

# The Role of Referential Intention as a Component of Joint Attention in Object-Label Association and Shared Knowledge Acquisition

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**Abstract.** Discrepancies in the evidence for the influence of joint attention on lexical acquisition seem to have two causes: the variety of possible lexical acquisition outcomes (formation of an association between an object and a word, or emergence of a unit of the symbolic system) and variety in the contents of joint attention (the act of naming, the using of an object, events involving the object). In this study, we varied the moment when an object was named (familiarization with the object; using the object; removing the object). We suppose that providing children with referential intention cues, which are involved in an object’s familiarization, facilitates their discerning of the word as a sign in the symbolic system, in contrast to the joint attention without this component. Based on our results, the choice of an object as a referent of the heard label showed that children established object-label matching in all conditions. The test for the mutual exclusivity phenomenon was passed only in the familiarization condition. Thus, drawing a child’s attention to the act of naming is critical for the formation of a new unit in the symbolic system; that is, for shared knowledge acquisition.

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**Keywords:** word learning, referential intention, joint attention, object-label matching, shared knowledge acquisition, social learning

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## Introduction

There are discrepancies in the evidence for the influence of joint attention on lexical acquisition (see review in Akhtar & Gernsbacher, 2007). Some authors suppose that joint attention is an essential element in the process of learning a new word (Baldwin, 1995; Akhtar, Jip-

son, & Callanan, 2001; Diesendruck, Markson, Akhtar, & Reudor, 2004). Their studies revealed that children learn a new artificial label for a new object significantly better when the joint attention of the child and the experimenter is focused on this new object at the moment of the new label pronunciation (Baldwin, Markman, Bill, Desjardins, Irwin, & Tidball, 1996). Furthermore, an unaccompanied

child's mere the observation of the joint attention of others has such an impact (Floor & Akhtar, 2006). In fact, video demonstration or third-party observation of one person labeling an object for another person in reciprocal interaction is effective for word learning, unlike the observation of a one-sided offering of information between the two parties (O'Doherty, Troseth, Shimpfi, Goldenberg, Akhtar, & Saylor, 2011).

Other authors insist that the findings about joint attention's influence can be explained by the contextual nature of attention and memory (Samuelson & Smith, 1998; Smith, Jones, & Landau, 1996; Smith, 2000). A context change usually accompanies an adult's bid for joint attention, and therefore it may be this novelty that grabs a child's attention and provides an opportunity to remember the connection between an object and a word (Samuelson & Smith, 1998).

There is also evidence that grabbing of child's attention does not always increase label learning (Baldwin et al., 1996; Houston-Price, Plunkett, & Duffy, 2006). For example, the 18 to 20-month-olds in the experiment by Baldwin and colleagues did not learn a word uttered by a disembodied voice using infant-directed speech, even though it was contingent on the child's own attention to an object (Baldwin et al., 1996). The utterances lacked cues to reference, which are the most important components of joint attention in the social/communicative account (Baldwin, 1995; Moore, Angelopoulos & Bennett, 1999; Akhtar, 2005; Tomasello, 2001; Sabbagh & Baldwin, 2005). The understanding of a speaker's referential intent is supposed to be the critical factor for word learning in this account, since a word is considered to be a component of the communicative system, and hence, a part of shared knowledge (Tomasello, 2001). The theory based on general cognitive processes appeals to object-label matching (Samuelson & Smith, 1998; Smith, 2000), which may be understood as an association between an object and a word.

We suppose that both of the forms of representation of a connection between a word and an object (the word as a unit of symbolic system and the word-object association) are acquired simultaneously in the natural situation of word learning, but they are provided by different factors. Referential intention cues facilitate the emergence of a unit in the symbolic system as it is formed for communication. Furthermore, word-object association, as with any other matching, is under the impact of attention and memory support.

Interestingly, Fennel and Waxman's (2006) study revealed that referential intention, expressed by the grammatical construction of the phrase "Look at the ...! I like the ...", gave 14-month-olds the opportunity to use phonetic detail ("bin" and "din") to map novel words to objects in a habituation paradigm. The study's participants looked significantly longer in the trials with switched words than in the trials with the same word during the demonstration of the same object, in contrast to toddlers hearing isolated words. These findings demonstrate that referential intention allows children to determine that the present set of sounds is a sign for marking an object. But it does not seem to be necessary for association of the object with the set of sounds.

The current study examines whether referential intention as a possible component of joint attention has a spe-

cial effect on the forming of symbolic system units. We controlled the support for children's attention and memory from joint attention by comparing word learning in joint attention with varied content: familiarization with an object, object using, demonstration and removing the object.

