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Afshordi, N., et al. (2018). Children's Third-Party Understanding of Communicative Interactions in a Foreign Language. *Collabra: Psychology*, 4(1): 2, pp. 1–10, DOI: https://doi.org/10.1525/collabra.105

ORIGINAL RESEARCH REPORT

Children's Third-Party Understanding of Communicative Interactions in a Foreign Language

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Two studies explored young children's understanding of the role of shared language in communication by investigating how monolingual English-speaking children interact with an English speaker, a Spanish speaker, and a bilingual experimenter who spoke both English and Spanish. When the bilingual experimenter spoke in Spanish or English to request objects, four-year-old children, but not three-year-olds, used her language choice to determine whom she addressed (e.g. requests in Spanish were directed to the Spanish speaker). Importantly, children used this cue – language choice – only in a communicative context. The findings suggest that by four years, monolingual children recognize that speaking the same language enables successful communication, even when that language is unfamiliar to them. Three-year-old children's failure to make this distinction suggests that this capacity likely undergoes significant development in early childhood, although other capacities might also be at play.

Keywords: communication; conventionality; metalinguistic awareness

Language unlocks a child's capacity to accumulate vast amounts of information from – and about – other people. Spoken language allows the transfer of information between speakers and listeners *if* they share knowledge of the same linguistic conventions, the arbitrary relations between symbols and their meanings (Saussure, 1916/1983). But what, if anything, do children understand about communication between two people speaking a foreign language that they cannot comprehend? A large body of research has explored how children learn to speak and understand a second language, but it remains unclear how children reason about communicative interactions in a foreign language – which occurs without access to the meaning of speakers' utterances. The current studies directly tested whether preschool-aged children recognize that a shared language between two speakers is at the crux of what enables successful communication.

Previous research suggests that even young children are aware of general features of verbal communication. Children use their own speech and gestures to provide information to listeners, keeping track of others' knowledge and monitoring correct comprehension of their communicative efforts (Grosse, Behne, Carpenter, & Tomasello, 2010; Matthews, Lieven, Theakston, & Tomasello, 2006; Wittek & Tomasello, 2005). Children are also often privy to others' conversations, and can accurately interpret such overheard communicative interactions. For example, infants expect a speaker to speak toward another individual rather than toward inanimate objects (Molina, van de Walle, Condry, & Spelke, 2009), use a speaker's gaze to locate her audience (Beier & Spelke, 2012), and look toward listeners in anticipation of their response to others' speech (Thorgrímsson, Fawcett, & Liszkowski, 2015). Infants also seem to appreciate that speech provides information, expecting a listener to respond appropriately to speech, but not to non-speech vocalizations (e.g., a cough; Martin, Onishi, & Vouloumanos, 2012; see also Cheung, Xiao, & Lai, 2012; Song, Onishi, Baillargeon, & Fisher, 2008; Vouloumanos, Martin, & Onishi, 2014; Vouloumanos, Onishi, & Pogue, 2012).

The communicative transfer of information depends not only on the use of language, but specifically on the use of a language *shared* between speaker and listener. There is evidence that young children have some understanding of this dependency. Infants expect two people to share knowledge of common nouns (Buresh & Woodward, 2007; Graham, Stock, & Henderson, 2006; Henderson & Graham, 2005; Henderson & Woodward, 2012) but this expectation of shared knowledge does not extend to proper names (Diesendruck, 2005) or preferences (Fawcett & Markson, 2010a). At the level of specific languages, infants distinguish between the sounds (Mehler, Jusczyk, Lambertz, Halsted, Bertoncini, & Amiel-Tison, 1988) and speakers of their own and other languages (Kinzler, Dupoux, & Spelke, 2007), and prefer speakers of their own language

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(e.g., Kinzler et al., 2007; Kinzler, Dupoux, & Spelke, 2012). Whereas children could simply prefer people who sound familiar (e.g. Experiment 2 in Kinzler, Shutts, DeJesus, & Spelke, 2009), these preferences may alternatively support, or in fact reflect, children's desire to engage and communicate with others who speak their language. But how do children view speech that is in a (foreign) language that they do not understand? The language communities that children inhabit are far from uniform, and many monolingual children grow up within a broader multilingual environment (e.g., Akhtar, Menjivar, Hoicka, & Sabbagh, 2012; Fan, Liberman, Kinzler, & Keyzar, 2015). It is thus important to understand how children reason about interactions across unfamiliar languages. Additionally, understanding how children think about language transactions that occur in the absence of meaning can inform our knowledge of children's concept of communication. Critically, the extant evidence leaves unanswered the question of whether children recognize that a common language is a necessary component for successful communication between a speaker and listener, and that this is independent of the child's own knowledge.

Study 1 uses a novel task to ask whether children recognize that speaking the same language enables two people to communicate, regardless of whether that language is familiar or unfamiliar to children. During the study, English-speaking children interacted with three adults: two monolingual actors who spoke exclusively in English or in Spanish, respectively, and a bilingual experimenter who spoke both in English and in Spanish. Children then watched the experimenter request several objects from the actors using either English or Spanish, and were instructed by the experimenter to retrieve the object from the intended person. Beyond her choice of language, the experimenter did not indicate to whom she was speaking. If children understand that shared language enables communication, then they should recognize that the experimenter's language is a clear cue to which actor she addressed, and approach the corresponding listener.

