Learning new words in unfamiliar frames from direct and indirect teaching

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Abstract

In our study, we aimed at investigating how two years old children make use of the pragmatics in order to learn new words from an ongoing interaction. We operationalized the situational pragmatics by frames as introduced by developmental psychologists. The basic logic was to place 30 children at the age of 27 months in situations, in which they can barely rely on their prior pragmatic knowledge. Instead, they depend on extracting more information from the observed interaction. Our hypothesis was that when learning in unfamiliar frames, children in the indirect teaching condition would take advantage of the modeled behavior to identify with one of the communicative partners and thus to learn new words.

1 Introduction

Imagine a family eating breakfast. The children have invited a friend over, who asks for a napkin: "Can I have a Zewa?". In German, "Zewa" is an eponym standing for piece of a kitchen roll or a paper towel. She is corrected by the other children who inform her that at their home, she must ask "Can you give me a napkin?" Both sentences are syntactically and semantically different but on a pragmatic level, they lead to the same goal. And obviously, one must know how to frame such a goal (i.e. which verbal action to choose) to successfully achieve it. In this work, we were interested how children learn the pragmatic frame as a form of an appropriate action.

The concept of frames was introduced to developmental psychology by Bruner (1983) as an implicitly encoded social behavioral pattern acquired through experiencing social interactions in one's cultural environment (Bruner, 1983; Fogel, 1993; Tomasello, 1999; 2003). Frames are supposed to give children access to the principles that guide social interaction as they provide "predictable, recurrent interactive structures" (Ninio & Snow, 1996, p. 171) that scaffold the child's emerging understanding of new linguistic labels (Tomasello, 2003). In this sense, embedding a new word within a familiar frame results in the reduction of the information load on the child as this word will be perceived within a familiar routine and "the process of word learning is constrained by the child's general understanding of what is going on in the social situation in which she hears a new word" (Tomasello & Akhtar, 200: 182).

The importance of frames for learning has been acknowledged by Fogel (1993), Ninio & Snow (1996) and Tomasello (2003). However, pragmatic knowledge is difficult to investigate as it provides action frames within which a successful interaction takes place and therefore can usually be observed only implicitly. To our knowledge, ours is the first experimental study actively manipulating the pragmatic frame in the context of word learning to explore its influence on learning success. By pragmatic frame, we understand an interaction protocol involving actions in a sequence that is coordinated with the interaction partner. The coordination evolves as a routine: Performing a speech act such as labeling a new object, a competent speaker knows that this goal has to be framed by (a) looking at the other person, (b) pointing in the direction of an object and (c) uttering a label (see Figure 1, column "familiar frame"). In this familiar routine, (c) can be perceived as a slot, within which new information is provided and can be easily picked up.

To date, investigation of pragmatic frames concentrated on whether and at which age chil-

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dren master a particular routine. E.g., Franco & Butterworth (1996) have shown that at the age of 16 months, children learn to visually check whether the interlocutor is attentive before they actually point to something, which is basically the part (b) in the labeling speech act described above. Another strand of research is devoted to the link between language acquisition and imitation skills drawing from the fact that pragmatic frames consist of an appropriate action. Thus, it is likely that children acquire such frames through their imitation skills. Interestingly, a strong link between imitation capabilities and language learning is assumed suggesting not only that such frames might be a form of cultural transmission but also that children need to learn to apply it in a reverse role (Tomasello, 1999). Studies found that children's ability to imitate in a reverse role was related to various measures of language acquisition for 18 month olds (Carpenter et al., 2005; Herold & Akhtar, 2008). Thus, children need to imitate in a reverse role "to learn to use bidirectional communicative symbols" (Carpenter et al., 2005, p. 275).

