



## Infants' Use of Shared Experience in Declarative Pointing

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In this study, we asked whether 14- and 18-month-old infants use the experiences they have previously shared with others when deciding what to point to for them declaratively. After sharing a particular type of referent with an adult in an excited manner, 18-month-olds subsequently found a picture of that type of referent more worthy of declarative pointing than some other picture—but only for that adult, not for a different adult. Mixed results were found with 14-month-olds. We thus show that by 18 months, infants accurately track their shared experiences with specific individuals and use this to make communicative decisions. These results also demonstrate that infants sometimes use declarative pointing to indicate not totally “new” things, as in the classic formulation, but things which are “old” in the sense that “we” should recognize them as similar to something we have previously shared.

In order to communicate successfully, interlocutors need to keep track of what experiences they have shared with whom and adjust their communication accordingly. In other words, they need to keep track of the common conceptual ground they have with their communicative partners (Bruner, 1983; Clark, 1996; Clark & Marshall, 1981; Lee, 2001; Lewis, 1969; Schiffer, 1972; Tomasello, 2008).

Recent evidence suggests that from soon after their first birthdays, infants keep track of the common ground they share with particular others in their

comprehension of communicative acts. For example, Liebal, Behne, Carpenter, and Tomasello (2009) had infants first shared a puzzle game with one experimenter (E1), in which the last puzzle piece was missing. Then infants shared a clean-up game with a different experimenter (E2) in which they put objects that were spread over the floor into a basket. At test, either E1 or E2 pointed toward a novel object, which could either be considered the missing puzzle piece or another object to clean up. They found that 18- but not 14-month-olds interpreted the experimenter's point flexibly, based on what they had previously shared with that particular person: they put the object into the puzzle game if E1 pointed, but put it into the clean-up game if E2 pointed. Similarly, in a study by Saylor and Ganea (2007), 17-month-old infants shared two different ball games (each with a different colored ball) with two different experimenters. When later in the test either E1 or E2 asked, "Where's the ball?," infants chose the ball they had previously shared with that experimenter. Similar results have also been found in other studies using slightly different methods (Ganea & Saylor, 2007; Moll, Richter, Carpenter, & Tomasello, 2008). These findings demonstrate that 1-year-old infants are not egocentric in their interpretation of others' communicative acts—they do not just respond in terms of what is relevant or interesting to them at that moment. Instead, they use the experiences they have shared with others to interpret others' communicative acts.

All of these studies concern infants' comprehension. With regard to production, there are only a few studies that show that infants and young children communicate differently depending on what they and/or the other have experienced in the past (Liszkowski, Carpenter, & Tomasello, 2007a; O'Neill, 1996; O'Neill & Happé, 2000). But none of these studies directly tested whether it was their shared experience with the adult that made the difference. In children's linguistic development, it is judgments about common ground with others that determine everything from referential choice (e.g., whether to use a noun or pronoun) to the information structure of sentences (e.g., which words to stress given what is given or new to us in previous discourse) (e.g., Gundel & Fretheim, 2002). Thus, it is important to investigate whether even in their earlier, nonverbal or barely verbal communication infants rely on shared experience in their production of communicative acts.

We used a declarative pointing task to elicit communicative acts from infants. Classically, declarative pointing is about an object or event that is new to the scene, such as a suddenly appearing clown or puppet, and the infant points excitedly, wanting to share excitement about this new thing (Bates, 1979). If the adult responds by in some way sharing this excitement overtly, the two of them have expanded their common ground both by sharing attention to the new referent and by sharing their attitudes about

it. However, it is not just newness by itself that elicits declarative pointing. Sometimes, even an “old,” familiar object might be a worthy target of communication simply because we have shared it previously in a special way. We might point to such an object in recognition of our special shared experience, to acknowledge the common ground we share. For example, if an infant and mother have shared special interest in a bluebird that appears from time to time at their bird feeder, if they now encounter a bluebird in the park, it might very well be a worthy target for declarative pointing and sharing emotions (whereas without this previous experience at the bird feeder it would not be).<sup>1</sup> One could imagine that in such cases the infant is just egocentrically excited about the bluebird, not taking into account the adult’s perspective, and it is only for that reason deemed worthy of sharing. The test case would be if the infant points to the bluebird only for her mother and not for other adults—because she has previously shared special interest in bluebirds only with her mother—but then points only for her father to a sunflower they see because they, and only they, have previously shared some special experiences with sunflowers. In either case—whether what is pointed to is new or old/shared—the function of this communication is “purely social” in the sense that infants have achieved their goal when the two of them share emotions/attitudes. It is well known in social psychology that a major way of bonding and deepening social relationships is by sharing attitudes and emotions about the world (Schacter, 1959).