Study 1

Method

Participants

Thirty typically developing, monolingual, English-speaking three- (N = 15, M_{age} = 42.7 months, range 37 to 47 months, 7 girls) and four-year-old (N = 15, M_{age} = 53.9 months, range = 48 to 58 months, 8 girls) children participated in a university lab. An additional seven three-year-old children were excluded from analyses for failing to complete the procedure (3), or a side/actor bias, which was predetermined as choosing the same actor on all six trials (4). The monolingual actors remained seated in the same relative locations during the test phase (on the right or left hand side); therefore approaching the same actor on all six trials could reflect a side or an actor bias. The exclusion criteria of dismissing participants who demonstrated this pattern of choices was made prior to beginning data collection. Parental consent and child assent were obtained prior to testing, and children received a small toy after participating. The IRB at Washington University in St. Louis granted ethical approval for the current research.

Parents completed a questionnaire providing information about the language environment of their child. The criterion for being monolingual was based on parental report of whether their child spoke another language. None of the parents reported that their child spoke a language other than English, thus all of the children in our sample were monolingual. Nearly every child (N = 27) had limited exposure to a language other than English, but this exposure was typically not in a direct, communicative context. Children were mostly exposed through television (N = 16; e.g. *Dora the Explorer*), and the rest through family (e.g. grandparents; N = 6) or community settings (e.g. playgroups; N = 5). Exposure through family typically happened during occasional visits to extended family members. Parents were also asked about the linguistic diversity in their community (i.e. whether it was primarily English-speaking or linguistically diverse). No parent reported their community as linguistically diverse.

Materials

During familiarization, children saw a "Favorites" book, which displayed images of several familiar objects on each page (e.g. animals, snacks). At test, children played a "Curious George" game presented via a laptop computer, which provided motivation for the child's actions. A tray with three attached clear plastic cups covered the laptop keyboard; the laptop screen displayed three identical images of a familiar object hovering above three onscreen cups (see **Figure 1**). The objects were toy cars, bouncy balls, toy shoes, toy trucks, toy chairs, rubber ducks, shells, and toy frogs. The experimenter gave children physical instances of these objects, and when the child placed the object in the tray cup, the experimenter used a wireless remote to activate an animation showing the onscreen object sliding into the onscreen cup. If the child placed the appropriate objects in all three cups, a short video clip showed a Curious George puppet playing with the object. During the test phase, the two monolingual actors each had an opaque bag under her chair containing six items. Three of these items matched the object the experimenter would ask for in their language, so that they could provide the child with the appropriate object when approached on matching trials. The three remaining objects were foils (toy candle, toy pig, toy star) that were never requested in either language. The actor gave the child one of the foil objects if s/he approached her on a trial in which the object was asked for in the other language.

Procedure

Children participated in a familiarization phase followed by a test phase involving three female adults: a bilingual experimenter and two monolingual actors. The experimenter spoke in English and Spanish, whereas one actor spoke only in English (henceforth EA) and the other only in Spanish (henceforth SA). The experimenter first introduced the child to the two actors, saying, "This is my friend, [EA's name]. She goes to the same school as me."

Figure 1: Sample displays from the computer game that children played. The display on the computer screen at the start of the trial with toy shoes (top left). If all three shoes were retrieved and placed in the physical cups, the experimenter changed the computer display to reflect this (top right), and children viewed a short video of Curious George playing with the shoe (bottom). Each display encompassed the whole laptop screen.

and, "This is my friend, [SA's name]. She is visiting from a place far away from here." When being introduced, the actors smiled in order to appear friendly, but did not speak.

Familiarization phase. For each page in the "Favorites" book, the experimenter first asked the child to pick his or her favorite item, then asked each actor about their preference, using the appropriate language (i.e., "Which is your favorite, [EA]?" and "Cual es tu favorito, [SA]?"). Each actor responded with a statement describing her preference; for example, the EA might say, "I love pandas because they are really cute. Pandas are my favorite", and the SA might say, "Me gusta jugar con mi perro. Perros son mis favoritos." When speaking, each actor pointed to the relevant item in the "Favorites" book, while looking at the book, the child, and the experimenter in turn. Each actor was asked first on half of the trials. Given that children prefer people who share their preferences (Fawcett & Markson, 2010b), each experimenter agreed with the child's preference twice. The actors' actual choices varied across children, given whether they chose or did not choose the same item as the child on that trial. After finishing the "Favorites" book, the experimenter asked the child to play another game in the adjoining room. She then asked each actor, using the appropriate language, whether she had work to do. Each actor replied that she did, and remained in the original room.

Test phase. The child and experimenter then moved into the adjacent room, leaving the door open, and stood in front of the laptop placed on a child-sized table. The experimenter drew the child's attention to the cups on the tray covering the keyboard and told the child that they were going to play a game in which the goal was to put objects in the cups. She explained that if they put the right toys in the cups, then Curious George could play with the toy and they would see him playing. The first trial acted as a warm-up during which the experimenter provided all three objects, demonstrated how to put the objects into the cups, activated a video of the puppet, and praised the child for finding the correct toys.

