



Brief article

Two-year-olds exclude novel objects as potential referents of novel words based on pragmatics

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ABSTRACT

Many studies have established that children tend to exclude objects for which they already have a name as potential referents of novel words. In the current study we asked whether this exclusion can be triggered by social-pragmatic context alone without pre-existing words as blockers. Two-year-old children watched an adult looking at a novel object while saying a novel word with excitement. In one condition the adult had not seen the object beforehand, and so the children interpreted the adult's utterance as referring to the gazed-at object. In another condition the adult and child had previously played jointly with the gazed-at object. In this case, children less often assumed that the adult was referring to the object but rather they searched for an alternative referent – presumably because they inferred that the gazed-at object was old news in their common ground with the adult and so not worthy of excited labeling. Since this inference based on exclusion is highly similar to that underlying the Principle of Contrast/Mutual Exclusivity, we propose that this principle is not purely lexical but rather is based on children's understanding of how and why people direct one another's attention to things either with or without language.

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1. Introduction

One of the most interesting and robust findings in the word learning literature is that children avoid multiple labels for the same object, that is, they exclude as potential referents for novel words any objects for which they already have names. This exclusion inference acts as a powerful constraint to help children zero in on speakers' intended referents in a variety of word learning contexts; for example, it enables them to learn subordinate or superordinate terms, part terms, and property labels when adults make reference to objects whose names they already know (e.g., Markman & Wachtel, 1988; Markman, Wasow, & Hansen, 2003; but see Saylor, Sabbagh, & Baldwin, 2002).

Different principles have been put forward to account for this exclusion effect, for example, the Mutual Exclusiv-

ity Assumption (Markman, 1989, 1992) and the Principles of Contrast and Conventionality (Clark, 1988, 1990). Markman suggested that the Mutual Exclusivity Assumption is given to the word learning process *a priori* and is grounded in children's early categorization abilities (i.e., each object belongs to just one category; see Markman, 1989, 1992). Along these lines, Markman et al. (2003) found that children avoid redundant labels and search for alternative referents early in lexical development (by at least 16-months). Other researchers have proposed that children might derive some pragmatic principle of exclusion on the basis of their understanding of rational human behavior and communication more general. That is, children might exclude familiar objects as referents of novel words based on their learning of something like "if she had intended this object she would have used the conventional label that we both know, so she must be referring to something else" (e.g., Clark, 1988, 1990; Diesendruck & Markson, 2001; Gathercole, 1989). This latter account suggests that children's avoidance of lexical overlap in word

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learning is based on pragmatic inferences that might be available even pre-linguistically. A number of recent studies have shown that from soon after their first birthdays young children are able to identify the intended referents of adults' nonlinguistic communicative acts in ambiguous situations based on the pragmatics of the situation. For example, Tomasello and Haberl (2003) found that when 12- and 18-month-old infants observed an adult looking ambiguously at an array of three objects saying "Wow! Cool! Can you give it to me? ", they assumed she intended the one that was novel for her – two of the three objects were "old news" and only one was "new news" for her – based on the general principle that people get excited about new things not old things. One could easily imagine something like this as a basic principle that children assume or learn about how and why people direct one another's attention to things in various contexts, either with or without language. Earlier studies showed that children also learn words in such ambiguous situations (Akhtar, Carpenter, & Tomasello, 1996; Diesendruck, Markson, Akhtar, & Reudor, 2004).

In a recent study, Moll, Koring, Carpenter, and Tomasello (2006) investigated 14, 18, and 24-month-olds' exclusion inferences based on common ground when only one potential referent object of an adult's excited exclamation was available. That is, in contrast to the earlier studies showing that common ground influences children's interpretation of an ambiguous act of reference, the adult's act of reference was not obviously ambiguous in this study. An experimenter entered the room, looked at an object from a moderate distance, and said excitedly "Wow! Look!" In one condition this experimenter had been out of the room when the object was introduced to the infant by another adult. In this case, infants assumed the experimenter was excited about the new object (by doing various things including handing her the object). However, in a second condition the experimenter herself had introduced the child to the object and they had played with it jointly before she looked at and referred to the object excitedly, infants did such things as follow her gaze to the side of the object or look around the room for another object. They seemingly assumed that the experimenter was not excitedly referring to the object that was "old news" for them based on their previous joint play. Thus, in this condition the infants excluded as a potential referent of the adult's excited but ambiguous exclamation the object the two of them had previously played with, that is, based on social interaction, not on any type of language.

