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Cognitive Imitation

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Synonyms

Imitation; Non-motor imitation; Observational learning; Social learning

Definition

Cognitive imitation is a type of social learning; specifically, a subtype of imitation that involves copying abstract – inferred – rules rather than observed – concrete – motor or oral responses.

Introduction

Cognitive imitation is typically contrasted with other subtypes of imitation including, motor and vocal or oral imitation. Like all forms of imitation, cognitive imitation involves vicariously learning and replicating specific abstract rules inferred from observation. The main difference between cognitive and motor imitation, for example, is that whereas in the typical imitation learning experiment, subjects must copy representations of novel responses or sequences of specific actions (novel motor imitation), and in a novel cognitive imitation paradigm, subjects have to learn and copy abstract representations or rules. In such a paradigm, while the actions themselves may be familiar (e.g., pressing a button), the rule organizing those actions is new.

The following example illustrates the difference between cognitive and motor imitation: Imagine someone overlooking someone's shoulder and stealing their automated teller machine (ATM) password. As with all forms of imitation, in this example, the thief learns and successfully reproduces the observed sequence. The thief in our example, like most of us, presumably knows how to operate an ATM. As such, the actions associated with operating an ATM isn't what the thief is learning (or copying). Instead, the thief is likely to learn and copy one of two abstract rules: spatial or cognitive. For example, the thief may learn and subsequently copy the following spatial rule: touch the button in the bottom left, followed by button on the bottom right, then the button in the top right, and finally the one in the middle. This would be an example of motor-spatial imitation, because the thief's response is guided by an ~~abstract~~ spatial rule. Alternatively, the thief may ignore the spatial patterning of the observed responses and instead focus on the particular markings on buttons (i.e., numbers) that were touched, generating the following abstract numerical (cognitive) rule: 7-9-3-5. Vicariously learning and reproducing this response would be an example of cognitive imitation. Of course, this is not an

LINE 50: Replace "abstract" with "observed"

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Line 56 add the following between 'this' and 'response': …THIS "unobserved (inferred) rule to guide their" RESPONSE…

ideal example because, in fact, unless you ask the thief, you would not know if they used a spatial or cognitive rule given that the numbers are in the same location with every attempt. However, if the numbers appeared in a new position every time you tried to enter the password – the thief using a cognitive rule would, nonetheless, reproduce the target password.

Cognitive Imitation in Rhesus Monkeys

The term "cognitive imitation" was first introduced by Subiaul and his colleagues (Subiaul et al. 2004). In their original paper, they defined cognitive imitation as "a type of observational learning in which a naïve student copies an expert's use of a rule." To isolate cognitive from motor imitation, Subiaul and colleagues trained two rhesus macaques to respond, in a prescribed order, to different sets of photographs (serial lists) that were displayed simultaneously on a touch-sensitive monitor. The position of the photographs varied randomly from trial to trial, preventing subjects from learning a series of motor-spatial responses (Terrace 2005). Both monkeys learned new sequences more rapidly after observing an expert monkey execute those sequences than when they had to learn new sequences entirely by trial and error. A microanalysis of each monkeys' performance showed that each monkey learned the order of two of the four photographs faster than baseline levels. A second experiment ruled out social facilitation as an explanation for these results. A third experiment demonstrated that monkeys did not learn when the computer highlighted each picture in the correct sequence in the absence of a monkey ("ghost control"), which suggests that monkeys, in contrast to human children (Hopper 2010; Subiaul et al. 2007, 2011), require an agent to motivate social learning.

Cognitive Versus Motor-Spatial Imitation

Subiaul et al. (2012), using two computerized tasks that measure the learning of two abstract rules: cognitive rules (e.g., apple-boy-cat) and motor-spatial-based rules (e.g., up-down-right), have shown that there are important dissociations between the imitation of these two types of rules. Specifically, results have shown that while 3-year-olds successfully imitate cognitive rules, these same 3-year-olds fail to imitate motor-spatial rules (Subiaul et al. 2012). This dissociation is not because there is something inherently harder about learning spatial versus cognitive rules. A series of follow-up studies showed that 3-year-olds correctly recall spatial rules learned by trial and error following a 30s delay (Exp. 2). This result demonstrates that 3-year-olds' motor-spatial imitation problems are not due to difficulty learning new spatial rules in general. But perhaps, 3-year-olds have a problem learning vicariously from a model. To test this hypothesis, a follow-up study had 3-year-olds observe a model correctly touch the first item (e.g., Top Right) in the sequence, but then skip the middle item (e.g., top left picture) and, instead, touch the last item in the sequence (e.g., bottom left picture), resulting in an error. Upon making this error, the model said, "Whoops! That's not right!" This highlighted that the error was unintentional. This is a goal emulation learning condition, as the child has to copy the model's intended goal (top-right, bottom-left, top-left), rather than the observed (incorrect) response (top-right, top-left). In this study, 3-year-olds generated the intended (rather than the observed) sequence (Exp. 3). Three-year-old's success in the goal emulation condition excludes the possibility that 3-year-olds' motor-spatial imitation problem is due to difficulty vicariously learning (i.e., because of a lack of interest, failure to attend, problems inferring goals, etc.) a novel spatial rule from a model. Children's success in the goal emulation condition suggests that social learning may be achieved by social reasoning (inferring goals) and causal inferences (error detection), independently of any domain-specific imitation learning mechanism.

Domain-Specificity in Imitation Learning

To further explore this dissociation between cognitive- and motor-spatial imitations, Subiaul et al. (2015) tested preschoolers (2–6 years) on a variety of learning conditions using the cognitive and motor-spatial tasks. Results demonstrated that there was no significant relationship between imitation in the cognitive and the motor-spatial task. Analyses showed that only age predicted improved imitation performance in each task. Moreover, children's ability to individually learn in each task by trial and error did not predict their ability to imitate those same rules in either task. However, goal emulation in the motor-spatial task did predict imitation learning in the same task. This result is surprising because, children can infer the spatial rules from a model's error before they can imitate spatial rules (Subiaul et al. 2012: Exp. 3). The association between goal emulation and imitation in the motor-spatial tasks suggests that goal emulation scaffolds the development of imitation in the motor-spatial domain, but critically, it does not seem to do so in the cognitive domain. These patterns of results support the hypothesis that distinct cognitive processes underlie cognitive versus motor-spatial imitation.

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