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Imitative flexibility and the development of cultural learning

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ABSTRACT

Two studies test the hypothesis that imitative fidelity is influenced by cues to interpret behavior as instrumental versus conventional. Study 1 ($N = 57$, 4–5-yr-olds) manipulated non-verbal cues (start- and end-states of action sequences) and Study 2 ($N = 211$, 4–6-yr-olds) manipulated verbal cues to examine the effects of information about instrumental versus conventional goals on imitative fidelity. Imitative fidelity was highest (Studies 1 and 2), innovation was lowest (Study 1), and difference detection was more accurate (Study 2) when cued with information about conventional rather than instrumental behavior. The results provide novel insight into the kinds of information children use to adjudicate between instrumental and conventional behavior.

1. Introduction

The capacity to imitate others is integral to the development of human cultural learning (Gergely & Csibra, 2006; Legare & Watson-Jones, in press; Tomasello, Carpenter, Call, Behne, & Moll, 2005; Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009). Imitation is a pervasive feature of children's behavior, yet to date there is not an integrated theoretical account of how children flexibly use imitation and innovation to drive cultural learning. To be effective and efficient learners, children must be selective about when to imitate, when to innovate, and to what degree. Here we examine the kinds of information children use to determine when an event provides an opportunity for learning instrumental skills and when it provides an opportunity for learning cultural conventions such as rituals.

We hypothesize that the process of learning instrumental skills versus cultural conventions is driven by interpreting behavior as *instrumental* versus *ritual* action. When interpreting behavior as an instrumental act, the physical-causal basis of an action is in principle knowable, even if it is currently unknown (as would be the case for novice learners). In contrast, when interpreting behavior as a ritual act, the rationale for interpreting an action is not in principle knowable from the perspective of physical causality and instead is based on social conventionality. Here we define ritual as socially stipulated, causally opaque behavior. We propose that ritual is a socially-motivated subset of conventional behavior with affiliative functions. The key distinction between instrumental and ritual behavior is not merely the presence of causal opacity (i.e., a physical-causal rationale for the action is unavailable) but is based on the interpretation of causal opacity. What distinguishes instrumental from ritual practices often cannot be determined directly from the action alone (Humphrey & Laidlaw, 1994; Staal, 1990; Whitehouse, 2004), but requires interpretation by the learner based on relevant social cues and contextual information. For instance, the act of lighting a candle could be interpreted instrumentally (e.g., to find a lost object in the dark) or ritualistically (e.g., to commemorate an event or mourn a death). Where ambiguity in interpretation exists, learners may seek out cues to determine how to interpret the goal of the behavior. We propose that instrumental and ritual interpretations are best understood as overlapping continua; in practice, the difference in perspective is often a matter of relative degree rather than kind.

Whereas learning an instrumental skill allows for variability and innovation in methods of execution, learning rituals requires close conformity to the way other group members perform the actions (Herrmann, Legare, Harris, & Whitehouse, 2013; Watson-Jones, Legare, Whitehouse, & Clegg, 2014). Given that imitation is used to acquire instrumental skills as well as to engage in

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cultural conventions such as rituals, what kinds of information influence imitative fidelity? Here we examine cues to the presence of an instrumental versus a conventional goal, using nonverbal (Study 1) and verbal (Study 2) cues.

1.1. Instrumental imitation

Imitation has primarily been studied as a means of acquiring instrumental skills for manipulating the physical world through a process of social learning. Research on instrumentally motivated imitation examines children's search for physical-causal rationales for behavior (Gergely, Bekkering, & Kiraly, 2002; Gleissner, Meltzoff, & Bekkering, 2000; Nielsen & Tomaselli, 2010; Williamson & Markman, 2006; Woodward, 2009), a process with origins in early-developing beliefs about causal determinism (Gelman, 2003; Schulz & Sommerville, 2006) and goal hierarchies (Byrne & Russon, 1998). For example, although children are most likely to imitate an end-goal in an action sequence (Bekkering, Wohlschlager, & Gattis, 2000), when an end-goal is not available, an observer will imitate the means, presumably because reproducing the actions becomes the goal (Carpenter, Call, & Tomasello, 2005; Schachner & Carey, 2013). According to the principal of rationality in action, children use the most efficient means to reach a goal given knowledge of means, goals, constraints, and relevance (Buchsbaum, Gopnik, Griffiths, & Shafto, 2011; Gergely & Csibra, 2003; Gergely et al., 2002; Kiraly, Csibra, & Gergely, 2013).

In contrast, research on "overimitation" has shown that children will imitate obviously causally irrelevant aspects of an action sequence even when they are aware that the behavior is unnecessary to achieving an end-goal (Horner & Whiten, 2005; Kenward, Karlsson, & Persson, 2011; McGuigan, Whiten, Flynn, & Horner, 2007; Nielsen, 2006; Nielsen & Blank, 2011; Nielsen, Moore, & Mohamehdally, 2012; Nielsen & Tomaselli, 2010; Over & Carpenter, 2009). An interest in understanding instrumental imitation is reflected in the experimental paradigms used to examine this process (e.g., tool use activities to retrieve rewards), priming a search for physical-causal rationales for behavior (e.g., puzzle boxes).