In the current study, we adapted this paradigm to see if children would similarly exclude novel "gazed-at" objects as potential referents of novel words based on their non-linguistically established common ground with the speaker. If so, it would show that potential referents for novel words can be blocked for young children not just based on their word knowledge (as shown by Markman and colleagues) but also based on the pragmatics of their interaction with the speaker. We basically followed Moll et al.'s procedure but we extended it by having the adult use a novel word (e.g. *Nohle*) when looking at the object (instead of just saying "Oh, wow, look."). In one condition, the object was new for the adult and so the child should apply a de-

fault interpretation and assume she was using the new word to refer to it. In the other condition the object had been previously played with jointly by child and adult, which – if non-linguistically established common ground could serve as a referent blocker – should lead the child to look for some other referent. We measured both children's behavioral responses when they first heard the novel word and their comprehension of the word in a later comprehension test.

2. Method

2.1. Participants

Twenty-four monolingual German-speaking children participated in the study (12 girls and 12 boys). Children's mean age was 2;9,26 (range 2;9,1 – 2;11,22). Seven additional children participated but were not included in the final sample due to disinterest of the child (2) or experimenter error (5). Children's parents had previously volunteered to participate in studies of child development.

2.2. Materials and design

The study consisted of four phases: warm-up, play phase, labeling phase, and comprehension test. The play phase comprised two experimental conditions. Children participated in both conditions – with a counterbalanced order of the two conditions across children. The warm-up was a picture pointing task using pairs of pictures that showed whole objects in one picture (e.g., a tiger – with its tail not visible in the picture) and a part of the object in the other picture (the tiger's tail). We used eight pairs of familiar wholes and parts: flower–leaf, train–wagon, car–car door, boy–legs, tiger–tail, bus–wheel, cat–eye, and house–door.

For the play phase two novel objects were created which could be manipulated in a special way on their front side. The objects measured approximately 20 cm × 15 cm × 20 cm and had a small part attached to their back side (Fig. 1). This small part served as possible alternative referent for children who searched during the play phase. In a pilot study we established that the objects were indeed novel for 2-year-olds. Ten 2-year-olds (5 girls and 5 boys, range 2;10,0–2;11,26; mean 2;10,25) were presented with the two novel objects and two familiar objects (car and ball). Children played with each object successively for 45 sec in the same manner as in the main study. During play children got three prompts for each object to elicit labeling: "Look, what I have here!", "Have you seen something like this before?", and "Do you know what that is?" All children labeled all familiar objects with the strong tendency to do so spontaneously. Only three children labeled one of the novel objects (after the third prompt), and they used only a very general term (*box, cube*). Thus, we can conclude that the objects we used were indeed novel to 2-year-olds.

In the main study we varied in two conditions whether the novel object was new to the experimenter when she uttered the novel word (Object New Condition) or whether