To measure the acquisition of a symbolic system unit in contrast to object-label matching, we used a special test based on the phenomenon of mutual exclusivity (Markman & Wachtel, 1988; Diesendruck & Markson, 2001). Three-year-olds tend to choose a novel object rather than a familiar one when asked for the referent of a novel label. This tendency is considered to reflect children's avoidance of lexical overlapping. The meanings of words cannot be overlapped if the words are elements of one lexical system. Consequently, the mutual exclusivity phenomenon implies that children recognize a demonstrated label as an element of the lexical system in common with other labels. In the present study, a more traditional comprehension test was exploited to examine object-label matching.

## Method

### Participants

Seventy-nine children ( $M = 3$  years 7 months; range = 2 years 11 months to 3 years 11 months;  $SD = 2.3$  months; 38 boys and 41 girls) participated in the study. Additional four participants were excluded from the final analysis because of (a) fussiness (i. e., failing to play on warm-up phase,  $n = 1$ ), (b) experimenter error ( $n = 2$ ), and equipment failure ( $n = 1$ ). Children were recruited from local preschools. Parents of all of the children provided informed consent to participate in the study.

### Stimuli

Two sets of experimental objects (target and test) with varying shapes, parts, colors, textures, and roughly equal size were used in this experiment (see Figure 1). Along with the experimental objects, an additional supporting object was designed for use with the target objects (Figure 1). The set of target objects consisted of three items, each with a small loop which could be attached to the supporting object. One of the three objects was presented during the first phase of the procedure (the Demonstration Phase). A separate set of test objects consisted of four items: one of them was shown in the mutual exclusivity test (paired with a target object) and three of them were shown during the comprehension test (again, accompanied by a target object).

The pseudowords "moza" and "gatsun" were used as novel labels and as an alternative label in the mutual exclusivity test with equal frequency in the different conditions, and were chosen because they obey the rules of Russian phonology.

### Design and Procedure

The study involved a Demonstration Phase (consisting of a Familiarization stage, Using stage and Removing stage) and a Test Phase. The independent variable was the stage of the Demonstration Phase during which an object was labeled. That was the between-subject variable with

the three experimental conditions. All of the experimental conditions (*familiarization*, *using* and *removing*) included cues to support attention and memory in making a connection between a word and an object. Only the *familiarization* condition included referential intention cues, which were implemented in the pragmatic meaning of the novel object's presentation. The linguistic parameters were equalized as much as possible at different stages and consisted of phrases for commenting on the manipulation with the target object.

Along with the experimental conditions, the control condition *without labeling* was introduced in the design of the experiment. A separate group of participants passed through all stages of the Demonstration Phase without any labeling of the target object. This condition allowed us to ascertain whether possible differences in test performances were caused by label availability in the three experimental conditions.

The combination of conditions with the target object was counterbalanced. Children were tested individually in a quiet room at their preschool. After a brief warm-up play session with the experimenter and familiar toys, children were told that they were going to be shown some new things that the experimenter had.

**Demonstration Phase.** During the following stages, the experimenter established joint attention with the child towards a target object: alternating the gaze between the object and the child, and showing the object by turning it in different directions. The experimenter also named the target object four times in each of the stages: with a label in experimental conditions of labeling or with pronouns in experimental conditions of labeling in another stage and in the control condition.

**Familiarization stage.** The experimenter placed a transparent box with a novel object inside it in front of the child and said, "Look, what I have! Let's take the moza/it out of the box? We open the lid and take the moza/it out of the box!" <opened the lid and invited the child to look at the box by the gaze> "Here is the moza/it! We take the moza/it out and close the box, ok?" Then the target object was taken out and exhibited to the child.

**Using stage.** The experimenter then said, "I want to show you how to play with the moza/it! I have a special hook here." <showed the hook on the bottom side of the supporting object> "We hang the moza/it on this hook and swing the moza/it! Cool! Look, the moza/it is swinging! Do you want to do it like that?" The experimenter allowed the child to explore the exemplar for approximately 30 seconds.

**Removing stage.** Next, the experimenter said: "Did you like to play? Now let's return the moza/it to the box! We have the special box for the moza/it!" <placed the box on the table and opened it> "We open the lid and put the moza/it inside! Now the moza/it is in the box! I have other toys, let's play with them now!"

The experimenter then began the interference play with familiar toys for approximately two minutes.

**Test Phase. Mutual exclusivity test.** The experimenter brought out one of the test objects and the target object, placed them in front of the child, and said: "Look, what I have! Let's play with them now!" The child and the experimenter played freely with the objects for about one minute.