For each of six subsequent test trials, the experimenter presented children with only two of the three needed toys. The experimenter explained that her friend had the missing third toy –without specifying which friend– so the experimenter would ask for it, but the child must go to retrieve it. The experimenter then said, "Pay attention to who I'm asking, because you only get one chance." The experimenter and child then walked to the door of the original room, where the two actors sat equidistant from the door, each reading a paper in her lap, with an opaque bag under her chair. The experimenter said, "Hey!" and both actors looked up ("Hey" can be used to attract attention in both English and Spanish). The experimenter then requested the object using English (on three trials) or Spanish (on three trials): "We need another [object]! We need one more [object]." or "Necessitamos otro/a [object]! Necessitamos [object] mas." While making these requests, the experimenter looked at the wall equidistant between the two actors, to avoid providing visual cues to

which actor was being addressed. The experimenter then encouraged the child to retrieve the object, saying, "Can you go get it?" If the child did not approach an actor, the experimenter waited five seconds before asking again. If necessary, after an additional five seconds she asked, "Who should you go get it from? Can you point?"

The actors looked at the experimenter until the child's choice was clear to them (the child either approached or pointed toward them). The chosen actor then retrieved an object from the bag under her chair and gave it to the child. Children received the requested object only if they approached the matching actor (e.g. SA when Spanish was used). If they approached the non-matching actor (e.g. SA when English was used), children received a foil object, to avoid the impression that both actors understood both languages. The actors provided children with the correct objects only when they were approached on appropriate trials. If children received the correct objects on all trials, regardless of the language spoken, those who had the knowledge to solve the task correctly may have inferred that they were misunderstanding the purpose of the object retrievals and changed their pattern of response as a result.

After retrieving an object, the experimenter encouraged the child to place the object into the third cup. If the child had received the requested object, the puppet video was activated. If the child received a foil object, the experimenter did not play the puppet video and said, "I guess we didn't get the right toy for George" and proceeded to the next test trial. To ensure that the session ended positively, all three objects were provided and the puppet video was played for a final post-test trial. The order of presentation of the objects for each participant was one of three randomized versions.

Parents observed silently from the side of the room and were instructed to respond neutrally to any interaction initiated by the child. Test sessions were recorded by two video cameras, directed toward the child's face and toward the monolingual actors' faces.

Design

Of the six test trials, three featured English and three featured Spanish. The dependent measure was the actor children approached on each test trial. The order of test trials was randomized within a child and counterbalanced across children with three constraints: Spanish was always used first, English second, and across the four subsequent trials, the same language was used no more than two trials in a row. Given previous findings that children prefer to receive objects from speakers of their own language (Kinzler et al., 2012), children might approach the English-speaking actor on the first trial either because they thought that she understood a request in English, or because they prefer to receive objects from English speakers. By using Spanish on the first test trial, this preference would work against our prediction that the language used on the trial would guide children's responses.

Coding

Recordings from the two cameras were synchronized into one video file. A coder watched the videos with the sound muted, blind to the language used by the experimenter on each trial. The coder first recorded which actor the child chose. Given that the actors were not blind to the language used on each trial (they could hear the experimenter), when possible, the coder also recorded when the child's choice became clear to her and when the "chosen" actor reacted by retrieving the object (via time stamp, using a child's face/body orientation and trajectory toward the actors, any gestures, and the actor's movement). Trials on which the "chosen" actor reacted prior to the child's choice being clear *to the coder* were coded as mistrials, and were excluded from analyses.

Results and Discussion

To assess whether children understand that shared language enables communication, we analyzed children's correct choices for the matching language actor (i.e., EA when the experimenter used English, and SA when she used Spanish) (see **Figure 2**). The coder could establish the timing of children's and actors' responses for six of 15 four-year-old and for seven of 15 three-year-old participants, and three trials (out of 78) were coded as mistrials because the actor reacted prior to the child's choice being clear to the coder. For the remaining participants, the camera angles did not sufficiently allow the coder to observe the child's or the actors' faces at the immediate beginning of the test trial. Critically, the number of correct choices did not differ between children for whom mistrial coding was possible and children for whom it was not, $t(28) = .9$, $p = .37$. All the following analyses exclude mistrials and performance is reported in proportion correct responses in order to accommodate the participants who did not have data available for all six trials.

Children chose between two actors on each of six trials; random choices would produce an average of 50% matching choices per child. Four-year-old children chose the matching actor 88.9% of the time, which is significantly more than expected by chance *(*$M = .889$, $SD = .16$, $t(14) = 9.26$, $p < .0001$, Cohen's $d = 2.39$). Indeed, the majority of four-year-old children (9 out of 15) chose the matching actor on all six test trials, and they were equivalently accurate when interpreting requests in English ($M = .867$ matching responses, $SD = .21$, $t(14) = 6.76$, $p < .0001$) or in Spanish ($M = .911$ matching responses, $SD = .15$, $t(14) = 10.56$, $p < .0001$), paired $t(14) = 1.00$, $p = .33$.

Three-year-old children's performance was correct 51.9% of the time and could not be distinguished from chance, ($M = .519$, $SD = .16$, $t(14) = .619$, $p = .546$). Three-year-olds were also no more likely to succeed when interpreting requests in English than when responding to trials in Spanish ($M = .511$ average matching choices on English trials, $SD = .25$; $M = .544$ average matching choices on Spanish trials, $SD = .23$), paired $t(14) = .37$, $p = .72$. Thus, three-year-olds did not show a preference to approach the speaker of their native language. Further, four-year-olds succeeded on significantly more trials than did three-year-olds ($t(28) = 6.34$, $p < .0001$).

