



Original Article

Task-specific effects of ostracism on imitative fidelity in early childhood[☆]Rachel E. Watson-Jones^{a,*}, Cristine H. Legare^a, Harvey Whitehouse^b, Jennifer M. Clegg^a^a University of Texas at Austin, Department of Psychology^b University of Oxford, Institute of Cognitive and Evolutionary Anthropology

ARTICLE INFO

Article history:

Initial receipt 5 August 2013

Final revision received 13 January 2014

Keywords:

Imitation

Social convention

Affiliation

Ostracism

Ritual

Cultural learning

ABSTRACT

This study examined task specific effects of third-party ostracism on imitative fidelity in early childhood ($N = 96$, 3–6-year-olds). Start- and end-states of action sequences were manipulated to examine the effects of priming third-party ostracism versus affiliation on children's imitation of instrumental (i.e., action sequence with a different start- and end-state) versus social convention (i.e., action sequence with an identical start- and end-state) tasks. Children's performance was coded for imitative fidelity and children's explanations for their behavior. As predicted, imitative fidelity was highest and social convention explanations were most common when primed with ostracism in the social convention task. The data are consistent with our proposal that imitation serves an affiliative function in response to the threat of ostracism, a response amplified for social conventions.

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1. Introduction

The development of instrumental skills based on physical–causal rationales is a central task of early childhood learning (Gergely & Csibra, 2003; Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009; Nielsen & Tomaselli, 2010). Previous research on instrumental imitation has demonstrated that children imitate goals hierarchically (Byrne & Russon, 1998; Carpenter, Call, & Tomasello, 2005; Williamson & Markman, 2006). For example, although children are most likely to imitate an end-goal in an action sequence (Bekkering, Wohlschlagler, & Gattis, 2000), when an end-goal is not apparent or salient, children will imitate the means, perhaps because the means (or movements) become the goal (Carpenter et al., 2005; Schachner & Carey, 2013). Gergely and colleagues have proposed the principal of rationality in action interpretation to explain this behavior, asserting that infants use the most efficient means to reach a goal given knowledge of means, goals, constraints, and relevance (Gergely, Bekkering, & Kiraly, 2002; Gergely & Csibra, 2003; Kiraly, Csibra, & Gergely, 2013).

In contrast, other research has shown that children will “over-imitate” obviously causally irrelevant aspects of an action sequence even when they are aware that the behavior is irrelevant to achieving an end-goal (Horner & Whiten, 2005; Nielsen, 2006; McGuigan,

Whiten, Flynn, & Horner, 2007; Over & Carpenter, 2009; Nielsen & Tomaselli, 2010; Kenward, Karlsson, & Persson, 2011; Nielsen & Blank, 2011; Nielsen, Moore, & Mohamedally, 2012). Although overimitation has been interpreted as a search for physical–causal rationales (Lyons, Young, & Keil, 2007), Heyes and colleagues have argued that imitation is not reliant on goal encoding, either as physical end-states (Bird, Brindley, Leighton, & Heyes, 2007) or as intentions (Leighton, Bird, & Heyes, 2010).

Social accounts of overimitation propose that children engage in high fidelity imitation as a means of demonstrating shared intentions with the experimenter (Tomasello, Carpenter, Call, Behne, & Moll, 2005; Over & Carpenter, 2012). Kenward et al. (2011) and more recently, Keupp, Behne, and Rakoczy (2013), have argued that children may be biased toward encoding both causally relevant and irrelevant actions not as causally efficacious in some way, or to demonstrate shared intentions, but to conform to normative conventions.