Then the objects were set back down in front of the child and the experimenter asked, "Give me the gatzun, please!" 'Gatzun' was an alternative word, which the child had not heard in the Demonstration Phase, when the target object was labeled 'moza', and vice versa. The experimenter waited up to 20 seconds for the child to hand over one of the two objects on the table. When given any object, the experimenter encouraged the child by saying, "Thank you!" Then, the experimenter hid the objects under the table and offered to look for what else she had. If the child was reluctant to choose an object after 20 seconds, the child's results in both tests were excluded ( $n = 1$ ).

**Comprehension test.** The experimenter brought out one of the test objects and the target object, placed them in front of the child, and said: "Look, what I have! Let's play with them now!" The child and the experimenter played freely with the objects for about a minute. Then the objects were set back down in front of the child and the experimenter said, "Give me the moza, please!" 'Moza' was used when it was the pseudoword that the child had heard in the Demonstration Phase in all experimental conditions with labeling; when the target object was labeled 'gatzun', the experimenter asked to give her the 'gatzun'. The experimenter waited up to 20 seconds for the child to hand over one of the four objects on the table. When given any object, the experimenter encouraged the child by saying, "Thank you!" If the child was reluctant to choose an object after 20 seconds, the child's results in both tests were excluded ( $n = 0$ ).

After the tests, the experimenter placed the test objects and the target object in front of the child, and asked the recall question, "Do you remember what we were playing with in the beginning? Which of them? Give it to me, please!" If the child was reluctant to choose an object, the experimenter brought out the supporting object with a hook and asked, "Which of them were we playing with this one?"

The placement of the test objects on the table was determined randomly. All experimental sessions were videotaped for initial and reliability coding.

## Results

Table 1 shows the number of participants in the three experimental conditions and control condition who selected the target object during the comprehension test. The statistical analysis confirmed that in all three experimental conditions, the children performed this test significantly better than would be expected by chance (25%) ( $\chi^2 = 19.11$ ,  $p < .001$ ;  $\chi^2 = 38.23$ ,  $p < .001$  and  $\chi^2 = 10.01$ ,  $p = .002$ ). In the control condition *without labeling*, the children chose a referent for the label as expected by chance (25%),  $\chi^2 = 0.02$ ,  $p = .97$ . The children therefore acquired the object-label matching after four utterances of the label in any stage of the object demonstration: whether upon first familiarization, use of the object, or even moving the object back to its container. It should be noted that the smallest deviation from chance was found in the *removing* condition, and the largest deviation was in the *using* condition.

The mutual exclusivity test was passed only in one condition, namely *familiarization* (see Table 1). Only when the label was uttered in the first stage of the object's dem-



**Figure 1.** Experimental target and test objects and additional construction for the target object's manipulation (supporting object with a hook).

**Table 1.** Number of Children Performing the Comprehension and Mutual Exclusivity Tests in All Conditions

		Comprehension test (%)	Mutual exclusivity test (%)
Familiarization stage	right	11 (57.9)***	14 (73.7)*
	wrong	8 (42.1)	5 (26.3)
Using stage	right	16 (72.7)***	14 (63.6)
	wrong	6 (27.3)	8 (36.4)
Removing stage	right	10 (47.6)**	14 (66.7)
	wrong	11 (52.4)	7 (33.3)
Without labeling	"right"	4 (23.5)	10 (58.8)
	"wrong"	13 (76.5)	7 (41.2)

**Note.** \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

onstrator did the children choose the unfamiliar object as a referent of the unfamiliar label significantly more often than would be expected by chance (50%;  $\chi^2 = 4.26$ ;  $p = .039$  in contradiction to  $\chi^2 = 1.64$ ;  $p = .201$  and  $\chi^2 = 2.33$ ;  $p = .127$ ). In the control condition *without labeling*, the children chose a referent for the label as expected by chance (50%;  $\chi^2 = 0.53$ ,  $p = .78$ ). These findings demonstrate that exposing children to a novel word through familiarization with an object allows children to recognize the word as an element of common knowledge with the experimenter. Exposing the word through the later stages did not have such an effect, although there was the joint attention context through those stages.

In the *familiarization* condition, 5 of 19 participants answered the recall question before supporting object demonstration (26%); in the *using* condition, 7 of 22 participants (32%) did so; in the *removing* condition, 6 of 21 (28%) did so; and in the *without label* condition, 6 of 17 participants (35%) did so. All of the children recalled the target object after the supporting object demonstration.

## Discussion

The current study examined whether providing children with referential intention cues facilitates their discerning of a word as a sign in the symbolic system, in contrast to the joint attention with other content. We expected that joint attention without referential intention cues would support children's general cognitive processes and therefore would allow them to match the pronounced label with the demonstrated object. The obtained data confirmed our expectation.

