Causal Properties Support Categorization in Infancy

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Recent research and theory suggests that causal information plays a critical role in adult cognition (e.g., Ahn, Kim, Lassaline & Dennis, 2000; Rehder, 2003). Perhaps most importantly, it appears to contribute to the coherence of categories by binding diverse features together into meaningful units (e.g., Murphy & Medin, 1985). To the extent that this is true, we might expect causal information to contribute to the formation and organization of conceptual structures throughout development, perhaps even in infancy. Existing research supports this possibility. There is no doubt that infants are sensitive to causal information (e.g., Oakes & Cohen, 1995; Kotovsky & Baillargeon, 1998). Moreover, recent evidence demonstrates that the causal powers of objects can serve as the criterial feature around which toddlers organize new categories (e.g., Gopnik & Sobel, 2000). It appears then that causal nformation facilitates categorization from an early age, and has the potential to support the development of important conceptual distinctions. Unfortunately, however, the causal powers of objects are often not observable when assessing category membership, particularly for infants whose ability to interact directly with objects is limited. It is
therefore critical that infants (and adults) identify correlates of causal powers that are more readily and consistently available for use in categorization.

In the current work, we ask whether 14- and 18-month-old infants can utilize these correlates in the service of forming novel categories. Specifically we ask whether they attend more to perceptually obvious commonalities among novel objects when those objects share the same causal powers than when they do not. After random assignment to either a causal or non-causal condition, infants completed a familiarization, contrast, and test phase with each of four sets of novel stimuli. Infants in all conditions were first familiarized with four objects drawn from the same category. In the causal condition, the experimenter demonstrated how each object could cause the same outcome (e.g., a stuffed dog barked and wiggled only when the objects made contact with the smoked glass box in which it was contained). In the non-causal condition, the same objects and outcomes were observed for the same amount of time as in the causal condition, but there was no causal link between them. This was accomplished by activating the outcome before holding up each exemplar and turning it off before placing the exemplar back on the table. In the subsequent contrast phase, all infants were introduced to an object from a contrasting category and shown that it did not activate the familiar outcome. In the test phase, the experimenter simultaneously presented the infant with a familiar test object (i.e., a novel exemplar of the familiarization category) and a novel test object (i.e., a novel object drawn from a different category). After a short free-play session, the experimenter introduced a target object (drawn from the familiarization set) and asked infants to 'find another one' among the test objects. Because the causal powers of the test objects were not demonstrated, this task required the infants to infer category membership from other static perceptual features of the objects.

Infants in the causal condition responded categorically (i.e., selected the familiar test object) more frequently (M = .62, SE = .03) than did infants in the non-causal condition (M = .43, SE = .04). This pattern of results held for both the 18- and 14-month-olds independently. Two important conclusions can be reached from these results. First, infants can detect causal relations (even in non-collision events) well before two years of age. Second, infants' sensitivity to causality can support their acquisition of new categories. Not only can causal powers serve directly as the basis for determining category membership (as in the work of Gopnik and colleagues), but they can also direct attention to other perceptible commonalities (e.g., shape, color) among objects that are more readily and consistently available for this purpose.

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