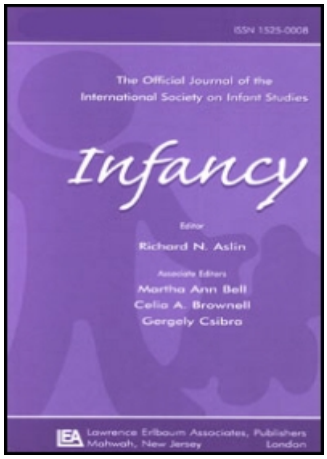


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# Fourteen-Month-Olds Know What "We" Have Shared in a Special Way

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People often express excitement to each other when encountering an object that they have shared together previously in some special way. This study investigated whether 14-month-old infants know precisely what they have and have not shared in a special way (and with whom). In the experimental condition an adult and infant shared an object (the target) excitedly because it unexpectedly reappeared in several places. They then shared 2 other objects (the distractors) in a more normal fashion. Later, the adult reacted excitedly to a tray containing all 3 objects and then made an ambiguous request for the infant to hand "it" to her. There were 2 control conditions. In 1 of them, a different adult, who knew none of the 3 objects, made the ambiguous request. In the other control condition, the adult who made the request had previously experienced the objects only alone, while the infant looked on unengaged. Infants in the experimental condition chose the target object more often than the distractors and more often than they chose it in either control condition. These results demonstrate that 14-month-old infants can identify which one of a set of objects "we"—and not just I or you alone—have had a special experience with in the past.

Several studies have investigated what infants know about what other people have and have not experienced in the past. Tomasello and Haberl (2003), for instance, found that 12- and 18-month-old infants know which of three objects a person does not know from past experience and is thus getting excited about now. By around their first birthdays, then, infants know what others do and do not know from past perceptual experience.

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In that study, the question was what infants understand about others' experiences independent from the infants' own experiences. However, Moll and colleagues (Moll, Carpenter, & Tomasello, 2007; Moll & Tomasello, 2007) hypothesized that in some situations it might be easier for infants to judge what others experience and know if infants are engaged in joint attention with them (Bakeman & Adamson, 1984; see also Adamson & Bakeman, 1991). To test this hypothesis, Moll and Tomasello (2007) tested 14- and 18-month-olds using the same basic procedure that Tomasello and Haberl (2003) used. In the crucial condition, an adult and an infant jointly engaged around two novel objects in turn for 1 min each. Then the adult left the room. While she was gone, the infant and a second adult played with a third novel object. Finally, all three objects were held in front of the infant, at which point the first adult returned and excitedly exclaimed "Wow! Look! Look at that one!" gazing in the direction of all three objects. She then made an ambiguous request for the infant to hand "it" to her. In two other conditions, (1) infants saw the adult examine the two familiar objects individually (instead of in joint engagement) or (2) the adult simply looked on from afar as the infant and the assistant examined the two familiar objects. The result was that, in accord with the hypothesis, the 14-month-old infants only knew which objects the adult knew from past experience when the infants themselves had shared joint attentional experience with the adult with the familiar objects. In both other conditions in which infants did not share the adult's experiences, infants failed to distinguish between what the adult did and did not know. Following up on this finding, Moll et al. (2007) showed that it is not sufficient for 14-month-olds to witness from a third-person perspective the adult sharing the familiar objects with another person, but rather they need to be directly involved in sharing the adult's experience. Fourteen-month-old infants thus know which objects they have and have not shared with others and can use this to interpret others' ambiguous communicative requests.

Infants' behavior in these studies depends on their general understanding that people tend to get excited about things that are new, not old, for them. However, people get excited about things for reasons other than novelty. In particular, people might get excited about an object that they have previously shared with some other person when they encounter this object again with that person—so that it is actually old, not new, for both of them. In this case the excitement is generated by the recognition that this is something "we" have shared in some special way—quite often in a way that neither of us has shared it with anyone else. For example, if you and I have often talked about our shared special interest in a rare breed of dog, if we now encounter one on the street, we will very likely look to one another knowingly and excitedly—in a way that we would not if we encountered this same dog in the company of someone with whom we did not share this same interest and history. It is thus important to know if infants can determine not just which objects are old and new for others

in general, but also which of several old objects has a special significance for "us," based on the special history that "we" (and not others) have had with this object. If infants could do this, it would show us that they can not only attribute knowledge versus ignorance in a yes-or-no fashion, but in addition that they know the specific quality of their past shared experiences. In other words, it would suggest that infants know not only what we have and have not shared, but also how we have shared it.