We define conventions, such as rituals, as causally opaque, socially shared actions (Herrmann, Legare, Harris, & Whitehouse, 2013; Legare & Herrmann, 2013; Legare & Souza, 2012, 2014). We propose that start- and end-state equivalency of an action sequence prompts the interpretation that the observed actions are unknowable from a physical–causal perspective and thus, conventional. Because conventions are socially motivated, there is no better or more correct way to reproduce them than exactly the way they were demonstrated. In contrast, when actions result in a distinct end-state, the action sequence is interpreted as having an instrumental goal and a potentially knowable causal structure. Thus, in the current research we differentiate conventional interpretations of action from instrumental interpretations of action by taking the novel theoretical perspective that children can interpret the nature of action sequences (conventional or

[☆] The raw data associated with the current research may be found on the Cognition, Culture, and Development Laboratory's website.

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instrumental) based upon whether or not the sequence contains an end-state that is the same or different from the start-state.

Here we build upon normative and social accounts of imitation by providing information about the affiliative motivation and function of imitating conventional behavior. To do this we examined the differential impact of priming third-party ostracism on children's imitation of instrumental versus social conventional actions. Recent research suggests that even 2-year-old children imitate social convention tasks more faithfully than instrumental tasks (Yu & Kushnir, 2013). These data are consistent with the proposal that whereas learning an instrumental skill allows for variability and innovation in methods of execution, learning social conventions requires close conformity to the way other group members perform the actions (Herrmann et al., 2013). We propose that research on the social function of imitation should be interpreted in light of the general human desire to affiliate (Brewer, 2007). In particular, we argue that the desire to affiliate goes beyond specific interaction partners to a desire to demonstrate affiliation with an imagined group marked by social conventions. Because instrumental acts do not carry as much "social weight" as conventional acts, ostracism may have a greater impact on children's imitation of social conventions.

The adaptive value of group membership has created an early-emerging sensitivity to ostracism resulting in behaviors aimed at promoting an individual's inclusion within a group (Buss, 1990; Caporael, 1997; Buss & Kenrick, 1998; Williams, 2007; Williams & Nida, 2011). There is also evidence that young children are sensitive to ostracism and use imitation as a behavioral strategy to address the negative effects of social exclusion. Over and Carpenter (2009) found that children primed with ostracism were more likely to copy the irrelevant actions of a demonstrator than children in a control condition. Whereas this work provides evidence that priming ostracism increases children's imitative fidelity in a task with an instrumental goal (i.e. turning on the light in a puzzle box), it did not examine task-specific effects of how priming ostracism may affect children's imitation of instrumental versus conventional behavior. This is noteworthy in light of evidence that children imitate with higher fidelity after observing a conventional task as opposed to an instrumental task (Herrmann et al., 2013).

We hypothesized that the motivation for imitating social conventions when faced with the threat of ostracism is to seek affiliation through social conformity or high fidelity imitation. Consistent with this hypothesis, Over and Carpenter (2009) demonstrated that the elements of their novel action sequence that were most reliably copied following ostracism priming were the causally irrelevant or "conventional" elements. For example, children in the ostracism and control conditions were equally likely to reproduce the angle of the tool used in achieving an instrumental goal, whereas children in the ostracism condition were more likely to reproduce the conventional action of rolling the tool between one's hands. Over and Carpenter's (2009) task involved a clear goal (turning on a light in a puzzle box). Using this paradigm precludes determining if children's imitative fidelity was influenced by the children's desire to affiliate with the model, achieve the goal, or engage in a social convention. Our aim is to disambiguate the interpretation of an instrumental goal from a conventional goal within the task. By differentiating these interpretations within our paradigm we can examine the effects of affiliative motivations on imitation without conflating instrumental and conventional interpretations of the actions.

