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Infants' and Young Children's Imitation of Linguistic In-Group and Out-Group Informants

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Although children can use social categories to intelligently select informants, children's preference for in-group informants has not been consistently demonstrated across age and context. This research clarifies the extent to which children use social categories to guide learning by presenting participants with a live or video-recorded action demonstration by a linguistic in-group and/or out-group model. Participants' (N = 104) propensity to imitate these actions was assessed. Nineteen-month-olds did not selectively imitate the actions of the in-group model in live contexts, though in-group preferences were found after watching the demonstration on video. Three-year-olds selectively imitated the actions demonstrated by the in-group member regardless of context. These results indicate that in-group preferences have a more nuanced effect on social learning than previous research has indicated.

Much of children's learning is dependent on social partners. However, informants are not uniform in their ability to provide correct or relevant information, and intelligent social learners must be able to selectively consume accurate knowledge. Even young children appear to be intelligent social consumers, endorsing information tendered by those who appear accurate (e.g., Birch, Vauthier, & Bloom, 2008; Corriveau & Harris, 2009; Koenig, Clement, & Harris, 2004; Scofield, Gilpin, Pierucci, & Morgan, 2013), confident in their knowledge (e.g., Birch, Akmal, & Frampton, 2010; Sabbagh & Baldwin, 2001), and who profess relevant topical information (e.g., Henderson, Sabbagh, & Woodward, 2013; Koenig & Harris, 2005; Kushnir, Vredenburgh, & Schneider, 2013; Sabbagh & Baldwin, 2001).

In addition to resisting information provided by unreliable informants, children also seem to resist information from people who are members of "outgroup" social categories. Preschool children prefer to play with objects, eat food, and engage in activities that members of the same gender or age group previously endorsed (e.g., Shutts, Banaji, & Spelke, 2010), and they reference peers over adults when seeking information pertaining to toys (e.g., VanderBorght & Jaswal, 2009). Furthermore, older children selectively endorse actions performed by an individual with a native accent compared to an individual with a foreign accent (Kinzler, Corriveau, & Harris, 2011).

A recent finding by Buttelmann, Zmyj, Daum, and Carpenter (2013) suggests that infants may also be discriminating social learners. In this study, 14-month-old infants were familiarized to a video of a model who told a story in either the infant's native language or a foreign language. Infants then viewed the video model acting upon two objects. Infants who viewed the native-speaking model imitated significantly more of the actions than infants who viewed the foreign-speaking model, suggesting a learning preference for in-group and resistance against out-group speakers.

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These findings make it tempting to assume that selective social learning is pervasive throughout early childhood. On this view, it may be presumed that children evaluate the source for socially provided information, and thus filter out much of the information that they encounter. However, several findings also indicate limits in children's ability to modulate social learning: Preschool children have trouble ignoring incorrect or incompetent testimony when it is presented in face-to-face social interactions (e.g., Couillard & Woodward, 1999; Jaswal, 2010; Jaswal, Croft, Setia, & Cole, 2010; Palmquist, Burns, & Jaswal, 2012), even when this information comes from an overtly malevolent individual (Mascaro & Sperber, 2009), suggesting that appropriately ignoring unreliable information may be difficult early in life.

Why is it that, in some situations, children appear to resist information tendered by those who are perceptually different from themselves, while in others, children cannot ignore information that is detrimental to their learning? This could be viewed as a question concerning research methods—What are the testing conditions that reveal versus restrict children's selectivity in learning? At a deeper level, this question is essential to understanding the processes at work in childhood social learning. Discovering the factors that affect children's selective social learning is necessary for understanding how laboratory responses may, or may not, reflect children's learning in real-world situations. The present research addresses these questions by testing whether children always ignore certain kinds of socially provided information, or whether children are generally open to such information, with selectivity emerging only under very specific contexts, such as in certain laboratory-based experimental paradigms.

The available evidence suggests that the mode of presentation may strongly affect children's propensity to disregard informants. Studies demonstrating selective social learning have generally involved presenting stimuli on video (e.g., Buttelmann et al., 2013; Kinzler et al., 2011), whereas studies in which children fail to resist unreliable messages often involve live interactions with the informant (e.g., Couillard & Woodward, 1999; Jaswal et al., 2010). The salience of live social interactions (vs. video-recorded demonstrations) may make it difficult for children to ignore information provided by less relevant informants. Indeed, when information is presented via video, learning and imitation rates are significantly diminished, suggesting that video models are a less salient source of information for young learners, especially for learners between 1 and 3 years of age (Anderson & Pempek, 2005; see Barr, 2010, for a review; see also Kuhl, 2007; Nielsen, Simcock, & Jenkins, 2008). Thus, it is possible that the tendency to avoid learning from out-group members would be evident in children's responses to video models, but not in the context of live social interactions.

Even within live interactions, children's propensity to imitate is affected by variations in the social situation, such as whether a demonstrator directly engages the child (e.g., Király, Csibra, & Gergely, 2013) or whether a demonstrator is present during imitation (e.g., Király, 2009). Nielsen (2008) suggests that these effects reflect infants' social motivation as much as their analysis of the informational value presented, whereas Over and Carpenter (2012) suggest that imitation is highly influenced by the child's desire to affiliate with a social partner. Indeed, the fact that children sometimes imitate actions that are irrelevant to instrumental outcomes indicates the importance of social motivations in imitative learning (Nielsen & Blank, 2011).

Children's responses to variations in the learning context may also change across development. Nielsen (2006) found that 18-month-old infants imitated the noncausal actions of an adult *only* when the model was socially engaging (e.g., smiled, attempted to elicit joint attention), whereas 24-month-olds imitated both a social model *and* an aloof model to the same extent (e.g., one who avoided eye contact, focused only on the object stimuli), suggesting an increased propensity to imitate, even in the absence of overt communicative cues, between 18 and 24 months of age. Furthermore, there is evidence demonstrating that preschool-aged children are increasingly able to ignore misleading information (see Mascaro & Sperber, 2009) and also ignore information from someone who had previously been inaccurate (Corriveau & Harris, 2009; Ganea, Koenig, & Millet, 2011), suggesting a developmental shift in the ability to resist social information.

Thus, although recent evidence suggests continuity from infancy through childhood in the tendency to selectively screen out information provided by out-group members, as yet little is known about the conditions that support this selectivity. Furthermore, research on young children's imitative learning indicates that the propensity to accept socially provided information varies considerably across early development and across contexts. Together, these considerations indicate a need to look more comprehensively at children's selective social

learning, examining learning from live versus video-recorded demonstrations and investigating selective social consumerism in both infants and young children within the same contexts.

In the current set of experiments, we examined whether 19-month-old and 3-year-old children would learn selectively from a linguistic in-group (vs. out-group) member who modeled a novel action during a live or video-recorded demonstration. We chose the 19-month-old age group for two main reasons. First, by 19 months of age, infants have been shown to effectively remember and imitate actions from other individuals, demonstrating social learning (e.g., Jones, 2007; Neilsen & Dissanayake, 2004). Second, given the previous research conducted by Kinzler, Dupoux, and Spelke (2007) involving younger infants, we hypothesized that 19-month-olds would have already developed linguistic in-group preferences.

Three-year-olds were selected as an older age group because of past work suggesting that children older than 2.5 years of age are already sensitive to linguistic in-group information (e.g., Kinzler, Dupoux, & Spelke, 2012). Furthermore, 3-year-olds are able to screen out irrelevant informants or information under certain conditions (e.g., Corriveau & Harris, 2009; VanderBorght & Jaswal, 2009). Given these past findings, we determined that 3-year-olds would represent an appropriate comparison group, which would thus highlight any methodological issues that might serve as alternative explanations of the 19-month-old effects. For example, if the 3-year-old children did not demonstrate selective learning in either condition, we would not be able to confidently conclude that our methods were effective in testing linguistic in-group preferences.

Children of both age groups watched a linguistic in-group and/or out-group model demonstrate an action that elicited both an instrumental goal result (e.g., pressing an object to turn on a light) and an unusual manner (e.g., using one's head to do so) because previous studies involving 14-month-old infants (Buttelmann et al., 2013) and 4- to 5-year-old children (Kinzler et al., 2011) have suggested that social group information would be most relevant for arbitrary (thus, possibly culturally relevant) actions. Spanish was chosen as the language of the out-group speaker due to the availability of English/Spanish bilingual demonstrators, and in accordance with previous research demonstrating looking-time preferences for English versus Spanish speakers in younger infants (Kinzler et al., 2007).