In the current study, we asked whether 14- and 18-month-old infants would point differentially to one of two target objects for an adult depending on what they had excitedly shared with that particular adult some moments previously, as a recognition of their shared experience with and attitude toward it. We first had infants share one set of objects (e.g., ducks) with one experimenter (E1), then another set of objects (e.g., teddy bears) with a different experimenter (E2). Later, infants entered the test room with just one of those adults—either E1 or E2—where they faced two large photographs, one of each type of object (a duck and a teddy bear). We noted which photograph infants communicated about to the accompanying adult. If infants communicated more often about the photograph of the object they had previously shared excitedly with that particular adult—and about the other object with the other adult, since that is what they had shared with

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<sup>1</sup> The bluebird in the park is of course new in some sense, if it is a different bluebird than the one that visits the bird feeder. The key point is that it is a worthy target for pointing only because it is another exemplar of the “old” category of bluebird, and without the previous special experience with a similar bird at the bird feeder, it would likely not be worth pointing out at all.

her—it would suggest that: (1) in their early production of communicative acts, infants take into account what they have shared with whom, and (2) infants sometimes select instances of even old, familiar referents (that in themselves are not particularly interesting) as targets of their declarative communication, because they have shared them specially with the adult previously.

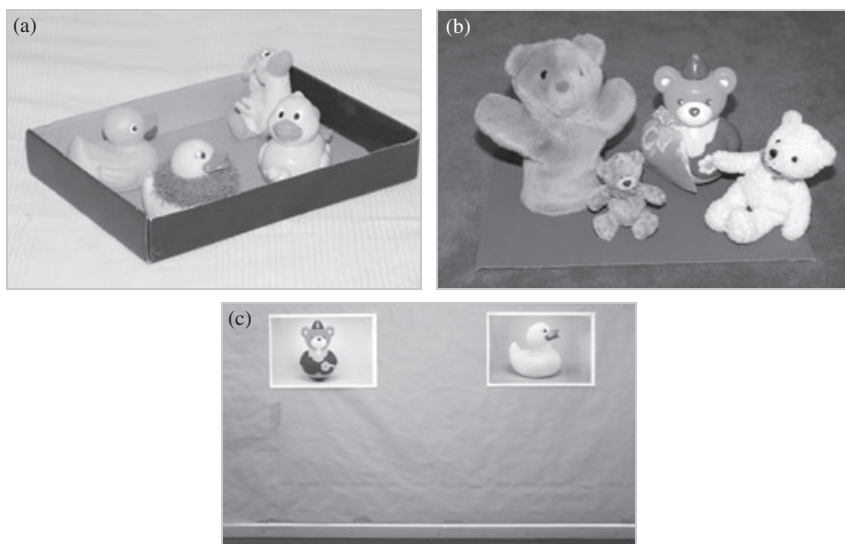
## METHOD

### Participants

Participants were 24 18-month-olds (11 girls, 13 boys; *M age* = 18 months 6 days, range = 17 months 25 days to 18 months 21 days) and 24 14-month-olds (12 girls, 12 boys; *M age* = 14 months 9 days, range = 13 months 24 days to 14 months 25 days) from a medium-sized city in Germany. Infants were recruited from a database of children whose parents had volunteered to participate in child development studies. Additional infants were tested but excluded because they did not participate at all due to shyness or lack of attention (eleven 18-month-olds, one 14-month-old), because they became fussy during the procedure (five 18-month-olds, three 14-month-olds), because they did not communicate during the test (five in each age group), or due to experimenter error (one at each age). The relatively high dropout rate for the 18-month-olds was likely a result of the toys we used in the sharing phase of the study: we chose relatively uninteresting toys in order to minimize distraction during the sharing games (so that infants could attend to the experimenter sharing the toys with them) and so that the test pictures at the end would have little inherent interest in themselves.

### Materials and design

Materials for the shared games were four ducks of different sizes and materials (rubber, plush, plastic) for the duck game and four teddy bears of different sizes and materials (plush, plastic) for the teddy game. The two test stimuli were large photographs (40 × 30 cm each) that depicted a different duck and teddy bear, respectively (i.e., one that was similar but different from one of the ducks and teddies from the games). We used pictures, not objects, for the test stimuli so that infants could not point because they wanted to request/retrieve them. The duck picture was on the right and the teddy picture was on the left. For 18-month-olds, both pictures were .80 m above the floor, 1.00 m apart from each other, and at a distance of 2.50 m away from the entrance; for 14-month-olds, to adjust to their smaller body size, the



**Figure 1** The materials used for (a) the duck game, (b) the teddy game, and (c) the test.

pictures were .60 m above the floor, .80 m apart from each other, and 1.20 m away from the entrance. See Figure 1 for photographs of the materials.