In this study, therefore, we used a paradigm that was similar to, but importantly different from, that of Tomasello and Haberl (2003) and Moll and Tomasello (2007). In the paradigm used here, infants shared *all three* objects with the adult, so that now the correct response was to hand over an object that was old, not new, for the adult. Specifically, in the Share Condition, the infant and adult had special experiences with one target object—they encountered it several times in unusual places and shared excitement about this. Then they also shared in a more normal fashion two other objects, in turn, for the same length of time that they had shared excitement about the first object. As in the previous studies, in a subsequent test phase the adult then expressed excitement about "it" in the direction of all three objects grouped together, and then asked the child, ambiguously, to give "it" to her. For infants to choose the target object in this study, then, they would need to recognize the object that "we" have shared a special experience with previously—as opposed to others with which "we" have had no such special experience. To make sure that infants knew that they had shared the special experience with only this one specific person—and were not just choosing the object about which they themselves had gotten most excited previously with whomever—there was a control condition in which the infant had the exact same experiences prior to the test phase, but then in the test a different adult ambiguously requested "it" (Adult Change Condition). To make sure that the sharing dimension of the previous experience was an important component, there was also a control condition in which the infant watched "from the outside" as the adult experienced the target object specially as in the share condition, but by herself, and then at test ambiguously asked the infant for "it" (Individual Condition).

Our prediction was that infants would preferentially hand over the target object in the share condition in which they had shared special experiences around that object with the requesting adult. If infants were to conform to this prediction, it would demonstrate impressive flexibility in their ability to discern an adult's intended referent in an ambiguous request based on an assessment of their previous shared experiences with that particular adult. Moreover, because they had actually experienced all three objects together with that adult, it would demonstrate an ability to single out from their shared experiences with one particular person those having a special significance to "us."

## METHOD

### Participants

One-hundred and eight 14-month-old infants (51 girls and 57 boys; $M$ = 14;01, range = 13;17–14;17) participated in this study. All participants were obtained from a database of parents from a medium-sized German city who had volunteered to participate in studies of child development.

An additional 23 infants were tested but had to be excluded from the study because they either failed the pretest ($n$ = 12), were uncooperative ($n$ = 5), made no clear responses in the test ($n$ = 1), or because of experimenter error ($n$ = 5).

### Materials and Design

For the pretest (see below), three familiar toys were used: a ball, a teddy bear, and a toy car. In the main test, three unusual objects served as toys: a modified abacus, a gardening tool, and a modified bird cage utensil (see Figure 1). Each of them was easily distinguishable by color and shape and all of them were about the same size. When manipulated in a particular way each of them made a distinctive sound. A previously conducted preference test showed no significant interindividual preferences among these toys. One object was designated ahead of time as the target object for a given participant on the basis of a counterbalanced schedule. The order of the toys in the sequence of play and their spatial position in the tray at test were also counterbalanced. There was a male and a female experimenter and their roles as E1 and E2 were counterbalanced.

Each infant was randomly assigned to one of three experimental conditions, yielding 36 infants in each condition. Infants received only a single experimental

FIGURE 1 The three novel objects and the tray used in the study.

trial. The sessions were conducted in German (with the English glosses here being approximate translations).

## Procedure

Infants visited a child laboratory with their parent for one session of approximately 30 min. The study was conducted in several locations of the child laboratory. In the crucial experimental condition (Share Condition), infants had shared the adult's experience with the target object before this adult made the ambiguous request for the infant to hand "it" to her. In two control conditions, either the adult making the ambiguous request was a different adult than the one with whom the infant had shared the experience with the target object (Adult Change Condition), or infants did not share the adult's experience with the target object but instead only watched the adult experiencing the object individually (Individual Condition). We describe the procedure of the share condition in detail first and then describe how the procedure of the two control conditions differed from it. Table 1 gives a brief description of the main points in the procedure as a function of condition.

In the Share Condition, E1 and the infant shared the first novel object (the target) together at three different predefined locations. They saw it for the first time on the floor as they walked along the hallway on their way to the testing area. E1 reacted with surprise and excitement when he/she detected the object, sharing his/her experience with the infant by exploring it together for 20 sec, taking turns manipulating it. During this time, E1 alternated gaze between the infant and the object several times and emoted positively, but made only very general comments (e.g., "Look, what is this? What can we do with this?"). The parent had been instructed not to intervene in these episodes of joint engagement. After the 20 sec,

TABLE 1
Main Points of the Procedure in Each Experimental Condition

| *Condition* | *Procedure* | | |
|---|---|---|---|
| Share | E1 and infant "share" target three times excitedly (60 sec total) | E1 and infant "share" the two distractors (60 sec each) | E1 excitedly requests an object |
| Adult Change | E1 and infant "share" target three times excitedly (60 sec total) | E1 and infant "share" the two distractors (60 sec each) | E2 excitedly requests an object |
| Individual | Infant watches E1 explore target three times excitedly (60 sec total) | Infant watches E1 explore the two distractors (60 sec each) | E1 excitedly requests an object |

*Note*. In the individual condition, infants became familiar with the three objects (for 60 sec each) by playing with them at the beginning of the experiment. When making the excited request in the response phase, the experimenter's behavior was identical in all three conditions.