Participants came from monolingual, English-speaking homes, and heard only English from their parents and caretakers. In Experiment 1, 19-month-old infants interacted with a live model who spoke either their native language (English) or an unfamiliar foreign language (Spanish). In Experiment 2, 19-month-old infants and 3-year-old children interacted with two experimenters, an English speaker and a Spanish speaker, each of whom demonstrated a different action on the same object. In Experiment 3, 19-month-old infants and 3-year-old children saw the modeled events presented on video. In each experiment, participants' propensity to produce the modeled manner and/or instrumental goal actions was assessed.

Experiment 1

Method

Participants

Thirty-two full-term 19-month-old infants (M = 19.2 months, range = 18.8–19.9 months) participated in Experiment 1. Infants were recruited from a list of parents who had expressed an interest in participating in developmental studies in an Eastern United States metropolitan area. All participants heard a minimum of 95% English in their daily lives, and heard only English from their parents and caretakers according to parent report. A minority of participants (22%) had received incidental exposure to languages other than English, for example, from seeing a television show, meeting a family visitor, or learning a song in a music class. Parents of these children estimated that this incidental exposure accounted for an average of 1.71% of their children's language input.

Sixteen infants (M = 18.9 months, range = 18.6–19.5 months, 9 females) participated in the English condition and 16 infants (M = 19.1 months, range = 18.6–19.6 months, 9 females) participated in the Spanish condition. Five additional infants participated, but were excluded from the final sample due to unwillingness to participate (n = 1), or technical difficulties with the video camera, which prevented coding of the data (n = 4). The sample of infants was 81% Caucasian, 13% African American, 3% Asian, and 3% other.

Procedure

Setup. Infants sat on their parent's lap at a large table with an experimenter seated directly across from them (~ 76 cm away). Parents were asked not to influence their infant's actions in any way during

the session. Tasks were video-recorded for later coding, with one camera behind the experimenter focused on the infant and one camera behind the infant focused on the experimenter.

All infants interacted with two experimenters. The host experimenter conducted the consent, baseline, and test phases, but was absent during the demonstration phase. The host spoke the infant's native language (English). The demonstrating experimenter conducted the familiarization and demonstration phases but was absent during all other experimental phases. The demonstrator spoke to the infant in either English *or* Spanish for the entire experiment. The experimenters who served as demonstrators were bilingual, allowing the same person to present in both conditions, and thus eliminating the possibility that superficial demonstrator differences could affect imitation. The demonstrators were fluent English–Spanish bilinguals since early childhood and could speak each language without a foreign accent, as judged by native speakers of both English and Spanish.

Materials. Stimuli included six novel toy sets. Each toy set was modified or created to meet the requirements of the study. Each toy set had two accompanying actions: one that was irrelevant to obtaining the goal (the manner action) and one that was instrumental to obtaining the goal (the goal action); see Table 1.

Baseline phase. Infants were presented with each of the six toy sets, one at a time, by the host in a predetermined randomized order. For each set, the host produced the relevant toy and placed it on the middle of a foam-core tray (measuring approximately 91 × 24 cm). While looking at the infant the host said, "Hi! What does this thing do?" She continued to look at the infant, pushed the tray across the table toward the infant, removed her hands from the tray, and looked toward the floor. The infant was allowed 30 s to act upon each toy. If the infant seemed hesitant to interact with the toy, the host looked backup at the infant and prompted manipulation by saying, "You try it!" or "Your turn!" This procedure was repeated for each of the six toy sets.

Familiarization phase. After baseline, the demonstrator knocked on the door, entered the room, looked at the infant and said, "Hi! I'm going to show you some toys!" or "¡Hola¡ Te voy a mostrar unos juguetes" depending on the infant's assigned condition. The host moved to sit in a chair behind the infant, where she directed her attention to reading a magazine. The demonstrator sat across the table from the infant.

The demonstrator produced a farm animal puzzle, removed each piece, and encouraged the infant to help her put the pieces back into their correct locations. While completing the puzzle, the demonstrator labeled each animal in either Spanish or English (depending on the assigned condition). Each animal label was embedded in full sentences such as, "Where does the horse go?"/"¿Dónde va el caballo?" or "Look, this is the pig!"/"¡Mira! Este es el cochino," allowing the infant to become familiarized with the spoken language of the demonstrator.

Demonstration phase. During this phase, the demonstrator modeled a novel manner and goal action on each toy set. Toy sets were produced, one at a time, in the same order as the baseline phase. Once a toy set was placed on the foam tray, the demonstrator made eye contact with the infant and said, "Hi! Let's see what this thing does" (English condition) or "Hola! Vamos a ver lo que esto hace!" (Spanish condition) before acting on the toy. The manner action was always demonstrated before the goal action (e.g., the demonstrator would first brush the top of the hinged box three times, then open the box and retrieve the toy). After acting on

Table 1
Experimental Stimulus Sets and Their Associated Actions

Stimulus set name	Manner action	Goal action	Goal
Headlight*	Put head to light (put elbow to light)	Push light	Light turns on
Button box*	Put Object 1 to button (put Object 2 to button)	Push button	Noise sounds
Hinged box*	Brush box with object (knock box with object)	Open box	Retrieve toy from inside box
Paddle tube	Place Velcro paddle on top of tube	Shake tube	Tube makes cow noise
Knock box	Knock on outside of box with fist	Open box	Retrieve toy from inside box
Elbow box	Use elbow to open slide box	Open box	Retrieve toy from inside box

Note All stimulus toy sets were utilized in Experiment 1. Only those sets with an asterisk (*) were utilized in Experiments 2 and 3. Actions in parentheses denote alternative actions created for the within-subjects design (Experiments 2 and 3). The head-light and button-box functions were derived from stimuli used in Meltzoff (1988).

each set, the demonstrator said, "Let's see that again!" or "Vamos a verlo otra vez!" and repeated the actions a second time.

Test phase. After demonstration, the demonstrator waved good-bye to the infant and left the room. The host moved from behind the infant to the table across from the infant. The host produced each toy set, said, "Hi, what does this thing do?" and allowed the infant to act on the toy for 60 s or until he or she had produced the manner and goal actions. If the infant pushed the toy away repeatedly, the trial was terminated. Toys were presented in the same order as the baseline and demonstration phases.

Coding and Reliability

Baseline and test trials were coded from video recordings by a research assistant blind to experimental condition using the Interact coding software (Mangold, 1998). A second independent assistant coded 25% of the participants, with the two coders agreeing on 95% of total behavioral scores (Cohen's $\kappa = 0.89$). The baseline and test phases for each participant were coded for whether or not the infant produced the goal action and/or the manner action (as described in Table 1). For a majority of the actions coded, infants were able to easily and proficiently act in the same manner as the demonstrator during the test period (e.g., pushing a button, knocking on a box). However, in some instances, children found the elbow box difficult to open with their elbow (due to the height of our table and the height of the box) and so we accepted any attempts to use the back of their forearm as a manner imitation.

Infants received credit for only the first instance of a manner or goal action. Rates of imitation are presented as proportions (number of goal or manner actions imitated out of all toy sets administered).

Results

Figure 1 summarizes infants' imitation rates across the two conditions for both baseline and test phases. Preliminary analyses revealed that there were no effects of gender, toy set, or trial number for either condition; therefore, subsequent analyses were collapsed across these factors. Two mixed-design analyses of variance were run to test the effect of linguistic group presentation on the proportion of trials in which the infant imitated goal and manner actions at baseline and test phases. First, a 2 (phase: baseline, test) × 2 (condition: English, Spanish) mixed-design analysis of variance (ANOVA) with phase as the within-subject factor was conducted to compare the effects of linguistic group presentation on manner imitation during baseline and test phases. The ANOVA revealed a significant main effect of testing phase, $F(1, 30) = 138.0$. $p < .001$, $\eta_p^2 = .83$, demonstrating that infants produced significantly more manner actions during the test phase ($M = .57$, $SD = .17$) than the baseline phase ($M = .11$, $SD = .13$) across conditions. The ANOVA also revealed a significant main effect of

