Cognition 147 (2016) 85–92

Contents lists available at ScienceDirect

Cognition

journal homepage: www.elsevier.com/locate/COGNIT

Rational over-imitation: Preschoolers consider material costs and copy causally irrelevant actions selectively

Stefanie Keupp *, Christin Bancken, Jelka Schillmöller, Hannes Rakoczy, Tanya Behne

Department of Psychology, University of Göttingen, Waldweg 26, D-37073 Göttingen, Germany

ARTICLE INFO

Article history:
Received 21 April 2015
Revised 19 September 2015
Accepted 15 November 2015
Available online 28 November 2015

Keywords:
Over-imitation
Social learning
Pre-schoolers
Rational imitation
Normativity

ABSTRACT

Children's strong tendency to over-imitate – i.e., to reproduce causally irrelevant actions – presents a well-documented, yet puzzling, phenomenon. On first sight this instrumentally inefficient behavior seems maladaptive and different accounts have been put forward to explain it. Causal accounts claim that children are misled by an adult's demonstration, mistake the superfluous actions as causally necessary, and therefore imitate them. Other accounts emphasize cognitive-motivational aspects underlying over-imitation, e.g. social motivations to affiliate with the model, or to adhere to normative conventions. Since all accounts predict the occurrence of over-imitation under typical conditions, different parameters and circumstances have to be considered to distinguish between them. Thus, we investigated children's over-imitation and their spontaneous verbal reactions to a puppet's behavior, in contexts in which a causally irrelevant action either led to the destruction of a valuable object belonging to the experimenter, or not. In addition, children saw the full action sequence being demonstrated either with an instrumental or a conventional focus. Causal accounts predict no flexibility across these contexts, because over-imitation is said to occur automatically. Normative accounts claim that different normative considerations affect children's behavior and action parsing, and therefore predict different response patterns across conditions. We found that over-imitation was less frequent in costly and instrumental conditions. Children criticized the puppet for omitting irrelevant actions more often in the non-costly condition, but criticized her more often for performing irrelevant actions in the costly condition, often expressing their moral concern. The results support the rational normative action interpretation account of over-imitation.

1. Introduction

Humans, as a species, are particularly good at imitating others around them. Imitation helps us to deal with new social situations, acquire new instrumental skills, and transmit our cultural knowledge to others (Nielsen, 2012; Tomasello, 1999; Whiten, Hinde, Laland, & Stringer, 2011). Due to its flexibility, imitation constitutes a powerful learning strategy, which is present since early in childhood. From a very early age, children are not just blind imitators but adjust their copying behavior to situational circumstances in impressive ways, for example with regard to inferring intended goals from failed attempts (Meltzoff, 1995), complementing only partially observed actions (Carpenter, Akhtar, & Tomasello, 1998), or taking into account characteristics of the model (Zmyj, Buttelmann, Carpenter, & Daum, 2010), as well as physical constraints of a model during performance of goal-directed actions (Gergely, Bekkering, & Kiraly, 2002). In light of these findings of selective and rational imitation, it comes as a surprise that more and more studies have accumulated, which report a phenomenon that has been termed "over-imitation". Over-imitation refers to the faithful reproduction of causally irrelevant elements in goal-directed action sequences. For example, children will reproduce a superfluous action, such as tapping on the surface of a transparent box with a stick, at high rates, after having observed an adult perform this action before she opened the box to retrieve a reward from inside (Horner & Whiten, 2005). Over-imitation occurs robustly in humans across different cultures (Nielsen, Mushin, Tomaselli, & Whiten, 2014; Nielsen & Tomaselli, 2010; but see Berl & Hewlett, 2015, for an interesting recent finding on cultural differences), increases with age (e.g., McGuigan, Makinson, & Whiten, 2011), and is absent in nonhuman primates (Horner & Whiten, 2005; Nielsen & Susianto, 2010). Because such behavior renders the actions of the copier less efficient than necessary, from a purely instrumental point of view, the behavior seems maladaptive on first sight and in need of explanation.

* Corresponding author at: Cognitive Ethology Lab, Deutsches Primatenzentrum GmbH, Kellnerweg 4, D-37077 Göttingen, Germany.

E-mail addresses: skeupp@uni-goettingen.de (S. Keupp), christin.bancken@gmx.de (C. Bancken), jelkaschillm@web.de (J. Schillmöller), hrakocz@uni-goettingen.de (H. Rakoczy), tbehne@gwdg.de (T. Behne).

http://dx.doi.org/10.1016/j.cognition.2015.11.007
0010-0277/

One class of explanatory approaches claims that over-imitation rests on children's lack of causal understanding. Lyons and colleagues argue that children are causally confused as a consequence of an adult's intentional demonstration of such actions, and mistake them for causally relevant (automatic causal encoding hypothesis, ACE) (Lyons, Damrosch, Lin, Macris, & Keil, 2011; Lyons & Keil, 2013; Lyons, Young, & Keil, 2007). Children thus over-imitate because "the normally adaptive ACE process blinds them to the irrelevance of the adult's unnecessary actions", i.e. "they have to" (Lyons et al., 2011, p. 1159).

Another class of approaches emphasizes cognitive-motivational aspects. Some of these accounts put special emphasis on imitators' motives to affiliate with the model by reproducing his or her actions very precisely (Nielsen & Blank, 2011; Over & Carpenter, 2012). For example, Nielsen and Blank (2011) found that children, in the presence of a model, adapted their method to retrieve a toy from an apparatus to the method previously used by the model. Crucially, they did so flexibly depending on the presence of one of two models, who had either demonstrated the efficient or inefficient method.

