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Social Versus Memory Demands on Cognitive Set Shifting
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Key Terms
ASC = autism spectrum condition TDC = typically developing comparison
PO = Person Only CO = Computer Only PIC = Person-Computer

BACKGROUND

• Executive functions refer to brain processes needed for planning, flexibility, abstract thinking, and other everyday organizational tasks.
• There remains inconsistency in executive function (EF) studies in autism. A recent review of previous studies (Corbett et al., 2009) reports overall significant deficiencies in EF for autism groups, but it is uncertain how much of this may be due to the presence of ADHD symptoms in 30-50% of children diagnosed with autism (Yerys et al. 2009).
• It has been shown that children with high-functioning autism perform the Wisconsin Card Sort, a test of set-shifting and perseveration, better when it is administered via computer than by a person (Ozonoff 1995).
• Ozonoff suggested this was due to social demands on cognition during the in-person task that interfered with performance, rather than damaged executive functioning in set-shifting.
• We aimed to investigate this hypothesis by varying the amount of social input in the administration of the WCST, across three different conditions.

METHODS

Measures
1. Child ASD participants completed one of three versions of the Wisconsin Card Sort Task (WCST) to measure the effect of set shifting during various levels of social interaction. Each task was presented using standard instructions.
   a) Person Only Task (PO): Original version of the WCST - highest social demand
   b) Computer Only Task (CO): Computerized version of the WCST - lowest social demand
   c) Person-In-Computer Task (PIC): Videotaped human administration of the WCST - partial social demand
Each task was timed so that the time from the end of one trial to the possibility of making your next decision was about 4 seconds.

Figure 1- CO Animation to make timing comparable to PIC administration
Figure 2- Screen shot of the CO version
Figure 3- Screen shot of PIC recorded administration

1. The participants were matched with a typically developing control group for age, sex, and IQ.
2. The ASC group was much more anxious (per parent report) than the TDC group.

BEHAVIORAL RESULTS: Overall Performance on the WCST

When all conditions were averaged together, the ASC group performed significantly worse than the TDC group on all aspects of the WCST.

One-way ANOVA analyses of performance across task conditions

<table>
<thead>
<tr>
<th>WCST Variable</th>
<th>Task comparisons</th>
<th>F</th>
<th>Task comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASC Total Trials</td>
<td>PO &lt; (CO, PIC)</td>
<td>6.38*</td>
<td></td>
</tr>
<tr>
<td>ASC Total Errors</td>
<td>PO &lt; PIC</td>
<td>4.41*</td>
<td></td>
</tr>
<tr>
<td>ASC Perseverative Errors</td>
<td>PO &lt; (CO, PIC)</td>
<td>7.53*</td>
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<tr>
<td>TDC Total Trials</td>
<td>PO = CO = PIC</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>TDC Total Errors</td>
<td>PO = CO = PIC</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>TDC Perseverative Errors</td>
<td>PO = CO = PIC</td>
<td>0.94</td>
<td></td>
</tr>
</tbody>
</table>

*** = p < .001

CONCLUSION

• Children affected with ASD performed significantly worse on both computer related tasks (CO and PIC) than on the person-administered task. This may be due to the increased demand for working memory and attention when using computer versions of the computer task, which include delays between each trial.
• This was especially true for the number of perseverative errors, which is a hallmark symptom of executive function problems in autism.
• The TDC group performed much better, but followed a similar trend by performing better on the PO task.
• Recommendations: ASD/ADHD correlation be explored to discover relationship between working memory in each setting. Include a measure for working memory.

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