Journal of Pragmatics 42 (2010) 3377–3383

Contents lists available at ScienceDirect

Journal of Pragmatics

journal homepage: www.elsevier.com/locate/pragma

21-Month-olds understand the cooperative logic of requests

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ARTICLE INFO

Article history:
Received 28 January 2009
Received in revised form 2 December 2009
Accepted 9 May 2010

Keywords:
Requests
Communication
Comprehension
Cooperativeness
Infants

ABSTRACT

Human communication rests on a basic assumption of partner cooperativeness, including even requesting. In the current study, an adult made an ambiguous request for an object to 21-month-old infants, with one potential referent being right in front of her and the other being across the room. In a normal situation (Hands-Free), infants interpreted the request as referring to the distant object—the one the adult needed help fetching. In contrast, in a situation in which the adult was constrained so that fetching either object herself would be difficult (Hands-Occupied), infants selected the far object much less often. These results suggest that infants just beginning to acquire language already understand something of the cooperative logic of requests.

1. Introduction

In adult language, requests fall on a continuum from orders or demands to cooperative or indirect requests. In all cases, the assumption is that the listener will want to comply—either because of some threatened sanction or because she wants to be cooperative. Most requests in everyday life are toward the cooperative end of the continuum and are based on a mutual assumption among interlocutors that people want to be helpful if it's not too much trouble. In recognition of this, requesters typically make only reasonable requests involving things that they cannot more easily do for themselves (Grice, 1975; Searle, 1969). Adults generally mark the effort that is involved in fulfilling their request by using more polite, formal, or indirect language as the intrusiveness of the request increases (Gordon and Ervin-Tripp, 1984).

It is unknown at what age young children begin to comprehend this cooperative logic of requests. From practically as soon as they are born, infants have ways of getting what they want from adults. But Camaioni (1993; see also Bates, 1976) claimed that to make requests young infants only need to understand adults as causal (not intentional or mental) agents, and then manipulate them as a kind of social tool (see also Shatz, 1983). Accordingly, in comprehension, infants react to requests directed at them on a superficial basis: they simply act either based on the context and their understanding of isolated lexical items, without taking into account the other person's mental states (Shatz, 1978a,b), or on the understanding of causal relationships and commands—where no assumptions of cooperativeness need to be involved.

There are only a few studies of young children's comprehension of requests. Bates (1971) and Shatz (1978a) found that two-year-olds comply with indirect requests (e.g. 'Can you pick up the block?') as often as with direct commands (e.g. 'Pick up the block!'). But this does not yet show a higher order understanding of the issues involved in indirect requests. It is still possible (and quite likely) that children learn such highly frequent and mono-functional phrases in a formulaic manner. In several recent studies, however, even younger infants have proven quite skillful at interpreting potentially ambiguous adult

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doi:10.1016/j.pragma.2010.05.005

requests helpfully (Liszkowski, 2005) and at using a variety of different pragmatic cues to interpret ambiguous requests; such as, the requester's previously expressed preference (Repacholi and Gopnik, 1997), her previous experience and current excitement (Tomasello and Haberl, 2003), or her visual access to the candidate objects (Moll and Tomasello, 2006), as well as direct and indirect, verbal and non-verbal shared experience (Babelot and Marcos, 1999; Ganea and Saylor, 2007; Liebal et al., 2009; Saylor and Ganea, 2007). None of these studies has directly addressed the basic question of what infants understand about the cooperative logic of requesting.

There is evidence from studies on cooperation that from 14 months infants have the ability to understand when a struggling (but not communicating) person needs their help (Warneken and Tomasello, 2006, 2007). But to our knowledge there are no studies of infants' comprehension of requests in which they must comprehend the underlying cooperative logic in order to figure out what the requester wants, for example, which of several objects she is requesting.