The inconsistency of results from the two tests provides evidence that object-label matching does not always accompany acquisition of shared knowledge. We observed children who could choose the object correctly when asked for the referent of a presented label, but who did not avoid lexical overlapping of this label and a novel one. We suppose that they did not use the knowledge about matching a presented label with a presented object to match a novel label with a novel object, which would be typical for chil-

dren of this age (Markman & Wachtel, 1988; Diesendruck & Markson, 2001).

The common component of the *familiarization* condition (the only condition of the current study in which the mutual exclusivity test was performed) and the traditional procedure for studying the mutual exclusivity phenomenon is an expression of referential intention. Consequently, it is possible that a referential intention cue is not critical for word learning on the whole, but for its important side that is acquisition of the symbolic system unit.

It is worth pointing out that, in this study, referential intention was not expressed with any linguistic parameters of communication, unlike Diesendruck and Markson's experiment (2001) where naming phrases were used ("Look at this one, it's a zev. ... This is a zev"). It was the pragmatics that conveyed referential intention in the familiarization stage: when an adult shows a novel object and names it in that moment, the child's attention is attracted to the act of naming.

Although an alternation of the gaze between the object and the child is also considered to be a referential cue (Baldwin, 1995), these findings demonstrate that it does not have such an effect on word learning. We suppose that gaze direction gives a child the opportunity to find the named object (the referent), but it does not necessarily indicate a referential intention. Perhaps it is not surprising, then, that joint attention with other content allowed children to perform the comprehension test but not the mutual exclusivity test. Consequently, we found evidence that object-label matching and acquisition of a sign in the symbolic system depend on different factors.

The procedure of the current study did not include a demonstration of test objects along with the target object. This might cause doubt about whether children could choose the target object because of its salience as previously presented. However, in the control condition *without labeling*, children did not prefer the target object in spite of that fact that it was the only previously presented object in this condition.

Furthermore, the children had an opportunity to play freely with the test objects along with the target object for about a minute at the beginning of the tests. We suppose that this play time reduced the salience of the target object, because only a small number of the participants were able to recall the object identified as "what we were playing with in the beginning". However, all of the children could recall the target object when the supporting object was presented; therefore, they seemed to retain the target object demonstration but not to distinguish it as the one that was presented earlier than all the other objects.

In the condition *without labeling*, having seen a novel object in the mutual exclusivity test, some of the children asked the experimenter, "And how to play with this?" This reaction demonstrated that they acquired shared knowledge about the target object when it had not been labeled, but that the knowledge concerned the method of using the object. That fact allows us to assume that intentional demonstration of an object invites children to acquire shared knowledge about it.

It remains unclear whether revealing a speaker's intent to name an object affects shared knowledge acquisition or its combination with naming. Further studies that control for this distinction are needed to investigate the social and statistical learning mechanisms involved with respect to words and other cultural aspects.

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**■ экспериментальные сообщения ■**

# Роль референциального намерения как компонента совместного внимания в формировании совместного знания и ассоциации между словом и объектом

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**Аннотация.** Существующие на данный момент разногласия в результатах эмпирических исследований в области влияния совместного внимания на освоение ребенком нового слова, как мы предполагаем, имеют под собой две основные причины: разнообразие возможных результатов лексического научения (формирование ассоциации между звучанием слова и видом объекта или возникновение единицы символической системы) и разнообразие возможных содержаний совместного внимания (сам акт наименования, использование объекта, события, происходящие с объектом). В данном исследовании мы варьировали ту стадию в ходе демонстрации объекта, на которой взрослый называл его ребенку (ознакомление с объектом, использование объекта или убирание объекта). Мы полагаем, что сигналы о референциальном намерении со стороны демонстрирующего объект взрослого, включенные в стадию ознакомления с объектом, приводят к включению слова в знаковую систему ребенка, тогда как совместное внимание без этого компонента не приводит к такому результату. Тест на выбор объекта по слову показал, что дети устанавливают ассоциативную связь между словом и объектом во всех трех условиях. Тогда как МЕ-тест, построенный по процедуре выявления феномена взаимного исключения, был пройден только теми испытуемыми, кто услышал название объекта на стадии ознакомления с ним. Таким образом, мы видим, что привлечение внимания ребенка к акту называния объекта является критически важным для формирования новой единицы знаковой системы.

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**Ключевые слова:** освоение нового слова, референциальное намерение, совместное внимание, ассоциация слова с объектом, совместное знание, социальное научение

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