

The interplay between perceptual organization and categorization in the representation of complex visual patterns by young infants

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Received 24 January 2006; revised 10 April 2006

Available online 21 June 2006

Abstract

The relation between perceptual organization and categorization processes in 3- and 4-month-olds was explored. The question was whether an invariant part abstracted during category learning could interfere with Gestalt organizational processes. A 2003 study by Quinn and Schyns had reported that an initial category familiarization experience in which infants were presented with visual patterns consisting of a pacman shape and a complex polygon could interfere with infants' subsequent good continuation-based parsing of a circle from visual patterns consisting of a circle and a complex polygon. However, an alternative noninterference explanation for the results was possible because the pacman had been presented with greater frequency and duration than had the circle. The current study repeated Quinn and Schyns's procedure but provided an equivalent number of familiarization trials and duration of study time for the infants to process the pacman during initial familiarization and the circle during subsequent familiarization. The results replicated the previous findings of Quinn and Schyns. The data are consistent with the interference account and suggest that a cognitive system of adaptable feature creation can take precedence over organizational principles with which a perceptual system comes preequipped.

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Keywords: Category learning; Perceptual organization; Infant cognition

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Introduction

Perceptual organization occurs when the elements of a visual pattern are grouped into larger perceptual units or perceptual wholes (e.g., Kimchi, Hadad, Behrmann, & Palmer, 2005). Perceptual categorization occurs when objects from a common class are grouped into a category representation (e.g., Hampton, Estes, & Simmons, 2005). Although the topics of perceptual organization and categorization traditionally have been considered in separate literatures, there have been recent efforts directed at understanding how perceptual and more conceptual representations for objects can be understood within a common framework (Goldstone & Barsalou, 1998; Palmeri & Gauthier, 2004). A point of departure for these efforts has been to highlight the difficulties associated with achieving a complete accounting for object representation with one or another fixed featural vocabulary (Goldstone, 2003). As an alternative, Schyns, Goldstone, and Thibaut (1998) proposed a flexible system of perceptual unit formation where the features that come to represent objects are developed during the task of concept learning. An individual's history of concept formation and the concepts possessed by that individual at a particular moment in development affect subsequent perceptual organization processes. Concepts develop based on perceptual experiences, but perceptual experiences are also affected by developing concepts.

The interplay between processes of perceptual organization and categorization is of particular interest and importance for developmentalists (e.g., Quinn & Bhatt, 2005b). Through studies of the object representation abilities of young infants (who have a minimum of experience and acquired knowledge of objects and object kinds), one can (a) learn how the formation of emergent perceptual features is constrained by Gestalt grouping principles and (b) observe whether such grouping principles can at times be overridden if a feature that might be nonnatural in the Gestalt sense is diagnostic of a concept that an infant has been asked to learn. To this end, Quinn and Schyns (2003) undertook a set of experiments to better understand the relation between adherence to Gestalt organizational principles and flexible feature creation in young infants. The experiments were designed to answer the following question: Will organizations of scenes into objects that are natural by Gestalt principles be "overlooked" by young infants if alternative means of perceptual organization are "suggested" by presenting the infants with a category of objects in which the features uniting the objects are not those predicted by adherence to Gestalt organizational principles? In the first experiment, 3- and 4-month-olds were familiarized with a number of complex figures, examples of which are shown in the top portion of Fig. 1. Subsequently, during a novelty preference test, infants were presented with the pacman shape paired with the circle shown in the bottom portion of Fig. 1. Infants were found to recognize the circle as familiar, as evidenced by their preference for looking at the pacman shape, a preference that was not attributable to a spontaneous preference for the pacman shape over the circle shape given that a null preference is observed for the two shapes when there is no familiarization (Quinn, Brown, & Streppa, 1997). This result suggests that infants had parsed the circle from the complex figures in accord with good continuation, a finding that is consistent with other reports that infants in this age range can use the Gestalt principle of good continuation when processing visual pattern information (Quinn & Bhatt, 2005a; Quinn et al., 1997).

In a second experiment, Quinn and Schyns (2003) asked whether an invariant part abstracted during category learning would interfere with the perceptual organization

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