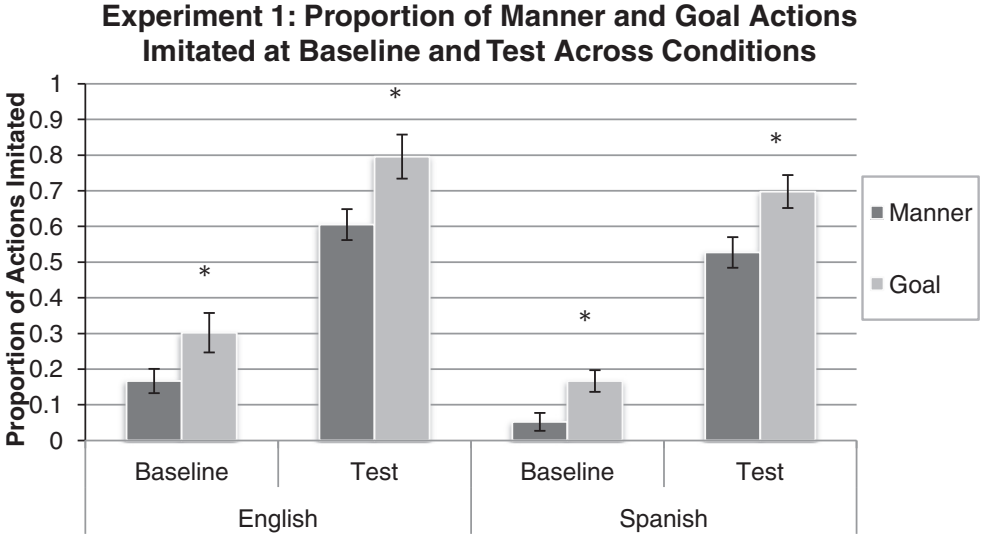

Figure 1. Proportion of manner and goal action imitation by 19-month-olds for both English and Spanish conditions at baseline and test in Experiment 1. *$p < .05$ and denotes differences between manner and goal actions imitated.

condition, $F(1, 30) = 5.80$, $p = .012$, $\eta_p^2 = .19$, with infants in the English condition producing significantly more manner actions in both baseline and test than those in the Spanish condition. This suggests that infants in the English condition were more likely to spontaneously produce the manner actions at baseline, and thus were also more likely to produce these actions during test. There were no other reliable effects. A planned contrast examining the rates of imitation when accounting for baseline scores (i.e., proportion of manner actions imitated at test minus proportion of manner actions imitated at baseline) revealed no significant differences in manner imitation scores between the English ($M = .44$, $SD = .24$) and Spanish ($M = .47$, $SD = .19$) conditions, $t(30) = .47$, $p = .64$, $d = .13$, $r = .07$.

A second 2 (phase: baseline, test) × 2 (condition: English, Spanish) mixed-design ANOVA with phase as a within-subject factor was conducted to compare the effects of linguistic group presentation on goal imitation during baseline and test phases. The ANOVA revealed a significant main effect of testing phase, $F(1, 30) = 154.44$, $p < .001$, $\eta_p^2 = .84$, revealing that infants performed significantly more goal actions at test ($M = .75$, $SD = .22$) than at baseline ($M = .23$, $SD = .19$), again indicating learning across the experimental session. The ANOVA also revealed a significant main effect of condition, $F(1, 30) = 4.17$, $p = .05$, $\eta_p^2 = .12$, with infants in the English condition producing more goal actions across both phases than did infants in the Spanish condition. There were no other reliable effects. Importantly, a planned contrast examining the rates of imitation when accounting for baseline action rates revealed no significant differences in manner imitation scores between the English ($M = .49$, $SD = .24$) or Spanish ($M = .53$, $SD = .23$) conditions, $t(30) = .45$, $p = .65$, $d = .17$, $r = .08$. Thus, the greater imitation rates of infants in the English condition seem to be a function of infants in that condition being slightly more likely to perform the target actions during the baseline phase.

Discussion

In contrast to prior findings with video stimuli and younger infants (e.g., Buttelmann et al., 2013), Experiment 1 did not indicate that 19-month-old infants preferentially imitated the actions of a live linguistic in-group versus a live out-group member. Although we hypothesized that the manner actions may be more robustly imitated when presented by an in-group member (see Nielsen & Tomaselli, 2010), infants imitated both the goal and manner actions equally across conditions. Furthermore, infants imitated significantly more actions at test than at baseline, suggesting robust learning even though it was not specific to one group member over another. These findings suggest that, when given action information from a live informant, infants readily learn from and imitate regardless of linguistic group membership.

Given that the findings in Experiment 1 were inconsistent with prior research, Experiment 2 examined in-group preferences under a modified forced-choice procedure that sought to highlight the salience of the informants' linguistic group membership.

Experiment 2

Experiment 2 adjusted the live testing procedure to examine whether: (a) highlighting the contrast between the linguistic group membership of the demonstrators (English vs. Spanish speaker) and (b) reducing task memory demands would reveal selective learning in infants. The simultaneous presence of both an in-group and out-group speaker has been used in past work (e.g., Kinzler et al., 2007; Shutts, Kinzler, McKee, & Spelke, 2009), allowing infants to compare and contrast the speakers and, hypothetically, choose between them. Although this contrastive evidence was not present for the infants in Buttelmann et al. (2013) study, it seemed possible that including it in the current live testing procedure could heighten infants' sensitivity to the language the informant used. To limit the memory demands of this procedure, we allowed the infant to act on each toy directly after seeing each demonstrator act on it, reducing the number of items to be remembered at the end of the task.

As an additional measure of in-group preferences, we included a toy-offering preference task, similar to that used in prior work with video models (Kinzler et al., 2007). We hypothesized that, in accordance with past work, participants should prefer the toy that had been preferred by a member of their in-group.

Finally, to evaluate potential developmental changes in selective social learning, we included a group of 3-year-old children. Since previous research has suggested a developmental progression in the ability to resist irrelevant or inaccurate informants from late infancy through to the preschool years (e.g., Ganea et al., 2011; Mascaro & Sperber, 2009), we hypothesized that older children

may be able to more easily inhibit learning from a live out-group member, and would therefore be more likely than the 19-month-olds to demonstrate selective social learning.

Method

Participants

Eighteen full-term 19-month-old infants (M = 19.4 months, range = 18.6–20.4 months; 10 females) and 18 full-term 3-year-old children (M = 38.2 months, range = 36.2–40.5 months; 9 females) participated in Experiment 2. Participants were recruited as in the first experiment. As in Experiment 1, only participants who heard English in 95% of their daily lives (based on parent report) participated in the experiment. The minority of participants (19-month-olds: 44%, 3-year-olds: 11%) were reported to have incidental exposure to a language other than English (average of these children's input was 3.22% for 19-month-olds and 4.17% for 3-year-olds according to parent report).

The sample of 19-month-olds was 56% Caucasian, 33% African American, and 11% mixed/other. The sample of 3-year-olds was 50% Caucasian, 33% African American, 5% Hispanic, and 11% mixed/other.

Procedure

The procedure was similar to that used in Experiment 1 with the following changes. First, both actors were present during the demonstration phase and each produced a unique manner action that resulted in a shared goal action. For example, one demonstrator used her head to reach the goal of turning on a light while the other used her elbow to achieve the same goal (see Table 1). This "double demonstration" of the goal action shifted the experimental focus to children's imitation of the manner actions alone, which were specific to one linguistic group model.

Second, neither age group participated in a baseline phase. The reason for this omission was that 3-year-olds, in piloting, were able to figure out a number of the goal actions during baseline and were thereafter unwilling to imitate the demonstrator's seemingly superfluous manner actions. In lieu of a baseline, the host played a puzzle (19-month-olds) or matching game (3-year-olds) with the participants while sitting directly across the table from them (*familiarization phase*). This game allowed the children to become familiarized with the host experimenter and the room.

After the familiarization phase, two bilingual demonstrators entered the room and verbally introduced themselves to the child. One demonstrator spoke only English and the other spoke only Spanish for each participant, though the language assigned to each bilingual demonstrator was counterbalanced across participants. The two demonstrators only communicated with the child, never talking or making eye contact with each other throughout the experiment. Upon entering the room, both demonstrators greeted the child and introduced themselves in their assigned language ("Hello, my name is ___ and I'm going to show you some toys!" and "Hola, me llamo ___y voy a mostrarte unos juguetes!"). The host then moved to a chair at the side of the table, and the two demonstrators sat in chairs directly across the table from the child.

