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Three-Year-Olds Hide Their Communicative Intentions in Appropriate Contexts

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Human cooperative communication involves both an informative intention that the recipient understands the content of the signal and also a (Gricean) communicative intention that the recipient recognizes that the speaker has an informative intention. The degree to which children understand this 2-layered nature of communication is the subject of some debate. One phenomenon that would seem to constitute clear evidence of such understanding is hidden authorship, in which informative acts are produced but with the communicative intent behind them intentionally hidden. In this study, 3- and 5-year-old children were told that an adult was seeking a toy but wanted to find it on her own. Children of both ages often did something to make the toy easier for the adult to see while at the same time concealing their actions in some way. This suggests that by the age of 3, children are able to separate the multiple layers of intentionality involved in human cooperative communication.

Keywords: communication, child development, communicative intention, hidden authorship

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Much human communication is intentional, in the sense that signalers intend to inform the audience of something they wish to communicate. In order to fulfill this intention, they must produce behaviors that allow receivers to grasp whatever it is that the signaler wishes to communicate. Such an intention is typically termed an *informative intention*. However, according to several influential accounts, this description is incomplete (Csibra, 2010; Grice, 1975; Sperber & Wilson, 1986; Tomasello, 2008). Although the precise details of how best to describe what is going on in intentional communication vary, there is agreement that in addition to the informative intention described previously, signalers must also have a communicative intention, whose function is to make manifest to the audience that they have an informative intention. Put another way, signalers must have an intention that their behavior be recognized as communicative. This sort of intention is referred to as a (Gricean) communicative intention. Mastery of adult-like intentional communication thus involves the command of two distinct intentions and the relationship between the two.

Infants communicate intentionally, but the degree to which they use and understand the full, rich schema we have sketched is the subject of some debate (Southgate, van Maanen, & Csibra, 2007; Tomasello, Carpenter, & Liszkowski, 2007). In terms of comprehension, infants as young as 14 months are able to determine the difference between behaviors that are produced with and without communicative intentions; specifically, children react differently to a pointing behavior that is produced in order to direct their attention than to a point that is the incidental byproduct of somebody looking at his watch (Behne, Carpenter, & Tomasello, 2005). In terms of production, as early as 12 months infants show sensitivity to whether their informative intention has been met (Grosse, Behne, Carpenter, & Tomasello, 2010; Liszkowski, Carpenter, & Tomasello, 2008). However, no previous study has investigated whether children's production involves both informative and communicative intentions, appropriately distinguished. Thus, it is not clear whether communication in these early stages is differentiated in an adult-like way or at what age a flexible command of the separate layers of intentionality involved in communication begins. It is feasible, for example, that early communication production in infants involves a more basic, undifferentiated version of the full, adult schema and that infants develop the adult version only later in ontogeny (Tomasello et al., 2007).

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Communicative and informative intentions are typically made manifest in one and the same behavior. However, some nonstandard varieties of intentional communication illustrate the difference between them. In particular, several theorists have pointed to the importance of hidden authorship as a phenomenon that demonstrates a differentiated understanding of the role of communicative intentions (Csibra, 2010; Sperber & Wilson, 1986; Tomasello, 2008; Tomasello et al., 2007). Hidden authorship refers to those scenarios in which an informative act is produced but the communicative intent behind it is intentionally hidden. Suppose, for example, that a dinner guest wishes to have some more wine but recognizes that, for whatever reason, it would be impolite to ask for this directly. Thus, the guest instead places her empty glass in a conspicuous location where it is likely to be noticed by the host but does not explicitly bring attention to the fact that the glass is empty. The reason hidden authorship is of particular interest is that it involves the deliberate separation of communicative intent and informative intent: the signaler must have what we might term a *negative communicative intention*: that the host *not* realize that she has an informative intention (to inform the host that she wants more wine). In other words, just as knowledge of others' false beliefs is convincing evidence of the representation of other minds (Dennett, 1978), the suppression of behavior that would otherwise reveal authorship offers a clear demonstration of an understanding of the role of communicative intentions in intentional communication. Thus, in this article, we present the first empirical investigation of children's capacity to hide authorship as a way to explore their command of the multiple intentional layers involved in communication, and specifically the production of communicative intentions.

