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## The benefit of seeing in company

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### Abstract

A new study by Ward and colleagues finds that participants use mental rotation to calculate an avatar's perspective on a scene without any prompt to do so. This often enables them to make faster judgements about the appearance of the scene than they could make if they viewed it on their own.

A recent paper by Ward et al. [1] uses an elegant new method to advance our understanding of visual perspective taking (VPT) in human adults.

Classic work on VPT requires explicit judgements of whether or not someone else can see an object (VPT1) or *how* they see it (VPT2) (see Box 1). More recent work has found evidence of VPT even when the possibility of perspective-taking is only implicit in the task. Samson et al. [2] asked participants to judge how many dots appeared on the wall of a cartoon room, when the room also contained a task-irrelevant avatar that either saw the same number of dots as the participant, or fewer (VPT1). Judgements were slower when the avatar's perspective was incongruent with participants' own, suggesting that the avatar's perspective was being calculated, in parallel with participants' own perspective in a relatively automatic manner, without direct motivation and despite its disruptive effects in this task. Ongoing research is examining the extent to which such effects are distinctively social [3,4].

To date, for VPT2 similar "altercentric interference" effects have been observed only when participants were also required to make explicit VPT2 judgements on other trials [5], or when they were motivated by interacting with another person, rather than an inanimate avatar [6]. This combined evidence has been used in favour of a "two systems" model of understanding other people's minds [7], in which simple mindreading (including VPT1) is supported by efficient and relatively automatic processes, while more complex mindreading is supported by flexible but more effortful processes (including those that enable VPT2).

Ward et al. use a novel task to test 1) whether VPT2 may in fact be more automatic than previous research has suggested, 2) whether VPT2 can facilitate (and not merely disrupt) participants' judgements from their own perspective, and 3) whether such effects are due to the "social" or the spatial features of other people. The

task builds upon classic work on visual imagery [8] by requiring participants to judge whether an alphanumeric character presented on the flat surface of a table at varying degrees of angular rotation from participants is in its canonical form or mirror-flipped. The classic result is that judgements become slower with increasing angular rotation. In a novel twist, on half of the trials Ward et al. placed an avatar in the scene seated at a fixed angular distance either left or right from participants (as an approximation, imagine the right hand example in Box 1 with the “6” replaced with an “R” or “Я”). Critically this meant that the same alphanumeric character would appear at a different angle of rotation to the avatar and the participant. The authors reasoned that if participants processed the avatar’s perspective even without instruction, they might show faster judgements of the appearance of the character on the table when less mental rotation was required from the avatar’s perspective than from participants’ own. Such facilitation was indeed the consistent pattern observed over 3 experiments, and conversely, interference was evident in slower judgements when *more* mental rotation was required from the avatar’s perspective. In Experiment 2 a similar effect was not found when the avatar was replaced by a lamp. This result supports a “social” interpretation of the phenomenon in which participants process the avatar’s visual perspective, which lamps do not have. Experiment 3 found the same pattern of results, but larger effect sizes, when participants *were* explicitly instructed to respond from the avatar’s perspective.

The studies provide clear support for two of the authors’ three questions: Participant’s own judgements can be facilitated (as well as disrupted) by perspective-taking, and this effect appears specifically social. What of the first question, of whether spontaneous VPT2 might be more automatic than previous studies have suggested? Here the evidence remains equivocal. First, all 3 experiments showed that response

times were predicted by the angle of rotation from the avatar's perspective, as well as participants' own. This elegantly reveals the mechanism involved in computing the avatar's perspective but suggests that implicit VPT2 in this task depends upon cognitively effortful mental rotation in the same way as explicit VPT2. Second, the interference observed from the avatar's perspective cannot be due to competition between incongruent information about the appearance of the number/letter because, unlike other paradigms, the right answer from the perspective of the avatar and the participant is always the same. This effect could instead arise from participants calculating both perspectives in parallel, but responding only once the slowest calculation was completed. Or participants might only attempt whichever calculation seems easier, but make imperfect choices, resulting in "interference" when they erroneously choose the slower perspective to calculate. Only the first possibility would evidence parallel processing of self and other perspectives, and neither requires that implicit VPT2 uses a different process from explicit VPT2. This remains an open question.

Where does this leave us? Ward et al. have shown us that adults use VPT2 without instruction, without needing interaction with a real person, and most importantly that this "seeing in company" can confer benefits. These are important contributions. Previous work has assumed that spontaneous perspective-taking must be helpful, but has only demonstrated that it is disruptive. It is intriguing to imagine what other benefits may come indirectly through vicarious experience of others' perceptions, thoughts, and feelings. Moreover Ward et al. provide a great new paradigm and methods of analysis for investigating perspective-taking, which have much potential for further work. It would be exciting to know whether mental rotation for VPT2 draws on the same processes as generic mental rotation, or whether these truly

are distinct processes that could be independently manipulated or impaired. More broadly the phenomena revealed here open the way for new methods of assessing VPT2 in non-human animals or human infants. For example, there is evidence that male infants are more likely to engage in mental rotation of objects [9]. Wouldn't it be interesting if this "male advantage" were eliminated or reversed in the presence of an alternative perspective?

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Box 1. Summary of classic work on perspective-taking.

In Figure I below, appreciating that you see 6 but he does not requires VPT1. Appreciating that she sees the numeral as a “9” while you see the very same numeral as a “6” requires VPT2. In children VPT1 develops around 2 years while VPT2 develops around 4 years and is thought to require a more sophisticated conceptual understanding [10]. Adults’ speed of VPT1 judgements varies according to the distance between the other person and the object, suggesting that participants track their line of sight. Speed of VPT2 judgements varies according to the angular distance to the other person, suggesting that *how* the other person sees the object is calculated via mental rotation [11]. Mental rotation is not essential to VPT2 – I could find out how you see things through other spatial transformations, or by moving myself physically to your position – but mental rotation is a key feature of most VPT2 tasks.

Figure I. Levels of visual perspective-taking.