Several analyses were conducted to test whether children's tendency to choose the matching actor changed over the course of the experiment, thus assessing whether children's performance was impacted by feedback. First,

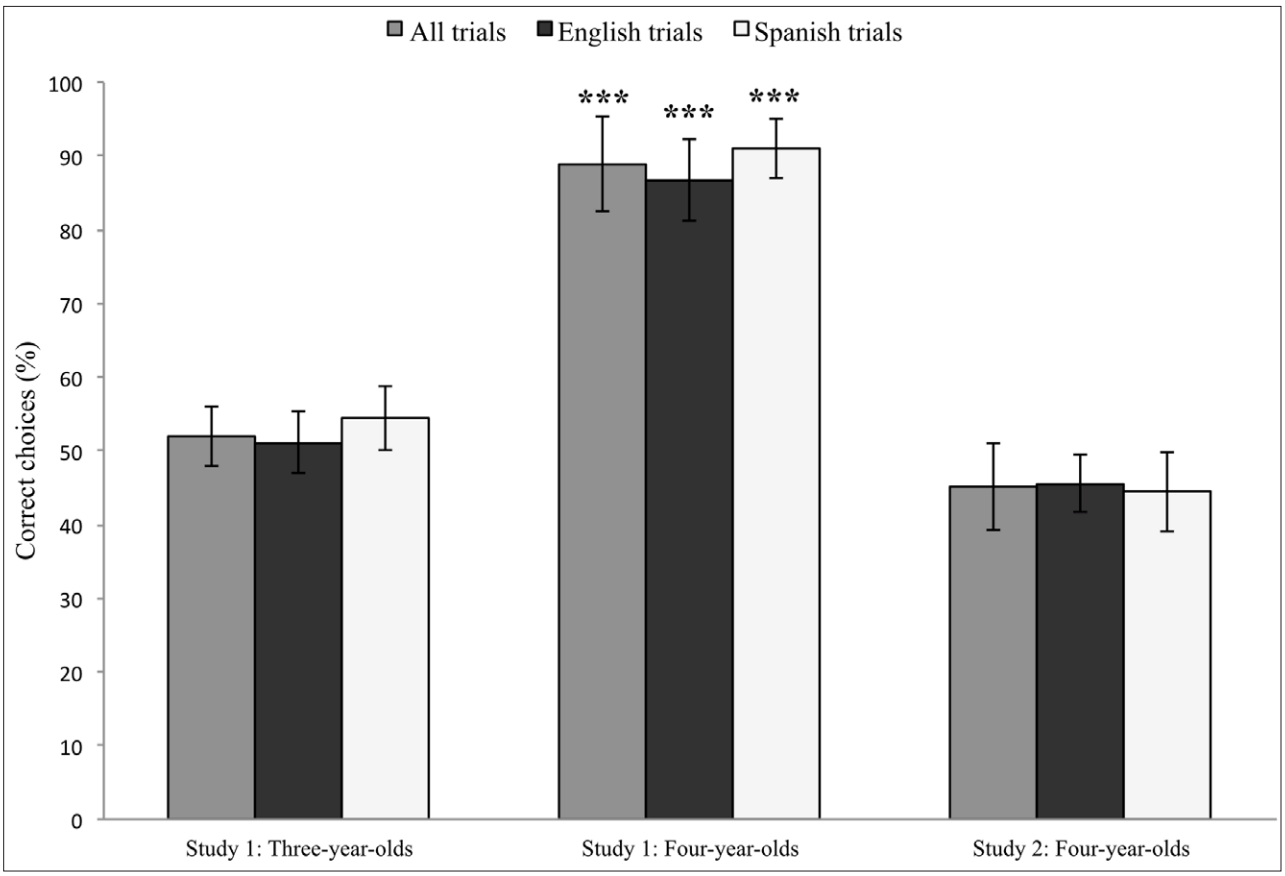

Figure 2: Percentage of correct choices on all trials, English-language trials, and Spanish-language trials across the six test trials of Study 1 (separated by age between three- and four-year-olds), and Study 2. Error bars indicate standard error of the mean. *** $p < .001$ and denotes difference from chance.

children's responses on the first two trials were analyzed separately using a binomial test. Four-year-olds' performance was significantly better than chance on the first trial, which used Spanish for all participants (12 correct responses out of 15, $p = .03$), and separately for the second trial, which used English for all children (12 correct responses out of 15, $p = .03$). In contrast, three-year-olds' performance on the first two trials was at chance (first trial: 5 correct responses out of 14, $p = .42$, second trial: 9 correct responses out of 15, $p = .6$). Thus, three- and four-year-old children failed and succeeded respectively on the first trial in each language. Second, children's performance on the first three trials was compared to the last three trials (three-year-olds: paired $t(14) = .25$, $p = .80$; four-year-olds: paired $t(14) = 1.17$, $p = .26$). Both ages of children were no more accurate in the second half of the test phase, suggesting that receiving either the requested objects or the foil objects during the initial trials did not influence children's choices on subsequent trials. There was also no significant difference between children's average responses on the first two trials compared to the last two trials (three-year-olds: paired $t(14) = .77$, $p = .45$; four-year-olds: paired $t(14) = .76$, $p = .46$). In sum, there was no evidence of learning over the course of the experiment.

The results indicated that four-year-old children actively monitored the experimenter's choice of language when requesting an object, and retrieved the object from the actor who also spoke that language. In contrast to four-year-olds, three-year-old children were unable to draw on the experimenter's language as a cue to whom she addressed. The current task may have been more challenging for younger children for several reasons, including processing demands and conceptual limitations. Pilot testing suggested that three-year-old children could recall which actor used English or Spanish when asked immediately after participating in the "Favorites" book task. However, moving into another room and engaging in the game being played could have disrupted this memory. Crucially, children needed to recruit their memory of the actors' language use to guide their choices to succeed on the experimental task.