The emphasis on the instrumental aspects of imitation is historically linked to research agendas in comparative psychology (Call, Carpenter, & Tomasello, 2005; Call & Tomasello, 1995; Nagell, Olguin, & Tomasello, 1993; Tomasello, Savage-Rumbaugh, & Kruger, 1993; Whiten, Custance, Gomez, Teixidor, & Bard, 1996). Horner and Whiten (2005) have demonstrated that even when it is obvious that some actions are causally irrelevant in retrieving a reward from a puzzle box, children still faithfully copy all of the actions of a demonstrator, as compared to chimpanzees, who omit obviously irrelevant actions to retrieve the reward. According to these researchers, overimitation is an adaptive human strategy facilitating more rapid social learning of instrumental skills than would be possible if copying required a full representation of the causal structure of an event (Gergely & Csibra, 2006; Horner & Whiten, 2005; Nielsen, Tomaselli, Mushin, & Whiten, 2014; Wood, Kendal, & Flynn, 2013). The copying of unnecessary actions has also been interpreted as over-attribution of causal efficacy to redundant elements or automatic causal encoding (Lyons, Damrosch, Lin, Macris, & Keil, 2011; Lyons, Young, & Keil, 2007).

Despite evidence that children are indeed instrumental imitators (Gergely et al., 2002; Want & Harris, 2002; Williamson, Meltzoff, & Markman, 2008), causal reasoning is not integral to all imitative behavior (Bird, Brindley, Leighton, & Heyes, 2007; de Waal & Ferrari, 2010; Heyes, 2009; Leighton, Bird, & Heyes, 2010). Beyond instrumental skills, children must also learn cultural conventions such as socially shared beliefs, values, norms, and practices (Harris, 2012; Kashima, 2008; Legare, Evans, Rosengren, & Harris, 2012; Whitehouse, 2011).

1.2. Ritual imitation

High fidelity imitation has been linked to quintessentially social concerns (Uzgiris, 1981), such as encoding normative behavior (Kenward, 2012; Kenward et al., 2011), affiliation (Churchland, 2011; Kitayama & Cohen, 2007; Over & Carpenter, 2012; Preston & de Waal, 2002), shared experience (Tomasello et al., 2005), and fear of ostracism (Lakin, Chartrand, & Arkin, 2008; Over & Carpenter, 2009). Social accounts of overimitation have proposed that children engage in high fidelity imitation to demonstrate shared intentions with the actor (Over & Carpenter, 2012; Tomasello et al., 2005). Kenward et al. (2011) and more recently, Keupp, Behne, and Rakoczy (2013), have argued that children encode causally irrelevant actions not as causally efficacious in some way, or even to demonstrate shared intentions, but rather to conform to normative conventions.

Much of cultural learning is motivated by affiliative goals, resulting in the acquisition of conventional rather than instrumental behavior. A growing literature indicates that children's social learning is sensitive to relations among individuals (Chudek, Heller, Birch, & Henrich, 2012; Chudek & Henrich, 2011; Nielsen & Blank, 2011) and particularly to whether two or more individuals act or judge in the same way (Corriveau, Fusaro, & Harris, 2009; Corriveau & Harris, 2010). New research suggests that imitative fidelity is higher after witnessing multiple actors than single actors and higher after witnessing synchronous than successive actors, even among 3-year-olds (Herrmann et al., 2013).

Children conform to a group consensus in situations where no instrumental knowledge can be gained (Claidière & Whiten, 2012) and disguise their correct opinions to conform to a group consensus (Haun, Rekers, & Tomasello, 2012; Haun & Tomasello, 2011). Children are highly sensitive to the "proper" way to engage in conventional tasks such as games (Schmidt, Rakoczy, & Tomasello, 2011) and work to both recreate and enforce normative actions (Haun & Tomasello, 2011; Haun, van Leeuwen, & Edelson, 2013). Preschool children also protest when the rules of a novel game are broken (Rakoczy, Brosche, Warneken, & Tomasello, 2009; Rakoczy, Warneken, & Tomasello, 2008) or social role conventions are violated (Carter & Patterson, 1982; Levy, Taylor, & Gelman, 1995). Children have also been shown to conform to a group consensus in purely social situations, where no new instrumental knowledge can be gained (Schmidt et al., 2011). Children are more likely to engage in high fidelity imitation of an instrumental task when primed with ostracism (Over & Carpenter, 2009; Watson-Jones et al., 2014), suggesting that children's motivation to engage in high fidelity imitation may be inherently motivated by affiliating with social groups (Legare & Watson-Jones, in press; Over & Carpenter, 2012). Based on these early developing capacities, there is evidence for an early-developing "norm psychology" that supports reasoning about the conventionality of behavior (Chudek & Henrich, 2011; Chudek, Zhao, & Henrich, 2013), a prerequisite for ritual learning.

We propose that many of the rituals that children must learn to become competent members of their cultural communities are opaque from the perspective of physical causation and instrumental goals. In addition, many social conventions (e.g., forms of greeting such as handshaking, kissing, genuflection, bowing) do not entail changes to the physical state of the world in any observable fashion. Although often intended to have effects, rituals typically involve changes to social status (e.g., initiation rites) or to relationships with other people (e.g., weddings) and supernatural agents (e.g., sacrifices). If they are intended to have instrumental effects (e.g., magical rituals promoting crop fertility or healing the sick)