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Dissecting children's observational learning of complex actions through selective video displays

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ABSTRACT

Children can learn how to use complex objects by watching others, yet the relative importance of different elements they may observe, such as the interactions of the individual parts of the apparatus, a model's movements, and desirable outcomes, remains unclear. In total, 140 3-year-olds and 140 5-year-olds participated in a study where they observed a video showing tools being used to extract a reward item from a complex puzzle box. Conditions varied according to the elements that could be seen in the video: (a) the whole display, including the model's hands, the tools, and the box; (b) the tools and the box but not the model's hands; (c) the model's hands and the tools but not the box; (d) only the end state with the box opened; and (e) no demonstration. Children's later attempts at the task were coded to establish whether they imitated the hierarchically organized sequence of the model's actions, the action details, and/or the outcome. Children's successful retrieval of the reward from the box and the replication of hierarchical sequence information were reduced in all but the whole display condition. Only once children had attempted the task and witnessed a second demonstration did the display focused on the tools and box prove to be better for hierarchical sequence information than the display focused on the tools and hands only.

Introduction

Observational learning allows a child to acquire much adaptive information from his or her cultural environment, and several different processes of learning underpin the assimilation of the critical

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aspects of what is witnessed. Tomasello, Kruger, and Ratner (1993) distinguished different forms of observational learning, including mimicry, where the actions of another individual are copied with little thought to the resulting outcome, and imitation, where an individual instead reproduces the outcome as well as the actions that led to the outcome. Whiten and Ham (1992) defined imitation more simply as a process in which "B learns some aspect(s) of the intrinsic form of an act from A" (p. 250). By contrast, in emulation an observer focuses on the mechanics of a scene, potentially learning about the affordances of the objects concerned (Byrne, 1998), for example, that an object can be moved in a certain manner (object movement reenactment; Custance, Whiten, & Fredman, 1999) or that a certain goal can be achieved (goal emulation; Whiten & Ham, 1992).

Dissecting imitation versus emulation

There has been a recent drive in both comparative psychology (Whiten, Horner, Litchfield, & Marshall-Pescini, 2004) and developmental psychology (Want & Harris, 2002; Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009) to dissect these different mechanisms within the observational learning process in order to establish the importance of each (see Hopper, 2010, for a review). To do this, a number of ingenious paradigms have been developed, two of which are particularly relevant to the current study: two-action tasks and ghost controls.

In two-action tasks (Dawson & Foss, 1965), the same outcome is achieved by a model or models using either of two alternative methods such as pushing a lever versus pulling a lever. Replication of the method a participant saw a model use to achieve the outcome then implies imitation. Achieving the outcome witnessed, but not using the method observed, implies result or goal emulation. Research using such two-action tasks has been extremely fruitful, showing that young children often imitate, copying the means they see others use to achieve a desirable outcome (McGuigan, Whiten, Flynn, & Horner, 2007; Nielsen & Tomaselli, 2010; Tennie, Call, & Tomasello, 2006). However, in some contexts, children have also been shown to be selective learners, either not copying all of the actions they have witnessed or replicating the outcome but using alternative means (Bekkering, Wohlschläger, & Gattis, 2000; Carpenter, Akhtar, & Tomasello, 1998; Flynn, 2008; Meltzoff, 1995; Wood, Kendal, & Flynn, 2012).

"Ghost control" experiments instead remove the agent from the display witnessed, so that it takes a "ghostly" form, offering participants the opportunity to recreate the outcome they witnessed through emulation as the pertinent parts of the apparatus move, but the absence of an agent offers no possibility of imitation. Such displays have been engineered by using a remote control (Thompson & Russell, 2004), by discreetly using fishing line (Hopper, Flynn, Wood, & Whiten, 2010; Hopper, Lambeth, Schapiro, & Whiten, 2008; Tennie et al., 2006), or by digitally altering a video display (Huang & Charman, 2005). Children as young as 17 months have been found to learn from displays that present only information about the interactions of objects without the model's movements being seen (Huang & Charman, 2005). By contrast, Tennie and colleagues (2006) found that 18-month-olds did not match the pushing or pulling of a door when it was displayed within a ghost control, whereas they did match the method witnessed when the model was included in the scene and 24-month-olds matched the method witnessed in both conditions. Finally, Hopper and colleagues tested the learning of slightly older children (3- and 4-year-olds) with (a) a simple bidirectional task in which a door could be moved to the left or right (Hopper et al., 2008) and (b) a more complex tool-use task in which a tool could be used to remove an obstructing block (Hopper et al., 2010), with both tasks resulting in the release of a reward. For the bidirectional door task, children matched the response they witnessed on the first trial. But when all responses were considered, only children who witnessed a whole demonstration or an "enhanced" ghost control (in which another child was present but did not manipulate the apparatus) matched the direction that they witnessed the door moved above chance levels. The enhanced control provided a social element to draw participants' attention to the display, working under social facilitation to control for mere presence effects (Akins, Klein, & Zentall, 2002; Fawcett, Skinner, & Goldsmith, 2002; Klein & Zentall, 2003). Children who witnessed a standard ghost control, with no other child present, did not match the direction of the door movement. The tool-use task produced similar results, with children who witnessed a whole demonstration showing the best performance and children in a ghost control showing better performance than children who witnessed no demonstration.