, 2010; Popescu & Wexler, 2012) and tested with the appropriate contrast vector that compares 0° to 80° of angular disparity with 120° and 160° of angular disparity (0° vs. 40° vs. 80° vs. 120° vs. 160°: −2 −2 −2 3 3). Note that the lower RT that are usually observed at 80° of angular disparity do not mean that no embodied transformation happens at 80° of angular disparity. As can be seen by visually inspecting the 80° pictures (see https://osf.io/m92rv), participants' egocentric left-right relation of the world is different from that of the person in the picture and consequently, a new frame of reference has to be adopted first by means of embodied transformation. This process requires less effort at 80° of angular disparity because a shorter distance must be covered. But note that Experiment 2 already ruled out task difficulty as an explanation for the observed effects.

For the other two analyses a contrast matrix for the interaction term was coded. The anchoring effect was assumed to be smaller when no embodied self-other-merging occurs (i.e., at 0° and 40° of angular disparity) than at the remaining levels of angular disparity (i.e., 80° to 160°). Therefore, for the high anchor condition, the vector (0° vs. 40° vs. 80° vs. 120° vs. 160°: −3 −3 2 2 2) was coded. Because the jump was expected in the opposite direction in the low anchoring condition, a second vector for the anchor condition (high vs. low: 1 −1) was introduced and the two were multiplicatively combined to a contrast matrix. For the anchoring differences, the opposite pattern was assumed, that is, smaller differences (that is, numerically lower numbers that are closer to zero) in the high anchoring condition starting at 80° of angular disparity (0° vs. 40° vs. 80° vs. 120° vs. 160°: 3 3 −2 −2 −2), and the opposite pattern (i.e., higher numbers that are closer to zero) in the low anchoring condition (high vs. low: 1 −1).

Results

Here, we report the results of the specified contrast analyses (see above). The omnibus tests of the general linear model can be calculated from data available at https://osf.io/m92rv. Again, the anchoring effect and the anchoring differences were correlated, rs $> .62$, ps $< .001$, for both anchors and all levels of angular disparity.

Visual perspective-taking. For RT, the planned contrast yielded a significant result, $F(1, 225) = 87.46$, $p < .001$, $\eta_p^2 = .28$. RT were very similar between 0° and 80° of angular disparity and increased only starting at the 120° level, see Figure 4. These results are in line with prior research (cf. Janczyk, 2013; Kessler & Thomson, 2010; Popescu & Wexler, 2012).

Anchoring effect. The contrast analysis of the anchoring effect yielded a significant result, $F(1, 223) = 5.42$, $p = .021$, $\eta_p^2 = .02$. Only when an embodied self-rotation into the target's position

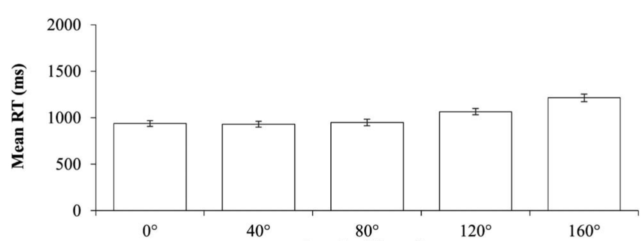

Figure 4. Reaction times for the visuospatial perspective-taking task as a function of angular disparity. Error bars represent ±1 *SEM*.

happened (angular disparity ≥80°), the anchoring effect was increased (see Figure 5).

Anchoring differences. Finally, the contrast for the anchoring differences also yielded a significant result, $F(1, 223) = 4.03$, $p = .046$, $\eta_p^2 = .02$. The differences between participants' and the target's estimations were smaller upward of 80° angular disparity compared with the lower levels of angular disparity, see Figure 5.

Discussion

These results support our embodied transformation account. Both the enhancement of the anchoring effect and the smaller differences between participants' judgments and the target's judgments were specific to angular disparities of 80°-160°. This corresponds to the threshold for embodiment effects in prior research (Kessler & Rutherford, 2010; Kessler & Thomson, 2010). These effects again were independent of task difficulty because in this case the psychological perspective-taking measures should be affected starting at 120° of angular disparity (in parallel to the RT increase, see Figure 4).

