















There were no significant group difference in overall change in behavior between the control group ( $M=0.06$ ,  $SD=0.17$ ) and the ASD group ( $M=0.03$ ,  $SD=0.13$ ;  $t(30)=0.56$ , n.s.). Similarly, there was no significant group difference in the number of attempts to get the attention of a parent, between the control group ( $M=0.53$  attempts,  $SD=0.52$  attempts) and the ASD group ( $M=0.27$  attempts,  $SD=0.42$  attempts;  $t(30)=1.56$ , n.s.). There were no group differences in the number of times the child touched the table between the control group ( $M=0.8$  times,  $SD=1.11$  times) and the ASD group ( $M=0.43$  times,  $SD=0.49$  times;  $t(30)=1.24$ , n.s.) (see Figure 3(b)).

Neither group was likely to offering verbal explanations for the dilemma (control group ( $M=0$ ,  $SD=0$ ); ASD group  $M=0.1$ ,  $SD=0.28$ ). None of these performance variables correlated significantly with MA in the ASD group, but in the control group alone, VMA showed a significant correlation with looking at the sticker table ( $r(14)=0.91$ ,  $p<0.001$ , two-tailed) and looking at faces ( $r(14)=0.76$ ,  $p<0.001$ ) and a marginally significant correlation with tapping or hitting the table ( $r(14)=0.51$ ,  $p=0.08$ ). No other variables were significantly correlated with MA.

## Discussion

The results of Experiment 2 provide no evidence that children with ASD use an explanatory drive in the social domain. In contrast to the result reported for Experiment 1, typically developing children generated more exploratory and problem-solving behaviors and responses than children with ASD. Specifically, typically developing children evinced more exploratory behaviors such as looking at the stickers on the table and problem-solving (i.e. attention-getting) behaviors such as making noises.

Given the results of Experiment 1, where children with ASD visually inspected and actively explored the blocks, the failure of children with ASD to generate similar exploratory and problem-solving responses in the social domain suggests that children with ASD are unable to use their exceptional explanatory drive to compensate for their social cognitive deficits.

## General discussion

Experiments 1 and 2 were designed to answer two questions: (1) Do children with ASD show evidence of an explanatory drive that is similar to that of typical children? (2) Does the explanatory drive appear to function differently in the social versus the physical domain? Results support the conclusion that the children with ASD in this study had an intact explanatory drive, but only in the non-social domain. In Experiment 1, when confronted with a physical problem, children in the ASD group were more likely than the control group to ask a “why” question and were also more likely than the control group to offer a

physical explanation for what was happening. The children with ASD asked for help more often and offered more physical explanations than typically developing control participants. There was also non-verbal evidence consistent with the notion that children with ASD may have an exceptional explanatory drive in the physical domain. For instance, children in the ASD group were more likely than children in the control group to touch the surface of the table and were more likely to put the block outside of the circle in an attempt to make it stand. Not only do children with ASD have an explanatory drive, but it is more robust than that of the control group. This difference cannot be explained by group differences in verbal ability.

Children with ASD were just as likely as the control children to explore the block by touching the bottom, looking at the bottom, and flipping it over. They were just as likely as control children to try standing the block up on the other end of the table, and most significantly, they spent as much time as the children in the control group inspecting the block tactilely and visually. All of these behaviors are consistent with the idea that children in the ASD group have an intact explanatory drive.

These results are consistent with the systemizing hypothesis of autistic cognition (Baron-Cohen et al., 2001; Lawson et al., 2004). According to this hypothesis, ASDs are characterized by a “systemizing” cognitive style, meaning those with ASD want to know how system works. This systematizing cognitive style may have led children with ASD in Experiment 1 to seek out explanations for puzzling physical events to a greater extent than controls.