However, the investigation focuses mostly on direct teaching scenarios. Yet, there is increasing evidence suggesting that indirect teaching scenarios might be even more fruitful learning environments in conveying skills that are related to pragmatic knowledge. This evidence is coming from a variety of different research strands. One strand is dedicated to overhearing studies. In these studies, children are not addressed directly but rather hear the tutor talking to another person and pick up a learning content from this indirect teaching (Akhtar, 2005; Akhtar, Jipson, & Callanan, 2001; Floor & Akhtar, 2006; Gampe et al., 2012). In theses studies, it has been found that when a reciprocal social interaction is guaranteed, young children learn words similarly well as in direct teaching scenarios. The other strand of research is coming from sociolinguistic studies emphasizing that in many cultures, children are taught how to behave and act appropriately within the community's interaction rules (Heath, 1983; Ochs, 1986; Pye, 1986; Schieffelin, 1986; Scollon & Scollon, 1981), therefore centering learning processes in the field of pragmatics.

Yet another strand of research comes from work by Oshima-Takane and colleagues (1996), who demonstrated that children with more multiparty interaction experience had better success in the acquisition of personal pronouns. This line of investigation pursues the idea that not only the acquisition of the lexical item itself takes longer in children who are less experienced with multiparty interactions, but their lack of opportunity to observe its correct usage – i.e. the unfamiliarity with contexts in which personal pronouns are typically used – delays production.

All together, the various strands of research speak to the possibility that the acquisition of pragmatic frames is particularly facilitated in polyadic interactions. However, to date, neither the question of how pragmatic frames are acquired nor in which learning environment they might be learned has been addressed in word learning studies. This paucity is due to the fact that pragmatic knowledge is implicit to the process of language acquisition: Children make use of culturally established routines and it is difficult to design a new interaction protocol consisting of truly new actions. Thus, we think that both, (a) a defined routine consisting of a fix interaction protocol and (b) new actions within it are required to appropriately test the acquisition of pragmatic frames.

2 Designing unfamiliar frames

When investigating the acquisition of pragmatic frames, it is necessary to ensure that children bring little prior knowledge of action into the testing situation. More specifically, in the study by Gampe and colleagues (2012), it was tested whether eighteen month-old children will learn new words from overhearing, even though the frames that were used to introduce the new words were not established as a labeling routine. A labeling routine would be to say, "look, this is a toma!", but in Gampe et al. (2012, p. 5), the experimenter said "I'm going to show you the toma. Do you want to see the toma?". Thus, basically, a 'showing' frame was used to introduce the novel label, which is definitely not a typical labeling routine but nonetheless a familiar frame. From the results in this study, it was concluded that children could learn a novel label even in less transparent situations, in which not a typical labeling frame was used. With respect to the pragmatic skills, it is interesting to see that the use of (almost) any kind of pragmatic frame will facilitate learning of words in children. However, the question of how such frames are established remains barely investigated. As already mentioned above, it is difficult to create truly new actions, i.e. actions that the children have to learn without drawing advantage on their prior knowledge. In our attempt to solve this problem, we created a frame with unfamiliar elements in an

interaction protocol – on the basis of Pepperberg's model/rival labeling routine (1997; 2002) – as a condition in which children needed to learn a new behavior to be able to participate appropriately in the interaction. Based on Bandura's work (1971), Pepperberg (2002) developed this routine for a grey parrot acquiring labels for fifty objects, seven colors, number labels up to eight, categories, etc. The linguistic abilities of the grey parrot trained with the model/rival technique exceeded simple naming of individual items as he was able to combine these labels and use them referentially, which enabled him to identify, classify, request or decline over a hundred items. On a pragmatic level, he was able to distinguish simple speech acts and communicative roles (Pepperberg, 1992). Pepperberg (2002) argues that the model/rival technique maximizes the level of explicitness in presenting reference, functionality and nonverbal context framing the social interaction: During teaching sessions, the parrot observed a dialog taking place between two experimenters. One of the experimenters acted as tutor and the other as both model and the parrot's rival for the tutor's attention. The dialog consisted of a fixed question-answer-routine: The tutor asked for the denomination of an object and the model/rival gave either a correct or an incorrect answer. This in turn triggered either a positive, reinforcing feedback or a negative, corrective feedback. The positive feedback consisted of verbal praise and the possibility for the human (and later the parrot, were it correct) to play with the object — which was the ultimate goal. The negative feedback consisted of a verbal scolding, interruption of eye contact and retraction of the object. Tutor and model constantly changed roles so the parrot learned to separate the role from the person.