Overall, the present findings suggest that by four years of age children recognized the communicative flow of information for both familiar and unfamiliar languages, revealing an understanding that shared language enables communication. However, it is possible that at test, four-year-old children simply approached the actor associated with each language, regardless of how that language was being used to communicate. That is, four-year-old children may have succeeded at the task without appreciating that shared language enables communication in a communicative context. Thus, it is possible that four-year-olds approached the EA on English trials and the SA on Spanish trials because the way the experimenter had requested the object sounded similar to the way the actor spoke, not because they understood that the experimenter was

communicating with each actor by using their respective language. Study 2 directly tested whether the communicative use of language drives four-year-olds' success in the current task.

Study 2

As in Study 1, children heard the experimenter speak English or Spanish on each test trial. However, the speech in Study 2 was not intended to communicate with either actor. Instead, the experimenter addressed the Curious George character on the laptop, commenting (in English or Spanish) that she had an *extra* object. Children were then asked to give this extra object to an actor. If children's choices reflect an association between actor and language, then hearing this language should still cue children to approach its speaker. In contrast, if children's choices are guided by the *relevance* of a particular language for communication, then they should choose randomly between the actors.

Method

Participants

Fifteen monolingual, English-speaking, four-year-old children participated (7 female, M_{age} = 53.1 months, range 48-58 months). Parental consent, child assent, participant compensation, and language assessment occurred as in Study 1. All children spoke only English, whereas all but one child was regularly exposed to a language other than English, similar to the exposure described for children in Study 1 (N = 9 via television, N = 3 via family, and N = 2 via community). One additional participant was excluded from analyses due to a side/actor bias.

Design and materials

The basic design and materials were identical to those used in Study 1.

Procedure

The familiarization phase was identical to Study 1.

Test phase. A warm-up trial was followed by six test trials. On each test trial, the experimenter presented all three needed toys, and after watching the puppet video, held a fourth toy up to the laptop screen. The experimenter spoke to the still image of George on the laptop using English or Spanish, saying, "George! We have an extra [object]! We have one more [object]." or "George! Tenemos otro/otra [object]. Tenemos [object] mas." The experimenter then told the child, "We should give this to my friend. Pay attention to who you give it to, because there's only one extra." The experimenter and child then walked to the door of the original testing room, said, "Hey!" and the actors looked up. The experimenter then encouraged the child to approach an actor, saying, "Can you go give it?" and provided prompts if necessary, as in Study 1. The actors looked at the experimenter until the child indicated a choice. The "chosen" actor then put out her hand to receive the object, and placed it in the bag under her chair. Children's choices, as well as the child's and actors' response times to reveal potential mistrials, were coded offline from video as in Study 1.

Results and Discussion

The camera angle allowed mistrial coding for 14 of the 15 participants; one trial (out of 84) was coded as a mistrial, and excluded from analyses. Children chose the matching speaker 45.1% of the time, and in contrast to Study 1, the number of such responses did not differ from chance, M = .451 , SD = .16, $t(14)$ = 1.13, p = .28. Thus, when the experimenter was not communicating with the actors, her use of a particular language did not cue children to approach another speaker of that language. Children tended to approach the English actor on the first trial (9 children out of 15), even though Spanish was used, but this pattern did not differ significantly from chance, binomial p = .30. Children chose the EA and the SA on an equivalent number of trials overall, paired $t(14)$ = 1.46, p = .16, and their tendency to approach the matching actor did not change over the course of the experiment, as their performance on the first two trials was not significantly different from performance on the final two trials (paired $t(14)$ = 1.47, p = .16).

Four-year-old children chose the matching actor significantly more in Study 1 than in Study 2, $t(28)$ = 7.27, $p < .0001$. The results of Study 2 thus rule out the possibility that a simple association between an actor and a language explains four-year-olds' choices of the matching actor in Study 1. Rather, children used the experimenter's language choice as a cue to which speaker she addressed only when it was relevant for communication.

General Discussion

The current findings suggest that four-year-old children have a robust understanding of the role of a shared language in communicative interactions. The active third-person task used here disentangles children's own capacity to communicate from their conception of how communication works in general. Under these conditions, even monolingual four-year-old children demonstrated an understanding that successful communication depends on speakers' and listeners' shared language, regardless of whether that language is comprehensible to the child. Study 2 further supports this conclusion by showing that communicative relevance is a crucial component of children's reasoning about speech in familiar or unfamiliar languages. Further, the findings suggest that the capacity to think about communication between speakers of different languages improves between three and four years of age. Critically, whereas previous studies found that unfamiliar languages disrupt infants' otherwise robust expectations about the transfer of information between speaker and listener (Pitts, Onishi, & Vouloumanos, 2015), the current study provides the first evidence that four-year-olds have the capacity to track *successful* communication in both familiar and unfamiliar languages.

These results also build on our knowledge of several emerging capacities that may support four-year-olds'

success in interpreting communicative interactions among speakers. First, the ability to reason about the different ways that speech can be used in conversations appears to improve between ages three and four. Wagner, Greene-Havas, and Gillespie (2010) asked three-, four-, and five-year-old children to identify the intended target of an utterance. In the case most relevant to the current study, four- and five-year-olds chose the option of a "little girl who lives far away" as the target of a sentence spoken in Spanish, while three-year-olds failed on this item. Children's performance across other items followed a similar developmental pattern, suggesting that flexible understanding of registers appears at age four. More generally, this study suggests that four-year-old children grasp linguistic register as a way that speakers customize utterances based on the identity of the listener. Our findings add to this research by demonstrating that four-year-old children are also sensitive to a vital aspect of the audience's identity – the language she speaks.