Third, the demonstrators proceeded through a toy-choice preference procedure before the demonstration phase (*preference task 1*). During the preference task, each demonstrator produced an identical toy penguin from beneath the testing table. One at a time, each demonstrator expressed positive affect toward their penguin by looking at it, smiling, and saying, "Oooo!" Then, each demonstrator placed their toy directly front of them on the foam-core tray used during baseline and test. Each demonstrator placed their right hand on the tray and pushed the tray across the table to the infant. Both demonstrators then put their hands in their own lap and looked at the floor. The task was terminated once the infant had selected one of the two toys or after 15 s if no choice had been made. The host experimenter then collected the toy penguins and foam-core tray from the child and returned them to the demonstrators.

The demonstrators proceeded through the demonstration, whereby each model utilized a different manner action to obtain the same goal for each toy (*demonstration phase*); see Table 1. For example, one demonstrator would turn the light on with her head and the other would turn the light on with her elbow. As in Experiment 1, the demonstrator made eye contact with the child and said, "Hi! Let's see what this thing does" (English) or "Hola! Vamos a ver lo que esto hace!" (Spanish) before acting on the toy the first time, and "Let's see that again!" (or "Vamos a verlo otra vez!") before repeating the sequence. After the first demonstrator acted on the toy, she placed the toy in the middle of the table, put her hands in her lap, and looked at the floor. At this point, the second demonstrator looked up, retrieved the toy from the table, and

began her demonstration. After each demonstrator modeled their assigned action, they then placed the toy on the foam-core tray and pushed it toward the child, allowing the participant to act upon the toy immediately after demonstration (*test phase*). Due to the fact that two novel actions were demonstrated for each toy set (as opposed to a single action in Experiment 1), the number of toy sets was reduced down to three (see Table 1). The demonstration/test phase pairings were completed for each of the toy sets.

Finally, the demonstrators administered a second preference phase with the same toys as the first (*preference phase* 2), as a way to see if children's propensity to take a toy from one demonstrator over another changed with sustained social experience with each demonstrator. The order of toy sets presented the sides that the English and Spanish speaking demonstrator sat on, the actions that the English versus Spanish speaking demonstrator carried out, and which demonstrator acted first were all counterbalanced across participants.

Coding and Reliability

The test phases for each participant were coded from video for whether or not the child produced the goal action, the English manner action, and/or the Spanish manner action by a trained research assistant blind to experimental condition. Participants received credit for only the first instance of each type of action. However, each infant could receive a score for both a Spanish and an English manner action if he or she produced both forms within the allotted time frame. See Table 1 for descriptions of the manner and goal actions demonstrated, which also serve as the coding criterion for infant and child imitation.

Rates of imitation are presented as proportions (number of goal, English, or Spanish manner actions imitated of all toy sets administered). The preference tasks were also coded from video for which toy penguin (either English or Spanish presented) the infant selected first. Infants were given a preference score of 1 (*they touched or grabbed a toy penguin*) or 0 (*they did not touch a toy penguin*) for each demonstrator's language (English and Spanish). Scores were analyzed separately for each of the two preference phases. For all coding schemes, a second independent assistant coded 25% of the participants, with the two coders agreeing on 93% of total behavioral scores during the test phase for the 19-month-olds (Cohen's $\kappa = 0.88$) and 96% of total behavioral scores for the 3-year-olds (Cohen's $\kappa = 0.94$). Coders agreed on 100% of toy preference scores for the preference tasks for both age groups (Cohen's $\kappa = 1.00$).

Results

Figure 2 summarizes children's rates of English versus Spanish manner imitation during the test phase. As in Experiment 1, preliminary analyses revealed no reliable effects of gender, toy set, or trial number for either condition; therefore, subsequent analyses were collapsed across these factors. A 2 (age group: 19-month-olds, 3-year-olds) × 2 (linguistic presentation: English, Spanish) mixed-design ANOVA with linguistic presentation as the within-subjects factor was conducted to compare the effects of linguistic group presentation on the proportion of trials in which participants imitated the manner action during the test phase for each age group. No main effect was found for linguistic presentation on imitation scores collapsed across the age groups, $F(1, 34) = 1.4$, $p = .24$, $\eta_p^2 = .04$; however, there was a significant Linguistic Presentation × Age Group interaction, $F(1, 34) = 4.84$, $p = .035$, $\eta_p^2 = .13$. As in Experiment 1, follow-up analyses revealed that 19-month-old infants did not preferentially imitate the English-speaking demonstrator ($M = .41$, $SD = .22$) significantly more often than the Spanish-speaking demonstrator ($M = .46$, $SD = .31$), two-tailed paired t test, $t(1, 17) = .64$, $p = .53$, $d = .19$, $r = .09$. In contrast, 3-year-old children did selectively imitate the manner actions presented by the English-speaking demonstrator ($M = .52$, $SD = .26$) significantly more often than they did the Spanish-speaking demonstrator ($M = .33$, $SD = .23$), two-tailed paired t test, $t(1, 17) = 2.76$, $p = .01$, $d = .77$, $r = .36$. Thus, 3-year-olds, but not 19-month-olds, preferred to imitate their linguistic in-group member.

When examining the imitative preferences on an individual level, 19-month-olds appeared equally divided among English- or Spanish-tendered actions. Of the 18 infants tested, 6 infants produced more English than Spanish manners at test, 7 infants produced more Spanish than English manners at test, and 5 infants produced an equal number of Spanish and English manners at test. In contrast, for the 3-year-old children, 10 of 18 children produced more English than Spanish manners at test, 2 of 18 children produced more Spanish than English manners at test, and 6 of 18 children produced an equal number of Spanish and English manners at test. These numbers further confirm that

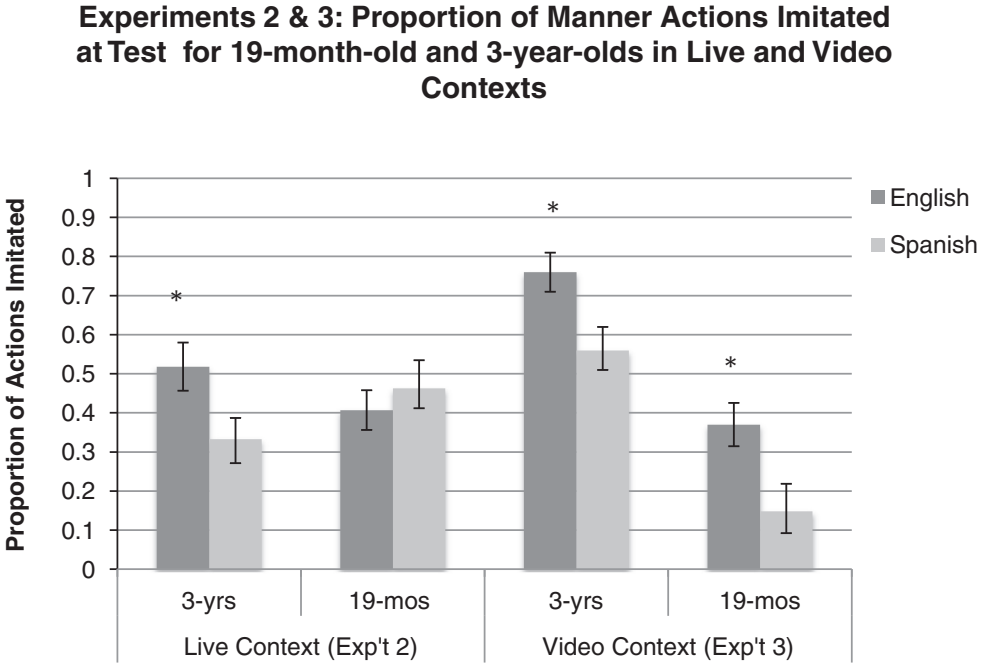

Figure 2. Proportion of trials in which infants and children performed English and Spanish manner actions at test in Experiments 2 and 3. *$p < .05$ and denotes differences between the imitation rates of Spanish or English manner actions.

3-year-olds selectively imitated the in-group demonstrator, whereas 19-month-olds did not.

During the first toy preference task, 16/18 of the 19-month-olds chose a toy, and 15/18 of the 3-year-olds chose a toy. Of those who chose a toy, six 19-month-olds (37.5%) first picked the out-group-endorsed toy and 10 (63.5%) picked the in-group-endorsed toy. Although this may indicate a slight preference for choosing the toy tendered by the English speakers, these choices did not differ significantly from chance, $\chi^2(1, 16) = 1$, $p = .32$. In the 3-year-old age range, 3 (20%) picked the out-group-endorsed toy, and 12 (80%) picked the in-group-endorsed toy. In this case, the 3-year-olds were significantly more likely than chance to choose the toy tendered by the English speaker at the start of the session, $\chi^2(1, 15) = 5.4$, $p = .02$.