E1, the parent, and the infant moved on, leaving the object where they had found it. E1 and the infant then saw this object, that is, an identical looking exemplar, at another location in the hallway. This time they found it on the floor under a piece of cloth. E1 pulled away the cloth and reacted excitedly as he/she recognized the object, saying "Look, here it is again!" E1 and the infant jointly engaged with the object again in the same manner and for the same amount of time (20 sec) as previously. They then moved on and entered a play room, where they encountered and shared the object for the third time. While the parent filled out a consent form, E1, sitting close to the infant, retrieved a box from a shelf. As they looked into the box together, they detected the target object again. As previously, E1 expressed excitement about it and played with it together with the infant for another 20 sec. All three joint engagement episodes with the object followed the same standardized script. After E1 and the infant finished playing with the target object, it was placed out of sight. E2 then entered the play room and interacted with the infant until the infant seemed comfortable with the newly introduced adult.

At this point, the second part of the procedure began. E1, E2, the parent, and the infant entered the testing room (4.30 m × 4.30 m) and sat down at a square table. To see whether the infant generally responded appropriately to an adult request, a pretest was conducted first. The experimenter who would later conduct the test (i.e., E1 in the share and the individual condition, E2 in the adult change condition) also conducted this pretest. This experimenter sat facing the child. In the pretest, E1, E2, and the infant played with a ball, a teddy bear, and a toy car in turn for 1 min each (always in this order). The three toys were then placed in a tray at randomized positions and held in front of the infant. E1 then successively asked the infant to hand him or her the toys by name—without looking at the objects. (A pilot test had revealed that infants this age usually knew the names of these objects.) For infants to pass the pretest, they had to identify correctly either the first or the second requested object by at least touching it. If they failed to respond correctly to both the first and the second request, they were excluded from the final sample. This was the case for 12 infants.

Following the pretest, E2 brought out another novel object (the second object) and handed it to E1. E1 then played with the infant with this object together for 60 sec. Again, playing followed a standardized script that was identical across conditions. E1 expressed excitement while playing with this object and emoted positively, but she did not express the surprise that she expressed when she encountered the target object at the three different locations. E2 did not engage in the play. After the 60 sec, E2 brought out the third, final novel object on the schedule and again handed it to E1, who then shared this object with the infant in the same manner and for the same amount of time as he/she had done with the second novel toy (60 sec). E1 then announced "I am going over there," stood up from her chair, and went to the light switches next to the door. E1 remained there for a moment, facing the door, at which point E2 placed the tray containing all three novel objects (the target

plus the two distractors) in front of the infant. At this point, E1 turned around from the door, fixated the tray containing the toys from afar and exclaimed with excitement, "Wow, look!" E1 then briefly looked up to the infant and shifted his/her gaze back to the toys, exclaiming "Look at that!" E1 then looked up to the infant again and made an ambiguous request, "Can you give it to me, please?" while approaching the infant and holding out his/her hand toward the tray. During this time, E1's eyes remained fixated on the infant. Importantly, E1 did not gaze at, point to, or hold out his/her hand at a specific object—the request was absolutely ambiguous from a behavioral point of view and was identical across all three conditions.

In the Adult Change Condition, the procedure was identical until the part that took place in the testing room. Unlike in the Share Condition E2—and not E1—conducted the pretest, requesting from the infant the familiar objects by name as in the Share Condition. When the pretest was finished, E2 left the room saying "I'm leaving now!" and waved goodbye to the infant. During her absence E1 retrieved the second novel object and played with it with the infant for 60 sec just like in the Share Condition. E1 and the infant then also shared the third novel toy in the same manner and again for 60 sec. When they were finished playing, E1 held the tray containing all three objects in front of the infant. At the same time, E2 returned to the room and, while standing near the door, exclaimed excitement and requested ambiguously exactly as E1 did in the Share Condition. The main difference with the Share Condition was thus that all three objects were new for the adult when he/she reacted with excitement to them. Infants thus could not know which object the adult was referring to, and so we would expect infants to choose objects randomly in this condition.

