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## Cognitive Development



# Children's understanding of communicative intentions in the middle of the second year of life

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### ABSTRACT

Two tasks were administered to 40 children aged from 16 to 20 months (mean age = 18;1), to evaluate children's understanding of declarative and informative intention [Behne, T., Carpenter, M., & Tomasello, M. (2005). One-year-olds comprehend the communicative intentions behind gestures in a hiding game. *Developmental Science*, 8, 492–499; Camaioni, L., Perucchini, P., Bellagamba, F., & Colonnesi, C. (2004). The role of declarative pointing in developing a theory of mind. *Infancy*, 5, 291–308]. In the first task, children had to respond to the experimenter who pointed at a distal object; in the second task, children had to find a toy in a hiding game after the experimenter indicated the correct location either by pointing or by gazing. In the first task, most children responded to the declarative gesture by "commenting" on the pointed object instead of just looking; however, looking responses were more frequent than commenting responses. In the second task, children chose the correct location of the object significantly more frequently when the informative gesture was the point than when it was the gaze; moreover, there were significantly more correct choices than incorrect choices in the point but not in the gaze condition. Finally, no significant relation was found between tasks. Taken together, the findings support the view that infants' developing understanding of communicative intention is a complex process in which general cognitive abilities and contextual factors are equally important.

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Children's understanding of others as having mental states is assumed to have major implications for social and communicative development (Astington, 1993; Astington & Gopnik, 1988; Whiten, 1991). Research in this area has traditionally focused on epistemic mental states, with most of the evidence showing that 4-year-olds are capable of understanding other's beliefs even when they are different from their own and from the state of reality (Welman, Cross, & Watson, 2001). More recently, the focus has widened to include attentional and intentional states, and results allowed researchers to identify the beginnings of children's social understanding at an even earlier age. Twelve-month-olds reliably follow the gaze direction of another person, although disagreement exists about how to interpret this evidence, that is, whether it involves infants' recognition of another's attentional focus from its onset (Carpenter, Nagell, & Tomasello, 1998; Tomasello, 1999), or leads to such recognition only later in development (Carpendale & Lewis, 2004; Moore & Corkum, 1994). When selective attention is considered, 18-month-olds recognize what is new and what is old for a person, therefore showing an ability to take into account the other's mental focus (Tomasello & Haberl, 2003). With respect to intentional states, 18-month-olds have been shown to be able to imitate the intended purpose of an action not actually fulfilled (Meltzoff, 1995), as well as to distinguish intentional from accidental actions (Carpenter, Akhtar, & Tomasello, 1998) and to infer the objects of the other's desire, even when it differs from their own (Repacholi & Gopnik, 1997). In sum, current findings converge in crediting children at the middle of the second year of life with an understanding of others as attentional and intentional agents.

In the present study, we investigated early understanding of communicative intentions. Studies on this topic are very scarce in the developmental literature, and most of them are focused on pointing gesture. Traditionally, two different aspects of infants' pointing have been considered: the referential aspect, as in Werner and Kaplan's representational theory (1963), and the intentional aspect, as in Austin's speech acts theory (1962). According to the first view, pointing is considered as a means for the expression of reference, resulting from a process of differentiation between the child and the object and therefore as a first step toward true symbolization. According to the second perspective, pointing is a performative behavior expressing children's communicative intentions in the prelinguistic period and thus a transitional form from the perlocutory – not intentional and not linguistic – to the locutory – intentional-linguistic – stage of language development. More recently, the intentional aspect of pointing has been emphasized by socio-cognitive research and various motives have been suggested for infants' pointing. One motive is to request an object/action from an adult (imperative intention), and another motive is to share with an adult attention and interest in an object (declarative intention; Camaioni, 1993; Camaioni, Perucchini, Bellagamba, & Colonesi, 2004). More recently, an informative motive has been proposed, that is, helping an adult to find something the adult is looking for (Liszkowsky, Carpenter, Striano, & Tomasello, 2006).

If we turn to pointing comprehension, the referential perspective has been the most common framework and infants have been studied with respect to their ability to identify the pointed objects at different spatial locations, not unlike gaze-following ability. It was found that 9- and 12-month-olds are pre-referential, since they are only capable of locating the object when it is close to the pointing finger, whereas most 14-month-olds are referential, being successful in locating distant objects (Lempers, 1979; Murphy & Messer, 1977; Morissette, Ricard, & Gouin Decarie, 1995). At 15 months, infants completely ignore an interfering object when looking at the target and are capable of looking at it also when it is outside their visual field, for example behind them (Butterworth & Grover, 1988, 1990).

