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# “Making it explicit” makes a difference: Evidence for a dissociation of spontaneous and intentional level 1 perspective taking in high-functioning autism



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## ABSTRACT

The ability of perspective taking is a fundamental aspect of social cognition. The ability to decide, what another person can or cannot see is referred to as “level 1 perspective taking.” This is thought to be a process that we can make use of intentionally, but which also takes place spontaneously. Autism is characterized by impairments of social interaction, which are thought to be related to deficits in implicit rather than explicit perspective taking. In order to assess both levels of processing with regard to perspective taking, we employed an established task in patients and controls. Our results demonstrate that both groups engage in spontaneous level 1 perspective taking. In contrast to controls, however, patients reacted more slowly if they had to verify the other’s as compared to their own perspective, which shows that participants with high-functioning autism have selective difficulties in explicit, but not implicit, level 1 perspective taking. These findings demonstrate that while spontaneous level 1 perspective taking appears to be intact in autism, this ability is impaired in patients when used explicitly.

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## 1. Introduction

To be able to put oneself in the spatial position of another person is assumed to play a crucial role in many other higher-level processes involved in social cognition. We take perspectives all the time, and we do so both consciously and unconsciously, both intentionally and spontaneously. Children acquire their first perspective taking skills at the age of seven months (Kovács, Téglás, & Endress, 2010); even non-human primates, to some

degree, have an understanding of other perspectives (Hare, Call, & Tomasello, 2001). If a person has problems with perspective taking tasks, the inability to take the perspective of someone else is often due to “natural egocentrism” (Piaget & Inhelder, 1956) and an inability to “decenter” or, in other words, to perform a perspective shift from the first person perspective to a third person perspective. Usually, however, humans cannot ignore others’ visuospatial perspectives and even take them spontaneously (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010). Persons suffering from autism spectrum disorders (ASD), however, experience disturbances in social interactions (Schilbach et al., 2013) that are associated with deficits in the ability to access others’ mental states and in spatial perspective taking (Frith, 1996). In this paper we study

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whether persons diagnosed with high-functioning autism (HFA) spontaneously adopt others' perspectives.

The available literature distinguishes between different types of perspective taking. On the one hand there are pure perceptual forms of perspective taking (Newcombe, 1989), referring to the capacity to imagine how others perceive the world, here research focuses on visuospatial perspective taking processes. The most famous visuospatial perspective taking task is the three mountains experiment (Piaget & Inhelder, 1956) in which children have to decide what a landscape looks like from another person's point of view. On the other hand, the term "perspective taking" is also used to indicate the capacity to ascribe mental states (e.g. judgments, thoughts, beliefs, feelings, emotions, desires etc.) to other persons, also referred to as "mentalizing" or "theory of mind" processes (Frith & Frith, 2006). In a well-known mentalizing task, namely the Sally-Anne task (Baron-Cohen, Leslie, & Frith, 1985), children have to decide where an agent Sally will search for a marble that was moved elsewhere (by Anne) while the agent Sally was absent. To which degree visuospatial perspective taking and mentalizing are based on functionally similar or independent processes is still an open question (David et al., 2008; Kockler et al., 2010), but we can assume that the ability of visuospatial perspective taking plays an important role for the ability of mentalizing (Frith & Frith, 2006).

In our study we focus on visuospatial perspective taking processes. Research distinguishes between "level 1" and "level 2" perspective taking (Flavell, Abrahams Everett, Croft, & Flavell, 1981; Michelon & Zacks, 2006): Taking the visuospatial level 1 perspective of another person requires responding adequately to the question of *what* the target person can and cannot see or, for example, *whether* a certain object is visible from the other's perspective. In contrast, level 2 perspective taking addresses the question of *how* the target person perceives the world, or *how* an object appears from the other's perspective, as is illustrated in the three mountains problem.

In level 1 perspective taking tasks, participants usually have to judge what another person is able to perceive in comparison to their own perceptions (Michelon & Zacks, 2006; Vogeley et al., 2004). As an example, Vogeley et al. (2004) presented static visual stimuli with a virtual character standing in the center of a room with several red balls placed around him. The scene was presented from different viewpoints and participants had to judge the number of balls as seen by the virtual character or by themselves. When participants had to judge from the other's perspective, reaction times increased and neural activation was increased in brain areas recruited during spatial cognition including the precuneus, the right superior parietal and the right premotor cortices. Samson et al. (2010) used similar stimuli to investigate the spontaneous nature of perspective taking in healthy controls under systematic manipulation of the consistency between the participant's and the other's perspectives. The underlying idea is that any perspective that is taken spontaneously or even automatically will interfere with the perspective that people are asked to take intentionally, provided that the perspectives differ from one another. In their scenes, participants

always had the same view on the virtual character. Instead of balls, discs were located on only two of the room's walls so that they were either in front of or behind the virtual character. Participants were presented with a number and had to verify whether the number corresponded to the number of discs as seen from either their own or the other's perspective. Samson et al. (2010) found an effect of "egocentric intrusions": The verification of the other's perspective was more difficult if participants saw a different number of discs than the virtual character, suggesting that one's own perspective has to be disengaged to verify the perspective of the other person. Crucially, however, they also found an effect of so-called "altercentric intrusions": It was more difficult for participants to verify the number of discs seen from their own perspective if the virtual character saw a different number of discs. This effect shows that the level 1 perspective of the virtual character is taken spontaneously, even if it goes against ostensible task demands. These results suggest that level 1 perspective taking is a spontaneous, pre-reflective process.

Autistic persons have difficulties with social interaction and with taking others' perspectives (Baron-Cohen, 1988; Frith, 1996). Interestingly, while they have difficulties with mentalizing tasks and also with level 2 perspective taking tasks (Hamilton, Brindley, & Frith, 2009), they do not appear to have any problems with level 1 perspective taking (for a recent overview on visuospatial perspective taking in ASD, see Pearson, Ropar, & Hamilton, 2013). For example, adult HFA participants are able to decide which of two objects appears at an elevated position with respect to a virtual character as quickly and as accurately as control participants do (David et al., 2010). Even autistic children show no difference to controls when they have to position a doll to make it "see" a specific object or when they have to indicate what a doll or an experimenter can "see" from its viewpoint (Baron-Cohen, 1989; Hobson, 1984; Leekam, Baron-Cohen, Perrett, Milders, & Brown, 1997; Leslie & Frith, 1988; Reed & Peterson, 1990). As described above, non-autistic participants cannot ignore the visuospatial perspectives of other persons and take them spontaneously (Belopolsky, Olivers, & Theeuwes, 2008; Frischen, Loach, & Tipper, 2009; Samson et al., 2010; Tversky & Hard, 2009; Zwickel, 2009; Zwickel, White, Coniston, Senju, & Frith, 2011). In this study, we wanted to investigate whether individuals with HFA, who are generally able to take others' visuospatial level 1 perspectives, also process them spontaneously, or whether they can only refer to others' perspectives in a controlled, intentional way. This objective was motivated by demonstrations of a dissociation between impaired implicit and relatively intact explicit levels of social cognition in high-functioning autism (Schilbach, Eickhoff, Cieslik, Kuzmanovic, & Vogeley, 2012; Senju, Southgate, White, & Frith, 2009).

To test these different levels of processing in autistic and control persons, we used a level 1 perspective taking task that differentiates between intentional and spontaneous perspective taking (Samson et al., 2010). To measure intentional perspective taking, participants were explicitly asked to take their own or someone else's perspective. To address spontaneous perspective taking, we measured the degree of interference between the explicitly requested

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