In the current study, therefore, we presented 21-month-old infants with a situation in which an adult made a potentially ambiguous request for the infant to fetch one of two identical objects for her. What differed was the accessibility of the objects for the adult: one was very close to the adult (easily within reach) whereas the other was far out of her reach. In the Hands-Free condition, the adult simply asked the infant for help—the cooperative assumption being that the intended referent was the object that she, the adult, could not easily fetch herself. In the Hands-Occupied condition, the adult was holding a large object so that she could not easily fetch either of the two objects herself—in which case either object could plausibly be the intended referent. These conditions were modeled on those of Gergely et al. (2002) in their investigation of so-called rational imitation. There was also a baseline condition in which the object was accessible but there was no request for help, instead infants were encouraged to take an object for themselves (Free-Choice condition). If infants understand the adult's ambiguous request as a simple command, then they should be uncertain which object the adult wants in both experimental conditions. But if they understand the ambiguous request as a cooperative request for help, then, in the Hands-Free condition, they should assume that the adult wants the object that she needs help fetching (and have no preference in the Hands-Occupied condition).

2. Method

2.1. Participants

Participants were obtained from a database of parents from a middle-sized German city who had volunteered for studies of child development. Participants were 48 German-speaking infants (21 girls and 27 boys) of 21 months of age (M = 20;27, range = 20;01–21;19). An additional 7 infants participated but had to be excluded from the final sample because they did not respond on at least one of four trials.

2.2. Materials and design

For each trial a different set of objects was used. Each set of objects consisted of one *main* object and two identical looking *complementary* objects: (1) a flashlight (main object) and two batteries (complementary objects), (2) a locked wooden box with a picture inside (main object) and two keys (complementary), (3) a plastic teddy bear in a toy car with a sound device inside (main object) and two screwdrivers (complementary) and (4) a long white plastic tube (main object) and two smaller u-shaped white plastic tubes (complementary). When one of the two complementary objects was inserted into or connected to the main object in a certain way an interesting effect could be produced: (1) the flashlight could be switched on, (2) the box could be opened and the picture inside could be seen, (3) the plastic teddy bear produced a sound when spun around and (4) two small cubes could be rolled down one long construction of tubes.

Each infant was randomly assigned to one of the three conditions (Hands-Free, Hands-Occupied and Free-Choice), yielding 16 infants in each condition. Each infant was presented with four trials but not all infants completed all of them. Trials were excluded from the analyses if the infant failed to choose one of the two candidate objects within 10 s after the adult had repeated the request twice. This was the case for 19 trials (6 in the Hands-Free, 8 in the Hands-Occupied, and 5 in the Free-Choice condition). The order in which the four sets of objects were presented, the spatial position of the adult relative to the infant (to the left or to the right in front of the infant) as well as the order in which the two candidate objects were placed in the room (the close object first or the distant object first) were counterbalanced across infants within each condition.

2.3. Procedure

Participants visited a child laboratory with a parent for one session of approximately 15 min. Parents were instructed to remain silent and not to intervene throughout the study. They were also instructed to simply let the infant depart from her initial position in the response phase after a prompt ("Give me the [*complementary object*] please!"). If there was a sign that parents did not follow these instructions but directed their child in any way during the response phase, the trial was excluded from the analysis.

Prior to the study, the experimenters (E1 and E2) played with the infant freely on the floor in the testing room (3.00 m × 4.00 m). When the infant seemed comfortable with the situation, E2 left the room—marking the beginning of the

study. E1 retrieved the first set of objects from a basket and explored together with the infant its properties and function. She ostensively demonstrated to the infant that while one of the two complementary objects made the main object function, the other one did not. For example, the flashlight functioned only with one of the two batteries but not with the other. Infants thus learned in each trial that even though they looked identical, the two objects had very different effects. This was done in order to make clear to the infants that their choice of objects later in the study would make a difference. Importantly, this demonstration was the same in all conditions.

After the demonstration, E1 put all three objects (the main object and the two complementary objects) back into the basket and placed the basket on the floor between two identical looking tables (each 57 cm high, 100 cm wide, 41.5 cm deep). The infant sat on the parent's lap at a distance of 2.30 m to each of the tables. Thus infants could neither be influenced by their parent's eye gaze nor could parents possibly correct their child's initial choice in any way since they were more than two meters away at the moment of choice.

