Mental Rotation Transfer

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The mechanisms underlying the effects of practice on mental rotation are still incompletely understood. Explanations that may apply include improved rotation processes (Wallace & Hofelich, 1992) and the learning of figure exemplars (Tarr & Pinker, 1989). One comparison of these two theories supported an exemplar explanation: Heil, Roesler, Link and Bajric (1998) looked for transfer of mental rotation performance in three conditions where 3-D block figure stimuli pairs were either identical to practiced pairs, the same objects around mixed old and new axes, or new objects around mixed axes. They found that mental rotation skill only transferred to the identical condition.

In contrast to this, in an experiment that included less practice and a transfer condition in which only the figure views were different, we found transfer of rotation performance.

Table 1: Data Summary

<table>
<thead>
<tr>
<th>Angle (°)</th>
<th>Mean RS (ms)</th>
<th>Same/Orth.</th>
<th>New/Orth.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>1830.5</td>
<td>1134.9</td>
<td>1350.4</td>
</tr>
<tr>
<td>40°</td>
<td>2800.5</td>
<td>1845.6</td>
<td>2255.9</td>
</tr>
<tr>
<td>80°</td>
<td>3314.3</td>
<td>2381.1</td>
<td>2861.3</td>
</tr>
<tr>
<td>120°</td>
<td>4164.7</td>
<td>2984.9</td>
<td>3922.8</td>
</tr>
</tbody>
</table>

Unlike the Heil, et al. (1998) study, our results suggest that transfer of rotation skill involving rotation around a particular axis can occur to new stimuli views. While we do not claim to refute Heil et al. (1998), it does seem that non-stimulus-specific transfer can occur. On the other hand the special advantage for 0° rotation pairs that were repeated from training does suggest that there is also a stimulus-specific component to the learning. The fact that the new view/same axis transfer condition showed transfer of RS, yet showed no benefit in the 0° disparity (identity recognition) trials suggests that our new view stimuli condition was significantly unique and transfer of rotation skill to these new views depended on general rotation learning independent of any exemplar view strengthening. As revealed by the data and a subsequently formulated ACT-R model, there is a complex variety of learning that is taking place in the first 200 trials of a mental rotation experiment.

Acknowledgments
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References
Heil, M., Roesler, F., Link, M., & Bajric, J. (1998). What is improved if a mental rotation task is repeated--the efficiency of memory access, or the speed of a transformation routine? Psychological Research, 61, 99-106.