A between-subjects design was used. Each infant received one trial. Infants were randomly assigned to either the E1 or the E2 condition, which determined which adult would accompany them to the test room (i.e., either E1 who had shared the first game with them or E2 who had shared the second game with them). The conditions, the order of the games, and the experimenters assigned to the roles of E1 and E2 were fully counterbalanced.

### Procedure

After a short *familiarization phase* with both experimenters, all infants shared *game 1* with E1 on a small rug on one side of the room: together, infants and E1 discovered four different animals (e.g., ducks) in different locations. First, they found a plush duck underneath a blanket and the infants played with it briefly, then E1 placed it on a tray. They then followed the same procedure with a rubber duck they found under the blanket, a plastic duck they found on a shelf, and a different rubber duck they found under the rug. This play period lasted a total of approximately 5 min. When they had finished, E1 left the room. Then, all infants shared *game 2* with E2 on a small rug on the opposite side of the room. In this game, infants and E2

discovered and played with four different animals (e.g., teddy bears) exactly as E1 and infants had done in game 1: they first discovered a white, and then an orange teddy bear in a basket, then a brown teddy bear on the window sill, and finally a smaller brown teddy bear under the rug, talking about and naming the animals each time and then putting them away, this time on a green mat. Again the total play time was approximately 5 min. When they had finished, E1 came back into the room. Note that during the shared games neither E1 nor E2 ever pointed toward any of the objects (so it can not be the case that infants when they pointed just imitated the experimenter's pointing gesture). The test then followed. Depending on the condition, either E1 or E2 said to infants, "Let's go and see the other room!" That experimenter opened a curtain to the other room and entered it, followed by the infant (infants walked, or, as needed in a few cases because they hesitated to enter the room, were carried by their parent, who put them down in the test room so that they were able to move freely). Infants always entered the room such that they faced the two pictures from a centered position. The other experimenter stayed behind the curtain in the first room during the test.

The response period comprised up to three phases: The first phase started as soon as infants and the experimenter had entered the room. In this phase, we assessed infants' completely spontaneous communication. The experimenter did not say anything at first, just waited as infants explored the room (1–10 sec). If infants communicated with her about one of the pictures, the response period was terminated. If they did not communicate with her during that first phase, a second phase (11–20 sec) followed in which the experimenter made sure infants saw the pictures by saying, "Look, there!" (in an excited, recognizing tone of voice) while alternating gaze between the infant's face and the general direction of the pictures (i.e., turning her head toward the pictures and looking at the center, between the two pictures). If infants still did not communicate with the experimenter, a third phase followed (21–30 sec) in which the experimenter said, "Look, the pictures!" (again in an excited, recognizing tone of voice) while alternating gaze between infants and the center of the two pictures. During the entire response period, the experimenter never looked directly at either of the pictures. Note that the experimenter never asked infants to communicate, never gestured, and never singled out either of the pictures in any way.

The 18-month-olds were tested first, followed by the 14-month-olds. While piloting the 14-month-olds, we observed that they communicated somewhat less often than the older infants. For the 14-month-olds, we thus added a second response period if infants did not communicate during the first response period. In that case, the experimenter and infants returned to the other room and repeated the sharing phases: infants shared two animals

of game 1 with E1 again, two animals of game 2 with E2 again, and then went back to the test room where the same procedure was followed for a second response period.