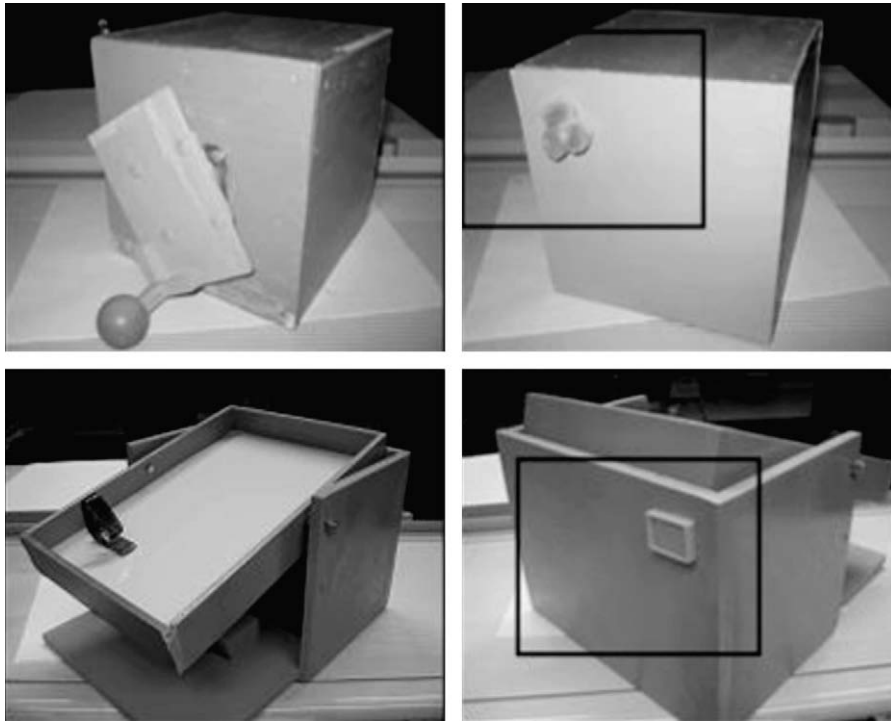


Fig. 1. The two novel objects from its front side (left) and with the novel part at the back (right) – frames indicate the section that was depicted in the part-picture in the comprehension test.

the object was familiar to her from previous joint play with the child (Object Familiar Condition). The novel words were phonotactically correct German pseudo-words: *Nohle* and *Grasch*.

For the comprehension test we used a picture pointing task. We created picture pairs of the novel objects from the experimental condition in such a way that pointing to the whole object could be distinguished from pointing to parts: One picture showed the novel object from its front side and the other picture showed a detail of the object's back with the attached part (Fig. 1).

2.3. Procedure

Children were tested individually in a quiet room in their daycare center. Children were sitting at a table in a child chair with the door being opposite to the child.

2.3.1. Warm up

The experimenter (E) asked the child to point to one picture from a pair of pictures showing a whole and one of its parts (e.g., a tiger and a tiger tail), "Where is the tail?" Four picture pairs were used to draw children's attention to the fact that parts and wholes were shown in different pictures of each pair. For each pair E asked the child to either point to the part or to the whole (in counterbalanced order). When children pointed to the wrong picture (e.g., when asked to point to the tail from a pair of pictures showing a tiger and a tiger tail, and the child points to the picture of the whole tiger), then the child was cor-

rected by E saying: "No. There is no tail. Where you can see the tail?" For four further picture pairs children were again asked to point to either the part or the whole (order counterbalanced across children), however, no corrective feedback was given in these trials. Then the play phase started with the different conditions.

2.3.2. Object Familiar Condition

An assistant put a novel object on the table and then withdrew herself and sat quietly away from the table. E and the child played with the object for 45 s: E demonstrated how to manipulate the object and then E and the child took turns. E commented on her or the child's action in a neutral way, "That's fun." During this phase, children saw the object only from its front side. After the time elapsed, E positioned the object in the middle of the table, called the child's name and said, "I am going over here." Then E went to the light switches next to the door, pretended to check something, and returned back to the table (this was done to make her returning to the table highly similar in both conditions). Then the labeling phase started.

2.3.3. Object New Condition

In this condition E left the room before the assistant brought out the object. The assistant and the child played with the object in the same manner as E and child did in the Object Familiar Condition. When the time elapsed, the assistant positioned the object in the middle of the table. Upon a sign E came back into the room and the labeling phase started.

2.3.4. Labeling phase

In approaching the table E looked at the object's back and said, "Oh, what is there?" She then looked to the child. When E was 50 cm away from the table, she stopped and leaned slightly toward the object, looked at it and said in an excited manner, "A *Nohle*, there is a *Nohle*. Look, the *Nohle*. The *Nohle* is great." While speaking, E altered gaze between the child and the object. After her utterance she looked to the child for 5 s. During E's utterance and the following 5 s the child had the possibility to respond without any restrictions. E then returned to her seat next to the child and the assistant took the object to clear it away. While moving the object she turned it back facing the child, held it for some moment, and said, "Oh, I also have a picture of the *Nohle*." Then she put the object away and the comprehension test started.