E1 then sat down on the floor behind one of the two tables, depending on the counterbalancing schedule, and pretended to be busy writing something. From her position, E1 could easily reach anything on the table right in front of her but was unable to reach anything that was located on the distant table (150 cm from her). Each table had a barrier attached to the side facing the room which made it even more difficult for E1 to retrieve the distant object (see Fig. 1 for the set up).

At this point the test phase started. E2 entered the room, picked up the basket containing the objects and placed one of the complementary objects on each of the two tables in a nonostensive manner —the order was determined by the counterbalancing schedule. She finally placed the main object incidentally on the table right in front of the adult, and left the room again. In the Hands-Occupied condition, she also left the basket on this table so that E1 could use it later as an object to occupy her hands with.

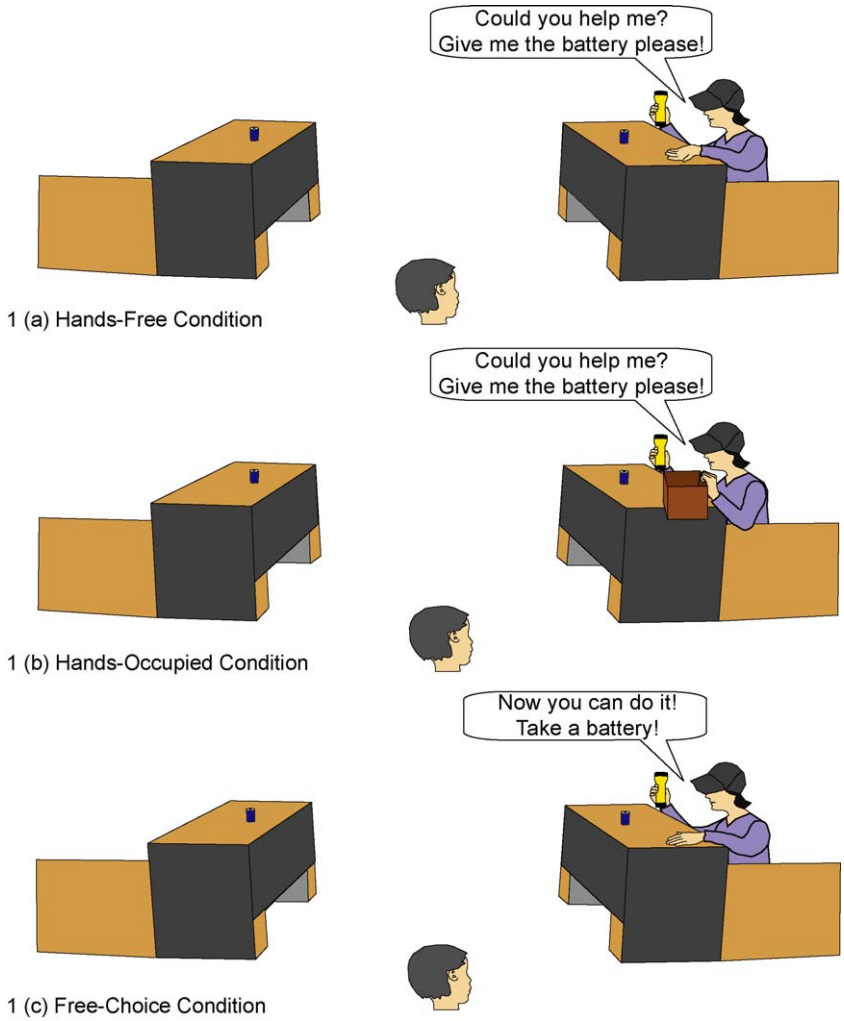

Fig. 1. Request situation from the infant's perspective in the three conditions: (a) Hands-Free condition, (b) Hands-Occupied condition, and (c) Free-Choice condition. The visor occludes access to the adult's line of gaze.