Recently, infants' comprehension of the communicative intent of the gesture has begun to be considered. Unfortunately, research in this area is even more scarce. The only two studies available parallel those on pointing production, one focused on declarative and imperative intentions, and the other on informative intention.

In the first study, Camaioni et al. (2004) used a longitudinal design to analyse infants' skills at 12 and 15 months of age. An experimental task was devised that differentiated imperative from declarative pointing. Two different conditions were used, the first presented with proximal objects that were pointed to by the adult for requesting (imperative condition) and the second presented with distal objects that were pointed to for directing infants' attention (declarative condition). For imperative

comprehension, the target response was infants' giving or refusing to give the adult the indicated object; for declarative comprehension, it was the expression of some sort of comment about the object, by smiling, vocalizing or gesturing. Twelve-month-olds were better in comprehending the imperative than the declarative intention, but they were equally able to comprehend both 3 months later. A second study by Behne, Carpenter, and Tomasello (2005) used a cross-sectional design to study 14-, 18- and 24-month-olds' responses to pointing as an informative intention. Infants had to find a toy hidden in one of two containers, using the experimenter's informative gesture, either point or gaze. Infants performed above chance in retrieving the toy at all ages; however, on the pointing trials, 18- and 24-month-olds performed better than the youngest group, whereas on the gaze trials 24-month-olds performed better than both 14- and 18-month-olds.

If we examine these results in more detail, some interesting questions arise concerning the nature of children's understanding of communicative intentions in the middle of the second year of life. With respect to the first study, pointing comprehension was attributed to the infant when she/he smiled, vocalized or gestured toward the pointed-to object. However, in the classical studies (Lempers, 1979; Murphy & Messer, 1977; Morissette et al., 1995; Butterworth & Grover, 1988, 1990), a correct response was assigned when the infant only looked at it. This methodological difference in the choice of the dependent variable can be traced to the two perspectives on pointing discussed earlier, as declarative gesture, or as referential gesture. According to the first perspective, Camaioni et al. measured pointing comprehension in terms of infants' ability to recognize the other's interest toward the attended object, whereas, in line with the second perspective, the other studies measured infants' ability to only identify that object. Hence, an infant's comment or an infant's look was the target response, respectively. Of interest here is the fact that in Camaioni et al.'s study, 15-month-olds responded to the adult's gesture on about half of the valid trials (59%), whereas infants in Morissette et al.'s sample (1995) responded much more frequently (on 75% of the trials). Given the different variables used as a target response, it seems that infants are more likely to recognize the referential aspect of the adult's pointing rather than the declarative aspect. However, some of the "referential" responses in the Morissette et al. study would have been "declarative" in Camaioni et al.'s terms, if the infants' look had been associated with a comment. Therefore, the question about the nature of infants' understanding of pointing is left unanswered. In the present study, we used Camaioni et al.'s paradigm to identify both types of responses, the "looking at the target" and the "commenting on the target" responses. The main goal was to determine if children in the middle of their second year of life react to the adult's pointing by commenting rather than by only looking, therefore showing an understanding of pointing as a declarative gesture that conveys both attention and interest, and not as a referential act, conveying only attention.

In Behne et al.'s study (2005), 18-month-olds were better in the point than in the gaze trials, in contrast to 14-month-olds who were equally poor in both conditions and to 24-month-olds who were equally good. Since gaze direction, in contrast to point, "is not typically used to express communicative intentions in interactions with infants" (p. 493), we could suppose that children in the middle of the second year are especially sensitive to the difference between a familiar and an unfamiliar gesture and perform worse in gaze than in point conditions because of this unfamiliarity. With reference to Tomasello, Call, and Gluckman's (1997) account of children's reactions to a gesture they had very likely never before encountered, we hypothesized two different reasons that could explain children's poorer performance in the gaze trials. First, children were not able to generalize from their previous communicative experience to the actual context and therefore did not comprehend the meaning of the experimenter's gaze. Second, children had difficulties in understanding how the unfamiliar gesture effectively works in that context and therefore understood the communicative intention of the gaze direction but were not able to locate the object that the gaze was directed to. The two types of difficulties are reflected in children's failures mentioned in the Behne et al.'s study. In that study, children failed to search successfully because, after looking at the cued container, they chose the other one or because, after following the experimenter's gesture, they searched in other locations. Since understanding the nature of children's failures can improve our understanding of their performance, we tested children with an adapted version of Behne et al.'s task, with the aim of finding whether children perform worse on the gaze than on the point trials because they are not able to infer the relevance of the adult's gaze or because they are not able to identify its referent. With this aim, we analysed children's searching