During the second toy preference task, 15/18 of the 19-month-olds and all of the 3-year-olds chose a toy. Of those who chose a toy, eight 19-month-olds (53%) first picked the out-group-endorsed toy and 7 (47%) first picked the in-group-endorsed toy, which did not differ significantly from chance, $\chi^2(1, 15) = .07$, $p = .80$. In the 3-year-old group, 9 (50%) first picked the out-group-endorsed toy, and 9 (50%) first picked the in-group-endorsed toy. Similar to the younger age group, the 3-year-olds responded at chance during the second preference phase, $\chi^2(1, 18) = 0$, $p = 1.00$.

Discussion

Experiment 2 investigated whether infants (19-month-olds) or children (3-year-olds) would selectively imitate English or Spanish speakers immediately after seeing them demonstrate an action in person. Experiment 2 also included the addition of a preferential toy-taking task at both the beginning and end of the experiment in order to examine changes in toy-choice preferences over time.

As in Experiment 1, 19-month-old infants did not preferentially imitate the manner actions of the English speaker over the Spanish speaker, even when given the chance to imitate immediately after watching a live, contrastive demonstration. Furthermore, there were no reliable differences between the speakers with respect to infants' toy selection during either preference task. These findings contrast with previous work demonstrating that infants selectively imitate members of their own linguistic group after seeing a video demonstration (Buttelmann et al., 2013) and prefer to select a toy that had been endorsed in a video by a linguistic in-group member (Kinzler et al., 2007).

In contrast, 3-year-old children reliably imitated manner actions demonstrated by the English speaker over those of the Spanish speaker. Furthermore, during the initial preference task, the 3-year-olds preferred to take a toy from the English

speaker over the Spanish speaker. This preference faded by the end of the experiment, when 3-year-olds chose both the Spanish- and English-tendered toy at equal rates. This shift in preferences as the experiment progressed suggests that live experience with foreign-language speakers may lead children to be more willing to interact with a toy offered by an out-group informant.

Together, these results suggest a shift in children's responses to in-group versus out-group members across development. Older children appeared to learn from and preferentially imitate a live native-language speaker, while 19-month-olds imitated at high rates for both of the live Spanish- and English speakers. The 19-month-old findings confirm the results from Experiment 1, suggesting that infants may not be influenced by group membership in a live context, though preferential imitation has been found when similar information is presented via video (Buttelmann et al., 2013).

These findings are consistent with the view that resisting live social information may be demanding for infants, though older children appear able to selectively inhibit certain socially provided information (e.g., Ganea et al., 2011; Mascaro & Sperber, 2009) and thus, raise questions concerning the factors that could affect selective learning. It is possible that these developmental trends are due to the maturation of executive function abilities in preschool children (see Diamond, 2006), allowing older children to effectively inhibit imitation where younger infants cannot (see Mascaro & Sperber, 2009, for further discussion). It is also possible that younger children are particularly social and are willing to take in information from a number of potential informants regardless of group membership.

Critically, the 3-year-old findings confirm that the methods used here are capable of revealing selective in-group learning. Thus, the lack of selective responding in the 19-month-olds seems unlikely to reflect inadequacies in the methodology, but rather reflects a relative insensitivity to in-group/out-group status at this age. Since the findings of Experiments 1 and 2 are inconsistent with prior findings from studies using video models in infants younger than 19 months of age (Buttelmann et al., 2013), in Experiment 3 we evaluated whether the current methods would reveal selective learning in 19-month-olds if the demonstrations were shown on video rather than live demonstrations. We again tested a group of 3-year-old children as a point of comparison. On the basis of the results of Experiment 2, we expected that 3-year-old children would selectively avoid imitating the out-group model regardless of context.

Experiment 3

The results of Experiment 2 demonstrate that there are factors, such as age, that mediate differences in selective learning. However, the results of the 19-month-old group stand in stark contrast to the findings by Buttelmann et al. (2013), who demonstrated that infants just 5 months younger prefer to imitate a linguistic in-group member. It is possible that there is something particularly special about the latter part of the 2nd year of life, such as an increased desire to prosocially affiliate with other individuals (see Hay & Cook, 2007), causing the 19-month-olds to respond differently than both their younger and older peers. However, it is also possible that the stimuli used to test these social constructs have a significant impact on infants' imitation responses. As mentioned previously, Buttelmann et al. (2013), along with researchers examining linguistic in-group preferences (e.g., Kinzler et al., 2007; Kinzler et al., 2011), examined infant responses to video-recorded models and extrapolated these findings to live phenomenon. In Experiment 3, we examined whether presenting 19-month-old infants and 3-year-old children with the same demonstration events from our live conditions in Experiment 2 in a video format would result in selective learning from the in-group member.

Method

Participants

Eighteen full-term 19-month-olds (M = 19.4 months, range = 18.6–20.4 months; 10 females) and 18 full-term 3-year-olds (M = 39.0 months, range = 35.8–42.3 months, 11 females) participated in Experiment 3. Participants were recruited as in Experiments 1 and 2, and thus, only participants who heard English in 95% of their daily lives (based on parent report) participated in the experiment. The minority of participants (19-month-olds: 22%, 3-year-olds: 5%) were reported to have incidental exposure to languages other than English (average of these children's input was 1.55% for 19-month-olds and 2% for 3-year-olds according to parent report).

The sample of 19-month-old infants was 69% Caucasian, 30% African American, and 13% mixed/other. The sample of 3-year-olds was 72% Caucasian and 28% African American.

Procedure

The procedure was similar to that used in Experiment 2 and is thus briefly described below. First, upon entering the testing room, children sat on their parent's lap at a small laptop table, across from an experimenter. The experimenter and child completed a farm puzzle (19-month-olds) or farm animal matching game (3-year-olds) for approximately 2 min, allowing the child to become comfortable with the experimenter and testing room (*warm-up phase*).

After the warm-up phase, the warm-up toy was removed and the parents were asked to swivel their chair to face a 24-in. LCD computer monitor on which the demonstration videos (described below) were presented. The monitor was equipped with a Tobii T60XL eye-tracking system, which recorded participant gaze at a rate of 60 Hz per second, utilizing a noninvasive corneal reflection technique. Calibration was performed with a standard infant 9-point procedure. Gaze data were collected using the Tobii Studio software (Tobii Technology, Danderyd, Sweden).

After calibrating the eye tracker, the experimenter went behind a curtain partition and started the demonstration video. As in the live version from Experiment 2, the video presentation involved two bilingual female demonstrators, each who spoke only one language (either English or Spanish) throughout the video. Videos were shown in a split-screen presentation mode, such that particular actor would always appear on the same side of the screen, but the two actors would not appear on the screen simultaneously during the familiarization or demonstration phases.

The videos started with the actors greeting the child and introducing themselves ("Hello, my name is __ and I'm going to show you some toys" or "¡Hola, me llamo __ y voy a mostrarte unos juguetes!") one at a time (*familiarization phase*). When one demonstrator was speaking, the other side of the screen would go blank. Each demonstrator then proceeded through the same preference phase as described in Experiment 2. However, unlike Experiment 2, the experimenters simply placed their respective toy on the table in front of them in the video as opposed to presenting them to the child (*preference phase*). This phase was included in order to keep the timing of this experiment and exposure to both models as similar as possible to Experiment 2.

The demonstration phase began with the first demonstrator saying, "Hi! Let's see what this thing does" in her respective language before silently demonstrating one manner action and goal action on the toy. The demonstrator then said, "Let's see that again!" (or "¡Vamos a verlo otra vez!") and repeated the action sequence. After this demonstration, the screen went blank and the video for the second demonstrator would begin. After the second demonstration video ended, a still-picture of the two experimenters on their respective side was shown for 3 s as a way to assess children's visual preferences toward one actor over the actor.

Once children viewed both demonstrators acting on the same toy, the experimenter paused the video, reentered the room from behind the curtain partition, and placed the just-viewed toy set on the small laptop table. Parents were asked to swivel their chair momentarily away from the monitor and toward the laptop table. The experimenter then asked, "What does this thing do?" and the child was then allowed to act on the toy as in Experiments 1 and 2 (*test phase*).

Once the test phase for each toy was complete, parents rotated their chairs back toward the computer monitor; the experimenter went behind the curtain partition and started the second set of video demonstrations. This demonstration-test phase sequence was repeated for each of the remaining two toy sets.

