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Cultural differences in visual object recognition in 3-year-old children



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ABSTRACT

Recent research indicates that culture penetrates fundamental processes of perception and cognition. Here, we provide evidence that these influences begin early and influence how preschool children recognize common objects. The three tasks ($N = 128$) examined the degree to which nonface object recognition by 3-year-olds was based on individual diagnostic features versus more configural and holistic processing. Task 1 used a 6-alternative forced choice task in which children were asked to find a named category in arrays of masked objects where only three diagnostic features were visible for each object. U.S. children outperformed age-matched Japanese children. Task 2 presented pictures of objects to children piece by piece. U.S. children recognized the objects given fewer pieces than Japanese children, and the likelihood of recognition increased for U.S. children, but not Japanese children, when the piece added was rated by both U.S. and Japanese adults as highly defining. Task 3 used a standard measure of configural processing, asking the degree to which recognition of matching pictures was disrupted by the rotation of one picture. Japanese children's recognition was more disrupted by inversion than was that of U.S. children, indicating more configural processing by Japanese than U.S. children. The pattern suggests early cross-cultural differences in visual processing; findings that raise important questions about how visual experiences differ across cultures and about universal patterns of cognitive development.

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Introduction

Human visual object recognition is fast and robust. People can recognize a large number of instances of many different categories under varied and non-optimal conditions. By all accounts, this prowess depends on visual experiences with the categories (e.g., Kourtzi & DiCarlo, 2006; Peissig & Tarr, 2007); that is, the recognition of cars, cups, and dogs depends on one's experience with those categories (Gauthier, Skudlarski, Gore, & Anderson, 2000; Kovack-Lesh, McMurray, & Oakes, 2014; Malt & Majid, 2013). We ask whether the development of visual object recognition also depends on the culture in which one develops. The hypothesis is not that culture affects object recognition because of the kind or range of experienced instances but rather whether culture biases visual processing more generally, encouraging the processing of more local or global properties, and in so doing changes the information used and represented for recognizing objects. The idea that culture penetrates a core cognitive function such as visual object recognition is novel but is consistent with a growing set of findings showing pervasive cultural effects on visual processing.

The relevant cross-cultural studies have primarily focused on the processing of scenes (visual arrays composed of multiple objects) and have used a variety of measures, including recognition measures (Ishii, Tsukasaki, & Kitayama, 2009; Masuda & Nisbett, 2001, 2006), eye-tracking (Chua, Boland, & Nisbett, 2005; Kelly, Miellet, & Caldara, 2010; Masuda et al., 2008), and brain imaging (Goh et al., 2013; Han & Northoff, 2008; Hedden, Ketay, Aron, Markus, & Gabrieli, 2008; Masuda, Russell, Chen, Hioki, & Caplan, 2014). The findings show consistent differences in how Western adults (residing in North America and Europe) and Eastern adults (residing in China, Japan, and Korea) process visual information. In aggregate, the findings suggest that Western perceivers are more selective, more focused on local elements in scenes, and less affected by visual context than Eastern perceivers. In contrast, Eastern perceivers are more holistic and more sensitive to the relational structure among elements in a scene (Chua et al., 2005; Hedden et al., 2008; Kitayama, Duffy, Kawamura, & Larsen, 2003; Masuda & Nisbett, 2001, 2006; Masuda et al., 2008; Miyamoto, Yoshikawa, & Kitayama, 2011; Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005; Nisbett, Peng, Choi, & Norenzayan, 2001). These differences are not all-or-none, but they are pervasive across a variety of tasks and visual stimuli.

Critically, cultural differences like those found in adults are also found in children (Duffy, Toriyama, Itakura, & Kitayama, 2009; Imada, Carlson, & Itakura, 2013; Moriguchi, Evans, Hiraki, Itakura, & Lee, 2012; Senzaki, Masuda, & Nand, 2014), including children as young as 4 years (Kuwabara & Smith, 2012; Kuwabara, Son, & Smith, 2011). The demonstration of developmentally early cultural differences imposes constraints on explanations of their origins. The demonstration of these early differences in core psychological tasks such as visual search and selective attention (Kuwabara & Smith, 2012) also challenges our understanding of presumed universal properties of cognitive development. With these larger issues in mind, we ask the question: Are cultural differences in visual processing also evident in how young children recognize common objects?

As several reviews have lamented (Braddick & Atkinson, 2011; Nishimura, Scherf, & Behrmann, 2009; Smith, 2009), the development of visual object recognition—despite its centrality to many human competencies—is relatively understudied beyond the first year of life. This is so despite the fact that the literature also shows that developmental changes in visual object recognition extend well into adolescence (Bova et al., 2007; Jüttner, Wakui, Petters, Kaur, & Davidoff, 2013; Wakui et al., 2013). The evidence that we do have from young children derives primarily from studies of Western children. These findings suggest a developmental progression from recognition based more on local and piecemeal features to recognition based on the relational structure among the features and parts (Augustine, Jones, & Smith, 2015; Augustine, Smith, & Jones, 2011; Davidoff & Roberson, 2002; Diamond & Carey, 1986; Smith, 2009; Wakui et al., 2013). For young Western children, for example, one or two highly diagnostic features—cat ears and whiskers or wheels—may trump other category-incongruent visual information (Pereira & Smith, 2009; Rakison & Butterworth, 1998). We ask the question: Is this early reliance on local category-diagnostic features principally a fact about Western children or a fact about the development of object recognition more generally?

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