behavior after the cue presentation, as in the original study, and children's looking direction during this presentation as a new variable.

As a further purpose of the study, we examined intra-individual competence on both tasks. One might expect that children who are successful on one task might be successful also on the other, because both tasks measure infants' understanding of communicative intentions. Alternatively, children could perform differently because the understanding of the declarative intention requires different abilities with respect to the informative intention, that is, to share attention and interest on a referent in the first case or to cooperate in a given game in the second case. Therefore, both tasks were administered to the same group of children.

## 1. Methods

### 1.1. Participants

Forty children (20 girls) from a middle-sized Italian city were tested in a university laboratory room. Children ranged in age from 16 to 20 months ( $M = 18;1$ ,  $S.D. = 1;3$ , range = 16;1–20;4). Children were recruited from a database of parents who were contacted by family paediatricians and had volunteered to participate in studies on child development.

### 1.2. Design and procedure

Children came to the laboratory with their mothers. After a familiarization phase with the experimenter in a comfortable and cheerful room, the dyad was brought into the testing room. Two tasks were used, first the "hiding-game task" and, after a 10 min pause, the "pointing task". The entire session lasted about 1 h and was videotaped. The room was equipped with two cameras remotely controlled from behind a one-way mirror. One camera provided a frontal view of the setting, including the child, the mother, the experimenter, the table and the experimental objects. The second camera provided an upper view of the child's face and torso.

#### 1.2.1. The pointing task

Following the original study (Camaioni et al., 2004), we assessed infants' comprehension of declarative pointing using the following procedure. Each child was seated on the mother's lap at a large table (200 cm × 100 cm × 80 cm). The experimenter sat on one side of the table (at 90° angle) facing the child. Distal stimuli for the declarative condition were three static objects: a wall poster with the storybook characters of Lilly and the vagabond, a Santa Claus puppet hanging on the other wall and a coloured stuffed cat standing on a small piece of furniture. They were located on the right, front and left side of the child, respectively. Three trials were repeated in a row for each of the three stimuli. At the beginning of each trial, the experimenter made eye contact with the child, said "Hi [the child's name]!" and then pointed to the poster/puppet/stuffed toy with a positive face, while alternating gaze between the child and the stimulus. The experimenter looked silently at the child for 15 s, waiting for a response. The procedure was exactly the same as in Camaioni et al.'s (2004) declarative condition.

#### 1.2.2. The hiding-game task

The procedure was similar to that described in Behne et al. (2005). Each child sat on the mother's lap at the same table, with the experimenter sitting in front of the child. All children participated in a warm-up task to familiarize them with the game and the containers used for hiding. The experimenter placed a pair of identical containers on the table, at either end of a wooden tray (76 cm × 96 cm) and at a distance of roughly 70 cm from each other. She then showed children an attractive toy mouse, saying the Italian equivalent of 'Look, now I'll hide it', while she overtly placed the toy in one of the containers and closed it. Then she invited the child to retrieve it by pulling the tray forward.

Subsequently, children participated in experimental trials in which the experimenter hid the toy behind a screen, so the child was not able to see in which of the two containers the toy was placed. At the beginning of each trial, a pair of empty containers was placed on the tray. The experimenter presented a toy and if the child showed interest in it, she placed the screen in front of the child while

saying the Italian equivalent of, 'Look, now I'll hide it'. She then lowered the toy behind the screen, quickly pushed both containers toward each other, hid the toy in one, and pushed the containers apart again. After removing the screen, she established eye contact with the child and indicated the hiding location giving a communicative cue.