Second, metalinguistic awareness, the ability to view language as a vehicle for meaning, is developing at this age. Children can flexibly apply English synonyms to name an object at four years, but not three years (Doherty & Perner, 1998), a skill that relies on understanding that the same meaning can be conveyed through different forms. Our task is admittedly more complex, but four-year-old children's success is still rooted in metalinguistic awareness, as they need to understand that speaking Spanish (or any foreign language) is adequate for conveying meaning to another Spanish speaker. In our familiarization phase, children observed the linguistic rapport between the experimenter and the Spanish actor. Although children did not understand the Spanish labels for the items in the favorites book, the pragmatics of the task made it clear that the speaker was communicating her preference for a specific item. This may have further highlighted to children that speaking in Spanish was sufficient for conveying meaning. Thus, three-year-old children's difficulty with synonyms (Doherty & Perner, 1998) could be related to their inability to succeed on the present task.

Finally, mentalizing capacities continue to develop in the preschool years (e.g. Wellman, 2001), and the overlap between the age of success in standard theory of mind (ToM) tasks and our task may be more than mere coincidence. Keeping track of others' language knowledge is at the heart of understanding how communication works across foreign languages. Although ToM tasks have typically focused on tracking short-term situation-specific knowledge states, representing a person's knowledge of a language may pose a similar representational problem for children. In fact, mentalizing abilities and metalinguistic awareness are strongly correlated (Doherty & Perner, 1998). Therefore, it is reasonable to assume that mentalizing would be a necessary component in children's developing understanding of communication between people speaking in a foreign language. Relatedly, executive function, which may play a role in standard ToM tasks, also improves between three to four years of age (Frye, Zelazo, & Palfai, 1995). Our current task, much like the real world situation of observing people speaking different languages, requires attending to, tracking, and processing the back and forth switch between languages and people. The executive function demands of such situations could preclude younger children from succeeding not only in our task, but also in its real world analog.

The present findings also add to the understanding of children's language-based social preferences. Interestingly, children did not show a preference for the English-speaking actor in these studies. Specifically, three-year-olds in Study 1 approached both actors equally, and in the non-communicative task of Study 2, twelve of fifteen four-year-olds distributed toys equally between the actors, and eleven alternated between the actors across trials. Previous findings suggest that whereas children distribute resources equally when possible (Olson & Spelke, 2008), they will allocate a single gift to a familiar-language speaker rather than an unfamiliar-language speaker (Kinzler et al., 2012). In this previous study, speakers were presented via life-sized video recordings, so children in our study may have acted more equitably because they interacted in person with the actors. The English- and Spanish-speaking actors also shared some of the child's preferences during familiarization, which may have increased children's liking of both of them (Fawcett & Markson, 2010b). Thus, it is possible that personal interactions with speakers of an unfamiliar language may help children overcome their initial bias in favor of speakers of their own language.

These results raise a number of questions. Do children believe that shared language is essential to communication or that it merely facilitates communication? Do children rely on a speaker's language use as a cue to communicative intent, on a listener's linguistic knowledge as a cue to understanding, or do both matter? In the present task, four-year-old children's responses suggest that they recognized the experimenter's knowledge of *both* languages. Future research should further explore monolingual children's reasoning about bilingual speakers.

Another important question is whether children who speak more than one language, and as a result have had more experience interacting with speakers of different languages, would succeed at this task more easily or at an earlier age. Bilingual children appear to have enhanced perspective-taking abilities (Fan et al., 2015; Liberman, Woodward, Keysar, & Kinzler, 2017) and theory-of-mind reasoning (Goetz, 2003; Kovács, 2009), which may support their ability to select between their own multiple languages (Tare & Gelman, 2010). Enhanced inhibitory control may also help bilingual children suppress their own language knowledge and consider others' shared language (Bialystok, Barac, Blaye, & Poulin-Dubois, 2010; Carlson & Meltzoff, 2008; Kovács & Mehler, 2009). Recent studies have begun to explore how language exposure may influence very young children's reasoning about conventional communication. For example, recent findings show that bilingual toddlers suspend their expectation that two words contrast in meaning (Pitts, Onishi, & Vouloumanos, 2015), and their expectation that listeners will react appropriately to speech (Byers-Heinlein, Chen, & Xu, 2014), when observing people who use different languages. Somewhat unexpectedly, diverse but limited language exposure may also improve children's reasoning about

unfamiliar languages (Akhtar et al., 2012), which could in turn aid children's reasoning about communication.

The present studies separate children's own communication, preferences, and learning from their conception of communication more generally, and demonstrate that by four years of age children understand that speaking the same language enables communication between two people. Importantly, children understand this regardless of whether the language being spoken is familiar or foreign to them. In this increasingly multicultural world, such knowledge provides critical support for children's developing capacity to interact with and learn from a diverse population, and lays the foundation for successful communication.

Data Accessibility Statement

Data from this manuscript is available via Washington University's Open Scholarship data repository: https://openscholarship.wustl.edu/data/8/.

Acknowledgements

We are grateful to Rebecca Marks, Tori Wesevich, Anne Diaz-Arrastia, Brenda Lagunas, Sara Rosenbaum, Lauren Keblusek, and Ola Abiose for assistance with data collection. We also thank the children and their families for their participation.