These first three experiments in our mind support the idea that embodied self-other-merging affects social–cognitive outcomes. However, one important question still needs to be answered, that is, whether these effects truly should be considered a variant of perspective-taking. Although the personalized anchoring task phenomenologically comes very close to measuring "The ability to intuit another person's thoughts, feelings, and inner mental states" (cf. Epley & Caruso, 2009, p. 297) in our opinion, it does not provide direct evidence for the proposed idea that the physical closeness that is created during visuospatial perspective-taking is the modal grounding of self-other-merging, which is the primary outcome of psychological perspective-taking instructions. The last two experiments went on to provide evidence for this assumption and to more directly connect the effects of our newly devised perspective-taking induction to the literature on psychological perspective-taking.

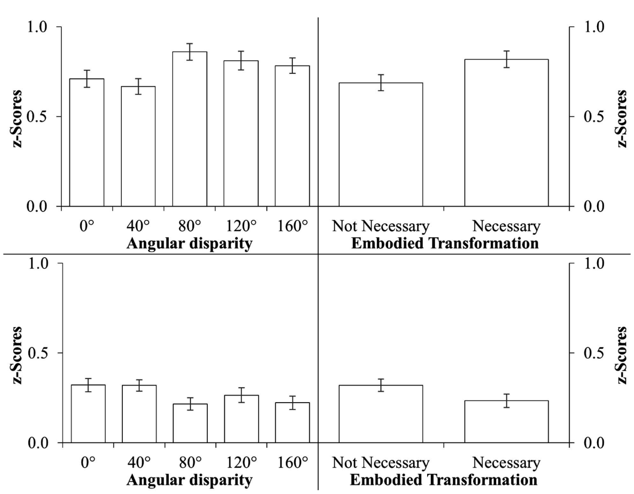

Figure 5. Difference between the low and high anchor condition for the anchoring effect (top) and anchoring differences (bottom) by angular disparity (left) and contrast results (right). Error bars represent ±1 *SEM*.

Experiment 4

Experiment 4 aimed to provide evidence for the assumed mechanism of modally grounded self-other-merging. To this end, we assessed whether visuospatial perspective-taking affects perceived similarity to the target of perspective-taking, a classic finding in the empathy and perspective-taking literature (Davis et al., 1996, 2004).

Method

Visuo-spatial perspective-taking task. Visuospatial perspective-taking was not manipulated via angular disparity, but with a direct instruction. Here, the target person was always sitting at 160° of angular disparity and at the beginning of each trial participants were either asked to grab the target object from the target's perspective, or to locate it from their egocentric perspective. This was done to ensure that the stimuli were identical for egocentric and allocentric trials, because it was conceivable that perceived similarity might differ between 40° and 160° of angular disparity. For instance, the 40° target persons are physically closer to the participant, which could enhance their similarity independent of perspective-taking, or conversely only the 160° targets are facing the participant, which could also affect their perceived similarity. Furthermore, in line with previous research (Batson et al., 1997), we ensured that the target person in the paradigm always had the same gender as the participant, because naturally participants would indicate higher similarity to same sex partners independent of any manipulation.

Psychological perspective-taking task. As dependent measure, participants were asked "How similar do you feel to this person right now?" after every visuospatial perspective-taking trial instead of answering a trivia question. They had to answer on a nine-point scale ranging from 1 (*not similar at all*) to 9 (*very similar*). Participants completed 16 trials of this task, eight where they had to adopt an allocentric perspective, and eight where they remained egocentric. They always saw the same same-sex target person sitting at 160° of angular disparity. Furthermore, we counterbalanced the relative locations of the two objects, which object was the target, and whether the target person was rotated 160° clockwise or counterclockwise from the participant.

Sample. $N = 265$ students at the university of Cologne ($n = 202$ female) participated. They were recruited at the university cafeteria and participated in a separate room in exchange for a candy bar. It took participants about 5–10 min to complete this experiment.

Results

Because participant gender neither affected visuospatial perspective-taking (all Fs < 3.54, all $ps \geq .061$), nor perceived similarity (all Fs $<$ 1.03, all $ps \geq .314$), paired samples t-tests were used to compare the egocentric and allocentric perspective trials.