As in Behne et al.'s (2005) task, two types of cues were used: (a) ostensive gaze: the experimenter repeatedly turned her head, gazed alternately between the baited container and the child, while accompanying the gesture with a typical facial expression, such as raised eyebrows (*gaze condition*); (b) point: she pointed to the baited container without touching it, looking back and forth at the container and at the child with a typical facial expression such as raised eyebrows (*point condition*). After giving the cue, she pulled the tray forward. Across the two conditions, the experimenter's head turn, look duration, and facial expression were the same; the only difference was the pointing gesture production in the point condition. Three pairs of containers, each of different colour, material and shape were used as hiding locations. Each pair of containers was used for one point trial and for one gaze trial. The containers were positioned at equal distance from E (70 cm), so that the child could not grab both the containers, and at equal distance from the child (70 cm.), so that the child could not reach them simply by leaning forward.

Findings from a pilot study showed that children in the test phase were likely to lean toward the containers immediately after removing the screen, in both the point and gaze conditions. This was probably due to our having the containers on the table where the child sat and was not observed in the original Behne et al. (2005) study probably because the containers were located on a table in front of the child. To prevent children from immediately choosing a container, an additional step was inserted before testing. The experimenter introduced the screen as in the test phase and pushed the containers behind it, this time without placing the toy inside any container. After removing the screen, she verbally invited the child to find the toy, which the child immediately did by opening one of the containers. After nothing was found, the experimenter quickly put the toy into the other container through a hole not visible to the child, then encouraged the child to open the baited container and praised the child for the successful result. The trial was repeated twice. This step probably made the task more challenging for the children than it was in the original study, because of the experience of not finding the toy where they thought it to be. However, it fulfilled our purpose because in the test phase all children waited a moment after the screen was removed, looked at the experimenter's face and attended to her cue.

All children participated in three point trials and three gaze trials, with the order of cue presentation counterbalanced across children. The side, left or right, of the hiding location was also counterbalanced for each child and each cue, with the toy never hidden more than twice in succession on the same side.

### 1.3. Scoring

Children's responses were coded from videotape and scored according to the following procedure.

#### 1.3.1. The pointing task

Valid and non-valid trials were first identified. A trial was coded as "not valid" if the child did not attend to the experimenter's gesture. The mean percentage of non-valid trials was 14%, very similar to that reported by Camaioni et al. (2004). For the valid trials, the following responses were identified as target behaviors:

*Looking response*, if the child only looked at the pointed object or alternated her/his gaze between the object and the experimenter.

*Commenting response*, if the child, after looking, smiled/vocalized/pointed toward the stimulus, and/or produced a proto-word/word relative to the stimulus, and/or re-enacted some characteristics of the stimulus, each time looking at the experimenter.

*No response*, if the child never looked or commented, for example staring at the experimenter's face or looking elsewhere.

Only one type of responses was counted per trial. To assess inter-observer reliability, 20% of the sessions were randomly selected from the videotape and coded by a second trained person. The computed *K* coefficient was .70.

### 1.3.2. *The hiding-game task*

All trials were valid. As the child approached the first container and opened or tried to open it, a correct response was scored if the child chose the container the experimenter was pointing to or gazing at; choosing the other container was scored as an incorrect response. Just touching a container without attempting to open it was scored as no choice.

As an additional measure, infants' direction of attention during the cue presentation was considered. Children looking at the experimenter or at the intended target or alternatively between the two was coded. Only one attentional behavior was counted per trial. To assess inter-rater reliability, 20% of trials for each condition were selected and independently coded from the tape by a second trained person. With respect to the coding of the correct/incorrect choice of the child, there was 100% agreement between the two coders; with respect to the attention behavior the computed *K* coefficient was .75.

## 1.4. *Measures*

The measure used for the pointing task was the percentage of trials in which there occurred one of the three target behaviors relative to the total number of valid trials. For the hiding-game task, the mean percentage of correct and incorrect responses, as well as the percentage occurrence of each type of attentional behavior, were calculated for each condition.

The pattern of individual responses was also considered. For the pointing task, a child was considered to comprehend declarative intention if he/she performed at least one commenting response in any trial and was considered to comprehend referential intention if he/she performed no commenting responses but only looking responses in more than half of the valid trials. In the first case, since a specific behavior – expressive, gestural or vocal/verbal – was required for coding comprehension, one response was thought to be sufficient, whereas in the second case, since the target behavior was not as straightforward in revealing child's intentionality, a more stringent measure was used. Finally, the child was considered as not responding in the absence of the above criteria, that is if the child performed no commenting responses or only looking responses in half of the trials or less. Thus, children were classified into three groups: *commenting*, *looking* and *not responding*.