The language each demonstrator spoke, the side of the screen on which their video was presented, and the manner actions performed by each demonstrator were counterbalanced across children; the presentation order of the toy sets was randomized for each child.

Coding and Reliability

Children's actions during the test trials were coded from video recordings by a trained research assistant blind to condition. Coding procedures for rates of imitation were the same as in Experiment 2. For all coding schemes, a second independent assistant coded 25% of the participants, with the two coders agreeing on 96% of total behavioral scores for the 19-month-olds (Cohen's $\kappa = 0.94$) and 100% of behavioral scores for the 3-year-olds (Cohen's $\kappa = 1.00$).

In order to examine attention to each actor, the data collected by the Tobii eye-tracker system were sorted and analyzed using Tobii Studio software (Tobii Software). Two areas of interest (AOIs) were defined for each video segment (familiarization, preference, and demonstration) and the still-pictures presented after each video clip. One AOI was drawn around the English speaker and one around

the Spanish speaker, allowing us to export information regarding the total looking time to each demonstrator.

Results

Figure 2 summarizes children's rates of English versus Spanish manner imitation during the test phase. As in Experiments 1 and 2, preliminary analyses revealed no reliable effects of gender, toy set, or trial number for either condition; therefore, subsequent analyses were collapsed across these factors. A 2 (age group: 19-month-olds, 3-year-olds) × 2 (linguistic presentation: English, Spanish) mixed-design ANOVA with linguistic presentation as the within-subject factor was conducted to compare the effects of linguistic group presentation on the proportion of trials in which children imitated the manner action during the test phase for each age group. A significant main effect was found for linguistic presentation on imitation scores collapsed across age, $F(1, 34) = 9.94$, $p = .003$, $\eta_p^2 = .87$. In contrast to Experiment 2, there was no significant Age Group × Linguistic Presentation interaction, $F(1, 34) = .019$, $p = .89$, $\eta_p^2 = .05$, revealing that, when action information was presented in a video-recorded context, both 19-month-olds and 3-year-olds preferred to imitate their linguistic in-group member. Follow-up analyses confirm that both 19-month-olds (English: $M = .37$, $SD = .30$, Spanish: $M = .15$, $SD = .23$), $t(17) = 2.20$, $p = .04$, and 3-year-olds (English: $M = .76$, $SD = .27$, Spanish: $M = .56$, $SD = .28$), $t(17) = 2.26$, $p = .04$, imitated the manner actions enacted by the English speaker significantly more often than the manner actions enacted by the Spanish speaker.

Next, we compared the performance of infants in this experiment to the performance of infants in Experiment 2 to directly test the effect of presentation format (live vs. video-recorded) on 19-month-olds' linguistic group imitation. A 2 (linguistic presentation: English or Spanish) by 2 (context: live or video) mixed-design ANOVA with linguistic presentation as the within-subjects factor revealed a main effect of context, $F(1, 34) = 8.80$. $p = .00$, $\eta_p^2 = .21$, and a significant Linguistic Presentation × Context interaction, $F(1, 34) = 4.38$, $p = .04$, $\eta_p^2 = .14$. Planned contrasts examining imitation rates for both the English speaker and the Spanish speaker across contexts indicate that infants imitated the English speaker equally whether they were live ($M = .41$, $SD = .21$) or video-recorded ($M = .37$, SD = .30), $t(1, 34) = .42$, $p = .67$, $d = .15$, $r = .07$. In contrast, infants imitated the Spanish speaker significantly more often when she was live ($M = .46$, $SD = .31$) than when she was video-recorded ($M = .15$, $SD = .23$), $t(1, 34) = 3.46$, $p = .00$, $d = 1.14$, $r = .49$. Importantly, these results confirm that overall levels of imitation did not decrease when the models were presented via video as in Experiment 3. Instead, the results confirm that infants showed reduced imitation rates in Experiment 3 only in the case of the videotaped Spanish speaker.

The same analyses were repeated with the 3-year-old data to examine whether there were significant differences between performance in live (Experiment 2) versus video-recorded (Experiment 3) contexts. A 2 (linguistic presentation: English or Spanish) × 2 (context: live or video) mixed-design ANOVA with linguistic presentation as the within-subjects factor revealed a main effect of linguistic presentation, $F(1, 34) = 11.99$, $p = .001$, $\eta_p^2 = .26$, demonstrating that 3-year-olds imitated the English speaker ($M = .64$, $SD = .28$) significantly more often than the Spanish speaker ($M = .44$, $SD = .29$) across contexts. Furthermore, there was a main effect of context, $F(1, 34) = 11.95$, $p = .001$, $\eta_p^2 = .26$, with children imitating significantly more manner actions overall in the video-recorded ($M = .66$, $SD = .19$) as opposed to live ($M = .43$, $SD = .19$) context. Unlike the 19-month-old age group, there was no significant Linguistic Presentation × Context interaction.

Gaze trace data collected from the Tobii eye-tracking monitor suggest that these imitation differences from video models were not due to differences in children's attention to the in-group speaker and out-group speakers. Across all experiment segments, children looked equally to both the English-speaking demonstrator and the Spanish-speaking demonstrator (see Table 2). Two 19-month-old infants and three 3-year-old children were excluded from eye-tracking analysis due to insufficient eye-tracking data collection.

Discussion

Unlike Experiments 1 and 2, Experiment 3 demonstrates that 19-month-old infants *do* selectively imitate linguistic in-group members over out-group members. This finding coincides with previous research, demonstrating that children selectively imitate actions from linguistic in-group models within the first 2 years of postnatal life (Buttelmann et al., 2013). However, considering these findings in conjunction with those of Experiments 1 and 2, our findings suggest that this selective learning is specific to video-recorded contexts. In Experiment 3,

Table 2
Mean Gaze (in s) to the English and Spanish Models During Experiment 3

Experiment phase	Gaze—English model	Gaze—Spanish model
19-month-olds familiarization	2.87 (± 1.18)	2.80 (± 1.58)
Toy-choice preference	3.70 (± 1.98)	4.42 (± 2.18)
Demonstration	42.39 (± 22.34)	38.55 (± 26.18)
Still-picture	1.93 (± 1.05)	1.86 (± 1.56)
3-year-olds familiarization	2.91 (± 1.66)	2.85 (± 1.44)
Toy-choice preference	4.32 (± 2.54)	3.65 (± 2.62)
Demonstration	48.75 (± 23.78)	43.31 (± 28.28)
Still-picture	2.00 (± 1.19)	1.55 (± 1.00)

Note. Planned contrasts revealed no significant differences between mean gaze length to the English or Spanish models in any of the following test phases: 19-month-olds: familiarization, $t(1, 15) = 0.25$, $p = .80$; toy-choice preference, $t(1, 15) = 1.18$, $p = .26$; demonstration, $t(1, 15) = 0.87$, $p = .40$; and still-picture, $t(1, 15) = 0.15$, $p = .88$. Three-year-olds: familiarization, $t(1, 14) = 0.19$, $p = .85$; toy-choice preference, $t(1, 14) = 1.00$, $p = .33$; demonstration, $t(1, 14) = 0.98$, $p = .34$; and still-picture, $t(1, 14) = 1.13$, $p = .28$.

19-month-olds were presented with exactly the same stimuli as in Experiment 2, except there were no live models in the room and all of the demonstrations were presented via video format. Under these circumstances, infants reduced their tendency to imitate the out-group (Spanish) speaker, while imitating the English speaker at the same rate as in the live context.

In contrast, 3-year-old children imitated the in-group model significantly more than the out-group model under both live (Experiment 2) and video-recorded (Experiment 3) contexts. This confirms the results of Experiment 2, demonstrating that by 3 years of age children are robustly able to screen out out-group informants. Interestingly, 3-year-olds appeared to imitate members of both linguistic groups at significantly higher rates when the action demonstration was presented in a video-recorded as opposed to live format. Such findings indicate that 3-year-olds are past the influence of the video-deficit effect (see Barr, 2010) and are able to robustly learn from information presented in video.

Across both age groups, selectively imitating the in-group member in the video context did not depend on differential attention to the English versus Spanish speaker. Indeed, both 19-month-olds and 3-year-olds attended to the demonstrators equally, though they imitated the in-group member more frequently.

General Discussion

The current experiments were motivated by observations that, under some circumstances, children prefer informants from within their own social group (e.g., Buttelmann et al., 2013) while in others, children are unable to ignore even maladaptive information (see Ganea et al., 2011; Jaswal et al., 2010; Mascaro & Sperber, 2009; Palmquist et al., 2012). Our results shed light on this apparent contradiction in the literature and thus illuminate the nuanced nature of children's early social learning.