2.3.5. Comprehension test

The assistant presented a picture pair to the child. The pair showed the novel object from its front side in one picture and a detail of the object's back and the novel part in the other picture. After a few seconds E asked the child, "Where is the *Nohle*?" After the child pointed to one of the pictures E thanked the child and the procedure went on.

2.4. Coding and reliability

All trials were coded from videotape. Children's actions during the labeling phase and their pointing in the comprehension test were coded. For the labeling phase, the occurrence of two general classes of actions was coded: (1) actions that were directed towards the object as a whole and (2) searching. Children's actions were coded as object directed when they touched the object or performed the particular action assigned to that object, or indicated that they accepted the novel word as label for the novel object by nodding. Children's actions were coded as searching when they turned the object around, stood up to look at the object's back, or looked under the table. We assume that object directed responses indicate that children accept the novel word for the novel object while searching indicates that children assume that the novel word does not refer to the novel object but to something else.

Children's responses in the comprehension test were coded for whether they pointed to the picture which showed the object from its front or whether they pointed to the picture which showed a detail of the object's back with the attached part.

An independent blind coder coded a random sample of six children. As estimated by Cohen's Kappa, inter-observer reliability was 1.0 for searching, 0.73 for object directed responses, and 1.0 for the comprehension test.

3. Results

Preliminary analyses revealed that the order of conditions had no effect on children's response in the labeling phase or on their pointing in the comprehension test.

3.1. Labeling phase

Table 1 shows the number of children who showed object directed actions and searching in the two conditions during the labeling phase. In order to establish whether children's initial hypothesis differed across conditions, we calculated McNemar Chi-square tests for both response types. These revealed that children showed more object directed actions in the Object New Condition than in the Object Familiar Condition ($\chi^2 = 9.03$, $df = 1$, $p < 0.01$). In contrast, in the Object Familiar Condition children searched more than in the Object New Condition, ($\chi^2 = 7.03$, $df = 1$, $p < 0.01$). This indicates that children initially interpreted the novel word as the novel object's label in the Object New Condition but avoided this interpretation in the Object Familiar Condition.

3.2. Comprehension test

The results of the comprehension test are shown in Table 2. In order to establish whether children's performance in the comprehension test differed across conditions, we calculated a McNemar Chi-square test. The results reveal that children pointed less often to the whole object in the Object Familiar Condition than in the Object New Condition ($\chi^2 = 5.04$, $df = 1$, $p < 0.05$). This indicates that some children maintained their initial avoidance to assume that the novel word refers to the novel object and interpreted the novel word as the back-side-part's label. However, comparison against chance revealed that children's pointing to the whole object or the part did not exceed chance level in the Object Familiar Condition. However, in the Object New Condition nearly all children pointed to the whole object ($p < 0.001$, $N = 23$, binomial test). Thus, while all children learned the novel word for the novel object in the Object New Condition, no clear evidence for word learning was found in the Object Familiar Condition.

4. Discussion

In the current study we found that two-year-old children interpreted an excitedly expressed novel word either

Table 1

Number of children who showed object directed actions and searching in both conditions (multiple responses possible), $N = 24$.

Condition	Children's actions	
	Object directed	Searching
Object new	15	5
Object familiar	10	18

Table 2

Number of children who pointed to the whole object and the part in the comprehension test.

Condition	Point to back-side-part	Point to novel object
Object new	1	22
Object familiar	7	16

as referring to the gazed-at novel object – or else avoided this interpretation – based on the status of the object in their non-linguistically established common ground with the speaker. When the object was new to the speaker as she uttered the novel word, children assumed that she intended to refer to the novel object. When the object had previously been shared between the speaker and child, children excluded the novel object as likely referent (“she wouldn’t be excited about that”) and searched for an alternative – with some children demonstrating subsequent learning of the novel word as a part term.

