Using Representations: Coordination of Symbols in Theory of Mind, Executive Function, and Representation of Imagined Objects
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Introduction

We propose that the difficulty 3-year-olds have with some theory of mind, executive function, and symbolic representation tasks derives partly from an inability to coordinate representations and reflect on these representations. Experiment 1 assessed 3 to 5-year-olds’ performance on an action pantomime task requiring children to symbolically pretend actions (e.g., pretend you are brushing your teeth). This task requires the coordination of:

• a symbolic object function, or action representation (e.g., pretend brushing teeth)
• a symbolic object state (e.g., pretend toothbrush).

Three other tasks were used:

• two theory of mind tasks, the false belief task and appearance-reality task
• an executive function/rule use task (the Dimensional Change Card Sort, DCCS)

It is argued that all of these tasks require the coordination of symbolic representations. In the DCCS, the child must coordinate two pair s of rules to decide on the correct action. For theory of mind tasks, children must coordinate conflicting representations.

Hypotheses

• There will be a developmental progression in the action pantomime task from using body-part-as-object (BPO) representations to imaginary object (IO) representations.
• Correlations between the DCCS and theory of mind (Frye, Zelazo, & Palfai, 1995), and between the action pantomime task and theory of mind (Suddendorf, Fletcher-Flinn, & Johnston, 1999) have been found. Therefore, a significant relation among all tasks is expected.

Experiment 1

Participants

A total of 107 children participated, 35 3-year-olds, 43 4-year-olds, and 29 5-year-olds.

General Design

All children completed four tasks: (1) the action pantomime task, (2) the DCCS, (3) three scenarios of the appearance-reality task (4) and three scenarios of the false belief task.

For the action pantomime task, the action request wasconst. Pretend you are <verb> with <object>.” Eight objects were used: toothbrush, hammer, shovel, pen, comb, saw, cup, and phone.

Scoring: 1) BPO representation, in which the child substituted a body part for the object (e.g., finger for toothbrush); 2) IO representation, in which the subject symbolically represented the object.

Performance on all tasks replicated past findings of increased performance with age. The data were analyzed to examine correlations among tasks. Table 1 presents the simple and further age-partialled correlations among the tasks.

Table 1
Simple and Age-Partialled Correlations Among Tasks in Experiment 1

<table>
<thead>
<tr>
<th></th>
<th>Pretend Action</th>
<th>DCCS</th>
<th>False Belief</th>
<th>Appearance-Reality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>.49***</td>
<td>.57***</td>
<td>.31***</td>
<td>.37***</td>
</tr>
<tr>
<td><strong>Action Pantomime</strong></td>
<td>.31***</td>
<td>.19*</td>
<td>.18*</td>
<td></td>
</tr>
<tr>
<td><strong>DCCS</strong></td>
<td></td>
<td>.42***</td>
<td>.26**</td>
<td></td>
</tr>
<tr>
<td><strong>False Belief</strong></td>
<td></td>
<td></td>
<td>.29**</td>
<td></td>
</tr>
<tr>
<td><strong>Appearance-reality</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Method

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All children completed the action pantomime task for two conditions. The action condition was the same as in Experiment 1. In the hold condition, children pretended they were holding an object (e.g., holding a toothbrush). Total IO responses were summed, yielding a score between 0 and 8 for both conditions.

Experiment 2

Participants

A total of 85 children participated, 26 3-year-olds, 37 4-year-olds, and 22 5-year-olds.

General Design

All children completed the action pantomime task for two conditions. The action condition was the same as in Experiment 1. In the hold condition, children pretended they were holding an object (e.g., holding a toothbrush). Total IO responses were summed, yielding a score between 0 and 8 for both conditions.

Discussion

The data from Experiment 1 were presented at the 2001 Meeting of the Jean Piaget Society in Berkeley, CA.