In each condition, E1 (who wore a visor) picked up the main object (e.g., the flashlight) and announced "Oh look! Here's the flashlight again! Shall we put it back together?" In the *Hands-Free condition*, E1 now had the main object (e.g. flashlight) in the far hand from the infant's perspective and the near hand was free. She then looked straight ahead in the direction of both the close and the distant object (but without looking at a specific one) saying "Oh, but I still need the battery there!" She did not indicate by her gaze direction (and the visor guaranteed that infants were unable to see where exactly she was looking) or any pointing cues to which of the two candidate objects she was referring. Note that in German the demonstrative particle *there* ('*da*') does not denote any information about distance.

E1 then looked to the infant and expressed her need for help, both nonverbally – using a facial expression and a manual gesture (raising and then dropping her arms) – and verbally: "What do I do now, [*infant's name*]? Can you help me?" She then made an ambiguous request for help, "Give me the battery, please!"—while stretching out her hand towards the infant with the palm of her hand facing upwards (see Fig. 1a).

In the *Hands-Occupied condition*, E1, after having presented the flashlight, first announced, "I will come over to you" (this was necessary in order to give infants a justification for taking and holding the basket). Then she picked up the basket with the hand close to the infant and raised both hands up to eye level *as if* she wanted to get up and come over. With both hands clearly occupied, E1 looked in the direction of the two target objects (exactly in the same angle as in the Hands-Free condition) and said: "Oh, but I still need the battery there!" Then she continued with the help request exactly as in the Hands-Free condition except for stretching out the near hand which was now occupied with the basket (see Fig. 1b).

In the *Free-Choice condition*, E1 first showed the exact same behavior as in the Hands-Free condition, looking ambiguously in the direction of both candidate objects but then she said, "Oh, but we still need a battery!" Instead of expressing the need for one specific battery and requesting help from the infant, E1 simply encouraged the infant to choose a candidate object for herself announcing, "Do you know what? Now you can do it! Take a battery!" During this last part of the prompt, E1 also put her hand on the table in the same position as in the Hands-Free condition but with the palm facing downwards which could not be interpreted as a requesting gesture (see Fig. 1c). Thus in each of the conditions we provided infants with multiple cues in order to make clear to them what was a request for help and what not—just as it occurs naturally. Upon receiving the object, E1 consistently gave positive feedback independent of which object infants had chosen.

In each of the conditions, the final request (depending on condition, either "give me the [*complementary object*]" or "take a [*complementary object*]") was repeated up to three times if an infant did not respond. If infants still did not respond after the third repetition, the whole sequence including the ambiguous gaze at the objects and the verbal expression ("Oh, but I still need the battery there!"/"Oh, but we still need a battery!") was repeated up to two times.

2.4. Coding and reliability

For each trial it was coded which of the two candidate objects the infant handed to E1 (Hands-Free condition), put into the basket (Hands-Occupied condition) or which of the objects the infant used on the main object (Free-Choice condition). If an infant did not respond by these means, it was coded which object the infant pointed to or grasped first. This was the case for 4 trials in the Hands-Free condition, 2 trials in the Hands-Occupied condition and 6 trials in the Free-Choice condition. The proportion of trials in which an infant chose the distant object relative to the total number of completed trials was calculated for each individual.

All sessions were videotaped and coded by the primary experimenter based on the video material. A random sample of 4 infants in each condition was coded by an independent second rater who was blind to the hypotheses of the study. Interrater reliability was excellent: the raters agreed on 96% of the trials, resulting in a Cohen's Kappa of .90.

3. Results

Infants in the Hands-Free condition chose the distant object twice as often (mean = .49; SD = .29) as infants both in the Hands-Occupied condition (mean = .23; SD = .34) and in the Free-Choice condition (mean = .23; SD = .21; see Fig. 2). A one-way ANOVA on the mean proportions of choosing the distant object showed a significant main effect of condition, $F(2, 45) = 4.50$, $p = .016$. Post-hoc analyses (Fisher's LSD) revealed that the differences between the Hands-Free condition and both the Hands-Occupied condition and the Free-Choice condition were significant (both $p = .013$). Infants' choices of the distant object in the Hands-Occupied and the Free-Choice conditions did not differ, $p = 1$. In these two conditions, infants chose the distant object at a relatively low level, thereby indicating a general preference for choosing the close object—we will lay out the possible reasons for this preference in section 4.