Visuospatial perspective-taking. Participants responded slower when they engaged in visuospatial perspective-taking ($M_{RT} = 1565$ ms, $SD = 861$) compared with when they remained egocentric ($M_{RT} = 1293$ ms, $SD = 860$), $t(264) = 5.15$, $p < .001$, $d_z = 0.32$. This demonstrates the feasibility of the instruction manipulation of visuospatial perspective-taking.

Perceived similarity to the target. As expected, perceived similarity was higher after visuospatial perspective-taking (M = 3.53, SD = 2.24) compared with the egocentric trials (M = 3.20, SD = 2.19), $t(264) = 3.34$, $p < .001$, $d_z = 0.20$.

Discussion

The results of Experiment 4 directly support our assumed mechanism, that is, that the embodied self-other-merging during visuospatial perspective-taking is the modal grounding of psychological self-other-merging after perspective-taking instructions. Thus, our newly developed visuospatial manipulation is not only phenomenologically, but also empirically close to established measures of psychological perspective-taking. However, as in Experiment 1, we manipulated perspective-taking within-subjects, but this time with a quite obvious manipulation, which might allow demand effects or strategic answering. Furthermore, participants always saw a same-sex target in this experiment. To address these concerns, and to bolster the validity of our paradigm even further, Experiment 5 implemented a between-subjects manipulation of visuospatial perspective-taking and assessed probably the second most popular indicator of psychological perspective-taking: feelings of sympathy for the target of perspective-taking (cf. Batson et al., 1997).

Experiment 5

Experiment 5 was closely modeled after two landmark studies on the effect of perspective-taking on feelings for another person (Batson et al., 1997; Davis et al., 1996). In these studies, participants always listened to a tape recording of another person in need. Before listening, half of their participants were asked to engage in psychological perspective-taking, whereas the remaining participants were asked to remain objective. After the tape recording, participants were asked what their feelings for the protagonist of the tape were (Batson et al., 1997; p. 115), whether they wanted to be friends with the protagonist, and how sympathetic the protagonist seemed to them (Davis et al., 1996; p. 716).

We conceptually replicated these studies with the only change being that instead of instructions and a tape recording, we asked half of our participants to engage in visuospatial perspective-taking with one specific target-person for a while, whereas the other half completed the same task but from an egocentric perspective. After this treatment, we assessed participants liking for that target person from the visuospatial perspective-taking task. We expected participants to report higher liking of the target person after completing the visuospatial perspective-taking task than after completing the egocentric task.

Method

Visuo-spatial perspective-taking task. Perspective-taking was manipulated as in Experiment 4, but this time between participants: participants in one condition always were asked to grab the target object from the target person's perspective, whereas in the other condition they were always asked to locate it from their egocentric perspective. Participants completed a total of 64 trials in both conditions with the same counterbalancing rules as in the previous experiments intact. In contrast to Experiment 4, participants always saw the same *opposite*-sex target person sitting at 160° of angular disparity. This was done (a) to generalize the effects of Experiment 4 to opposite sex targets, and (b) because for some participants it might feel awkward to indicate "feelings" for a same-sex target.

Psychological perspective-taking task. Shortly after this phase of the experiment, participants were asked the same three questions as in the seminal works on the topic (see above; cf. also Batson et al., 1997; Davis et al., 1996).

Sample. N = 255 students at the university of Cologne (n = 197 female; n = 55 male; n = 3 missing data; M_{age} = 22, SD = 4) participated. They were recruited at the university cafeteria and participated in a separate room in exchange for a candy bar. The experiment lasted about 5–10 min.

Results

Because participant gender neither affected visuospatial perspective-taking (all Fs < 1.97, all ps ≥ .163), nor Liking (all Fs < 0.80, all ps ≥ .375), paired samples t-tests were used to compare the egocentric and allocentric perspective conditions. Demographic data and liking ratings of n = 3 participants was lost. The answers to all three questions (feelings toward, sympathy for, and interest in friendship with the target) were combined into an index of Liking (CR-α = .704), which was the primary dependent measure of Experiment 5.