A 2 × 2 between-subjects design was used to prime either ostracism or affiliation prior to watching a video demonstration of either a social convention or instrumental task using modifications of minimal priming stimuli developed by Over and Carpenter (2009). Children participated in one of four conditions: *ostracism–convention*, *affiliation–convention*, *ostracism–instrumental*, and *affiliation–instrumental*. Affiliation was chosen as a strong control for ostracism because it provides the same amount of social information but does not depict exclusion (see

Williams, 2007). To manipulate children's interpretation of the action sequence we used start- and end-state equivalency (social convention) or difference (instrumental). Both action sequences used in the current study (conventional and instrumental) are opaque from a physical–causal perspective but vary based on difference or equivalency of start- and end-states. Our methodology is distinct from that used in previous research because all of the actions are necessarily irrelevant in achieving any concrete goal. There is only the inference of a potential goal associated with the distinct end-state in the instrumental conditions. This allows us to examine the imitation of purely conventional actions from actions that have a potentially instrumental goal. We predicted that imitative fidelity would be highest and that children would provide more social convention explanations for their behavior in the ostracism–convention condition. Conversely, we predicted that imitative fidelity would be lowest and that children would provide fewer social convention explanations within the affiliation–instrumental condition. In line with previous research on overimitation (Lyons et al., 2007; McGuigan et al., 2007; Nielsen & Tomaselli, 2010; Herrmann et al., 2013), we predicted that 5–6-year-olds would engage in higher imitative fidelity than 3–4-year-olds, a finding that may be due to increasing sensitivity to social convention with age.

2. Method

2.1. Participants

Forty-eight 3–4-year-olds (mean age = 3.61; range 3,0 to 4,11) and forty-eight 5–6-year-olds (mean age = 5.54; range 5,0 to 6,11), ($N = 96$, 45 female) were recruited from a university town in the American southwest. Participants were primarily Euro-American and from middle-class families.

2.2. Materials

2.2.1. Video primes

Video primes were created using animation tools within PowerPoint software. The priming stimuli consisted of short videos depicting geometric shapes moving on the screen, with no audio. The videos were designed to depict ostracism and affiliation. The ostracism prime consisted of three blue pentagons that entered the screen and appeared to interact as a group. Subsequently, a fourth pentagon entered and approached the group. The group moved away from the fourth pentagon four times in a manner suggesting exclusion. The fourth shape then "gives up", moved away from the group and stopped at the bottom left corner of the screen (Over & Carpenter, 2009). The affiliation prime matched the movements and timings of the ostracism prime. Four blue pentagons entered the screen together and appeared to interact as a group. The four pentagons moved to different areas of the screen as a group four times. Finally, two pentagons split off and moved to the lower left corner, while the other two moved to the upper right corner of the screen (see Fig. 1).

2.2.2. Object Set for video demonstration and imitation task

A set of objects was manipulated in a videotaped novel action sequence. In the convention conditions, the stimuli included a blue cube, orange sphere, purple piece, wooden peg-board (with three wooden pegs, colored yellow, red, and green), and silver box. The stimuli in the instrumental conditions were identical to the convention conditions except for the addition of a red pipe (see Figs 2 and 3). Object manipulation demonstrations were filmed for the convention and instrumental conditions for continuity in presentation to participants. Each video was 40 s in length.

Each participant watched a video demonstration of an action sequence in which the start- and end-states were either equivalent (convention conditions) or different (instrumental conditions).

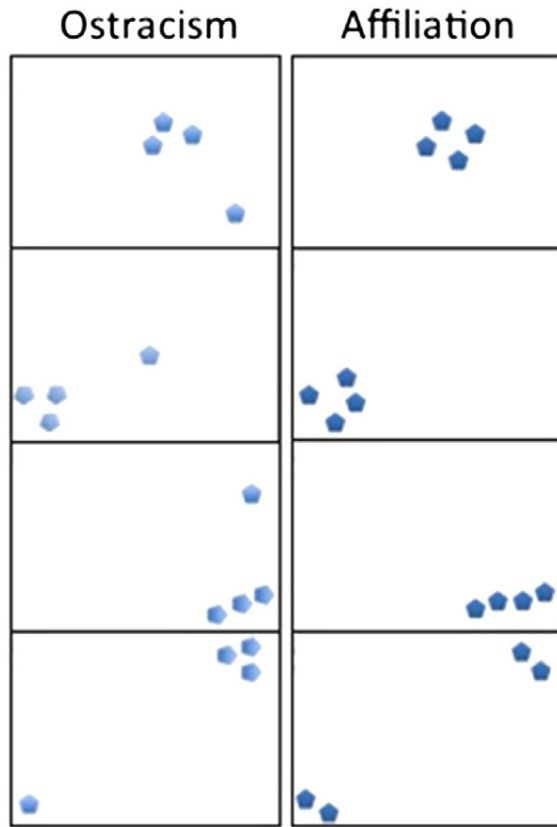


Fig. 1. Screenshot examples of the video priming stimuli.