Hidden authorship is categorically different from other varieties of intentional communication (Table 1). In particular, it differs from lying in that lying is characterized by an informative intention that includes the provision of false rather than true information. However, the intention to communicate is present and manifest. Thus, while lying involves the use of informative intentions in a nonstandard (i.e., false) way, what is nonstandard in hidden authorship is the use of communicative intentions. Hidden authorship is also different from absent authorship and indirect communication. Absent authorship, in which a communicative intention is not made manifest, is quite normal and common: when a customer places a credit card on the counter as the clerk processes his purchase, the customer may not verbally or otherwise draw the clerk's attention to it. Equally, however, the customer does not attempt to hide the fact that he was the one who placed the credit card on the counter. Thus, the communicative intention is implied but not hidden. In indirect communication, the content of what is intended to be communicated may be oblique; however, the intention to communicate is present and manifest (see Lee & Pinker, 2010, for examples and discussion).

Table 1
Differences Between Hidden Authorship and Other Variants of Intentional Communication

Type of special communication	Communicative intention	Informative intention
Hidden authorship	Hidden	Manifest
Absent authorship	Implied	Manifest
Indirect communication	Manifest	Implied
Lying	Manifest	Manifest but false

Although we are principally concerned with the communicative aspect of hidden authorship, there is also a quasi-deceptive aspect to such behavior. There are two main cognitive challenges to deceptive behavior. The first is the representation of others' minds. Many studies have shown that even very young infants can do this, at least implicitly (Baillargeon, Scott, & He, 2010). The second is the suppression of any instinctive behavior that would reveal something that the child wishes to withhold. Again, experimental studies show that 3-year-olds are able to do this and even that they can lie directly (Lewis, Stanger, & Sullivan, 1989; Melis, Call, & Tomasello, 2010). For these reasons, we did not expect the quasi-deceptive aspect of hidden authorship to be problematic, in and of itself, for the age groups we tested (3- and 5-year-olds), although it is possible that it could interfere with their command of our main concern, namely, the two-layered nature of communication.

Method

General Method

Hidden authorship is less common than absent authorship and seems to typically arise in those situations that involve social norms or conventions; in the wine glass example described previously, the guest hid authorship so as to adhere to the social expectation specific to that context that she not ask directly for more wine. To create a situation for our study in which children might hide authorship, we took advantage of their natural motivation to help (Warneken & Tomasello, 2006, 2007): the children were placed in a situation in which their help, in the form of an informative stimulus (the location of a puzzle piece), would be useful to another individual but in which the children knew that the same individual did not want help. Thus, the children had a motivation to provide the missing information but also a reason to suppress the fact that they were helping.

We focused on two age groups: 3-year-olds and 5-year-olds. Our main research question was whether children in these age groups are able to hide or otherwise suppress their communicative intentions in appropriate contexts—since even if we observed the absence of communicative intentions, if this were not done appropriately, doubt would be cast on the conclusion that children understand the role and function of communicative intentions. Thus, in a control condition, the adult was happy to receive help. Children should suppress their communicative intentions less in this condition than in the experimental condition, where the adult did not want help. An additional research question was whether such behavior develops between ages of 3 and 5. In previous studies investigating children's helping behavior (e.g., Warneken & Tomasello, 2007), children helped ostensively (e.g., by addressing the partner by name, establishing eye contact, and using social smiling). We thus assumed that the default mode of children's communication is ostensive and expected the capacity to suppress this mode to develop with age.

Participants

Participants were 66 children from two age groups, 3-year-olds (M age = 3 years 7 months; range = 3 years 0 months and 3 years

11 months) and 5-year-olds (*M* age = 5 years 6 months; range = 5 years 0 months and 5 years 11 months), randomly divided between the two between-subjects conditions. For the 3-year-olds, there were seven boys and eight girls in the experimental condition ($n = 15$) and nine boys and eight girls in the control condition ($n = 17$), For the 5-year-olds, there were10 boys and eight girls in the experimental condition ($n = 18$) and eight boys and eight girls in the control condition ($n = 16$). Three more children participated in the study but had to be excluded from analysis due to experimenter error. All participants came from a mid-sized German city and were recruited from a database of parents who had volunteered to participate in studies of child development. Official statistics indicate that the population from which participants were drawn consists of 93.5% native Germans and is predominantly middle class.