For the hiding-game task, the child was considered to be successful in the gaze or in the point condition if he/she performed correctly in at least two of three trials in a given condition. Therefore children were classified into two groups: *successful* and *not successful*.

## 2. **Results**

### 2.1. *Preliminary analyses*

Preliminary one-way ANOVAs on the mean percentage of target behaviors showed that gender was not significant in either task, nor was the order of cue presentation in the hiding-game task. Moreover, no significant differences were found in either task between younger and older infants, based on a median split of the sample. Therefore these variables were not included in further analyses.

### 2.2. *The pointing task*

As shown in Table 1, the mean percentage of trials in which infants looked and commented was significantly higher than the mean percentage of trials in which they did not respond (66% vs. 34%;  $t(39) = 4.82$ ,  $p < .001$ ); likewise, the number of children classified as "looking" or "commenting" was also significantly higher than the number of children classified as "not responding" (36 vs. 4, binomial test  $p < .001$ ). Both results confirmed the developmental trend found in previous research, that children in the middle of the second year of life are prone as well as capable of responding to an adult pointing to distal objects.

**Table 1**

Means, standard deviations, and frequencies for infants' responses in pointing task

Type of response	Frequency			Percentage			No. of children
	Mean	S.D.	Range	Mean	S.D.	Range	
No response	2.7	1.7	0–7	34	20	0–78	4
Looking	3.7	2.0	0–8	50	43	0–100	9
Commenting	1.3	1.5	0–6	16	16	0–67	27

As also shown in Table 1, the mean percentage of trials in which children commented was significantly lower than the mean percentage of trials in which they looked (16% vs. 50%,  $t(39)=5.01$ ,  $p<.001$ ). The reverse was found with respect to numbers of children: according to our criteria, 27 of 40 children (binomial test  $p<.04$ ) were classified as “commenting” and only 9 children were classified as “looking”. Thus, at the individual level most children responded with a comment, whereas at the group level most responses were attentional. With respect to the distribution of the responses by order of trials, *no* responses were equally distributed in proportion across the first, the second and the third trial (.33, .35 and .32, respectively); the same was true with respect to *looking* responses (.36, .35 and .29, respectively). However, *commenting* responses were higher in the first trial (49%) than in the second (34%) or third (17%) trial.

### 2.3. The hiding-game task

Data are presented first with respect to children's performance on point and gaze trials and then with respect to the direction of attention during the cue presentation.

As seen in Table 2, the mean percentage of trials in which children choose correctly was significantly higher in the point than in the gaze condition (73% vs. 45%,  $t(39)=4.61$ ,  $p<.001$ ); moreover, in the point condition this percentage was significantly higher than the mean percentage of trials in which children choose incorrectly,  $t(39)=5.38$ ,  $p<.001$ . Instead, no significant difference was found between the two percentages in the gaze condition. Individual data showed a pattern consistent with these findings. In the point condition, 30 children of 40 (binomial test,  $p<.05$ ) passed our success criterion – performing correctly on at least two trials – whereas only 15 children passed it in the gaze condition (binomial test *n.s.*). This pattern was corroborated by children's performance on the first trial in each condition: 82% of children (33 of 40, binomial test,  $p<.05$ ) searched correctly in the first trial when the cue was the point and 45% of them (19 of 40, binomial test *n.s.*) did so when the cue was the gaze.

With respect to children's attention to the informative gesture, children followed the cue's direction on 99% of trials in the point condition and on 25% of trials in the gaze condition. In the latter condition, they looked at the experimenter's face on 75% of trials. Therefore children always recognized the adult's gesture as an attention-directing cue when the cue was the point but recognized it very rarely when the cue was the gaze. We analysed gaze trials further to examine infants' choices by the direction of their previous looking. We found that 56% of the trials in which children followed gaze direction were successful and 44% were not; likewise, 46% of trials in which children stared at the experimenter's face

**Table 2**

Means, standard deviations, and frequencies for infants' responses in point and gaze condition of the hiding-game task

Type of response	Frequency			Percentage			No. of children
	Mean	S.D.	Range	Mean	S.D.	Range	
Point condition							
Correct choices	2.2	0.8	1–3	73.3	27.4	33–100	30
Incorrect choices	0.8	0.8	0–2	26.7	27.4	0–67	10
Gaze condition							
Correct choices	1.4	0.9	0–3	45.0	29.1	0–100	15
Incorrect choices	1.7	0.9	0–3	55.0	29.1	0–100	25

were successful and 54% were not. Therefore, children's choices in gaze condition were independent of their previous looking.

