Complex formation in young children: categorization of complex, asymmetric and

impossible figures

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Abstract

Adults readily detect structural coherence and it was recently discovered that young infants respond to pictures of impossible figures as well with increased looking, oculomotor activity and manual exploration (Shuwairi et al., 2007, Shuwairi & Johnson, 2013). Past research has demonstrated discrepancies between stimuli containing novel impossible figures suggesting that this increased attention could be associated with other perceptual properties such as symmetry or complexity, rather than inherent knowledge of global incoherence. The goal of this study is to evaluate the nature of children's conceptual knowledge of the global properties of real 3D objects and to clarify how and when young children achieve an understanding of the various perceptual dimensions of objects, such as complexity, symmetry and coherence.

Stimuli consisted of four sets of line drawings, presented one set at a time that varied along the three perceptual dimensions, with an addition of typicality. Children were instructed to look at all the shapes and sort them into two groups based on what seemed most natural. After "free-sorting", children were given a brief tutorial on particular aspects of shape geometry (e.g., symmetry; impossibility) and instructed to sort the figures by that perceptual dimension. For example, to draw attention to the pertinent properties of these objects, the experimenter traced the impossible cube and pointed out lines that joined incorrectly. The experimenter and the child also sketched a butterfly while emphasizing equivalent left-right sides.

When free-sorting by impossibility, only 6% of the children naturally sorted by impossibility (M errors = 2). After instructions, 25% sorted by structural possibility (M errors = 2). Those who didn't initially sort by the intended property sorted by properties like straight vs. curvy, with holes vs. without holes, etc. In the symmetry task, 60% free-sorted accordingly (M errors = 2), and another 34% did so after butterfly training (M errors = 1). When free-sorting by

complexity, 96% sorted by the intended dimension. Finally, in the paired sorting task, 23% perfectly identified possible and impossible, and 77% sorted with an average of 2 errors.

Curiously few children sorted by impossibility, even after extensive training. They relied on more salient but superficial perceptual qualities (e.g., curvy vs. straight edges) to sort depicted objects instead of by the broader level of structural coherence vs. incoherence.

References

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