Materials

Three different puzzles were used. One was a standard wooden four-piece puzzle, and the other two were handmade and each consisted of four pieces that had to be inserted into its corresponding slot on the puzzle board. Each of these pieces was uniquely identifiable by the shape of the slot. Fifteen different objects (containers, barriers, cloths, a large barrier, and so on) were spread around the room as hiding places. The puzzle boards were placed on a child-sized table in the middle of the room. We used two digital cameras placed in different corners of the room to capture each session.

Procedure

The basic set-up involved three puzzles, the pieces of which were hidden in a variety of locations around a room (Figure 1). These locations were known to the child and to an experimenter (E1). A second experimenter (E2) would attempt to find the pieces for two of these puzzles but would fail to find two of the pieces or objects per puzzle. Thus, the child would be able to help E2 find a total of four missing objects.

There were four phases to the procedure: a familiarization phase, in which the child learned about the locations of the objects; a demonstration phase, in which E1 helped E2 in a fully ostensive way; a prompted test phase, in which E1 prompted the child to help E2; and an unprompted test phase. We recorded how the children revealed the locations of the pieces to E2 in these final two phases.

Familiarization phase. E1 and the child entered the room and found two puzzles on a table in the center of the room but without their pieces, which were randomly hidden in the various hiding places, except for the following, which were always fixed: one piece of Puzzle 1 was placed in a yellow tin can across the room from where E1 would later ask the child to sit (see test phase sections later); a second piece of Puzzle 1 was located under a dark cloth; a ball that was part of Puzzle 2 was hidden behind a cardboard barrier; and a horseshoe, also part of Puzzle 2, was hidden under a box positioned just in front of the cardboard barrier.

E1 brought the child's attention to the first puzzle, a simple four piece wooden puzzle of a duck. E1 told the child that the game was to find the pieces of the puzzle, and she encouraged the child to search for the pieces with her. When the piece under the dark cloth was found, E1 highlighted this location ("Oh look! The head of the mother duck was under this dark cloth!"). When the puzzle was finished, E1 expressed pleasure and then brought the child's attention to Puzzle 2, a box with distinctively shaped holes for the missing objects: a ball, a horseshoe, a hat, and a recorder. E1 then suggested that they also look for the objects for this puzzle. During the search, E1 told the child that she knew where the ball was and that the child should stay where he or she was and wait. E1 then went behind the cardboard barrier; said "Look!"; and rolled the ball so that it came into the child's view. E1 also orally highlighted

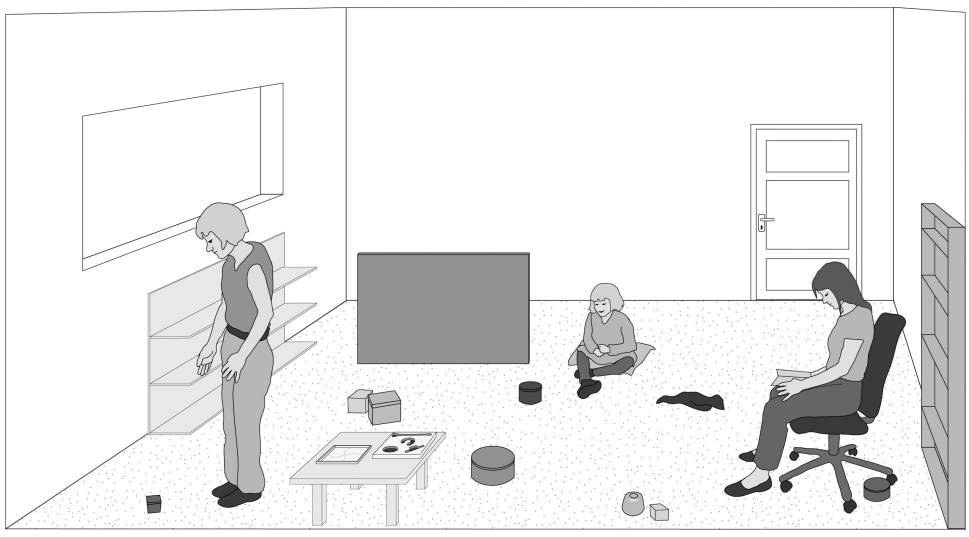

Figure 1. A schematic illustration of the experimental set-up. The two puzzles are on the table at the front of the figure. The miscellaneous objects on the floor are all possible hiding places for the missing objects. Objects can also be hidden behind the barrier.

the location of the horseshoe, once it had been found ("The horseshoe was under the golden box!").