Other accounts stress a more broadly social and normative motivation to do what is best in a given situation, including considering normative demands. Specifically, the rational normative action account suggests that the imitator may conceive the causally irrelevant action to be an essential part of an overarching conventional activity (Keupp, Behne, & Rakoczy, 2013; Keupp, Behne, Zachow, Kasbohm, & Rakoczy, 2015). That is, when confronted with a typical over-imitation action sequence (demonstration of causally superfluous action A, effect-relevant action B, and effect E) children can engage in flexible and hierarchical action parsing and individuation. They see each action element, and they see the causal connection between B and E. Depending on additional contextual information, they may see the whole sequence as constituting a bigger, conventional action comprising A, B and E. In such conditions –for example, when the action sequence has been introduced with a focus on the specific conventional means of behavior, with a specific label, or with a "ritual" rather than instrumental stance (Herrmann, Legare, Harris, & Whitehouse, 2013) – children will assume that the task is to reproduce this bigger action sequence, will thus over-imitate and will normatively expect third parties to reproduce the whole sequence. In other contexts, in contrast, for example when the action is introduced with a focus on efficiency, or an instrumental stance, children will segment the action accordingly, interpreting it primarily as "bringing about E", and will omit causally superfluous elements and expect others to do so.

In line with this account, Kenward, Karlsson, and Persson (2011) documented that even though children claim to be unsure as to why a causally unnecessary action has to be performed, they insist that it has to be done. In addition, they segment and interpret such actions in normative ways and criticize others for failing to imitate the causally unnecessary action. (Kenward, 2012; Keupp et al., 2013).

At first sight these three accounts are not easy to test against each other, since all three predict the occurrence of over-imitation under normal circumstances. However, there are two ways to distinguish between them. One is to use additional measures, such as protest that sheds light on children's action interpretation (Rakoczy & Schmidt, 2013). The second is to study over-imitation under special circumstances, in particular those that tap into the flexibility – or rigidity – of children's over-imitation. Here, the most informative cases are those in which over-imitation evokes some costs. Depending on how the imitator interprets the causally-unnecessary action she will either omit or include it under costly circumstances (for details see below).

Two recent studies have started to explore this issue– with mixed results. Lyons et al. (2011) found that children over-imitated even in costly scenarios. In their study, children first saw an adult retrieve a reward from a box, by performing both causally irrelevant and relevant actions. The reward could be accessed from two sides of the box, and the children then took part in a competitive race game against an orangutan puppet, to see who could retrieve the reward first. Despite losing the game repeatedly, children continued to re-enact the model's causally irrelevant actions. In addition, children performed a noisy causally irrelevant action when retrieving their participation gift from a box, despite risking waking up the orangutan puppet who would potentially steal it from them. Thus, in both situations over-imitation occurred despite the potential costs involved. In contrast to this, in a study with adults, Flynn and Smith (2012) observed that the rate of over-imitation decreased significantly when the adult participants faced time pressure (i.e., when told they could win a monetary reward for the quickest object retrieval from a puzzle box). Whether these divergent findings are a consequence of developmental change (with adults being more flexible than preschoolers), or whether they have to do with methodological differences between the two studies, is not clear at this point. The possible confound between participant's age and study procedure makes it difficult to draw conclusions about the early flexibility in children's over-imitation.

In the present study we examined the flexibility of early over-imitation with a new refined method (cf. Lyons et al., 2011) and with a much more comprehensive approach, including not only over-imitation itself, but third-party sanctioning. And we tested the three accounts against each other in a systematic manner, examining in particular the specific predictions generated by the rational normative action account (Keupp et al., 2013). According to this account, varying contexts engender different kinds of normative considerations, including conventional, instrumental-rational and moral ones, which results in flexible action interpretation in accordance with the situation-specific "rational" demands.[1] For example, when observing a model perform an action sequence comprising two action elements, A (tapping on a box) and B (flipping a switch), and an effect E (box opens), children do understand that only action B is causally necessary to bring about E. However, they might still consider action A relevant for conventional-normative reasons (this is the way boxes are opened, here), or for affiliative reasons (this is how the model likes boxes to be opened), and therefore reproduce it. Based on their flexible rational action interpretation, children may also chose to omit action A, if there are good reasons for this, for example, if A invokes negative moral consequences or unjustifiable costs.

To test the predictions of the rational normative action account, we investigated children's over-imitation, and their third-party intervention, in contexts in which a causally irrelevant element of a bigger action sequence did or did not go along with costs. The costliness was realized in the form of morally bad consequences resulting from material loss of certain items: the causally irrelevant action element led to the destruction of a valuable object belonging to the experimenter. This implementation of 'costly' actions was chosen in order to overcome some methodological problems of the Lyons et al. (2011) study, where children's robustly high rate of over-imitation in the competitive situation might be a consequence of the (false) assumption that both the participant, and the competitor, are supposed to produce the effect in the

[1] It is important to note, that what we mean by "rational action interpretation" refers more broadly and generally to "having good reasons for actions" and not only to instrumental rationality and efficiency. Children, in this view, interpret the actions as being guided by various forms of reasons (e.g., practical, but also conventional or social reasons), and act accordingly in their own imitative responses.