How this method from an animal study can be usefully applied in studies with children was shown in Pepperberg and Sherman (2002). The underlying argument was that children with special needs might benefit from the model/rival technique: Instead of requiring the child to react to parts of an interaction (e.g. a question), the behavior modeled in an indirect teaching scenario was assumed to demonstrate the appropriate verbal and nonverbal behavior in a holistic way. Pepperberg and Sherman (2002) tested the model/rival paradigm with 24 children with various disabilities: autism, physical disabilities with developmental delays, and attention deficit hyperactivity disorder. The rewards applied in model/rival training were modified for children: Instead of physical objects, the children received the opportunity to interact with the tutor and the model by singing a song or playing a game. All children had received conventional one-to-one treatment before the study but without obtaining an important improvement in their condition. With the model/rival training, however, all children made improvements in their interactive communicative skills even though this study did not primarily focus on the acquisition of new word knowledge but on the acquisition of appropriate behavioral patterns. This provides strong support to the idea that – in contrast to direct teaching – indirect teaching seems to facilitate learning under certain conditions, but still systematic application in the field of language acquisition is lacking.

Motivated by these findings, we aimed to apply this technique to language acquisition with typically developed children to evaluate the effects of indirect teaching with respect to learning pragmatic frames. It can be argued that the model/rival paradigm is similar to the so called overhearing scenarios (Akhtar, 2005; Akhtar, Jipson, & Callanan, 2001; Floor & Akhtar, 2006). There are, however, some crucial differences in these two scenarios. While in overhearing scenarios children are not a part of an interaction, in our scenario, children were positioned as onlookers to an instructive dialog between two adults. In addition, not only did the children hear a new word introduced – as in overhearing scenarios – but they were also presented with a model of a holistic verbal and nonverbal behavior. Thus, our setting can be considered a very specific form of an overhearing scenario.

	Familiar frame	**Unfamiliar frame**
		
Ostension	eye contact + calling the child by her given name	
Highlighting	pointing	illuminating/elevating
Question	"What's this?" for nouns; "What's the color of this block?" for color adjectives; "How many buttons are these?" for number words	
Answer	word production	nonverbal behavior: touching the correct display

Figure 1: Unfamiliar frame in a comparison to a familiar frame.

As can be seen in Figure 1, in our scenario, we manipulated two parts of a typical question-answer routine: The highlighting of the object or its properties and the way the children had to provide their answer.

In various studies, it has been shown that socio-pragmatic cues such as eye-gaze, pointing, touching or manipulation (see summary in Booth et al., 2008) can draw children's attention to an object or its properties. However, for younger children, it has been shown that before children begin to regard the socio-pragmatic cues within an interaction, their attention can be guided by perceptual properties of the objects themselves. For example, when hearing an object labeled, 10 months old will associate this label with a more salient object (Pruden et al., 2006). Thus, designing the unfamiliar pragmatic frame, we make use of the fact that children's attention to an object can be directed not in a familiar way (by pointing) but in an unfamiliar way by lighting up the object's location or elevating it mechanically. This specific way of highlighting was made possible by a table that was designed for this study (see Figure 2).

In addition to the way of highlighting an object, the children's answers in this interaction were also designed in an unfamiliar way. We reasoned that almost any action that elicits a word production from a child is familiar. Thus, we rather requested a nonverbal behavior from the child in form of placing the hand on the one of three displays in front of them. The object and the displays are depicted in Figure 3 below.