Across conditions, the video began with a female demonstrator seated and looking straight ahead with a neutral facial expression, with the object set directly in front of her. The model first picked up a blue cube and tapped it twice on the green peg of the wooden pegboard. She then placed the blue cube back in its original position and then pressed her fists together (novel gesture). Then she picked up the

orange sphere, which she tapped twice on the red peg and then placed it back in its original position and engaged in the novel gesture again. Following the aforementioned sequence of actions, in the convention conditions the action sequence had an equivalent start- and end-state (see Fig. 2), and in the instrumental conditions the action sequence had a different start- and end-state (see Fig. 3). In the convention conditions, the model picked up the purple piece and used it to slide open the lid of the silver box. She then placed the purple piece back in its original position and closed the lid of the silver box with her right hand. Thus, she did not use the obvious affordance of placing an object inside of the box.

In the instrumental conditions, a new (and previously occluded) red pipe was moved into view and used to slide open the lid of the box. The red pipe was then placed inside with the left hand, and as in the other conditions, the box was closed with the right hand. A new and previously occluded object was used in the instrumental conditions to clearly differentiate the causally meaningless elements from the potentially causally meaningful elements of the action sequence. This is expected to cue children to the presence of a possible instrumental goal in the action sequence. In both conditions, the video ended with the demonstrator’s hands flat on the table (see Figs 2 and 3). Whereas most of the behavior demonstrated in each condition may be described as causally opaque, only in the convention condition were the end-state and start-state identical, inhibiting expectations of an instrumental goal. In contrast, because end-states and start-states differed in the instrumental condition, the procedure had a distinct outcome that could be interpreted as an instrumental goal.

2.3. Design and procedure

Participants were randomly assigned to one of four between-subjects conditions (*ostracism–convention*, *affiliation–convention*, *ostracism–instrumental*, *affiliation–instrumental*). The experimenter presented the child with a display screen connected to a laptop where the experimenter controlled a video. Depending on condition, children viewed a video prime depicting ostracism or affiliation. Following the video prime, the experimenter told each participant, “This is Rachel. She has something interesting she wants to show you, so let’s watch very