Finally, E1 told the child that E2 would arrive shortly and would like to play the same game, so they should put the pieces and objects back in the same locations. This step ensured that the child knew the locations of the pieces and objects. E1 made certain that the target pieces were put in the same locations as before and again highlighted their locations. E1 and the child then together went to call for E2 to tell her that she could now do the puzzle.

Demonstration phase. E1 and the child sat down next to the cardboard barrier (Figure 1). E2 then approached the table and expressed her enthusiasm for the two puzzles and her goal with regard to solving the puzzles. This goal varied between conditions. In the experimental (no-help) condition, she said, "Ah, puzzles! I love puzzles! But I really want to do it on my own. I don't like it if somebody helps me!" In the control (want-help) condition, she said, "Ah, puzzles! I love puzzles! I really want to finish it. I don't like it if I can't finish it!"

E2 then began to search for the pieces for the duck puzzle. In general, her searching behavior was natural and accompanied by occasional oral utterances such as "I'm looking for [name of the piece]"; "Where could it be?"; Maybe here?"; and so on. She always searched in multiple places before finding each piece or object. After finding two pieces and expressing pleasure at each, she struggled with the third, with her verbal commentary becoming increasingly desperate. She eventually said, "Hmm. Where is this piece? I really, really can't find it!"; she then again searched the side of the room opposite to E1 and the child, and in doing so turned with her back toward them. This was the cue for E1 to help. E1 helped in an ostensive way: she called E2's name and orally informed her where the missing piece was, while also pointing to the correct location. E2 found the piece and then reacted according to condition. In the experimental condition, she said, in a discontented manner, "Oh, there it is. But I really wanted to do that on my own! I really don't like it if somebody helps me!" In the control condition, she said, in a happy fashion, "Oh, there it is! Thank you for your help! I really don't like it if I can't find something!". The procedure was repeated for the final piece of the puzzle, which was hidden under the dark cloth. E2 then finished the duck puzzle, expressed her joy, and announced she was going to proceed to Puzzle 2.

Prompted test phase. Before E2 started the box puzzle, E1 asked the child to stay on the cushion and watch E2 doing the puzzle task, while she looked something up in her notebook. She then left her position next to the child and moved to a chair at the side, pretending to be busy with reading. E2 searched as before. Because the target object was apparent from the shape of the empty space in the box, E2 was able to announce which specific object she was wanted to find. Again, she found the first two pieces (hat and recorder) but struggled with the other two (horseshoe and ball). As time passed, she used the same phrases as before (in particular "Hmm. Where is this piece? I really, really can't find it!") but in an increasingly desperate tone. If the child did nothing, then 30 s after this utterance, E1 prompted the child to act. Whispering, she called the child by name, established eye contact, and nodded in direction of the hidden object, accompanied by a whispered "Hmm!" If the child remained inactive, this prompt was repeated twice every 30 s. At the same time, E2 continued to search for the object.

If the child helped in a hidden way, then E2 found the object and expressed her happiness about finding it (as in the demonstration phase). If the child produced some kind of ostensive helping (i.e., drawing E2's attention to her action by using standard communicative means like language, calling her by name, establishing eye contact, and pointing), then E2 reacted according to the condition: either disappointed or happy, just as she did with the ostensive demonstration provided by E1 earlier. If the child produced a novel behavior, suppressing either the informative value or the ostensiveness to some degree, E2 reacted as naturally as possible according to condition. If the child used ostensive cues but did not reveal the location of the object (i.e., giving a hint), then E2 reacted to the communicative attempt orally but still did not find the object, again forcing the child to become more direct. If the child remained inactive for the whole period (90 s), E2 aborted the trial, expressed sadness about not finding the missing object, and proceeded to the next piece saying, "Ah, I can't find it! That's a real pity! Well, I will search for the next thing . . ." Then she started searching for the next object and proceeded exactly in the same manner as before. When she finished, she left the room under the pretext of needing to go to the toilet. If the child had not helped at all, E1 asked whether he or she had remembered the location of the object (to check whether not helping was due to having forgotten).