The study thus shows that the non-linguistic exclusion effect first found by Moll et al. (2006) concerning 14- to 24-month-olds interpretation of others’ attention is also operative in slightly older children’s word learning. Since the children in our study responded very similarly to the children in Moll et al.’s study, we suggest that they used the same inferences – something like “if she’d meant the object we both share knowledge about, she would not be that excited”. Thus, children may exclude a potential interpretation of their interlocutor’s communicative act based on knowledge they share with that person and their knowledge of general principles about the kinds of things people get excited about and refer to (see Saylor et al. (2002) for a similar argument).

Our findings go beyond earlier demonstrations of how common ground influences children’s interpretation of novel words in that in these earlier studies the labeling situation was ambiguous and required the child to decide between three or more alternatives (Akhtar et al., 1996; Diesendruck et al., 2004). In our study in contrast, there was no such obvious ambiguity of the adult’s word use since she is clearly looking towards a single novel object when saying the novel word. Importantly, children have never seen the part attached at the object’s back side before. Thus, our study demonstrates that common ground knowledge can override gaze – which is an otherwise important cue in word learning (e.g., Baldwin, 1991; Baldwin et al., 1996) – when it conflicts with children’s knowledge of communicative regularities, in our case that people get excited about new things.

Interestingly, however, children’s actual word learning seems to differ from their initial exclusion interpretation when the novel word is uttered for a given object. Of the 18 children who searched during the labeling phase only 6 indicated the part as the referent of the novel word in the comprehension test (and one child did so who did not search previously). This raises the possibility that the exclusion inference has much stronger effect on children’s initial interpretation than on their actual word learning. Indeed, Horst and Samuelson (2008) showed that 2-year-olds consistently exclude familiar objects as referents of novel words in the disambiguation task, but that word learning by exclusion is weaker than learning from ostensive naming. It might be that something similar accounts for children’s relatively poor performance in the comprehension task in the Object Familiar Condition in our study. It seems likely that the 12 children who excluded the whole novel object during labeling in that condition and later indicated it as the referent of the novel word did not establish any word-referent link during the labeling

phase at all. It seems likely that they pointed to the whole object because that is what they usually do in response to a “point to the X”-requests.

The pragmatic inference children drew during the labeling phase in the Object Familiar Condition in our study may be seen as deriving from some kind of more general Principle of Contrast, from which children may derive the lexical Principle of Contrast (Clark, 1988, 1990) – based on their use of similar types of exclusion inferences. According to this integrated perspective, blocking of particular referents in communicative situations is a result of children relying on their common ground with adults either in terms of shared knowledge from the current situation or in terms of shared knowledge of conventional labels. Non-linguistic contrast rests on shared knowledge about how people relate to given and new things in the situation: infants assume that people do not get excited about things already in their common ground, but rather they get excited about new things that are not in common ground (Moll et al., 2006; Tomasello & Haberl, 2003). Linguistic contrast, on the other hand, rests on shared knowledge about how people use particular lexical conventions – the use of the known label is in their common ground, so to speak. The importance of the sharedness component for the lexical Principle of Contrast has recently been demonstrated by Diesendruck (2005), who found that children applied the principle only when they assumed that the speaker knew the same lexical conventions that they themselves did (i.e., not for speakers of other languages).

Thus, the inference children drew in our study is highly similar to other exclusion inferences in word learning, namely those based on children’s knowledge of lexical conventions (Markman & Wachtel, 1988; Markman et al., 2003). Given these parallels, and also the parallels to Moll et al.’s (2006) finding, our study is the first to provide empirical evidence for Clark’s (1990) suggestion that children develop the Principles of Contrast and Conventionality for word learning based on their general understanding of human rational behavior. We may thus envision a kind of general Principle of Contrast for determining the likely target of people’s attention by excluding things that make no pragmatic sense in the context, which then paves the way for a lexical Principle of Contrast for determining the likely referent of people’s words by excluding things that make no pragmatic sense given our shared lexical conventions. Both rely on the same kind of inferences (about attention and reference) based on common ground and exclusion.

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