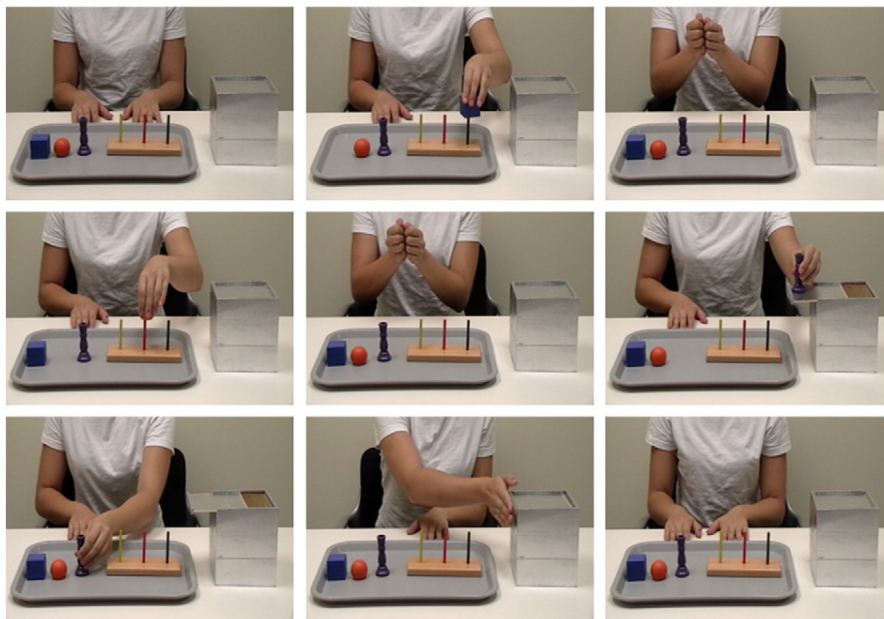


Fig. 2. Screenshots of the video demonstration in the convention conditions.

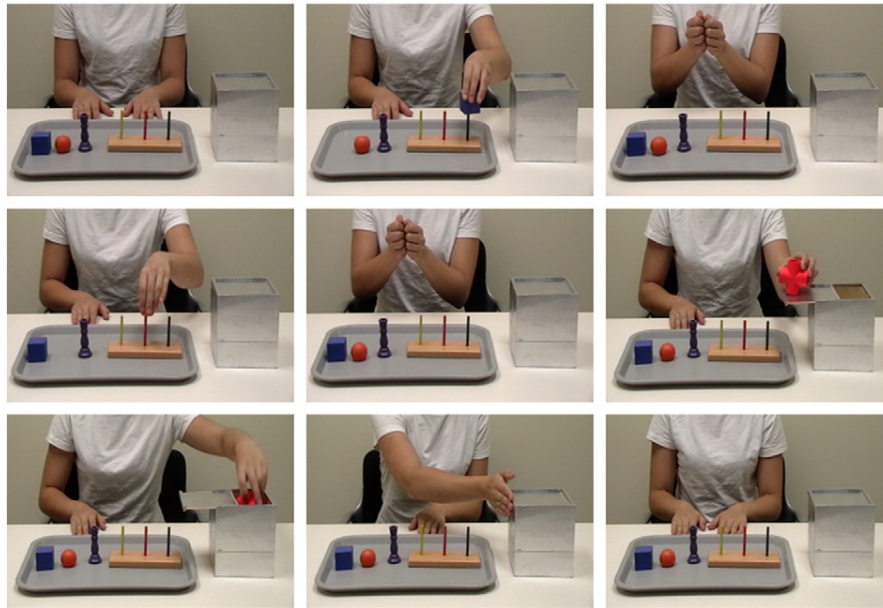


Fig. 3. Screenshots of the video demonstration in the instrumental conditions.

carefully.” Next, participants viewed either the convention or instrumental action sequence that included actions with the object set and a novel gesture. Children watched a single presentation of a videotaped action sequence in one of the between-subjects conditions. Prior work has demonstrated that copying fidelity is lower following video demonstrations than live demonstrations (Barr & Hayne, 1999; Hayne, Herbert, & Simcock, 2003; McGuigan et al., 2007; Nielsen, Simcock, & Jenkins, 2008). Using video demonstrations presents a more conservative picture of imitative behavior and optimizes consistency in the presentation of the experimental stimuli across participants.

2.3.1. Imitation task

At the conclusion of the demonstration video, the screen was turned off and the objects that the child had seen in the video were placed into view of the child, arranged in the same configuration from the child’s perspective. The experimenter told the child, “See these objects here? Now it’s your turn. Here you go.” No instructions were given to copy. The child was given 2 min to interact with the objects before they were placed out of reach but kept within view.