Based on the above referred sociolinguistic and laboratory studies about learning in multi-party contexts, for our study, we assumed that the "benefit [of multi-party learning] involve pragmatic skills rather than the more strictly linguistic skills such as vocabulary size" (Barton & Tomasello, 1991, p. 518). Therefore, the research question was whether children acquire pragmatic knowledge better in direct or indirect teaching conditions. Although a certain agreement exists in developmental pragmatics that frames play a role in language acquisition, this role has been claimed only for direct teaching interactions. Thus, our study fills a gap as it compares direct and indirect teaching scenarios with respect to how pragmatic frames are acquired and whether multi-party interactions can contribute to it.

We hypothesized that children in the indirect teaching condition would score significantly better than children taught directly by taking advantage of the presence of a model, thereby facilitating imitation of the involved appropriate action.

3 Method

In this experiment, in addition to our data obtained during the interaction between the child and the experimenter(s), we asked the accompanied parents to fill out two questionnaires: The short version of the ELFRA-2 (Grimm & Doil, 2006) – a German equivalent to MacArthur & Bates Inventory focusing on word production – and a questionnaire reporting experience with multi-party situations using birth order and day-care visit as indicators since sibling children were found to learn in a different environment (Dunn & Shatz, 1989). Finally, a list of all the words of vital importance for the study was given, and the parent had to check whether the child already understood or actively used them.

3.1 Participants

A sample of 36 children aged 25 through 28 months (M = 25.8, SD = 1.2) participated in this experiment. All children were native German speakers and lived in Bielefeld and surroundings. Children received a picture book and a rubber duck for their participation.

Of the 36 children (17 girls, 19 boys) who participated, 6 (2 girls, 4 boys) had to be excluded due to fussiness (2 boys) or non-compliance (2 girls, 2 boys). The sample, therefore, consisted of 30 children, 15 boys and 15 girls. 16 were firstborns and 14 were secondborns.

3.2 Stimuli

We operationalized word learning by providing words of different word classes. The referents were different pieces of jewelry, color adjectives denominating less common colors, and number words denominating different set sizes (see Figure 2).

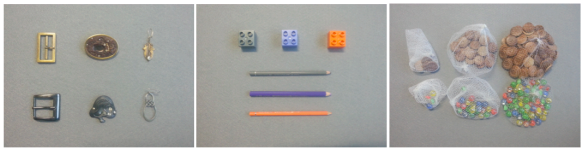

Figure 2: Stimuli for the presentation (above) and transfer (below) of nouns (left), color adjectives (middle), and number words (right).

For the acquisition of nouns, we chose labels that the children were unlikely to know, namely German words for different pieces of jewelry such as Ohrring (earring), Brosche (brooch) and

Gürtelschnalle (belt buckle). One set of these items was used to teach the words to the children, and another was used to test whether the children were able to transfer their newly acquired knowledge to another exemplar of the same object class (see Figure 2). Transfer objects differed in shape, color and size. The second word class, color adjectives were less common colors such as lila [lilac], grau [gray] and orange [orange]. During the teaching phase, colors were presented in the form of building blocks; for testing, we used crayons. We also taught children words for numbers. We chose number words such as vier [four], zwölf [twelve], and hundert [hundred] to denominate different quantities of objects. For the objects in the teaching phase, the different sets were presented using nets containing different quantities of identical wooden butons. For the transfer task, the child was presented with nets containing marbles.