Funding Information

This research was supported by a Dean's Dissertation Fellowship from Washington University in St. Louis to KRS. The writing of this manuscript was supported by a grant from the McDonnell Center for Systems Neuroscience to LM.

Competing Interests

The authors have no competing interests to declare.

Author Contributions

- Contributed to conception and design: NA, KRS, LM
- Contributed to acquisition of data: NA, KRS
- Contributed to analysis and interpretation of data: NA, KRS
- Drafted and/or revised the article: NA, KRS, LM
- Approved the submitted version for publication: NA, KRS, LM

Author Information

Lori Markson is an Editor at Collabra: Psychology. She was not involved in the peer review of the article. NA and KRS contributed equally to this research while graduate students at Washington University in St Louis.

References

Akhtar, N., Menjivar, J., Hoicka, E., & **Sabbagh, M. A.** (2012). Learning foreign labels from a foreign speaker: the role of (limited) exposure to a second language. *Journal of Child Language*, *39*, 1135–1149. DOI: https://doi.org/10.1017/S0305000911000481

Beier, J. S., & **Spelke, E. S.** (2012). Infants' developing understanding of social gaze. *Child Development*, 83, 486–496. DOI: https://doi.org/10.1111/j.1467-8624.2011.01702.x

Bialystok, E., Barac, R., Blaye, A., & **Poulin-Dubois, D.** (2010). Word mapping and executive function in young monolingual and bilingual children. *Journal of Cognition & Development*, *11*, 485–508. DOI: https://doi.org/10.1080/15248372.2010.516420

Buresh, J. S., & **Woodward, A. L.** (2007). Infants track action goals within and across agents. *Cognition, 104*, 287–314. DOI: https://doi.org/10.1016/j.cognition.2006.07.001

Byers-Heinlein, K., Chen, K. H., & **Xu, F.** (2014). Surmounting the Tower of Babel: Monolingual and bilingual 2-year-olds' understanding of the nature of foreign language words. *Journal of Experimental Child Psychology, 119*, 87–100. DOI: https://doi.org/10.1016/j.jecp.2013.09.011

Carlson, S. M., & **Meltzoff, A. N.** (2008). Bilingual experience and executive functioning in young children. *Developmental Science, 11*, 282–298. DOI: https://doi.org/10.1111/j.1467-7687.2008.00675.x

Cheung, H., Xiao, W., & **Lai, C. M.** (2012). Twelve-month-olds' understanding of intention transfer through communication. *PLoS ONE, 7*, e46168. DOI: https://doi.org/10.1371/journal.pone.0046168

Diesendruck, G. (2005). The principles of conventionality and contrast in word learning: An empirical examination. *Developmental Psychology, 41*, 451–463. DOI: https://doi.org/10.1037/0012-1649.41.3.451

Doherty, M., & **Perner, J.** (1998). Metalinguistic awareness and theory of mind: Just two words for the same thing? *Cognitive Development*, *13*(3), 279–305. DOI: https://doi.org/10.1016/S0885-2014(98)90012-0

Fan, S. P., Liberman, Z., Keysar, B., & **Kinzler, K. D.** (2015). The exposure advantage: Early exposure to a multilingual environment promotes effective communication. *Psychological Science*, *26*(7), 1090–1097. DOI: https://doi.org/10.1177/0956797615574699

Fawcett, C. A., & **Markson, L.** (2010a). Children reason about shared preferences. *Developmental Psychology, 46*, 299–309. DOI: https://doi.org/10.1037/a0018539

Fawcett, C. A., & **Markson, L.** (2010b). Similarity predicts liking in 3-year-old children. *Journal of Experimental Child Psychology, 105*, 345–358. DOI: https://doi.org/10.1016/j.jecp.2009.12.002

Frye, D., Zelazo, P. D., & **Palfai, T.** (1995). Theory of mind and rule-based reasoning. *Cognitive Development*, *10*(4), 483–527. DOI: https://doi.org/10.1016/0885-2014(95)90024-1

Goetz, P. J. (2003). The effects of bilingualism on theory of mind development. *Bilingualism: Language and Cognition, 6*, 1–15. DOI: https://doi.org/10.1017/S1366728903001007

Graham, S. A., Stock, H., & **Henderson, A. M. E.** (2006). Nineteen-month-olds' understanding of the conventionality of object labels versus desires. *Infancy*, *9*, 341–350. DOI: https://doi.org/10.1207/s15327078in0903_5

Grosse, G., Behne, T., Carpenter, M., & **Tomasello, M.** (2010). Infants communicate in order to be understood. *Developmental Psychology*, *46*, 1710–1722. DOI: https://doi.org/10.1037/a0020727

Henderson, A. M. E., & **Graham, S. A.** (2005). Two-year-olds' appreciation of the shared nature of novel object labels. *Journal of Cognition & Development*, 6, 381–402. DOI: https://doi.org/10.1207/s15327647jcd0603_4

Henderson, A. M. E., & **Woodward, A. L.** (2012). Nine-month-old infants generalize object labels, but not object preferences across individuals. *Developmental Science*, *15*(5), 641–652. DOI: https://doi.org/10.1111/j.1467-7687.2012.01157.x

Kinzler, K. D., Dupoux, E., & **Spelke, E. S.** (2007). The native language of social cognition. *Proceedings of the National Academy of the Sciences, 104*, 12577–12580. DOI: https://doi.org/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 & Development, 13*, 1–15. DOI: https://doi.org/10.1080/15248372.2011.567200