Imitative behavior was coded by the first author. An imitative fidelity score was calculated based on 7 elements of the action sequence. The seven criteria included: pairing the blue cube with the green peg, pairing the orange sphere with the red peg, engaging in the correct sequencing (using the blue cube first, the orange sphere next, then the purple piece for the convention conditions, or the red pipe for the instrumental conditions), performing the double tapping motion with an object on the pegs, opening the silver box with an object, engaging with the box at the end of the sequence only, and engaging in modeled box-oriented behavior (i.e. not placing an object inside the box in the convention conditions, and only placing the red pipe in the box in the instrumental conditions). The presence of these target actions was coded as 1, the absence was coded as 0. Modeled box-oriented behavior was coded differently by condition. For the convention conditions, if the child did *not* insert an object into the silver box he or she received a score of 1. For the instrumental conditions, if the child inserted the red pipe he or she received a score of 1. Due to low levels of reproduction of the modeled gesture (5% of the sample), this element was not included in the summary score.

2.3.2. Explanation task

Following the imitation task, the experimenter asked the child, “Why did you do it that way?” Explanations for why the participant had engaged with the objects in a particular way were coded for content. *Social convention explanations* referred to a socially prescribed behavior (e.g., “Because I have to do what she does,” “Because she did it that way,” “Because that is the way you do it”). *Agentive explanations* referred to the child’s desire and independent initiative (e.g., “Because I can do it anyway I want to,” “Because I like to do it that way,” “Because I wanted to”). Descriptions of concrete actions (e.g., “I put the purple object there”), reflections on the capacity to implement those actions (e.g., “It was hard to close the box”), or descriptions of uncertainty (i.e., “I don’t know”), were coded as *neutral responses*. Responses to the question were coded individually as 1 or 0 for each explanation type.

2.3.3. Inter-rater reliability

Three additional coders, blind to the hypothesis of the study, recoded the data from 72 children, representing 75% of the total sample. Inter-rater reliability was high (Cohen’s Kappa ranged from 0.70 to 1.00) for all of the elements of the imitative fidelity score, across the three coders, as well as the type of explanation provided, Cohen’s Kappa = 0.74 (Landis & Koch, 1977).

3. Results

Differences in imitative fidelity scores across conditions and age groups are presented first, followed by an analysis of the individual elements of the imitative fidelity summary score. Finally, the findings from the explanation task are presented.

3.1. Imitative fidelity score

An ANOVA with prime (2: ostracism, affiliation), task (2: instrumental, convention), and age (2: 3–4-year-olds, 5–6-year-olds) as between-subjects variables and the imitative fidelity score (0–7) as the dependent measure revealed a main effect of prime, $F_{1, 96} = 4.34, p < .05, \eta_p^2 = .047$. Bonferroni corrected pairwise comparisons, revealed that children in the ostracism conditions (Mean \pm SD = 4.73 ± 1.91) had higher imitative fidelity scores

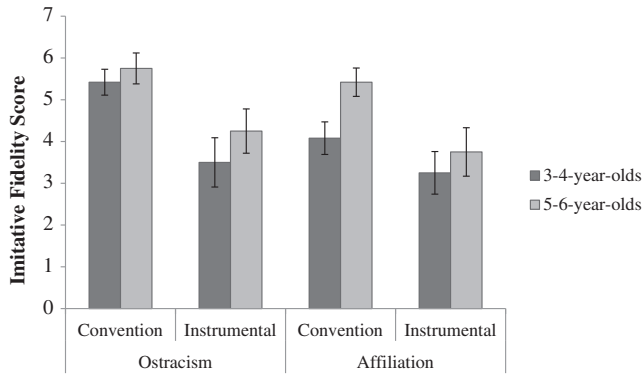


Fig. 4. Mean imitative fidelity scores by age and condition. Error bars represent SE.

than children in the affiliation conditions (Mean ± SD = 4.00 ± 1.87). There was also a main effect of task, $F_{1, 96} = 21.01, p < .0001, \eta_p^2 = .193$. Bonferroni corrected pairwise comparisons revealed that children in the convention conditions (Mean ± SD = 5.17 ± 1.46) had higher imitative fidelity scores than children in the instrumental conditions (Mean ± SD = 3.56 ± 1.99). There was also a marginal main effect of age, $F_{1, 96} = 2.98, p = .09, \eta_p^2 = .033$. Bonferroni corrected pairwise comparisons revealed that older children had marginally higher imitative fidelity scores (Mean ± SD = 4.67 ± 1.98) than younger children (Mean ± SD = 4.06 ± 1.81), see Fig. 4.