In keeping with prior findings (e.g., Buttelmann et al., 2013) our results show that, in some cases, infants and young children are discriminating social learners. English-speaking 3-year-old children were more likely to imitate the actions of a live and video-recorded English-speaking model than the actions of a Spanish-speaking model. Nineteen-month-old infants showed the same learning bias, but only when they viewed the modeled actions on video. Thus, infants and young children are sensitive to linguistic in-group status, and can use this information to modulate their early social learning.

However, our findings also reveal that children's propensity to modulate their learning in this way varies as a function of the learning context and over the course of development. When 19-month-old infants viewed the actions of live models, rather than videos, they showed robust imitation of both English- and Spanish-speaking models, and their tendency to imitate the two models did not differ. This pattern emerged in both a between-subjects design, in which infants viewed either an English- or Spanish-speaking model (Experiment 1), and in a within-subjects design that offered infants the opportunity to compare the English- and Spanish-speaking models (Experiment 2). In contrast, 3-year-olds selectively imitated the live English speaker's actions over the actions of the Spanish speaker regardless of context.

These results indicate that infants can modulate their learning based on social category information; however, these effects are not pervasive across learning contexts and they may change with development. This is important for understanding the implications of laboratory-based studies for children's everyday social learning, as most of the real-world contexts to which this research is relevant involve interactions with live social partners. The preferences documented in video studies might not have direct implications for how children learn from parents, caregivers, teachers, and peers. Indeed, there is a great deal of information in

others' actions, even when social partners differ from the child in social category membership, and so it is not obvious that an across-the-board resistance to out-group informants would be adaptive. Although an in-group member may provide culturally appropriate information regarding object use, completely screening out out-group information could entail ignoring potentially useful or more efficient action patterns.

More generally, since research in children's selective learning often uses video models (e.g., Corriveau & Harris, 2009; Koenig & Jaswal, 2011), the same issues arise for the broader question of children's ability to learn selectively. For example, children may be less resistant to unreliable or nefarious informants in live as compared to video contexts. On the other hand, the utility of avoiding unreliable information may mean that children are more consistently resistant to unreliable informants across formats as compared to out-group informants. Further research is needed to investigate this issue.

Our findings raise the question of what cognitive and contextual factors affect children's selective learning. They highlight several factors that may be particularly important, including social motivation, the social relationship between the informant and the child, and developments in executive function abilities. As discussed earlier, there are several factors that differ across video and live interactions, which may modulate the child's ability to learn from one informant over another. For example, the presence of joint attention and other communicative behaviors may signal that the model's actions are intended to be informative (see Csibra & Gergely, 2009; Gergely & Csibra, 2006). Indeed, referential communicative cues have been shown to affect the extent to which infants can inhibit information provided by an adult (e.g., Topal, Gergely, Miklosi, Erdohegyi, & Csibra, 2008). Beyond communicative cues, live events may simply be more salient, and therefore, more difficult to inhibit, than information provided via video (see the *video deficit effect*; Anderson & Pempek, 2005; see also Kuhl, 2007).

It seems possible that the presence of more salient communicative factors in the live conditions, such as contingent social eye gaze and interaction, could have overridden 19-month-olds' avoidance of the information provided by the Spanish-speaking demonstrator. Indeed, interacting contingently with a social partner via closed-circuit television can reduce video deficits in 2-year-old children (Nielsen et al., 2008; Troseth, Saylor, & Archer, 2006), suggesting that the lack of reciprocal communication may account for decreased learning from video in young children. The results of Experiment 3 support this idea, demonstrating that infants were able to selectively screen out the out-group informant when the demonstrations were presented on video.

There may be developmental variation in the extent to which live social interactions are socially compelling. During the 2nd year of life, infants' burgeoning prosociality is evident in a plethora of behaviors such as sharing (e.g., Svetlova, Nichols, & Brownell, 2010), increased empathy (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992), spontaneous helping (e.g., Rheingold, 1982; Warneken & Tomasello, 2007), and comforting behaviors (Demetriou & Hay, 2004), many of which have been theorized to coincide with other cognitive developments such as self-recognition or self–other differentiation (see also Brownell, 2011). This rapid increase in the understanding of others desires, beliefs, and feelings may mean that 19-month-olds are particularly responsive to social partners, and they find it difficult to ignore some models in favor of others. This is further supported by research demonstrating that the responsiveness of social partners influences imitation rates at 18-months, though older children appear unaffected by such factors (Nielsen, 2006), suggesting a particular sensitivity to the social components of an event.

Resisting a compelling social message may require inhibitory control, an ability that develops dramatically through early childhood (see Diamond, 2006). In the current experiments, selectively choosing information from one of two possible informants required the ability to imitate the action of one informant while inhibiting imitation of the other. Age-related changes in the ability to inhibit learning from inaccurate or malicious informants begin to emerge between the 3rd and 4th years of life (Ganea et al., 2011; Mascaro & Sperber, 2009), suggesting a link between inhibitory abilities and selective learning. Thus, it is possible that limitations in inhibitory control contributed to the differences in infants and 3-year-olds' responses to live out-group informants in the current experiments. Even so, our findings show that infants can resist out-group informants presented on video. Thus, to the extent that resisting modeled information requires inhibitory control, even infants can meet this challenge in some contexts. Further research is needed to fully evaluate the potential effects of individual and age-related variation in inhibitory control on children's selective imitation.

Finally, the findings at 3 years suggest that familiarity or an interactive history with the informant may affect the child's dispreference for an out-group individual. In the toy selection preference task (Experiment 2), 3-year-olds selectively avoided the toy offered by the Spanish speaker, but this tendency dissipated over the course of the session. In other words, interacting with an out-group member who appears friendly and provides interesting information may quickly override initial hesitancies, even when children are old enough to effectively inhibit learning. It is also important to note that even though 3-year-old children preferentially imitated the in-group member's actions, they did not entirely ignore the information tendered by the out-group member. A minority of children imitated both the Spanish and English speakers. This suggests that, while 3-year-olds realize it may be important to attend to the actions of the in-group, they do not completely disregard what could potentially be useful information from out-group members. Future research could explore the possibility that this pattern may become more pronounced with age.

Taken together, these results shed new light on the nuanced nature of selective in-group learning. Our findings demonstrate that preferring to interact with (e.g., take a toy from) or selectively learn from (e.g., imitate) in-group members may change in significant and meaningful ways across development as social motivations and cognitive abilities mature. These findings open new doors for studying in-group preference, highlighting the need for consistent methodological testing across many ages, careful consideration of experimental stimuli, and a focus on the developmental underpinnings that mediate young children's tendency to be selective in the informants they learn from.

References

Anderson, D. R., & Pempek, T. A. (2005). Television and very young children. *American Behavioral Scientist*, *48*, 505–522. doi:\10.1177/0002764204271506

Barr, R. (2010). Transfer of learning between 2D and 3D sources during infancy: Informing theory and practice. *Developmental Review*, *30*, 128–154. doi:\10.1016/j.dr.2010.03.001

Birch, S. A. J., Akmal, N., & Frampton, K. (2010). Two-year-olds are vigilant of others' non-verbal cues to credibility. *Developmental Science*, *13*, 363–369. doi:\10.1111/j.1467-7687.2009.00906.x

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*, 1018–1034. doi:\10.1016/j.cognition.2007.12.008

Brownell, C. A. (2011). Early developments in joint action. *Review of Philosophy and Psychology*, *2*, 193–211. doi:\10.1007/s13164-011-0056-1

Buttelmann, D., Zmyj, N., Daum, M. M., & Carpenter, M. (2013). Selective imitation of in-group over out-group members in 14-month-old infants. *Child Development*, *84*, 422–428. doi:\10.1111/j.1467-8624.2012.
01860.x

Corriveau, K. H., & Harris, P. L. (2009). Preschoolers continue to trust a more accurate informant 1 week after exposure to accuracy information. *Developmental Science*, *12*, 188–193. doi:\10.1111/j.1467-7687.2008.00763.x

Couillard, N. L., & Woodward, A. L. (1999). Children's comprehension of deceptive points. *British Journal of Developmental Psychology*, *17*, 515–521. doi:\10.1348/0261
51099165447

Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, *13*, 148–153. doi:\10.1016/j.tics.2009.01.005

Demetriou, H., & Hay, D. F. (2004). Toddlers' reactions to the distress of familiar peers: The importance of context. *Infancy*, *6*, 299–318. doi:\10.1207/s15327078in0602_9

Diamond, A. (2006). The early development of executive functions. In E. Bialystok & F. Craik (Eds.), *Lifespan cognition: Mechanisms of change* (pp. 70–95). New York, NY: Oxford University Press.

