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## Cognitive Development



# Contexts of a person's prior intentions facilitate observational learning in 2.5-year-old children



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### ABSTRACT

We examined whether contexts suggesting an actor's prior intentions facilitate observational learning in 2.5-year-olds. In Experiment 1, children observed an experimenter handle one box before proceeding to open a second box. In two prior intention conditions, children either watched the experimenter extract a toy from the first box or saw that the box had already been opened. In two no prior intention conditions, children watched the demonstration with only the second box or paired with irrelevant actions upon the first box. Children successfully opened the second box more often in the two prior intention conditions than in the two no prior intention conditions. Experiment 2 investigated stimulus generalization as another explanation for these results. A functionally different trap-tube task served as the pre-demonstration apparatus. Before watching the experimenter open the box, children either saw her extract a toy from the tube with a stick or observed the toy accidentally fall from the opening. In both cases, children opened the box at similar high rates. We discuss children's use of others' prior intentions or observable outcomes in observational learning.

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Imitation is thought to be a foundation for social cognitive abilities such as action understanding, empathy, and theory of mind (Iacoboni, 2009; Meltzoff, 2002), and the cognitive mechanisms underlying imitation have been a topic of considerable debate (Nielsen, Subiaul, Galef, Zentall, & Whiten, 2012). Awareness of the complex, diverse nature of imitation has begun to filter into developmental research.

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Infants appear sensitive to the intentions exhibited in a person's ongoing behavior, or "intention-in-action" (Searle, 1983), and use their understanding of others' intentions to imitate actions with objects. Meltzoff (1995) behavioral reenactment research shows that 18-month-olds imitate not what they observe a model do (e.g., unsuccessfully attempt to drape a loop over a prong) but rather what they infer the model intended (drape the loop over the prong). Carpenter, Akhtar, and Tomasello (1998) demonstrate that 14–18-month-olds are more likely, for example, to pull a ring than move a top when they see an experimenter pull the ring on purpose (saying, "There!") and move the top by accident (saying, "Whoops!"), even if both actions lead to the same result. Several recent models of imitation posit that the precision of imitation varies as a function of the hierarchy of goals. Imitation is less accurate when the goal of a demonstration is clear (Bekkering, Wohlschläger, & Gattis, 2000; Carpenter, Call, & Tomasello, 2005). A slightly different view is that infants construe an imitated act as the most efficient means available for a model to obtain the goal (Gergely & Csibra, 2006). Gergely, Bekkering, and Király (2002) show that infants imitate using the forehead to activate a light box when the experimenter's hands are free more than when they are wrapped tightly within a blanket. However, more recent evidence suggests that the effect obtained from wearing a blanket over the shoulders is due to perceptual distraction (Beisert et al., 2012) or direct motor matching (Paulus, Hunnius, Vissers, & Bekkering, 2011).

Developmentalists have recently shifted their focus to prior experiences that inform children about others' (and their own) efficacy or intentions before an adult provides a demonstration. There is evidence that 2–3-year-olds use efficacy (Williamson & Meltzoff, 2011; Williamson, Meltzoff, & Markman, 2008) or prior intentions (Carpenter, Call, & Tomasello, 2002) as a guide when learning to imitate a causal action.

Carpenter et al. (2002) examined whether 2-year-olds could benefit from a pre-demonstration related to a model's intention. Participants watched as the experimenter pulled out a pin and opened the door of a box. Before this demonstration, a subset of children either saw the experimenter unsuccessfully attempt to open the box (prior/failed attempt), open three different containers (prior/context), or simply present the already-opened box (prior/end state). This subset of children opened the box more often than participants who instead saw irrelevant actions involving the box as the pre-demonstration (no prior/irrelevant action) or only the demonstration (no prior/no pre-demo). In the prior/context condition, the containers had substantially different appearances than the box used in the demonstration. Carpenter et al. maintained that children's success in the prior/end state and prior/failed attempt conditions was not due to learning about specific locations or opening mechanisms.

In this study, we expand the context used by Carpenter et al. (2002), presenting a different box's end states as cues to prior intention. This new prior/end state condition is important because, as the authors suggested, when the same end state of the demonstration serves as a pre-demonstration, children interpret what they view as being about mental entities. We therefore predicted that children could benefit from end state information even if the pre-demonstration box differed from the box used in the demonstration.

In addition, we included a nonfunctional component in the demonstration. Carpenter and colleagues found that understanding prior intention detracted from a faithful copy of the experimenter's action. Their study did not include an entire irrelevant action, so the tendency to neglect unimportant details might have masked the overimitation observed in recent research (Huang, Heyes, & Charman, 2006; Kenward, Karlsson, & Persson, 2011; Kenward, 2012; Lyons, Young, & Keil, 2007; McGuigan & Whiten, 2009; McGuigan, Whiten, Flynn, & Horner, 2007). The tendency to faithfully copy all elements of an observed action sequence is notable, given that children engage in overimitation even after either discovering on their own (Nielsen & Tomaselli, 2010; Nielsen, Moore, & Mohamedally, 2012) or being shown by an adult (Nielsen & Blank, 2011) the causal mechanisms required to produce the intended outcome. Inclusion of an entire irrelevant action could allow the overimitation effect to be further dissected. We also added a cause and effect element to the nonfunctional component. If children automatically encode the experimenter's intentional act as causally necessary, as Lyons et al. suggested (2007), they should overimitate whether or not the action is followed by a particular effect.

Finally, we modified the Carpenter et al. (2002) task to allow children to reproduce the outcome via emulation (Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009). We did this by varying the sequence

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