The interaction between prime and task was not significant, $F_{1, 96} = .089, p = ns$. Because we predicted a larger effect of prime in the convention condition, we carried out Bonferroni corrected planned comparisons between ostracism and affiliation within the convention and instrumental conditions. Consistent with our predictions, the planned comparisons revealed that the difference between ostracism and affiliation priming was only significantly different within the convention conditions $t_{46} = 2.04, p < .05, d = .32$.

3.2. Analysis of the individual elements of the imitative fidelity summary score

The means and standard deviations of each individual element of the imitative fidelity summary score by condition are presented in Table 1. Children in the ostracism–convention condition consistently imitated each element of the action sequence more than children in the other conditions. The elements of the summary score that were performed significantly more than expected in the ostracism–convention condition were opening the box with an object (as opposed to with a hand), $\chi^2 = 32.92, (3, N = 96), p < .001$; engaging with the box only at the end of the sequence, $\chi^2 = 11.96, (3, N = 96), p < .01$; and engaging in the correct sequencing, $\chi^2 = 11.44, (3, N = 96), p < .01$; see Table 1 for adjusted standardized residuals. There was no difference in using the blue cube on the green peg, the

Table 1 Percentage of children imitating each element of the imitative fidelity summary score by condition.

	Ostracism–convention	Affiliation–convention	Ostracism–instrumental	Affiliation–instrumental
Blue cube on green peg	71% (1.50)	63% (.06)	58% (.10)	38% (–2.30)
Orange sphere on red peg	67% (1.50)	54% (.10)	50% (–.40)	42% (–1.3)
Double tapping	50% (.50)	42% (–.50)	50% (.50)	42% (–.50)
Open box with object**	92% (4.40)	71% (2.00)	21% (–3.70)	29 (–2.70)
Box-oriented behavior	100% (NA)	96% (NA)	83% (NA)	83% (NA)
Engage box at end only*	92% (2.90)	71% (.40)	63% (–.60)	46% (–2.60)
Correct sequencing*	88% (2.30)	79% (1.30)	63% (–.80)	49% (–2.80)

Note. $N = 96, 24$ per condition. Adjusted standardized residuals are in parentheses below observed percentages. NA indicates that adjusted residuals could not be calculated and that Fisher's Exact Tests were performed for those elements because less than 80% of cells had an expected frequency of 5 or greater.

* $p < .01$.
** $p < .001$.

Table 2 Percentage of children providing each category of response by condition.

“Why did you do it that way?”	Social Convention	Agentive	Neutral
Ostracism–convention	54% (2.5)	25% (–.4)	21% (–2.1)
Affiliation–convention	33% (.0)	25% (–.4)	42% (.4)
Ostracism–instrumental	29% (–.5)	17% (–1.4)	54% (1.8)
Affiliation–instrumental	17% (–2.0)	46% (2.2)	38% (–.1)

Note. $N = 96, 24$ per condition. Adjusted standardized residuals appear in parentheses below observed percentages.

orange sphere on the red peg, engaging in the double tapping action, or correctly placing an object (or not) in the box, $ps = ns$.

3.3. Explanation

Children's responses were coded as social convention, agentive, or neutral (see Table 2 for the percentage of each type of response by condition). There was a significant difference in providing a social convention explanation across conditions, $\chi^2 = 7.88, (3, N = 96), p < .05, \Phi = .29$. The adjusted residuals indicate that children in the ostracism–convention condition provided more social convention explanations than expected and children in the affiliation–instrumental condition provided fewer social convention explanations than expected, see Table 2 for the adjusted residuals. There was no difference in providing an agentive explanation, $\chi^2 = 5.51, (3, N = 96), p = ns$ or a neutral response across conditions, $\chi^2 = 5.76, (3, N = 96), p = ns$.