In the Individual Condition, the beginning of the experiment differed from the other two conditions. First, E2 and the infant played in the lobby of the research building with each of the three novel objects in turn in counterbalanced order, so that all objects were equally familiar to the infant, as in the other conditions. They played with each object for 60 sec following the same script that was used in all conditions for the distractor objects. E1 was not present at this time. When they were finished playing, E2, the parent, and the infant entered the hallway but stopped as they reached the first of the three predefined locations. Standing at a distance of 2.5 m, they watched how E1 appeared and reacted with surprise and excitement when E1 detected the target object on the floor in front of him or her. E1 explored the object, emoted positively about it, and commented on it ("This is great!"). During this time he/she never addressed the infant or looked at her. The infant simply watched E1's engagement with the object from afar. After the 20 sec, E1 left, leaving the object where she or he had found it. E2, the infant, and the parent moved on until they reached the second location. Here again, E1 appeared and found the target object. At both this and the next, third location, the infant watched from afar (always 2.5 m away) as E1 individually detected and played with the target object for 20 sec.

For the second part of the procedure E1, E2, the infant, and the parent entered the testing room. The pretest was identical to that in the Share Condition with E1 asking the infant to hand him or her the familiar objects by name. When the pretest was finished, E1 got up from his/her chair and positioned himself or herself next to the door at a distance of 2.5 m from the infant. E2 took out the second novel object, handed it to E1, and sat down again at the table. E1 played with this object for 60 sec and infants watched this event from their position at the table. As before, E1 never looked at the infant while playing with the object. After the 60 sec, E2 took the object and handed E1 the third novel object. E1 played with this one again for 60 sec and in the exact same manner as with the previous one. When time had elapsed, E2 took this object and placed it on the tray next to the other two objects. E2 picked up the tray and held it in front of the infant. E1 looked at the tray, exclaimed excitement, and made an ambiguous request for the infant to hand "it" to him or her just like in the other conditions. So in this condition, all three objects were familiar for both E1 and the infant, as in the other two conditions, but only E1 experienced one of them in a special way, individually. The response phase was identical in all three conditions.

If, as we predicted, infants understand with whom they have shared what experiences with which objects, then we would expect them to hand the first object (target) to the adult in the Share Condition. However, infants should choose objects randomly in the other two conditions because either (a) the three objects were all equally new for the adult and so none was particularly special for him or her (Adult Change Condition) or (b) one was special for the adult individually, but the infant had not shared the adult's experience with the special object (Individual Condition).

### Coding and Reliability

The female experimenter (the second author) judged which of the three novel toys the infant chose at test from the videotapes. If infants touched one object but then handed over another one, then the handed-over object was regarded as the chosen toy and so this object was coded, as long as the handing over took place within a time frame of 50 sec after the adult's request. To assess interrater reliability, an independent coder who was unaware of condition scored a random sample of 9 of the infants from each of the three conditions (25%). The two raters agreed in 100% of the cases, leading to a Cohen's kappa of 1.

## RESULTS

Figure 2 presents the number of infants who chose the target object, that is, the object that E1 experienced specially, as a function of condition. First, we compared

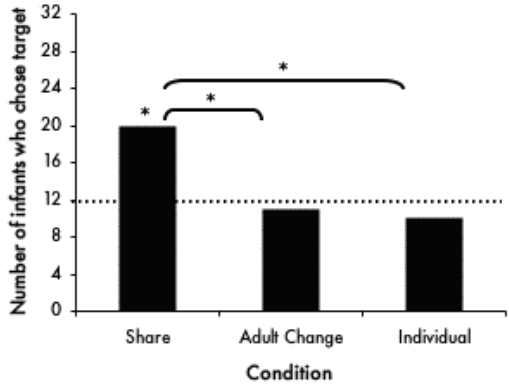


**FIGURE 2** Infants' choices of the target object as a function of experimental condition.

the number of target choices to chance (.33) using the binomial procedure. As predicted, more infants than would be expected by chance chose the target object in the Share Condition, $p < .01$. Infants' target choices in the Adult Change Condition as well as in the Individual Condition did not differ from chance ($p > .45$ and $p > .31$, respectively). In a second analysis we used Fisher's Exact Test to compare the number of target choices between conditions. As predicted, infants in the Share Condition chose the target more often than infants in the Adult Change Condition ($p < .03$), and more often than infants in the Individual Condition ($p < .02$, all $p$s are one-sided). The number of infants who chose the target object in the Adult Change and the Individual Condition did not differ significantly from one another ($p > .99$, two-sided).