#### 2.4. Relations between declarative pointing, informative pointing and informative gazing

No significant correlation was found between the number of trials in which children commented in the pointing task and the number of trials in which children chose correctly in the point condition ( $r = -.14$ , *n.s.*) or in the gaze condition ( $r = .03$ , *n.s.*) in the hiding-game task. The correlation between children's correct responses in point and gaze conditions ( $r = .08$ ) was also not significant. At the individual level, based on our criteria, only 9 children of 40 were successful in all three contexts; 10 children were successful in both the informative and the declarative pointing, 3 children in informative pointing and gazing and 3 in both the declarative pointing and the informative gazing. We also found that eight children were only successful in the informative pointing and five in the declarative pointing, whereas no child was successful in the informative gazing only. As a conclusion, both at the group and the individual level, no reliable relation was found between children's responses in the three communicative contexts. Also, informative gazing appeared the most difficult intention to recognize.

### 3. Discussion

This study examined children's understanding of communicative intentions as expressed by prelinguistic gestures. Two tasks, based on work by Camaioni et al. (2004) and Behne et al. (2005), were used to evaluate the comprehension of two different intentions—the declarative one, as expressed by the pointing gesture, and the informative one, as expressed by the point and the gaze gesture.

With respect to declarative intention, almost all children performed in the pointing task by following the direction of the adult's gesture to the target. However, a small group of children, after locating the target, only looked at it, whereas a larger group also smiled, vocalized or gestured. Thus, the first group responded to the adult by attending to the pointed object, whereas the second group by both attending and commenting. With reference to the two perspectives discussed earlier on pointing as a referential or a declarative gesture, we could argue that the first group recognized the attentional relation between the pointer and a given object and the other group recognized an additional meaning of this relation, that is, the pointer was also interested in that object. With respect to our research question concerning children's understanding of the nature of others' pointing in the middle of the second year of life, the majority of children recognized the declarative aspect of the gesture compared to the minority who only recognized its referential aspect.

The distinction between the referential and the declarative aspect in pointing comprehension parallels a recent point made by Liszkowsky, Carpenter, and Tomasello (2006) about reference and attitude in pointing production. They found that 12-month-olds looked at the adult's face more frequently when the adult responded to their pointing only by looking at the pointed object than when he also talked and commented on it, therefore showing a dissatisfaction with referential responses (Liszkowsky, Carpenter, Henning, Striano, & Tomasello, 2004). Moreover, infants pointed more when the adult reacted to their pointing by showing both attention and interest than when the adult matched only one of them, therefore expecting to share with the adult both the reference and the attitude (Liszkowsky, Carpenter, & Tomasello, 2006). They concluded that infant's pointing is a full communicative gesture from the outset, conveying both reference and attitude (Liszkowsky, Carpenter, & Tomasello, 2006; see also Tomasello, Carpenter, & Liszkowski, 2007).

In the present study, most children commented on the pointed object instead of simply looking at it. Since a comment is the proper modality for responding to a person who shows interest in what he or she is looking at, it can be inferred that also pointing comprehension involves children's recognition of the other's attitude and not only the reference. However, one third of the children never commented but merely looked; therefore, the recognizing of the other's attitude could be more difficult than the recognizing of the reference. This result suggests that pointing comprehension, is not a full competence from the outset, but develops during the second year of life from infants' understanding of the other's reference to their understanding of the other's attitude regarding the reference.