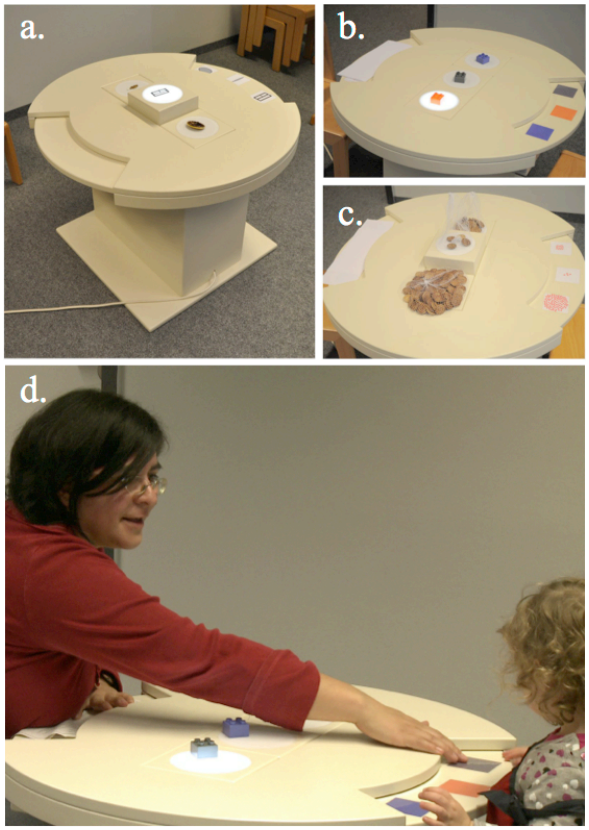

Figure 3: (a) The specifically designed table (b) the three areas in the middle of the table can be lighted up or (c) elevated in order to make the object salient; (d) on this display that the experimenter is touching, the child learned to nonverbally pick the right answer (for each word class, a different display was used as this part of the table can be rotated by the experimenter.

We randomized the ordering of the words, the ordering in which they were taught, and the position on the table on which they were presented. Each parent was asked to fill in a questionnaire during the warm-up phase that asked whether the child already knew certain words. Only when the child was reported to already know the target word, the randomization changed ad hoc.

The objects were presented on a specifically designed table (see Figure 3). The table display was used for both familiar and unfamiliar conditions as a presentation background. In the unfamiliar condition, however, the table made it possible that some elements of an interaction were unfamiliar: (a) the object was highlighted by lighting up or elevating it and (b) for the child's answer, a display was provided with featured symbols of the objects: For the noun-learning task, the display showed stylized pictures of the objects; for the adjective-learning task, the display was equipped with color patches and for the number-learning task (see Figure 3b), the pictures displayed different amounts of red dots corresponding to the numbers to be taught (see Figure 3c). These displays could be changed smoothly during the session by rotating a part of the table on the experimenter's side.

3.3 Procedure

We adopted Pepperberg's model/rival training (Pepperberg, 2002) creating a predesigned question-answer-routine. This routine contained reinforcing and corrective feedback. In both experimental conditions, the direct and the indirect teaching situation, children heard the new word five times before being testing children's learning effects that was measured using production and comprehension tests. In the tests, comprehension was defined as the child's ability to transfer the learned word to new objects. Thus, for our protocol, unlike that of Akhtar and colleagues (2001), it was not sufficient to identify the same object out of a random set of objects. Instead, children were required to use their knowledge to identify another object of the same type. As the study by Akhtar and her colleagues (2001) had shown that children – in contrast to Pepperberg's parrot – did not depend on role reversal to learn new words, we desisted from including role reversal in our experimental design, i.e. the model (the second experimenter) acted only as a learner. The whole procedure lasted 30–40 minutes with the word learning part taking ca 5 minutes.

Warm-up and pretest

After children arrived at our lab, the experimenter first engaged with the child in a simple jigsaw puzzle. Next, the experimenter tested whether the child understood the pragmatic implications of simple requests. Here the experimenter presented the child with a tray holding three objects: a train, a Playmobil® girl and a Playmobil® horse and asked the child to hand over the objects, one at a time. To make the experimental conditions comparable, we developed a script including utterances, gaze direction and gestural behavior of the experimenter(s).

Teaching

Children were taught three words from different word classes.

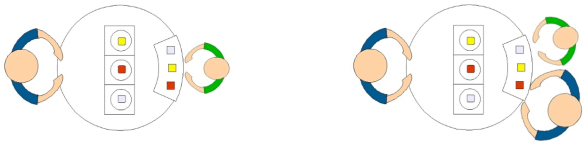

Figure 4: The two experimental conditions: unfamiliar direct versus unfamiliar indirect teaching.