Unprompted test phase. The unprompted test phase gave children two more opportunities to help but now without prompts from E1. While E2 was outside, E1 suggested that she and the child prepare a further puzzle, saying either "Did you see how happy she was about finishing the puzzle? We can please her by preparing another puzzle for her to solve!" if E2 had managed to finish the previous puzzle or "Did you see how sad she was about not finishing the puzzle? We can please her by preparing another puzzle for her to solve!" if not. E1 then presented the second box puzzle (which had previously been hidden on some high shelves) and hid the objects around the room, again making clear to the child the locations of each object. The target objects were hidden again at the same target locations as before in order to minimize memory load for the children. E1 called E2 back into the room, presented the surprise new puzzle, told the child to wait on the cushion, and then left. E2 then proceeded exactly as in the prompted phase described earlier.

Coding and Reliability

All trials were videotaped. A first coder then coded each child's behavior on two scales: ostensiveness and informativeness. For informativeness, we coded whether the child's behavior indicated the location of the object when E2 assumed or knew that the child was trying to communicate with her. We used a 3-point scale: zero (*the child did not help at all*), reduced (*e.g., hinted*), or full. For ostensiveness, we coded whether the child's behavior indicated to E2 that he or she was trying to communicate with her, also on a 3-point scale: zero (*situations in which the fact that the child revealed the object's location [e.g., by moving it] was wholly suppressed and hence could not have been noticed by E2*), reduced (*attempts to mitigate the fact that communication was taking place, short of whole suppression*), and full (*situations in which the child made no attempt to hide the fact that he or she was communicating with E2*). The full details of this coding scheme, with examples, are

included in the Appendix, which can be found in the online supplemental material.

Behaviors that were classified as reduced ostensiveness typically involved the production of a behavior that would reveal the location of the object, for example, tapping the barrier hiding the ball or pointing with some part of the body, such as the elbow or foot, but without any simultaneous eye contact or any other form of engagement or ostensive cue that would reveal that the behavior is communicative. Others involved the production of nonostensive attention-getting behaviors, coupled with behaviors that revealed, at least briefly, the object's location, for instance, simultaneously coughing and producing a momentary point, before pretending that nothing had happened.

If a child made more than one attempt to help in any individual trial, we chose which attempt to code as follows:

- If all attempts were fully ostensive, we coded the first attempt.
- If one or more attempts involved reduced or zero ostension, we coded the attempt with the lowest ostension level.
- If there were more than one attempt at this lowest ostension level, we coded the one with the highest information level.

In other words, we coded the most informative trial of those that were lowest in ostension. This procedure was determined by our central research question: whether children are able to hide authorship, that is, to suppress their communicative intentions while maintaining a high level of informativeness. To investigate whether children are able to hide authorship and whether they do it in appropriate contexts, we had to code for each trial the most informative attempt to help of those attempts that were low in ostension.

Trials in which children did not offer any help because they had forgotten the location of the object were excluded from all analyses ($n = 3$). Trials in which children did not offer any help despite remembering the location of the object were not excluded for informativeness, but they were for ostension (since otherwise they would be coded the same as hidden authorship in terms of the degree of ostensiveness, despite being wholly different behaviors). There were a total of eight such exclusions: three trials in one child, two trials in another, and one trial in each of three different children.

A second coder, blind to condition (video clips were produced with condition cues removed), coded a subset of this data consisting of a randomly selected 25% of the data (every fourth child), a total of 16 children. A high degree of agreement was found for both the degree of ostension (weighted Cohen's $\kappa = .87$) and the degree of informativeness (weighted Cohen's $\kappa = .87$), and so the first coder's data were used in all subsequent analysis.