## DISCUSSION

Several studies have now focused on infants' and toddlers' ability to attribute knowledge versus ignorance to others. In all of those studies, children had to know whether an adult knew or did not know an object (e.g., Tomasello & Haberl, 2003) or knew or did not know the location of an object (e.g., Liszkowski, Carpenter, Striano, & Tomasello, 2006; O'Neill, 1996; Onishi & Baillargeon, 2005). In some cases, the comparison was between objects that the infant had and had not shared with an adult previously (Moll et al., 2007; Moll & Tomasello, 2007). In contrast, in this study we used a paradigm in which all three candidate objects were familiar to the adult, and so to successfully choose the target object infants had to know which of these three objects the adult was excited about and requesting based on which of these objects "we"—and not just me or you alone—had experienced in a special way in the immediate past. Thus, in the crucial Share Condition the adult

did not get excited about an object from some past individual experience, but rather he/she recognized an object that he or she and the infant had shared together in a special way previously. Their shared experience with the target object had a special quality compared to their experiences with the other two objects because they had unexpectedly encountered it in several places previously, excitedly recognizing it on each reappearance. The infants themselves must have noticed the special quality of the shared experience with this specific toy, as they correctly interpreted the adult's excitement at test as referring back to their shared experience with this object.

One might object that perhaps infants just selected the object that they themselves found most exciting or interesting, and the target object was exciting or interesting simply because it had unexpectedly reappeared in various locations. However, if this were the reason infants selected the target object, they should have chosen it just as often in the Adult Change Condition. In this condition, the infant also experienced the target object unexpectedly reappearing in different places, and each time the infant shared the experience with an adult. However, in this condition the adult who excitedly requested an object at test was a different adult from the one with whom the infant had shared those experiences. The fact that infants in this condition chose the target object at chance level demonstrates that they were not attracted to this object based solely on their own individual experience and preferences. The target object was special to them only in connection with the specific person with whom they had shared it. It therefore seems that infants at 14 months know not only what experience they have shared previously, but they also know how and with which specific person they have shared it.

One might object instead that infants just selected the object that was most exciting for the adult, individually, and not the object that they had shared together in a special way. However, this interpretation is ruled out by the results of the Individual Condition. When the adult repeatedly got excited about the reappearing object, exactly as in the Share Condition but with the infant only watching from the outside without sharing, infants at test were unable to determine the referent of the adult's excitement. Only when they were jointly engaged with the adult and so shared his or her experience with the target object in this special way (in the Share Condition) could they later disambiguate the adult's excited request for an object. This result is consistent with previous results showing that 14-month-olds are very limited in their capacities to register what another person does and does not become familiar with when they are not jointly engaged (Moll et al., 2007; Moll & Tomasello, 2007). Csibra and Gergely (2006) also argued that if 1-year-old infants are not directly addressed in an ostensive manner, they are unlikely to learn what exactly another person is doing and why (see also Gergely & Csibra, 2006). It would thus seem from these studies that shared experiences are particularly important for infants to distinguish what others know and do not know.

One apparently contradictory finding, however, is that of Onishi and Baillargeon (2005), who found that 15-month-olds are sensitive to another person's knowledge state about the location of an object even though the infants never interacted in joint engagement with that person directly. Note, however, that the response measure in Onishi and Baillargeon's (2005) study was looking time, whereas in this study, infants had to actively resolve an ambiguous communicative situation. To do this, they needed to disambiguate the adult's request on the basis of some common ground or shared experience (see Tomasello, Carpenter, & Liszkowski, 2007). In the Share Condition, there was one specific object that was mutually significant because of a special shared experience between infant and adult, so infants inferred that the request was about this object. However, when there was no object that was mutually significant from some past shared experience, the referent remained unclear and infants chose objects randomly. In the Adult Change Condition, one of the three objects was clearly significant for the infants themselves, because they had had a special experience with this object; but because the adult who made the request was not the adult with whom infants had shared their special experience, the adult's request could not have been triggered by any special or shared experience with this object. In the Individual Condition, by contrast, it was the adult for whom one of the objects was clearly significant from past experience—but because infants had not shared the adult's experience, there was again no common ground on the basis of which the infant could interpret the request.

These results thus bring into focus that much of what 1-year-olds know about the mental states of others derives not from a dispassionate observation of their actions, but rather from their direct interactions with them, including the quality of the shared experiences they have had with them about particular objects. One-year-olds not only understand others' mental states, they also share them with others, and their shared experiences with others in many cases have a special salience and importance. This enables them to keep track of what they have experienced with whom, and in what ways, as a basis for their pragmatically appropriate social and communicative interactions with them.

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