As can be seen in Figure 4, in the direct teaching condition, the child was seated at a table facing experimenter 1 who acted as a tutor. In the indirect teaching condition, the child was seated at a table facing experimenter 1, who acted as a tutor, and next to experimenter 2, who acted both as a model for the child's behavior and a rival for the attention of experimenter 1. In the indirect teaching scenario, experimenter 1 reacted to the child as little as possible. In both conditions, experimenter 1 focused on his conversational partner – the child in the direct and experimenter 2 in the indirect teaching condition – and started the question-answer-routine by pointing to the object in question and asking for its name. Then, the correct name was given (either by experimenter 1 or 2 – depending on the condition) which was followed by a positive, reinforcing feedback including a reward consisting in the possibility for the learner to explore the object. Next, the routine was repeated, but this time, the answer was incorrect and was thus followed by a negative, corrective feedback. The verbal contribution by experimenter 1 in the direct teaching condition corresponded to the contribution provided by experimenter 1 and 2 in the indirect teaching condition; the child heard the new target word 5 times (3 in positive and 2 in negative formulations). After teaching, experimenter 1 proceeded to test the child's learning success.

Testing

After each teaching phase, experimenter 1 initiated the actual behavior production test: She turned to the child and call her or him by her/his given name. Then, the experimenter asked the child the same question as during the teaching phase (see Figure 1). Children sat in front of a display making it possible to provide an unfamiliar response protocol to the experimenter's questions. The child was expected to produce the learned behavior, i.e. they were expected to place their hand on the correct display in front of them (see 3.2 for more details). For scoring learning success using behavior production, children were given two points for correct and frame-appropriate production when they placed their hand on the correct display when asked for the label of the taught object; if they did not place their hand on the display but uttered the correct word, they got only one point for correct production, since they failed to produce the appropriate behavior; if the children either did not answer at all or answered incorrectly they were given no points.

In the word comprehension test, experimenter 1 cleared the table of all objects before placing an alternative set of objects in front of the child. Experimenter 1 took out a tray and asked the child to help her to place the objects on the tray. She then conducted the procedure that had previously been practiced during the warm-up phase, namely mixing the objects while saying *"mischen, mischen, mischen"* ("mix, mix, mix") and asking the child to hand over the object to which the noun referred or the object with the appropriate property by saying *"<name of the child> gibst du mir mal die Brosche?"* ("<name of the child>, would you give me the brooch?") while holding out the tray with the right hand and holding out her left hand palm up next to it, so the child knows that she waits to receive the object. For scoring, the child got two points for a correct and task-appropriate answer when she gave the experimenter the requested object or when she identified it by pointing to it. If the child handed over all objects beginning with the one the experimenter had requested, she got one point for a correct answer. This turned out to be necessary because many children seemed to have been primed by the warm-up task to hand over all items, one at a time. If the child chose not to

answer at all or handed over an incorrect item or all items at once, she got no points.

4 Results

4.1 Differences between the dyadic and triadic conditions

Children in both conditions (indirect and direct teaching) on average achieved 2.5 (*SD* = 1.83) out of 6 possible points with a range from 0 to 6 in the behavior production test, and 2.1 (*SD* = 1.65) out of 6 possible points with a range from 0 to 5 in the word comprehension test.

The following Table depicts the distribution of the achieved scores:

	production			comprehension		
scores	**0**	**1**	**2**	**0**	**1**	**2**
direct teaching	26	9	10	26	3	16
indirect teaching	22	3	20	29	4	12

Table 1: Children's performance according to the score distribution; each child participated in 3 trials.

A nonparametric Mann-Whitney test showed no significant differences between boys (*N* = 15) and girls (*N* = 15) in their overall performance either in behavior production (*U* = 100.5, *p* = 0.62) or in word comprehension (*U* = 95.5, *p* = 0.48). The children in the two experimental groups direct teaching (*N* = 15) and indirect teaching (*N* = 15) did not differ in lexical development (*U* = 86.5, *p* = 0.28).