Results

Our main research question was whether children are able to hide or otherwise suppress their communicative intentions in appropriate contexts. To address this, we measured the proportion of missing objects for which children suppressed ostension/informativeness in any way (i.e., where the behavior was coded as either reduced or zero ostension/informativeness; Table 2). A factorial multivariate analysis of variance revealed significant main effects of condition on both informativeness, $F(1, 62) = 11.706$, $p = .001$; $\eta^2 = .168$, and ostension, $F(1, 62) = 10.280$, $p = .002$; $\eta^2 = .151$ (Figure 2), and also of age on informativeness, $F(1, 62) = 13.718$, $p < .001$; $\eta^2 = .191$, but not ostension, $F(1, 62) = 0.389$, $p = .535$. There was no significant Age × Condition interaction on either dependent variable: informativeness: $F(1, 62) = 0.283$, $p = .597$, or ostension: $F(1, 62) = 0.125$, $p = .725$. There was neither a main effect of sex, nor any interaction of sex with any other independent variable, on either ostension or informativeness. This result shows that (a) children in both age groups reduced their degree of ostensiveness in the experimental condition and (b) 3-year-olds were more informative than 5-year-olds, regardless of condition.

Table 2
Mean Proportion of Trials in Which Children Used Each Reaction Level by Age and Condition

	3-year-olds		5-year-olds	
Level of reaction	No-help	Want-help	No-help	Want-help
Ostensiveness				
Full	.58	.87	.64	.89
Reduced	.36	.10	.11	.06
Zero	.06	.03	.24	.05
Informativeness				
Full	.73	.94	.43	.72
Reduced	.13	.06	.57	.28
Zero	.13	0	0	0

Our second research question was whether there is any development in hidden authorship between the two age groups. In particular, although both analyses showed no effect of a child's age on the degree of ostensiveness, it is possible that the older children suppressed ostension in more sophisticated ways than the younger children, specifically, with zero rather than only reduced ostension. To test this possibility, we compared, for each age group, the total number of children for whom the behavior with the lowest degree of ostension was zero with the total number of children for whom the behavior with the lowest degree of ostension was reduced (regardless of condition). We found that the 5-year-olds were disproportionately more likely than 3-year-olds to have used zero ostension ($\chi^2 = 3.888$, $p = .0486$; Figure 3).

Discussion

In the interpretation of our results, it is important not to conflate the task itself (helping another individual who is trying to find a missing object) with the cognitive ability required to complete this task (an understanding of the role of communicative intentions). In particular, an explanation of hidden authorship couched in terms of aiding the conditions for finding the object is not an alternative to the conclusion that 3-year-olds are able to hide their communicative intentions. Aiding the conditions for finding the object is the task that the children face, and we assume that they are able to grasp this concept. The question we sought to answer in our experiment was, Do children have the requisite cognitive capacities to find a solution to this problem? If the children in the

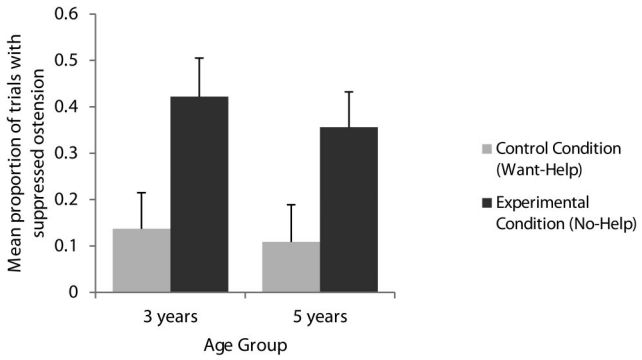

Figure 2. The mean proportion of trials in which a child suppressed communicative intentions in some way. In both age groups, children were more likely to suppress communicative intentions in the experimental (no-help) condition than in the control (want-help) condition.

experimental condition grasped the task but did not understand the role of communicative intentions, then they would have had no way to complete it, and we should not have seen any attempts to suppress communicative intentions. Under such circumstances, the children should have either revealed the location of the object ostensively or not have helped at all. However, we did not see this. Instead, we found that children in both age groups suppressed their communicative intentions in context-appropriate ways. This suggests that by the age 3, children have proper communicative intentions, whose content is an informative intention (whose content, in turn, is that the receiver understands the signal).