Ganea, P., Koenig, M. A., & Millet, K. (2011). Changing your mind about things unseen: Toddlers' sensitivity to prior reliability. *Journal of Experimental Psychology*, *109*, 445–453. doi:\10.1016/j.jecp.2011.02.011

Gergely, G., & Csibra, G. (2006). Sylvia's recipe: The role of imitation and pedagogy in the transmission of human culture. In N. J. Enfield & S. C. Levinson (Eds.), *Roots of human sociality: Culture, cognition, and human interaction* (pp. 229–255). Oxford, UK: Berg.

Hay, D., & Cook, K. (2007). The transformation of prosocial behavior from infancy to childhood. In C. A. Brownell & C. B. Kopp (Eds.), *Socioemotional development in the toddler years: Transitions and transformations* (pp. 100–131). New York, NY: Guilford Press.

Henderson, A. M. E., Sabbagh, M. A., & Woodward, A. (2013). Preschoolers' selective learning is guided by the principle of relevance. *Cognition*, *126*, 246–257. doi:\10.1016/j.cognition.2012.10.006

Jaswal, V. K. (2010). Believing what you're told: Young children's trust in unexpected testimony about the physical world. *Cognitive Psychology*, *61*, 248–272. doi:\10.1016/j.cogpsych.2010.06.002

Jaswal, V. K., Croft, A. C., Setia, A. R., & Cole, C. A. (2010). Young children have a specific, highly robust bias to trust testimony. *Psychological Science*, *21*, 1541–1547. doi:\10.1177/0956797610383438

Jones, S. (2007). Imitation in infancy: The development of mimicry. *Psychological Science*, *18*, 593–599. doi:\10.1111/j.1467-9280.2007.01945.x

Kinzler, K. D., Corriveau, K. H., & Harris, P. L. (2011). Children's selective trust in native-accented speakers. *Developmental Science*, *14*, 106–111. doi:\10.1111/j.1467-7687.2010.00965.x

Kinzler, K. D., Dupoux, E., & Spelke, E. S. (2007). The native language of social cognition. *Proceedings of the National Academy of Sciences of the United States of America*, *104*, 12577–12580. doi:\10.1073/pnas.0705345104

Kinzler, K. D., Dupoux, E., & Spelke, E. S. (2012). Native objects and collaborators: Infants' object choices and acts of giving reflect favor for native over foreign speakers. *Journal of Cognition and Development*, *13*, 67–81. doi:\10.1080/15248372.2011.567200

Király, I. (2009). The effect of the model's presence and of negative evidence on infants' selective imitation. *Journal of Experimental Child Psychology*, *102*, 14–25. doi:\10.1016/j.jecp.2008.06.003

Király, I., Csibra, G., & Gergely, G. (2013). Beyond rational imitation: Learning arbitrary means actions from communicative demonstrations. *Journal of Experimental Child Psychology*, *116*, 471–486. doi:\10.1016/j.jecp.2012.12.003

Koenig, M. A., Clement, F., & Harris, P. L. (2004). Trust in testimony: Children's use of true and false statements. *Psychological Science*, *15*, 694–698. doi:\10.1111/j.0956-7976.2004.00742.x

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*, 1261–1277. doi:\10.1111/j.1467-8624.2005.00849.x

Koenig, M. A., & Jaswal, V. K. (2011). Characterizing children's expectations about expertise and incompetence: Halo or pitchfork effects? *Child Development*, *82*, 1634–1647. doi:\10.1111/j.1467-8624.2011.01618.x

Kuhl, P. K. (2007). Is speech learning "gated" by the social brain? *Developmental Science*, *10*, 110–120. doi:\10.1111/j.1467-7687.2007.00572.x

Kushnir, T., Vredenburgh, C., & Schneider, L. A. (2013). "Who can help me fix this toy?" The distinction between causal knowledge and word knowledge guides preschoolers' selective requests for information. *Developmental Psychology*, *49*, 446–453. doi:\10.1037/a0031649

Mangold, P. (1998). Interact [Computer software]. Arnstorf, Germany: Mangold International.

Mascaro, O., & Sperber, D. (2009). The moral, epistemic, and mindreading components of children's vigilance towards deception. *Cognition*, *112*, 367–380. doi:\10.1016/j.cognition.2009.05.012

Meltzoff, A. (1988). Infant imitation after a 1-week delay: Long-term memory for novel acts and multiple stimuli. *Developmental Psychology*, *24*, 470–476. doi:\10.1037/0012-1649.24.4.470

Neilsen, M., & Dissanayake, C. (2004). Pretend play, mirror self-recognition and imitation: A longitudinal investigation through the second year. *Infant Behavior and Development*, *27*, 342–365. doi:\10.1016/j.infbeh.2003.12.006

Nielsen, M. (2006). Copying actions and copying outcomes: Social learning through the second year. *Developmental Psychology*, *42*, 555–565. doi:\10.1037/0012-1649.42.3.555

Nielsen, M. (2008). The social motivation for social learning. *Behavioral and Brain Sciences*, *31*, 33. doi:\10.1017/S0140525X0700324X

Nielsen, M., & Blank, C. (2011). Imitation in young children: When who gets copied is more important than what gets copied. *Developmental Psychology*, *47*, 1050–1053. doi:\10.1037/a0023866

Nielsen, M., Simcock, G., & Jenkins, L. (2008). The effect of social engagement on 24-month-olds' imitation from live and televised models. *Developmental Science*, *11*, 722–731. doi:\10.1111/j.1467-7687.2008.00722.x

Nielsen, M., & Tomaselli, K. (2010). Overimitation in Kalahari Bushman children and the origins of human cultural cognition. *Psychological Science*, *21*, 729–736. doi:\10.1177/0956797610368808

Over, H., & Carpenter, M. (2012). Putting the social into social learning: Explaining both selectivity and fidelity in children's copying behavior. *Journal of Comparative Psychology*, *126*, 182–192. doi:\10.1037/a0024555

Palmquist, C. M., Burns, H. E., & Jaswal, V. K. (2012). Pointing disrupts preschoolers' ability to discriminate between knowledgeable and ignorant informants. *Cognitive Development*, *27*, 54–63. doi:\10.1016/j.cogdev.2011.07.002

Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development*, *53*, 114–125. doi:\10.2307/1129643

Sabbagh, M. A., & Baldwin, D. A. (2001). Learning words from knowledgeable versus ignorant speakers: Links between preschoolers' theory of mind and semantic development. *Child Development*, *72*, 1054–1070. doi:\10.1111/1467-8624.00334

Scofield, J., Gilpin, A. T., Pierucci, J., & Morgan, R. (2013). Matters of accuracy and conventionality: Prior accuracy guides children's evaluations of others' actions. *Developmental Psychology*, *49*, 432–438. doi:\10.1037/a0029888

Shutts, K., Banaji, M. R., & Spelke, E. S. (2010). Social categories guide young children's preferences for novel objects. *Developmental Science*, *13*, 599–610. doi:\10.1111/j.1467-7687.2009.00913.x

Shutts, K., Kinzler, K. D., McKee, C. B., & Spelke, E. S. (2009). Social information guides infants' selection of foods. *Journal of Cognition and Development*, *10*, 1–17. doi:\10.1080/15248370902966636

Svetlova, M., Nichols, S., & Brownell, C. (2010). Toddlers' prosocial behavior: From instrumental to empathic to altruistic helping. *Child Development*, *81*, 1814–1827. doi:\10.1111/j.1467-8624.2010.01512.x

Topal, J., Gergely, G., Miklosi, A., Erdohegyi, A., & Csibra, G. (2008). Infants' perseverative search errors are induced by pragmatic misinterpretation. *Science*, *321*, 1831–1834. doi:\10.1126/science.1161437

Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young children's use of video as a source of socially relevant information. *Child Development*, *77*, 786–799. doi:\10.1111/j.1467-8624.2006.00903.x

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*, 61–71. doi:\10.1002/icd.591

Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy*, *11*, 271–294. doi:\10.1111/j.1532-7078.2007.tb00227.x

Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology*, *28*, 126–136. doi:\10.1037//0012-1649.28.1.126