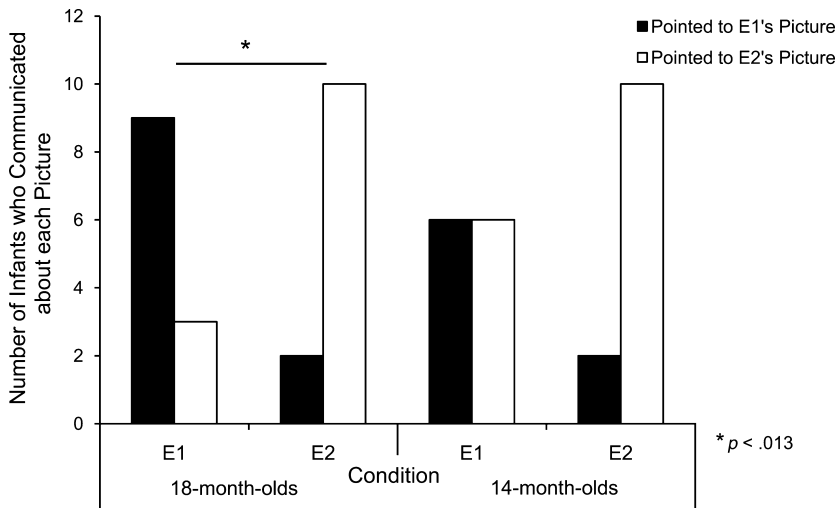
### Coding, reliability, and analyses

We scored which picture infants communicated about to the experimenter first, that is, whether they communicated about the picture that corresponded to the game they had shared with E1 before (called E1's picture) or the picture that corresponded to the game they had shared with E2 (called E2's picture). Communication was defined as pointing, naming, and/or touching a picture that was accompanied by eye contact with the experimenter (although note that no infant only named the picture, without pointing to it or touching it). Each infant received a single score. We also scored in which phase of the response period the communication occurred. To assess interrater reliability, a coder who was unaware of both the hypotheses of the study and which experimenter had shared which activity with the infant independently coded 33% of the data at each age. Perfect agreement was achieved ( $\kappa = 1$  for both measures). Exact, two-tailed  $p$ -values are reported throughout.

## RESULTS

For the 18-month-olds, there was a significant difference in infants' pattern of responses across the two conditions. When they went to the test room with E1, the majority of infants communicated about the picture that was relevant to the game they had shared with E1, but when they went to the test room with E2, the majority of infants communicated about the picture that was relevant to the game they had shared with E2, as shown in Figure 2 (Fisher's exact test,  $p < .013$ ;  $\phi = .59$ , large effect, see Cohen, 1988). Overall, 79% of the 18-month-olds communicated about the picture that was relevant to the experience they had shared with the adult who accompanied them to the test room, whereas only 21% communicated about the other picture (Binomial test,  $p < .007$ ;  $g = .29$ , large effect). Infants' responses in the E1 condition are particularly important because they indicate that infants were not communicating egocentrically in terms of what was most salient for them at that moment—the game they had played most recently—but rather based on the shared experience they had previously had with the particular adult with whom they were communicating.

For the 14-month-olds, in contrast, there was no difference between conditions (Fisher's exact test,  $p = .193$ ). Although the majority of



**Figure 2** Number of infants who communicated about each picture (i.e., the picture relevant to the previous shared experience with E1 or the picture relevant to the previous shared experience with E2) in each condition.

14-month-olds (67%) pointed to the picture that was relevant to their shared experience with the adult who accompanied them (compared with 33% who did not), this was not a significant difference (Binomial test,  $p = .152$ ). Thus, these infants communicated with each of the experimenters about the pictures but, especially in the E1 condition, they did so irrespectively of what they had shared with each adult previously.<sup>2</sup>

Finally, to investigate how spontaneously infants communicated, we coded in which phase of the response period infants' first communicative act

<sup>2</sup>We also looked at the main results in two additional ways. First, a few of the 14-month-olds included in this analysis (four infants) received a second response period with a partial repetition of the sharing phases. To address whether this slightly different experience might have had an influence on the results, we conducted an additional analysis that included only those infants who communicated in the first response period. It revealed the same result (Fisher's exact test,  $N = 20$ ,  $p = .628$ ). Second, as noted in the Participants section, we excluded infants who did not communicate at all from the main analyses (five infants for each age group), as it is impossible to tell whether their nonperformance was due to a lack of skill or a lack of motivation. If these infants are included in the analyses as a separate group of "noncommunicators" (for the 18-month-olds, this category included an extra four infants in the E1 condition and one infant in the E2 condition; for the 14-month-olds it included an extra three infants in the E1 condition and two infants in the E2 condition), we still get the same results: a significant difference between conditions for the 18-month-olds (Fisher's exact test,  $N = 29$ ,  $p = .008$ ) but no difference for the 14-month-olds (Fisher's exact test,  $N = 29$ ,  $p = .248$ ).

TABLE 1  
 Number of Infants who Responded in Each Phase of the Test (Response Either Relevant or Not Relevant to the Experience Shared With the Experimenter)

	<i>Phases (Response Period 1)</i>			<i>Phases (Response Period 2)</i>		
	<i>1</i>	<i>2</i>	<i>3</i>	<i>1</i>	<i>2</i>	<i>3</i>
18-month-olds						
Relevant	11	4	4	–	–	–
Not relevant	1	4	0	–	–	–
14-month-olds						
Relevant	4	4	4	2	1	1
Not relevant	4	3	1	0	0	0

occurred. Table 1 shows how many infants communicated in each phase. The majority of 18-month-olds who communicated about the relevant picture did this immediately upon entering the room in phase 1 (58%); only 25% of the 14-month-olds did this in their first response period (and only 13% in their second response period).