To test for potential effects of the set of items, we used a generalized linear mixed model (GLMM) with binomial error structure in which we included *set of items* and *condition* as fixed factors and *subject* as random effects. Significance of the factor *set of items* was derived from a likelihood ratio test of the full model against a model not comprising *set of items*. This test revealed no effects of *set of item*, χ^2 (3, $N = 45$) = 4.54, $p = .20$.

Despite our careful instructions to the parents, we wanted to look for any potential parental influence on infants' choices. We therefore coded a random sub-sample of 6 infants in each condition for changes in their direction when walking from their parent towards the objects—since infants who changed direction could not have been influenced by their parents. Infants' performance did not differ depending on whether they changed direction or not: In trials in which infants changed direction, they chose the distant object in 67% of the cases in the Hands-Free condition and in 30% in the Hands-Occupied

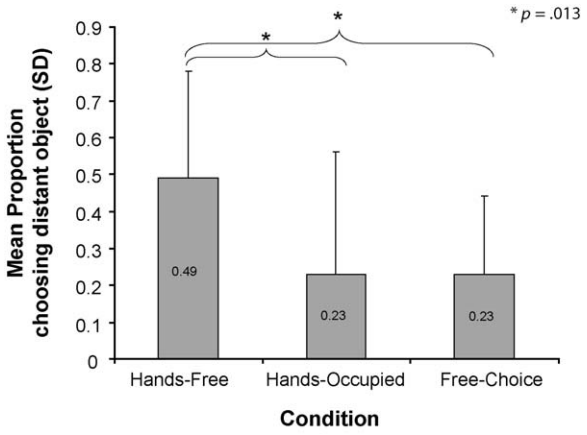

Fig. 2. Mean proportion of infants' choice of the distant object in each condition. Error bars represent standard deviations.

condition. In trials in which there was no change of direction, infants chose the distant object in 27% of the cases in the Hands-Free, and in 0% in the Hands-Occupied condition. Differences between conditions thus were the same irrespective of whether infants changed direction or not—suggesting that the results were not affected by any parental influence on the infants' initial movement.

4. Discussion

In this study, 21-month-old infants reliably chose a distant object more often when it was the only object the adult needed help in retrieving. That is, they chose the distant object more often in the Hands-Free condition than in (i) a baseline condition in which the adult did not request help and instead encouraged the child to choose an object (Free-Choice condition), and (ii) a Hands-Occupied condition in which the adult made the same request for help but when there was another object (the close object) which the adult also could not easily retrieve because her hands were occupied. Infants' performance in the Hands-Occupied condition shows that they neither interpreted the request as a command nor did they follow a simple associative strategy like always giving the distant object. Instead, they interpreted the request as a request for their help with a certain problem. They took into account the adult's whole situation including its specific constraints, and differentially chose one of the two candidate objects. This result provides specific evidence for the assumption that young children below the age of two years use cooperative reasoning to interpret ambiguous requests for help.

It thus complements previous findings that infants communicate with cooperative motives from as early as 12 months of age. In particular, they inform others of things helpfully, for example, providing the location of a sought-for object (Liszkowski et al., 2006). In comprehension, they understand when others are informing them of things helpfully as well, that is, as supplying the location of a sought-for object (Behne et al., 2005). This helpful informing motive is unique to human communication, as nonhuman primates neither communicate with this motive nor understand it as expressed by others (Tomasello, 2006, 2008). But requesting objects from others is not typically thought of as cooperative or helpful; the communicator wants what she wants only for herself and she wants the recipient to do what is necessary. Humans, however, have transformed even this basically 'selfish' speech act of requesting into something cooperative, at least in the majority of cases. Most requests in everyday human communication are based on mutual expectations of helpfulness: the recipient will help if it does not require too much effort, and the communicator will not request anything too costly. What we have shown here is that infants just getting started in language understand something of this cooperative logic of everyday requests.