Visuospatial perspective-taking. Participants responded slower in the visuospatial perspective-taking condition (M_{RT} = 1019 ms, SD = 404) compared with the egocentric condition (M_{RT} = 630 ms, SD = 174), $t(253) = 9.99$, $p < .001$, $d = 1.25$. This demonstrates the feasibility of manipulating visuospatial perspective-taking between-subjects.

Liking of the target. Liking was higher in the visuospatial perspective-taking condition (M = 5.30, SD = 0.96) than in the egocentric condition (M = 4.93, SD = 0.81), $t(250) = 3.34$, $p < .001$, $d = 0.42$.

Discussion

As in Experiment 4, we were able to show that a purely visuospatial induction of perspective-taking also causes empathic outcomes. Furthermore, this experiment rules out the idea that the effects of Experiments 1–4 are contingent on the insight participants have into the manipulation in a within-subjects design, because perspective-taking was manipulated between-subjects. The results of these last two studies clearly show that visuospatial perspective-taking not only affects social–cognitive outcomes, but two classic measures of empathic perspective-taking. Thus, the results of Experiments 4 and 5 further support the idea of a shared mechanism of all kinds of perspective-taking.

General Discussion

Across three experiments it was demonstrated that we adopt random thoughts uttered by another person more strongly after imagining how the world visually appears to that person. Thus, a mere shift in visuospatial perspective is sufficient to cause psychological consequences, too. These effects were independent of task difficulty (Experiment 2), and specific to instances of embodied self-other-merging during visuospatial perspective-taking (Experiment 3). Furthermore, visuospatial perspective-taking affected perceived similarity (Experiment 4) and sympathy (Experiment 5), two main outcomes of empathic perspective-taking. These findings have important implications for both psychological and visuospatial perspective-taking research.

For psychological perspective-taking and empathy researchers, visuospatial inductions provide a methodological innovation that overcomes many of the limitations of the presently predominant instruction paradigm. First, with instructions it is unclear how exactly empathic outcomes are achieved. Although some studies tried to tease apart aspects of visual and psychological aspects that feed into these effects (see, e.g., Fiske, Taylor, Etcoff, & Laufer, 1979; Libby & Eibach, 2011; Storms, 1973), researchers are still far from understanding how exactly they work—a notion that was acknowledged already a long time ago by one of the leading psychological perspective-taking researchers:

> In a nutshell, the problem is that researchers employing the "imagine-the-self" and "imagine-the-other" instructions [. . .] have generally assumed that observers who are given these instructions do as they are told. [. . .] What is poorly understood, however, is exactly what observers do when attempting to comply with such instructions. [. . .] Thus, while instructional sets [. . .] have been found to produce quite reliable effects on affective and behavioral outcomes, remarkably little is known about the precise cognitive activities which ensue when these instructions are followed. (Davis, 1994, p. 207)

Second, instructions and vignettes are always tied to one specific person in one specific instance. With this newly developed manipulation, it is possible to manipulate perspective-taking freely trial-by-trial. This makes our paradigm much more flexible and less susceptible to important aspects of the perspective-taker and the description of the target person that can impact the measurement outcomes of instruction studies (Davis, 1994; Dovidio et al., 2004; Eisenberg & Lennon, 1983; Eisenberg & Strayer, 1987; Lennon & Eisenberg, 1987).

Third, the visuospatial induction has one clearly defined mechanism by which it causes empathic outcomes whereas in the case of instructions it is unclear whether the observed responses even are the result of any empathic process. Most vignettes are written in a way that suggests one socially desirable answer that people can guess without engaging in any empathic activity. Therefore, in some cases it is possible that participants simply understand the way in which they are supposed to react to a story without actually showing such a reaction.

