Children with autism can track others’ beliefs in a competitive game


Background

• The Sally-Ann task has traditionally been considered the ‘litmus’ test for false belief understanding in children
• Typically Developing (TD) children have been shown to succeed on this task by 5 years of age. Verbal-age matched children with ASD have been shown to continue to fail this task well past the time when they would be expected to understand the verbal demands
• Meta-analyses of 591 different false-belief procedures share one common feature: they are motivationally barren

Objective

• Investigate whether motivation underlies the high failure rate in children with autism by contrasting performance on the Sally-Ann procedure with a novel competitive false belief task – the ‘Dot-Midge task’

Method

Participants

• 23 children with autism (M age = 10;4, range 7;2 to 13;2); M verbal age on PPVT = 6.42 (range 2;9 to 9;4)
• 26 older 4-year-olds (M age = 4;8, range 4;5 to 4;11)
• 24 younger 4-year-olds (M age = 4;2, range 4;0 to 4;3)
• 23 3-year-olds (M age = 3;7, range 2;9 to 3;11)

Instruments

• Diagnostic Assessment: according to the DSM- IV criteria, PDD-NOS was excluded
• Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997)
  o Only 56% of the TD sample completed the PPVT (M = 4.34 (range 2;10 to 6;8)

Procedure

• Sally-Ann task: 2 trials were administered (performance means reported /2)
  o Sally has a basket and Ann has a box. Sally places a marble in the basket, then leaves. Ann moves Sally's marble into the box. When Sally returns, children are asked, “Where Sally will look for her marble?”
    ▪ Correct response in the basket where she left it, as she has no knowledge that the marble was moved
• Dot-Midge task; 2 trials were administered (performance means reported /2)
  o A prize that the child wants is in contest. Two competitors, Dot and Midge, both express desire for the prize. Everyone watches as the prize is hidden in Container A. Dot leaves and the prize is moved to Container B. In order to win the prize, children must select the puppet who does not know where the prize is.
    ▪ The child wins the prize if they select Dot to look for the prize, since they did not see the prize move.
Results

<table>
<thead>
<tr>
<th></th>
<th>Autism</th>
<th>3-year-olds</th>
<th>Young 4-year-olds</th>
<th>Old 4-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>( M ) Sally-Ann Score (/2)</td>
<td>.52</td>
<td>.70</td>
<td>.54</td>
<td>.81</td>
</tr>
<tr>
<td>( M ) Dot-Midge Score (/2)</td>
<td>1.61</td>
<td>.74</td>
<td>1.29</td>
<td>1.58</td>
</tr>
<tr>
<td>Percent (n) correct Sally-Ann</td>
<td>13%</td>
<td>22%</td>
<td>4%</td>
<td>23%</td>
</tr>
<tr>
<td>Percent (n) correct Dot-Midge</td>
<td>74%</td>
<td>17%</td>
<td>54%</td>
<td>77%</td>
</tr>
</tbody>
</table>

- No significant group differences on the Sally-Ann
- Dot-Midge elicited better overall performance
  - ASD children performed similar to 4-year-old group
  - In typical development, children’s abilities on the Dot-Midge task emerge between 3 and 4 years of age

- Including language ability (PPVT) as a covariate did not change pattern of results
- 95% of all children passed the language control tasks of the Sally-Ann task, indicating comprehension of task instructions
- The basis for failure on both tasks was explained as a ‘reality bias’ or children fixating on the knowledgeable agent or the objects’ true location

Discussion

- Using a motivationally rich, competitive game, 10 year-old children with autism were found to succeed at a false belief task involving the understanding of mental states
- Typically developing 4, but not 3 – year-olds were also found to pass the Dot-Midge task
- Many children with autism failed the Sally-Ann task (87% failed), however most of these same children were able to pass the Dot-Midge task (74% passed). These results suggest that in contrast to pervious findings, children with autism are capable of understanding false beliefs, but require the right motivation to use these skills
- The rule-based hypothesis suggesting that other cognitive strategies could be used to succeed on traditional false-belief tasks was not explicitly investigated

Limitations

- Although the presentation of tasks was counterbalanced, an analysis of order effects was not included. Participation in Sally-Ann task first could produce practise effects, which may explain the improvement in performance on Dot-Midge task
- A direct test of the rule-based hypothesis for false-belief performance in children with ASD was not conducted. Given how rule-based the daily lives of children with ASD can be, this hypothesis may have direct relevance to understanding how children with ASD perform false-belief tasks.

Thoughts

- The ‘reality bias’ explanation for children who fail could be a result of difficulty with mental reversal (e.g. the correct response is the agent who lacks knowledge, or the place where the object is not). Thus, language abilities aside, development of basic executive abilities such as inhibition or working memory (holding two thoughts in mind concurrently) may also predict performance.