Given that the data were not normally distributed (Kolmogorov-Smirnov *df* = 15, $p < 0.05$ for word production and comprehension), nonparametric Mann-Whitney-tests were performed. Additionally, Spearman's Rank Order Correlations were computed between the children's performance and lexical development, shyness, and experience with multi-party situations operationalized by birth order and daycare experience.

Our data (see Figure 5) from the production tests revealed that when taught directly, children scored poorer (33.3 % of the possible correct responses) than children taught indirectly (50 % of the possible correct responses). In the word comprehension test, the result was reversed with children in the direct teaching condition achieving 38.9 % of correct answers and children in the indirect teaching condition scoring 31.1 % of the possible correct responses (see Figure 5).

Nonparametric Mann-Whitney-tests for overall production and comprehension showed no significant differences between children's performance in both conditions (production: *U* = 84, *p* = 0.11; comprehension: *U* = 93, *p* = 0.20, one-sided).

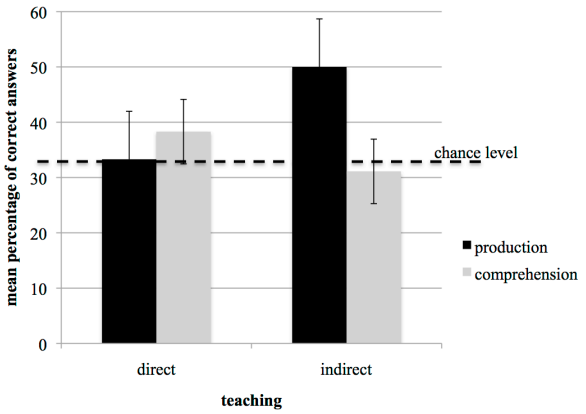

Figure 5: Overall performance in the unfamiliar direct (dyad) and indirect teaching (triad) conditions.

4.2 Learning effects

To assess the learning effects, we performed a Wilcoxon test comparing children's performance to a chance level of 33 %. We found that children in the direct condition did not differ significantly neither for production (*Z* = -0.274, *p* = 0.39, one-sided) nor comprehension (*Z* = 0.847, *p* = 0.19, one-sided). The same was true for children's comprehension in the indirect teaching condition (*Z* = -0.927, *p* = 0.463, one-sided). However, for the production, we found that children's performance in the indirect teaching scenario was significantly different than at the chance level (*Z* = -1.621, *p* = 0.052, one-sided) suggesting that only in the indirect teaching scenario, children improved their production.

In sum, the children accepted the unfamiliar frame conditions readily. They understood that they were expected to produce a response – which was elicited by addressing them with a direct question in the production test – but they also learned that uttering a word would not be the appropriate way to behave in this interaction. After all, only in 2.2 % of all cases did the children try to answer the question by producing a word rather than this novel nonverbal behavior. Thus, in the most testing trials, the children either refused to answer or applied the new behavior in trying to respond to the experimenter. In the aftermath of the experiment, they even tended to create their own non-verbal frames by placing a hand on one of the pictures placed in front of them and looking to the experimenter prompting her to utter a label and then replacing

the hand on another picture and again gazing at the experimenter etc. In none of the cases, in which the children initiated these games, did they try to include speech.

4.3 Relations to language skills and birth order

Correlations of children's overall performance reported to their lexical development displayed no relation with children's performance (production: $r_s = 0.31$, $N = 30$, $p = 0.10$; comprehension $r_s = 0.09$, $N = 30$, $p = 0.63$) implying that children reported to have a more advanced lexicon performed similarly to children reported to have a less advanced lexicon.

Next, we compared the performance of children who had older siblings or visited daycare, to firstborns or children who stayed at home with their mothers, because the former are supposed to have more experience in multi-party interaction than the latter. Our correlational analyses between overall performance and birth order did not reveal any relationship of experience in multi-party interactions with task performance (production: $r_s = 0.08$, $N = 30$, $p = 0.70$; comprehension: $r_s = 0.04$, $N = 30$, $p = 0.84$). Furthermore, no significant correlations could be found for overall performance and daycare visit (production: $r_s = 0.02$, $N = 30$, $p = 0.93$; comprehension: $r_s = 0.20$, $N = 30$, $p = 0.29$).