The developmental nature of pointing comprehension was already noted by [Lempers \(1979\)](#). In her representational account, infants initially recognize the perceptual contiguity between the pointing finger and the pointed object and later the symbolic link between the two, thus progressing from pre-referential to referential comprehension. A more communicative account of this process could revise this model by adding declarative comprehension, so as to argue that “referential” children progress even further from sharing the referent itself to also sharing interest in it. The proposal that referential understanding of pointing can be distinguished from declarative understanding is also in accord with [Woodward and Guajardo's \(2002\)](#) suggestion that “the understanding of the object-directed nature of pointing provides the basis for understanding the communicative nature of the gesture” (p. 1062). In particular, since they claimed that in the first year of life pointing is understood in a referential manner, the declarative manner could be considered the following step in children's understanding of the different components of pointing. In particular, “declarative” children would express their sharing earlier, at a sensorimotor level, by smiles, vocalizations and gestures, as in our sample, and later at a linguistic level by informative statements. To support this account, we are carrying out a microgenetic study of the development of the pointing gesture from 9 to 24 months of age.

Although the number of children who commented was higher than the number who only looked, the mean percentage of looking responses was significantly higher than the percentage of commenting responses. Thus, even competent children, who were otherwise capable of sharing the declarative function of pointing, were likely to respond by sharing the referential function. Since commenting responses were performed on the first trial rather than on successive ones, it may be that children in our experimental setting were not motivated enough to comment every time, having commented once. We therefore agree with [Tomasello, Carpenter, Call, Behne, and Moll \(2005\)](#) that in order to advance in joint attention experience, infants have not only to understand the other's goals, but also to be motivated to share these goals. Although their claim obviously refers to the ontogenesis of infant's social understanding and not to the infant's responses in a given experiment, the apparently conflicting data we obtained – the high level of children's competence in understanding declarative pointing and the low consistency of this level in their performance – show, in a quite novel way, the impact that social motivation has on infant's responses to the adult's communicative acts, whether the interaction occurs at home or in a laboratory.

With regards to informative intention, 18-month-olds performed more poorly in the gaze condition than in the point condition; more precisely, they were at chance level in the former, contrary to the latter. Children in the gaze condition did not reliably choose the correct location when searching for the hidden object, and the number of reliable children was not significant. Therefore, our results were consistent with the original [Behne et al. \(2005\)](#) study with respect to the point condition, but not the gaze condition. In the latter case, we confirmed [Povinelli, Reaux, Bierschwale, Allain, and Simon's \(1997\)](#) findings, showing that 2-year-olds did not perform above chance when the adult gazed at the baited container, in contrast to when the adult pointed at it.

Null results in the gaze condition were not completely unexpected, given the poorer performance also showed in this condition with respect to point condition in the [Behne et al. \(2005\)](#) study. Indeed, analysing children's errors was our main interest in the present study. We supposed that any problem children would have in the gaze condition was due to their difficulty either in understanding the referent of the gesture or in inferring its relevance. In the first case, children would fail to locate the target and in the second case to choose the target after locating it. In any case, children were expected to follow the adult's gaze direction. Instead, children stared at the experimenter's face almost every time, both when they were successful and when they were not. Such a result sounds very striking, from since gaze following – the ability to look where someone else is looking – is a milestone in infants' development from the end of the first year of life. However, could sound less striking if we consider that infants' skills in following the other's gaze has been tested in paradigms in which the gaze is used as an index of the other's attention to a given target and not as a communicative cue to inform about the target, for example to signal the place to find it, as in the present paradigm. Thus, findings from these two different conditions cannot be properly compared.

We hypothesized that two processes were responsible for this result. On the one hand, children noticed that the adult's gaze was different from the usual because of the mimical expressions used by the adult to emphasize the informative motive; on the other hand, children were not able to assign the

informative motive for the perceived difference. So, they were a bit puzzled when facing the ostensive gaze and probably stared at the experimenter's face in an effort to solve this puzzle. In other words, children recognized that the ostensive gaze was a special kind of gaze but did not recognize what of its special quality was. In [Tomasello et al.'s terms \(2007\)](#), children did not understand the "common ground" within which the adult's behavior was expressed, that the adult was informing them where to find the hidden toy. Probably, according to the engagement hypothesis suggested by [D'Entremont and Seamans \(2007\)](#), they were only aware that the adult was engaged with them in a relationship, and hence attended to the adult's expression as a social act without inferring her informative intent.