For visuospatial perspective-taking researchers, this flexibility opens other broad avenues for future research. As mentioned in the introduction, only very little is known about the consequences of visuospatial perspective-taking. Future research could establish such consequences by combining a visuospatial perspective-taking induction with other measures of psychological perspective-taking. Specifically, the anchoring paradigm of the present studies was chosen because it is free from any interpersonal relationship between the participant and the target and because it is a low-stakes social interaction. Similarly, participants had no knowledge of the target person in Experiments 4 and 5. Compared with the instruction studies that sometimes deal with situations as severe as murder (e.g., Batson et al., 2002), this is of course a limitation of our findings. It is important to demonstrate effects of our very subtle manipulation also in such high-stakes, meaningful, and ecologically more valid situations in future research. Combining this visuospatial induction also with behavioral empathy measures and investigating situations in which participants have a social relation or some knowledge about the target person of the visuospatial perspective-taking paradigm are important in determining the boundary conditions of the present results.

Another limitation of our work is the assumption that the observed effects are driven by an enhanced anchoring effect at 160° of angular disparity. Although this assumption is theoretically driven and plausible, in principle the present results can alternatively explained by a reduction of the anchoring effect at 40° of angular disparity. One possible mechanism for this could be that 40° trials make egocentrism salient to participants. Egocentrism should lead participants to ignore the anchor more strongly. And because the judgmental anchors are derived from the 15th and 85th percentile of a calibration sample, but egocentric judgments should converge to the 50th percentile, on average more modest estimations would be expected. What makes us question this account, though, is the opposite pattern of results in the nonsocial task of Experiment 2 and the results of Experiments 4 and 5. In Experiment 2, the above-mentioned mechanism would also predict a smaller anchoring effect at 40° of angular disparity, but this was obviously not the case. In Experiments 4 and especially 5, egocentrism would make features of the self salient, and as Greenwald and colleagues eloquently put it: "an expectable form of implicit attitude effect is that novel objects that are invested with an association to the self should be positively evaluated" (Greenwald & Banaji, 1995, p. 10). Again, the fact that participants regarded another person more highly after perspective-taking or alternatively less highly after remaining egocentric is obviously not compatible with this idea. Nonetheless, an important future research question should be the development of paradigms that feature an egocentric, and allocentric, and a true control condition.

From a theoretical perspective, researchers have struggled with the question whether perspective-taking should be conceptualized as a unitary construct or as a collection of independent but similarly named constructs (i.e., perceptual, affective, and cognitive perspective-taking) for a very long time (see, e.g., Ford, 1979; Kurdek, 1978; Underwood & Moore, 1982). Within this discussion, arguments too often are based on correlations between different perspective-taking tasks. However, the interpretation of such purely correlational analyses is often unclear and open to criticism. A better approach to establish construct validity would be to find common processes involved in all kinds of perspective-taking (such as a simulation of bodily self-other-merging) and to test whether manipulating this process affects measures of "different kinds" of perspective-taking similarly or not (cf. Borsboom, Cramer, Kievit, Scholten, & Franic, 2009; Borsboom, Mellenbergh, & van Heerden, 2004). Doing so could help to clarify some of the terminological confusion that has always surrounded perspective-taking, empathy, and theory of mind research (Batson, 2009) and by means of this inspire theorizing about empathy and the role perspective-taking (among other processes) plays in its context.

One final interesting question based on the present results concerns the direction of causality of the observed effects. Because it is a developmental precursor of psychological forms of perspective-taking (Kessler & Thomson, 2010), it was assumed that visuospatial perspective-taking is the grounding of psychological perspective-taking. But this does not preclude that the causal link is bidirectional. Is it possible that psychological knowledge about a person affects visuospatial perspective-taking, too? For instance, could people be slower to adopt the visuospatial perspective of a murderer than that of a positively framed person? As previously mentioned, the present Experiments 4 and 5 cannot address this question because no information about the target person was provided in these studies. But future studies could easily pursue this question by providing knowledge about the social agents involved in a visuospatial perspective-taking task before participants complete it and by assessing whether the effects on perceived similarity and liking generalize to such target persons.

To conclude, this paper is the first to demonstrate a shared causal mechanism between visuospatial and psychological perspective-taking. It shows that the self–other merging that is experienced during psychological perspective-taking is grounded in the physical merging of the self and the other that is known to happen during visuospatial perspective-taking. This is the first step on a long journey to understanding a simple trick that helps us to get along with other people but which, upon closer inspection, seems to be more complex than advertised by Atticus Finch.

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