With respect to testing in the social domain, we saw clear evidence of group differences of the type one would expect to find in any social context: those with ASD were less likely to look at the experimenter’s face, attempt to get the experimenter’s attention, or extend the open hand toward the experimenter. In contrast to performance in the physical domain, there was no evidence of an explanatory drive in the social domain for children with ASD. Given a social dilemma, children in the ASD group were less likely than children in the control group to look at the experimenter’s face and between the experimenter’s face and the stickers. This finding is consistent with the expectation that there may be group differences in the initiation of joint attention (Bedford et al., 2012; Charman and Baird, 2002; Warreyn et al., 2005).

It is possible that children with ASD have no explanatory drive with respect to the social domain. We speculate that children with ASD are accustomed to finding social situations perplexing and perhaps have no expectation of explaining social events; thus, they may not be driven to seek explanations in social situations. Alternatively, their behavior may result from an intact social explanatory drive and an inability (inhibition) to act. For example, seeking information in social contexts involve actually *initiating* a social situation (asking someone what they mean, etc.).



Such a difference between social and non-social information seeking might, in and of itself, reduce the frequency of information seeking in those with ASD. Our procedures were meant to control for this potential confound: it is for just this reason that the sticker experimenter did not interact socially, verbalize, or make eye contact with the participant. However, the less social measures such as touching the table and touching the sticker experimenter showed no significant group difference. One might think that touching was a social gesture, but the failure to find group differences in touching the experimenter may be a floor effect resulting from the fact that these behaviors were low-frequency behaviors in either group.

Note that it is possible, given these results, that children with ASD may still have an explanatory drive with respect to the social domain, and that group differences arise because children with ASD make attempts to seek explanations that rest on incorrect assumptions about the world. For example, it is possible that they are seeking explanations, but are not relying on other's mental states as information sources, so their explanatory behaviors do not look like those of the control group, incorporating eye contact and attention bids, for example. Similarly, they may not understand that the experimenter's visual attention to stickers forecloses the possibility that she is still interacting with the child. Future experiments could test the children's understanding of the relationship between visual attention and behavior, in order to aid the interpretation of these group differences.

This study is the first to report that high-functioning children with ASD have a preserved explanatory drive despite their reduced facility with respect to reasoning about psychological unobservables. Indeed, our data suggest that children with ASD may possess an exceptional explanatory drive in the physical domain. Our results suggest that the explanatory drive is present in young individuals with ASD and does not emerge late relative to typical development, which could be explained by either explicit training or practiced compensatory mechanisms.

The explanatory drive in ASD may be restricted to the non-social domain. Among those with ASD, folk psychology deficits dissociate from deficits in folk physics (for a review, see Baron-Cohen (2010)). Our results suggest that there is either no drive to seek explanations in the social domain (perhaps all social interactions are perplexing, and our experimental dilemma is no more confusing than everyday life) or the children with ASD lack the skills necessary to resolve the dilemma. The fact that the ASD group did not extend their explanatory drive in the social domain suggests that the explanatory drive might not be domain-general, but domain- or task-specific. Alternatively, the drive might be neutral with respect to domain but ineffective in the social domain because of a lack of coordination with other social abilities such as theory of mind. Such a possibility merits future research. If the explanatory drive

is domain specific, intervention strategies that attempt to use a child's exceptional explanatory drive to compensate for social reasoning deficits may prove ineffective.

Humans have an "Explanatory Drive," which leads them to seek information in ambiguous circumstances, a drive that may be unique among primates (Povinelli and Dunphy-Lelii, 2001). Because those with ASD have a deficit in social cognitive processing (Baron-Cohen, 1995), in some cases concurrent with preserved cognitive functioning in other domains (Baron-Cohen et al., 1999), we sought evidence of the explanatory drive in the social and physical domains in children with ASD. We see no evidence of an ASD-specific deficit in the explanatory drive with respect to physical problems. A failure to seek explanations in the social domain is consistent with poor performance in social situations among those with ASD and could suggest that the explanatory drive is domain specific.

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