### DISCUSSION

In the current study, we found that 18-month-old infants use their shared experiences with an adult in choosing what to point to declaratively for her. Specifically, we found that 18-month-olds pointed selectively for an adult to referents of a type they had previously shared in a special way with that particular adult. In addition to showing that infants keep track of their common ground with others in their communicative productions, this finding shows that infants sometimes select instances of even old, familiar referents as targets of their declarative communication—if they have shared them specially with the other previously.

Fourteen-month-olds in the current study did not show such clear-cut results. Although they responded very similarly to the 18-month-olds in the E2 condition, they did not communicate selectively in the E1 condition. This negative result is difficult to interpret. That is, in the E1 condition, in which 14-month-olds did not point selectively to one picture over the other, infants could either have been responding randomly or it could be that some infants chose to communicate about the new thing in the situation for the adult and some infants chose to communicate about the shared thing—we simply can not tell. Still, infants’ responses in the E2 condition suggest that they were not simply responding randomly, and infants’ responses in the E1 condition suggest that they were not just responding egocentrically (about the last type

of object they had seen)—because if they were, they would have chosen the last object in this condition as well. The 14-month-olds thus may have been able to track their shared experience with the adult in the E2 condition (the condition in which the shared experience had occurred just moments previously), but in the E1 condition (the condition in which the shared experience had occurred longer ago, and with an intervening game with another adult), the increased time lag between the shared experience and the communicative act may have made the information processing demands too great for the younger infants.

Support for this interpretation comes from a comprehension study by Ganea and Saylor (2007) in which they found that 15-month-olds use prior shared experience to interpret an adult's ambiguous request, but only when the adult's request comes immediately after the shared experience phase, not if it comes after a 2.5 min delay. Further support comes from the study of Liebal et al. (2009). They found that 18-month-olds were able to keep track of what particular experiences they had shared with two different interlocutors when they interpreted their communicative acts but 14-month-olds were not. However, 14-month-olds were able to interpret the pointing gesture of a *single* adult differently depending on whether or not they had previously shared a particular experience with her. These findings suggest that from 14 months on, infants may have the basic pragmatic skills to interpret others' communication based on the experience they have shared with them if the situation is maximally simple (see also Moll et al., 2008). So perhaps our situation with two adults was too complex for 14-month-olds, and they might have succeeded in a one-person version of our task; this is a question for future research.

One could argue that the current results could be explained in terms of lower-level associations and processes: infants' experiences led them to simply associate the two different types of objects with the two different adults and, subsequently, to point to one of the pictures in order to elicit a rewarding response from the adult (see Moore & Corkum, 1994; Moore & D'Entremont, 2001). While we can not completely rule out this explanation in the current study, previous studies have shown that even younger infants do not point declaratively in this way, simply to obtain positive adult reactions. For example, after pointing to a suddenly appearing puppet, 12-month-olds are not satisfied if an adult reacts by simply turning to them (or to some other object in the same direction) and expressing positive emotions, without looking at the puppet. They are only satisfied if the adult shares attention and interest with them to the specific referent they are pointing to (Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004; Liszkowski, Carpenter, & Tomasello, 2007b). It is thus unlikely that the older infants in the current study pointed just to obtain a superficially positive reaction from the adult;

the fact that much younger infants already point to share attention and interest suggests that our 18-month-olds were doing the same, and, in addition, were pointing out something that was interesting only because it was relevant to the special past experience they had shared with that particular adult.

One-year-old infants are just beginning to acquire skills of conventional linguistic communication. An absolutely critical aspect of those skills is the ability to keep track of what they share and do not share with particular other people, both in terms of information about the world and also in terms of emotions and attitudes about the world. Indeed, one could argue from the current results that the joint attentional skills which are so critical in early language development (Tomasello, 2003) manifest themselves not only in episodes of joint visual attention, as most often studied, but also in a joint recognition between child and adult of shared experiences from the recent past. Apparently, joint attentional skills of this less perceptual and more conceptual type are available from very early in the process of learning to communicate, and not just in language learning but also in early gestural communication. As children develop, they will learn to use their shared experiences with others in ever more complex ways, for example, as the basis for pragmatic judgments of givenness and newness, which play such an important role in syntactic development.

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