That this is still only a beginning understanding is evidenced by the fact that infants in this study chose the distant object only 49% of the time in the Hands-Free condition. But given the strong baseline bias against the distant object (they chose it only in 23% of the trials in both the Hands-Occupied and the Free-Choice condition), they were clearly affected both by the adult's specific needs and her ability to retrieve the object for herself. Presumably, infants had this bias for choosing the close object because it was closer both to the requester and the 'substrate' object for which it was needed—so fetching the distant object constituted a greater effort.

Some researchers (e.g., Shatz, 1978b) might propose a leaner interpretation of these results, supposing that 21-month-old infants do not possess the cognitive abilities necessary for such complex pragmatic reasoning. According to this view, children could solve the problem with only a superficial understanding of the situation and formulaic knowledge of some lexical items. But, from a mere behavioral point of view, the Hands-Free and the Free-Choice condition were very similar. Besides the palm of the hand facing up- or downwards, they differed only subtly in the verbal utterances directed at the child and yet they obviously led to different results.

An alternative interpretation may be that the child has no understanding of the cooperativeness of requests, but simply acts 'rationally' in the sense of performing the most efficient action (Csibra, 2003). The main conditions of this study were

modeled on those of Gergely et al. (2002). In that study, infants imitated an adult's unusual action when that action appeared to be freely chosen, but they did not when that action seemed to be forced by the circumstances (that did not apply to them). This phenomenon has been called 'rational imitation' because the infant understands that the adult is behaving rationally given the constraints of the situation. Along the same lines, one could argue that children in our study reasoned based on such an assumption of rationality in the adult's action, of the form: 'If she wanted the close object it would be less costly (in terms of effort and time) for her to simply take it than to request it from someone else. Therefore, she must mean the distant object.' But to account for the children's preference for the close object in the control conditions as well, the efficiency view would have to add as a corollary that in these situations, the child does what is most efficient for *herself*: she chooses the object which involves the least locomotion (the distant object would require a detour away from the adult and then back to the adult). But note that there is a shift in perspectives between conditions: in the Hands-Free condition, the child acts in a way that accords with maximum efficiency from the *adult's* point of view, but in the control conditions, she shifts to a strategy that involves the least effort for herself. What this account cannot explain is how the child comes to decide from whose perspective the efficiency analysis is to be conducted. If instrumental concerns alone had governed the child's behavior, she would have chosen the close object throughout the conditions, no matter what specific situation the adult was facing—which is not what we found. Moreover, the major premise on which the efficiency account rests – viz., that adults would not go to the 'trouble' of requesting things right in front of them – is regularly contradicted in the everyday experiences of children in their interactions with adults. Adults very frequently ask children to hand them objects which they could more easily take themselves. This is indeed so natural that it is taken for granted in many experimental studies (for example word learning studies) using procedures in which an adult asks the child to hand her an object located right in front of her (the adult). For these reasons, we do not think that any account that attempts to explain the children's responses solely with efficiency calculations is successful. Instead, if the child's interpretation is informed by an assumption of cooperativeness, she would not only be motivated to shift perspectives and find out which of the two objects the adult is asking for, but she would also distinguish between situations in which genuine help is needed and those in which requests may be uttered more playfully, for purely interactional reasons.

To summarize, the current study has shown that 21-month-old infants can use their understanding of helping situations in a rational way to interpret an ambiguous request for a needed object. Infants just beginning to learn language evidenced a nascent understanding of the underlying cooperative logic of the speech act of requesting, based on an emerging appreciation for the cooperative and rational structure of human communication.

Acknowledgements

We would like to thank Manuela Schmidt, Johanna Gundermann, Susanne Helmig and Sarah Girlich for help with data collection, Eva Siegert for helpful advice with the procedure and Roger Mundry for statistical advice. Many thanks to the participating infants and their parents. We also want to thank the following people for their critical comments on an earlier version of the manuscript: Danielle Matthews, Coralie Chevallier, Mikolaj Hernik and two anonymous reviewers from the *Journal of Pragmatics*.

This work was supported by the EU project "Origins of referential Communication" (REFCOM—FP6-2003-NEST-PATH/CONTRACT 012787).