However, children's looking behavior did not influence their choices, because they were correct or not whether looking at the target or at the experimenter's face. This result strongly corroborates [Behne et al.'s claim \(2005\)](#) that successful search involves more than the ability to follow another person's gesture to a target; rather, it implies the ability to infer why the adult was gesturing to that target. Therefore, what matters in the gaze condition is children's ability to share a common ground with the adult. We suggest that successful children were those who recognized that the experimenter had communicative intentions toward them and used this inference about the nature of the whole context to understand the nature of a specific behavior. This interpretation extends to an earlier age [Tomasello et al.'s \(1997\)](#) account of children's understanding of novel signs in the third year of life, saying that also children's understanding of unfamiliar gestures in the second year depends on their ability to infer the communicative meaning of the gesture from the communicative context. If this account of both failures and successes in gaze condition is correct, the abilities required to recognize the informative intention when expressed by the gaze seem to be at a higher level than those required to recognize the same intention when expressed by the point. In the latter case, the gesture used in the experimental context was one which children are familiar with and was used by the experimenter for conveying an intention frequently associated to that gesture. Therefore, although children have to recognize the common ground provided by the hiding game both in point and gaze conditions, pointing makes the recognition task easier. Contrary to the suggestion that recognition of informative pointing is a reliable indicator of children's differentiated understanding of communicative intentions ([Tomasello & Carpenter, 2007](#); [Moll & Tomasello, 2006](#)), we argue that recognition of informative gaze is a better candidate to assess this level of social understanding.

As a final result, the tasks were not reliably related to each other, whatever measure was used. In particular, no reliable relationship was found between gaze and point conditions in the informative task; nor was one found between the declarative and informative tasks. It seems that the abilities required for passing the tasks were different, depending on contextual features. When the contexts were different with respect to the gesture, as in the first case, children were required to make inferences from the entire situation when the gesture was the unfamiliar gaze, whereas they had only to perform a social practice when it was the familiar point. In the latter case, when the difference was due to the intention underlying the gesture, it could be that the declarative motive is managed by young children independently from the informative motive, as far as the first is aimed at sharing an attitude toward a common focus and the second at cooperating toward a common outcome.

Taken together, our results suggest that infants' understanding of communicative intention is a process much more gradual, differentiated and context-bound than implied by [Tomasello et al.'s \(2007\)](#) rich interpretation. In particular, it seems not to be a multilayered knowledge from the beginning. Three findings in particular support this conclusion. First, only a small proportion of children who passed the informative task when the cue was the point passed the same task when the cue was the gaze. If, according to the [Tomasello et al. \(2007\)](#) account of [Behne et al.'s](#) results, the reason for the success of children in the point condition was their full understanding of the communicative nature of the adult's behavior within a common ground, they should understand the adult's informative intention also when the gesture was the gaze. This was not the case. Second, children presented with the gaze gesture showed different kinds of failures. If the understanding of communicative intention was a full-fledged skill from its outset, the only errors caused by facing an unfamiliar gesture would be due to problems in generalizing this competence. As in one type of error reported by [Behne et al. \(2005\)](#), children failed because, although understanding the communicative relevance of the gesture, they did not understand how the gesture worked in that particular situation. Instead, more frequently, children did not understand the communicative intention itself, as happened in the other type of errors in

Behne et al.'s study and, even more, in children's looking behavior in our study. Third, no relationships were found across tasks. This result suggests that the understanding of the other's communicative intent is not a single competence but involves different abilities, related, according to our evidence, to some specific contextual features.

To conclude, different levels in the early understanding of communicative gestures were found in our study. With respect to declarative pointing, some children were able to respond at a referential level and others at a declarative level; with respect to the informative gesture, most children were capable of recognizing the point and less than half of recognizing the gaze; moreover, children who understood the informative gaze were more likely to understand declarative pointing, but the reverse was not the case. Results of this type support the idea that the understanding of communicative intentions is a very gradual process, in which earlier forms of communication are shared by infants before they become able to share more mature forms (Carpendale & Lewis, 2005). In order to account for this process, efforts should be made to identify what aspects of the intentional nature of a communicative context children appreciate. However, research examining the understanding of others' mental states at a prelinguistic age is hindered by the difficulty in objectively verifying claims (Leavens, Hopkins, & Thomas, 2004). Assuming an operational perspective and detailing child behaviors, as was attempted in the present study, could be a way to obtain evidence leading to a better understanding of this phenomenon.

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