We also found that the capacity to fully suppress communicative intentions develops over time: 3-year-olds tended to do it in somewhat imperfect ways, in comparison to 5-year-olds. We offer three possible explanations: First, although 3-year-olds do understand the two-layered nature of intentional communication, it is possible that either (a) the default setting of full ostension is sufficiently strong that they are only able to partially suppress their communicative intentions, or (b) they are unable to construct a suitable way to fully hide their communicative intentions. Alternatively, or perhaps in addition, it is possible that (c) 3-year-olds are able to fully suppress their communicative intentions, but the quasi-deceptive and playful nature of the interaction means that they are unable to suppress their excitement at having done so. Further research is necessary to tease these alternatives apart.

Explanation (c) may also explain why some of the children did occasionally suppress communicative intentions even in the control condition, when their audience was happy to receive help: the specific internal rules of the game may have legitimized a degree of mischief in the children's behavior. This interpretation also is consistent with the finding that 3-year-olds were more informative than 5-year-olds, regardless of condition: they were more informative because they were more excited about being able to help the adult.

We do not rule out the possibility that a proper command of communicative intentions in fact emerges earlier than age 3. We did not conduct any experiments on younger children. It is likely that our procedure would be too complex for younger age groups, but alternative approaches may find that younger children are also able to hide authorship. Furthermore, while our study took place in a cooperative, helping context, it may be that in neutral or even competitive contexts, children are more or less able or likely to hide authorship. It is also possible that even if younger children do understand the two layers of intentionality involved in Gricean communication, the degree to which they can demonstrate this understanding may be limited by the quasi-deceptive aspect of hidden authorship. As we noted in the introduction, it is plausible that the interaction between communicative intentions and the suppression of otherwise revealing behaviors may introduce a layer of complexity to the task that is beyond particularly young children who are otherwise in command of communicative intentions. We did not see any evidence of this in either of the age groups we tested, but for even younger children this possibility cannot be ruled out.

Finally, we wish to draw attention to the general importance of hidden authorship as a phenomenon worthy of further investigation. Unlike other varieties of intentional communication, hidden authorship offers a particularly clear demonstration of an understanding of the role and function of communicative intentions (Table 1). Thus, a better understanding of the conditions under which hidden authorship is performed and the capacities of different groups in this respect (e.g., infants of different ages) would further enhance our understanding of the mechanisms of intentional communication.

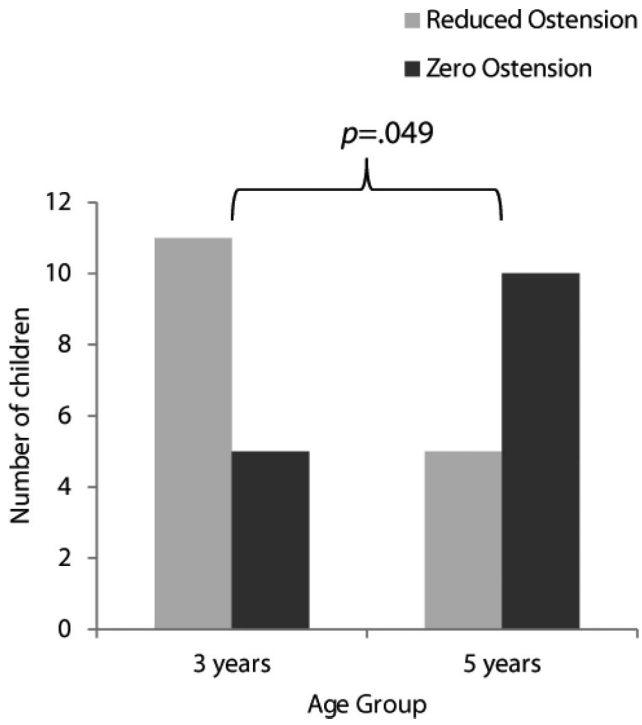

Figure 3. The total number of children for whom the behavior with the lowest degree of ostension was either zero or reduced in each age group. Five-year-olds were more likely than 3-year-olds to have used zero ostension.

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