4. Discussion

To become efficient cultural learners, children must be able to determine when a situation calls for high fidelity imitation, as in the case of social convention, or when actions are open to a more efficient means to achieve a goal, as in the case of many instrumental actions. The results of the current research provide evidence that both the nature of the action sequence (conventional versus instrumental) and affiliative motivations impact imitative fidelity in early childhood.

Our results demonstrate that start- and end-state equivalency cue expectations of social conventionality. Children in the convention conditions (equivalent start- and end-state) had higher imitative fidelity scores than children in the instrumental conditions (distinct start- and end-state). Notably, our study provides evidence consistent with the proposal that children are able to infer the conventional nature of a task from the actions themselves. Previous research (Byrne & Russon, 1998; Bekkering et al., 2000; Carpenter et al., 2005; Williamson & Markman, 2006; Schachner & Carey, 2013) has found that the presence or absence of an end-goal within an action sequence affects imitation of means versus goal. By providing convergent evidence of children's social conventional interpretation of action sequences with equivalent start- and end-states, the current research supports the proposal that even young children are adept at flexibly

navigating distinct kinds of social learning opportunities (Herrmann et al., 2013; Legare & Herrmann, 2013).

Our data are also consistent with previous research demonstrating that priming ostracism increases imitative fidelity (Over & Carpenter, 2009). We found that priming ostracism increased imitative fidelity in both conventional and instrumental tasks, consistent with our hypothesis that threat to group membership increases affiliative motivations. Although the interaction between prime and task was not significant, examination of the individual elements of the imitative fidelity summary score indicated that priming ostracism in the convention condition resulted in higher imitative fidelity of the most opaque elements of the action sequence (i.e., opening the box with an object, engaging with the box only at the end of the sequence, and engaging in the same sequencing of actions). For example, there is no instrumental reason to open the silver box with an object (which is more difficult than simply opening the box with one's hand). Priming ostracism in the convention condition also increased children's social convention explanations for their behavior. Thus, data from these measures suggest that affiliative goals may be particularly important when imitating social conventions.

We also have some evidence for age-related improvements in imitative fidelity across conditions. Five to 6-year-olds had marginally higher imitative fidelity scores than 3–4-year-olds overall. Previous research on overimitation has found that high fidelity imitation increases with age (Lyons et al., 2007; McGuigan et al., 2007; Whiten et al., 2009; Herrmann et al., 2013; Yu & Kushnir, 2013). These findings may reflect increasing sensitivity to social convention with development or age related improvements in working memory, a topic to be explored more fully in future research.

Additional research is also needed to examine the causal mechanisms by which ostracism increases imitative fidelity of social conventions. For example, ostracism may affect anxiety and attention to social information (Gardner, Pickett, & Brewer, 2000; Pickett, Gardner, & Knowles, 2004). Cues to social exclusion may also amplify associations between actions and normative representations. This is consistent with the recent proposal of children's normative encoding of action within imitation tasks (Kenward et al., 2011; Keupp et al., 2013), but identifies the motivation underlying this encoding as affiliative in nature. Ostracism also serves to increase out-group bias amongst adults (Gomez, Morales, Hart, Vasquez, & Swann, 2011). Future research should aim to explore the effects of ostracism and group membership on in- and out-group biases.

Learning social group behavior is essential to maintaining group membership and thus affiliative motivations for behavioral conformity are strong. This research provides evidence that priming ostracism increases children's imitative fidelity of social conventional and instrumental tasks and supports the proposal that the drive to affiliate motivates imitative fidelity in early childhood.

This research was supported by a grant from the Economic and Social Research Council to the second and third authors. Special thanks to Andre L. Souza, David Buss, and Patricia Herrmann for assistance with data analysis, manuscript preparation, and review. Special thanks also to the Thinkery for their assistance in data collection.

Supplementary Materials

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.evolhumbehav.2014.01.004>.

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