References

Babelot, Geraldine, Marcos, Haydee, 1999. Comprehension of directives in young children: influence of social situation and linguistic form. First Language 19, 165–186.

Bates, Elizabeth, 1971. The Development of Conversational Skills in 2, 3, and 4-year olds. Unpublished Thesis, Chicago.

Bates, Elizabeth, 1976. Language and Context: The Acquisition of Pragmatics. Academic Press, New York.

Behne, Tanya, Carpenter, Malinda, Tomasello, Michael, 2005. One-year-olds comprehend the communicative intentions behind gestures in a hiding game. Developmental Science 8 (6), 492–499.

Camaioni, Luigia, 1993. Continuity versus discontinuity in the development of pre-linguistic and linguistic communication. Sistemi Intelligenti 5 (2), 189–197.

Csibra, Gergely, 2003. Teleological and referential understanding of action in infancy. Philosophical Transactions of the Royal Society of London Series B—Biological Sciences 358 (1431), 447–458.

Ganea, Patricia A., Saylor, Megan M., 2007. Infants' use of shared linguistic information to clarify ambiguous requests. Child Development 78 (2), 493–502.

Gergely, György, Bekkering, Harold, Kiraly, Ildiko, 2002. Rational imitation in preverbal infants. Nature 415 (6873), 755.

Gordon, David, Ervin-Tripp, Susan, 1984. The structure of children's requests. In: Schiefelbusch, R.E., Pickar, A. (Eds.), The Acquisition of Communicative Competence. University Park Press, Baltimore, pp. 295–321.

Grice, Herbert Paul, 1975. Logic and conversation. In: Cole, P., Morgan, J. (Eds.), Syntax and Semantics. Academic Press, New York.

Liebal, Kristin, Behne, Tanya, Carpenter, Malinda, Tomasello, Michael, 2009. Infants use shared experience to interpret pointing gestures. Developmental Science 12 (2), 264–271.

Liszkowski, Ulf, 2005. Human twelve-month-olds point cooperatively to share interest with and helpfully provide information for a communicative partner. Gesture 5 (1–2), 135–154.

Liszkowski, Ulf, Carpenter, Malinda, Striano, Tricia, Tomasello, Michael, 2006. Twelve-and 18-month-olds point to provide information for others. Journal of Cognition and Development 7 (2), 173–187.

Moll, Henrike, Tomasello, Michael, 2006. Level I perspective-taking at 24 months of age. British Journal of Developmental Psychology 24, 603–613.

Repacholi, Betty, Gopnik, Alison, 1997. Early reasoning about desires: evidence from 14- and 18-month-olds. Developmental Psychology 33 (1), 12–21.

Saylor, Megan M., Ganea, Patricia, 2007. Infants interpret ambiguous requests for absent objects. Developmental Psychology 43 (3), 696–704.

Searle, John, 1969. Speech Acts: An Essay on the Philosophy of Language. Cambridge University Press, Cambridge, MA.

Shatz, Marilyn, 1978a. Children's comprehension of their mothers' question directives. Journal of Child Language 5, 39–46.

Shatz, Marilyn, 1978b. On the development of communicative understandings: an early strategy for interpreting and responding to messages. Cognitive Psychology 10, 271–301.
Shatz, Marilyn, 1983. Communication. In: Flavell, J., Markman, E.M. (Eds.), Cognitive Development. Wiley, New York, pp. 841–889.
Tomasello, Michael, 2006. Why don't apes point? In: Levinson, S., Enfield, N. (Eds.), Roots of Human Sociality. Berg, Oxford, pp. 506–524.
Tomasello, Michael, 2008. Origins of Human Communication. MIT Press, Cambridge, MA.
Tomasello, Michael, Haberl, Katharina, 2003. Understanding attention: 12- and 18-month-olds know what is new for other persons. Developmental Psychology 39 (5), 906–912.
Warneken, Felix, Tomasello, Michael, 2006. Altruistic helping in human infants and young chimpanzees. Science 311, 1301–1303.
Warneken, Felix, Tomasello, Michael, 2007. Helping and cooperation at 14 months of age. Infancy 11, 271–294.