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ScienceDirect
Cognitive Psychology 54 (2007) 133–154
Cognitive Psychology
www.elsevier.com/locate/cogpsych

Will any doll do? 12-month-olds' reasoning about goal objects

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Accepted 12 June 2006
Available online 26 July 2006

Abstract

Infants as young as 5 months of age view familiar actions such as reaching as goal-directed (Woodward, 1998), but how do they construe the goal of an actor's reach? Six experiments investigated whether 12-month-old infants represent reaching actions as directed to a particular individual object, to a narrowly defined object category (e.g., an orange dump truck), or to a more broadly defined object category (e.g., any truck, vehicle, artifact, or inanimate object). The experiments provide evidence that infants are predisposed to represent reaching actions as directed to categories of objects at least as broad as the basic level, both when the objects represent artifacts (trucks) and when they represent people (dolls). Infants do not use either narrower category information or spatiotemporal information to specify goal objects. Because spatiotemporal information is central to infants' representations of inanimate object motions and interactions, the findings are discussed in relation to the development of object knowledge and action representations.

Keywords: Goal attribution; Categorization; Action representation; Object representation

1. Introduction

In order to make sense of any goal-directed action, one must represent and integrate information about the actor, the action itself, and the goal object. Although adults do this

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doi:10.1016/j.cogpsych.2006.06.001

with ease, the task is extremely difficult, because correct interpretations of goal-directed action depend in complex ways on the situation in which an action occurs. For example, consider the act of reaching for a toothbrush. When it is performed at a sink, we likely think that the actor aims to brush his teeth with that particular object: i.e., we endow the actor with agency, predict his future behavior (tooth brushing), and infer that the goal of his action was the individual bounded object in his hand: *his own* toothbrush rather than any of the others at the sink. When the same action is performed at a drug store, however, we likely infer that the actor aims to buy a toothbrush. In this case, his actions are predictive of a different future action (paying the cashier), and the goal of his action is understood to be not the individual package in his hand but the toothbrush inside, and that any of the toothbrushes of a given type would have been equally satisfactory goal objects. How do we perform these nuanced interpretations of goal-directed behavior? Adults' object and action representations are complex, integrated, and fine-tuned to myriad contextual cues indicating the level of specificity at which to interpret an intentional action and its goal. To understand the core properties upon which we build these action representations, however, we must study how infants, who have little or no experience with actions and goals, begin to understand the complexity of goal-directed behavior. How do infants construe the goals of other people, and how does their understanding change with experience?

Research on infants' representations of objects provides evidence for high sensitivity to the features of object categories that adults use to track and categorize them. In numerous habituation experiments, infants form categories of perceptually similar objects (Cohen & Younger, 1983; Eimas & Quinn, 1994; Quinn & Eimas, 1993). Given appropriate spatiotemporal information, infants as young as 2–4 months represent objects as numerically distinct individuals (Carey & Xu, 2001; Spelke, 1990). Experiments using object manipulation indicate that infants 9–11 months and beyond are sensitive to the complex collections of properties that specify global object categories such as animal, vehicle, and furniture (Mandler, 1992; McDonough & Mandler, 2000; Pauen, 2002). Infants sometimes use this property information to segregate objects with shared boundaries (Needham, 1998).

Considerable controversy surrounds research on the ability of infants to integrate property information to perceive individual objects as members of stably persisting kinds: cups, bears, and toothbrushes. Research by Xu and colleagues suggests that the ability to form representations of property and kind information to discriminate and individuate objects emerges at about 12 months of age, in studies requiring use of featural information to predict the number of objects behind an occluder (Xu & Carey, 1996), or to parse object boundaries (Xu, Carey, & Welch, 1999). Younger infants, who fail these tasks using only property or kind information, succeed in doing so when spatiotemporal information is provided (Xu & Carey, 1996). Both groups of infants show sensitivity to the property differences of these objects, yet the younger infants do not use either kind information or property information for object individuation.

Further studies suggest that 12-month-old infants use kind contrasts rather than property contrasts for object individuation. Xu, Carey, and Quint (2004) provide evidence that, although infants detected the property differences between two perceptually distinct objects of the same kind (a china coffee mug and a plastic, hooded sippy cup) they failed to use them to infer two objects behind the screen. The infants only expected two objects behind the stage when the objects differed in kind (Xu et al., 2004).

Wilcox and colleagues have shown similar failure to use featural properties to individuate objects in young infants up to 11.5 months old, though the age at which infants begin to