5 Discussion

The children in this experiment presented above learned words from various word classes within an unfamiliar frame. This means that they experienced an interaction protocol with novel aspects as a new way of singling out referents and a new way of responding (placing one's hand on a display). These novel aspects of the interaction protocol differed from interactional knowledge that children had at their disposal, because commonly, a question is answered by a verbal behavior (Anselmi et al., 1986).

We expected children in the indirect teaching condition to follow the new interaction protocol and to learn the reference better because the multi-party situation presented them with a model to imitate, thereby making the expectation of how they should behave more transparent. Our results confirm our hypothesis. In general, children are able to learn new frames, i.e. a new interaction protocol from an ongoing interaction as both groups were able to apply the displayed symbols for an object or one of its characteristics (e.g., its color or amount). This achievement strongly supports the idea that when children learn words, they master many tasks concurrently (Clark, 1974). However, while one challenge consists of learning an appropriate behavior, the other – perhaps greater – challenge is to learn a new word and its concept. In our study, children not only had to acquire a concept of the new word and to bring this knowledge into the comprehension task, in which they had to pick the right example of this referent, they also had to apply the new concept within an appropriate, newly acquired nonverbal behavior in the production test. While we found no differences between the direct and indirect teaching conditions when compared the groups directly, only children in the indirect teaching scenario performed at a significantly better level than chance in their production test.

These findings put us in the position to think that when children can bring little previously acquired pragmatic knowledge to comparable teaching situations, but must acquire the pragmatics during the ongoing situation and learn a semantic content, they will perform better when exposed to the indirect teaching than those children taught directly in the production test. For the comprehension task, in contrast, the achievement in both groups was comparable.

Further, we assumed that birth order and daycare visit as operationalizations of the children's experience with multi-party interactions would enhance the advantage of the indirect over the direct teaching condition. This hypothesis could not be confirmed: The extent of experience with multi-party interactions did not influence children's performance in experiment 2 implying that all children can benefit equally from indirect teaching independently from how much experience with this kind of situations they had acquired previously. In the case of lexical development, our correlational analyses showed no significant relation to word comprehension and production tests.

Our results thus suggest that two-year old children benefit most from modeling taking place in indirect teaching conditions when the pragmatic frame is unfamiliar and thus the learning task puts high cognitive demands on the child. In such cases, children's ability to draw on already acquired interactional behavior is limited, and they seem to make use of an imitation mechanism that allows them to (a) to pick up the pragmatic information provided in the teaching situation and (b) keep the interaction going by simply

copying the interactional behavior previously displayed by the model and thus accomplish the task. The reason why we think that a cognitively less demanding mechanism of imitation is applied here are our obtained results in the comprehension test: Although in an unfamiliar frame, these indirectly taught children showed a better productive behavior, they did not perform better in a comprehension task suggesting that their concept of the presented new word remains weak and linked to a specific action. We suggest that taking advantage of indirect teaching does not mean that children achieve a deeper understanding of the object-label match but it allows them to stay further engaged in the ongoing situation (see behavior of impaired adults in Wrede et al., 2010), thereby prolonging the chance to learn from it. This is in line with adult research suggesting that overhearing does not lead to a better understanding. On the contrary, when addressed directly, adult participants demonstrated a much more accurate understanding of an instruction (Schober & Clark, 1989). We can extend the findings with our data from children suggesting that imitation does not seem to substitute for or boost cognitive processes.

As to the question of whether the acquisition of pragmatic frames is a prerequisite or an integral part of word learning, we see in our data that while the knowledge of frames is crucial for word production, it does not enhance the word comprehension. Thus, the acquisition of pragmatic frames seems to be an integral part of the learning process, needed for the emergence of a solid word concept.

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