Kinzler, K. D., Shutts, K., DeJesus, J., & **Spelke, E. S.** (2009). Accent trumps race in guiding children's social preferences. *Social Cognition, 27*, 623–634. DOI: https://doi.org/10.1521/soco.2009.27.4.623

Kovács, A. M. (2009). Early bilingualism enhances mechanisms of false-belief reasoning. *Developmental Science, 12*, 48–54. DOI: https://doi.org/10.1111/j.1467-7687.2008.00742.x

Kovács, A. M., & **Mehler, J.** (2009). Cognitive gains in 7-month-old bilingual infants. *Proceedings of the National Academy of Sciences, 106*, 6556–6560. DOI: https://doi.org/10.1073/pnas.0811323106

Liberman, Z., Woodward, A. L., Keysar, B. & **Kinzler, K. D.** (2017). Exposure to multiple languages enhances communication skills in infancy. *Developmental Science*. DOI: https://doi.org/10.1111/desc.12420

Martin, A., Onishi, K. H., & **Vouloumanos, A.** (2012). Understanding the abstract role of speech in communication at 12 months. *Cognition, 123*, 50–60. DOI: https://doi.org/10.1016/j.cognition.2011.12.003

Matthews, D., Lieven, E., Theakston, A., & **Tomasello, M.** (2006). The effect of perceptual availability and prior discourse on young children's use of referring expressions. *Applied Psycholinguistics, 27*, 403–422. DOI: https://doi.org/10.1017/S0142716406060334

Mehler, J., Jusczyk, P., Lambertz, G., Halsted, N., Bertoncini, J., & **Amiel-Tison, C.** (1988). A precursor of language acquisition in young infants. *Cognition*, *29*(2), 143–178. DOI: https://doi.org/10.1016/0010-0277(88)90035-2

Molina, M., Van de Walle, G. A., Condry, K., & **Spelke, E. S.** (2009). The animate-inanimate distinction in infancy: Developing sensitivity to constraints on human actions. *Journal of Cognition & Development, 5*, 399–426. DOI: https://doi.org/10.1207/s15327647jcd0504_1

Olson, K. R., & **Spelke, E. S.** (2008). Foundations of cooperation in young children. *Cognition*, *108*, 222–231. DOI: https://doi.org/10.1016/j.cognition.2007.12.003

Pitts, C. E., Onishi, K. H., & **Vouloumanos, A.** (2015). Who can communicate with whom? Language experience affects infants' evaluation of others as monolingual or multilingual. *Cognition, 134*, 185–192. DOI: https://doi.org/10.1016/j.cognition.2014.10.003

Saussure, F. (1983). *Course in General Linguistics* (R. Harris, Trans.). La Salle, IL: Open Court. (Original work published 1916).

Song, H., Onishi, K. H., Baillargeon, R., & **Fisher, C.** (2008). Can an agent's false belief be corrected by an appropriate communication? Psychological reasoning in 18-month-old infants. *Cognition, 109*, 295–315. DOI: https://doi.org/10.1016/j.cognition.2008.08.008

Tare, M., & **Gelman, S. A.** (2010). Can you say it another way? Cognitive factors in bilingual children's pragmatic language skills. *Journal of Cognition & Development, 11*, 137–158. DOI: https://doi.org/10.1080/15248371003699951

Thorgrímsson, G. B., Fawcett, C. A., & **Liszkowski, U.** (2015). 1- and 2-year-olds' expectations about third-party communicative actions. *Infant Behavior & Development, 39*, 53–66. DOI: https://doi.org/10.1016/j.infbeh.2015.02.002

Vouloumanos, A., Martin, A., & **Onishi, K. H.** (2014). Do 6-month-olds understand that speech can communicate? *Developmental Science, 17*, 872–879. DOI: https://doi.org/10.1111/desc.12170

Vouloumanos, A., Onishi, K. H., & **Pogue, A.** (2012). Twelve-month-old infants recognize that speech can communicate unobservable intentions. *Proceedings of the National Academy of Sciences, 109*, 12933–12937. DOI: https://doi.org/10.1073/pnas.1121057109

Wagner, L., Greene-Havas, M., & **Gillespie, R.** (2010). Development in children's comprehension of linguistic register. *Child Development*, *81*(6), 1678–1686. DOI: https://doi.org/10.1111/j.1467-8624.2010.01502.x

Wellman, H. M., Cross, D., & **Watson, J.** (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, *72*(3), 655–684. DOI: https://doi.org/10.1111/1467-8624.00304

Wittek, A., & **Tomasello, M.** (2005). Young children's sensitivity to listener knowledge and perceptual context in choosing referring expressions. *Applied Psycholinguistics, 26*, 541–558. DOI: https://doi.org/10.1017/S0142716405050290

How to cite this article: Afshordi, N., Sullivan, K. R., and Markson, L. (2018). Children's Third-Party Understanding of Communicative Interactions in a Foreign Language. *Collabra: Psychology,* 4(1): 2, pp. 1–10, DOI: https://doi.org/10.1525/collabra.105

Senior Editor: Jennifer Tackett

Editor: Megan Saylor

Submitted: 29 July 2017 **Accepted:** 28 November 2017 **Published:** 19 January 2018

UNIVERSITY of CALIFORNIA PRESS | Collabra

Collabra: Psychology is a peer-reviewed open access journal published by University of California Press.

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