

## Children’s comprehension of pronouns and definites.<sup>1</sup>

Saskia BROCKMANN — *University Tübingen*

Sara MCCONNELL — *University Maryland*

Valentine HACQUARD — *University Maryland*

Jeffrey LIDZ — *University Maryland*

**Abstract.** We present an experiment which tests children’s comprehension of the requirements of use of pronouns and definites. An adult-like use of definites and pronouns imposes different but related requirements. In the case of definites, a unique referent is required in the context, whereas in the case of a pronoun, the referent in the context has to be salient. In this experiment, we use a novel word task to test three-year-olds’ sensitivity to these requirements. Our results show that children are adult-like in their sensitivity to salience in their comprehension of pronouns, compared to definites. However, they failed to show sensitivity to the uniqueness requirement on the use of definites.

**Keywords:** pronouns, definiteness, language acquisition, salience, uniqueness, familiarity.

### 1. Introduction

In this paper, we present an experiment on children’s comprehension of the requirements of use of pronouns and definites. An adult-like use of the definite article and pronouns imposes different but related requirements. In the case of the definite article, a unique referent is required in the context (see e.g., Heim and Kratzer, 1998; Elbourne, 2005, 2013). For example, in (1), there should only be one doll in the context. If there were two dolls, the indefinite article should be used. In the case of a pronoun, the referent in the context has to be salient (see e.g., Roberts, 2003): if no object were salient in the discourse of (2), the addressee would likely not know how to obey the command. In this experiment, we use a novel word task to test three-year-olds’ sensitivity to these requirements.

(1) Put the doll in the suitcase!

(2) Put it in the suitcase!

A mature understanding of what it means for an expression to be context sensitive is necessary for children’s acquisition of pronouns and definites. More specifically, children have to be aware that conversations follow certain rules and goals, e.g., that an utterance serves the goal of adding information to the commonly shared pool of information, the the Common Ground (cf. Stalnaker, 1978). Related to this is the distinction between given and new information, such that given information is attributed to information within the Common Ground, while new information seeks to expand the Common Ground further. In the comprehension of definites and pronouns, children have to be able to track given information, because both constructions

---

<sup>1</sup>We would like to thank Robin Hörnig from the University of Tübingen for support regarding the statistical analysis, the Project on Children’s Language Learning at the University of Maryland (here especially Tara Mease) for assistance in collecting the children’s data, Nina Fritz for assistance in collecting the adult data, and Julia Braun for additional edits.

can only access referents in the discourse that have already been introduced and which have been identified as unique or salient, respectively.

Another important fact about language which children have to be aware of when hearing a pronoun or an article is that language is referential, i.e., that their task is to link the utterance to specific individuals within their discourse context. Which individual is mapped to which pronoun differs from context to context. Research on these pragmatic prerequisites has found that from a very early age on, and sometimes even in the preverbal period of language development, children are already sensitive to the purposes of communication. Roughly, children ages one or two demonstrate sensitivity to the goals within a conversation, the common ground, to given and new information and the distinction thereof, and to the interpretation of referring expressions (see for more detail Clark, 2016 and references therein). However, it remains less clear how and when children distinguish between different ways of referring to entities in the context, such as using a pronoun instead of a definite, i.e., picking the salient versus the unique referent, or an indefinite instead of the definite. Here we aim at giving first answers to these questions. We test three-year-olds' comprehension of pronouns and definites via a selection task, using novel words. Because the unfamiliar objects are described using unfamiliar labels, the only information children can use to identify the right object are the cues coming from the use of a pronoun or definite or indefinite in different contextual situations, where a toy is unique or salient or both. Our results show that children are sensitive to the salience requirement of pronouns, but they may still struggle with the uniqueness requirement of definites.

In the following, we will delve deeper into the theoretical background regarding the contextual requirements on pronouns and definites in Section 2.1 to 2.3 and introduce previous work on the constructions and their contextual requirements in Section 2.4 We introduce the experiment in Section 3 and conclude in Section 4.

## 2. Theoretical Background

### 2.1. Definite Article: Uniqueness

The definite article 'the' has been associated with triggering a presupposition of uniqueness, meaning that its interpretation can only be defined if there is exactly one unique referent in the context that has the characteristics specified by the NP complement (see e.g., Heim and Kratzer, 1998; Elbourne, 2013; Roberts, 2003).

- (3) # The semanticist gave a talk at Sinn und Bedeutung 22.
- (4) A semanticist gave a talk at Sinn und Bedeutung 22.

In the examples above, the DP 'the semanticist' fails to refer to one unique referent in the context, as there were more semanticists present at the Sinn und Bedeutung 22 conference. The indefinite article is not associated with a uniqueness condition and using it in the same context is natural. The dominant view to explain the infelicity of (3) is to assume that when a definite article is used, the DP, and thus also the complete sentence, is only well-formed if there is only one uniquely available semanticist. If there were two or none, the sentence would

not be false, it would just be inappropriate. A standard formal definition of 'the' including the presupposition of uniqueness can be seen below.

$$(5) \quad \llbracket the \rrbracket^{g,c} = \lambda f_{\langle e,t \rangle} : \exists! x[f(x) = 1]. \iota x[f(x) = 1]$$

## 2.2. Pronouns: Saliency

Elbourne (2005, 2013) argues that third person pronouns are interpreted in parallel to the definite article, i.e., they equally evoke a uniqueness condition on a contextually determined referent. The difference between definites and pronouns, according to Elbourne, lies in the NP complement: with pronouns, the NP complement is covert and contextually determined. For example, in (6) below, 'it' in the second sentence refers to the unique cat in the context. 'The cat' in the first sentence and 'it' in the second end up having the same interpretation, but in the latter case, the NP 'cat' is phonologically covert. 'It' under this analysis would thus be analysed as 'the' in (5) above.

- (6) *The cat is sleeping. It eat snores.*

Roberts (2003) proposes a refinement of Elbourne's account, focussing on the specific contextual requirements associated with third person pronouns and the definite article, respectively: third person pronouns trigger a presupposition of saliency entailing uniqueness, while the definite article triggers the classically assumed presupposition of uniqueness. She discusses the following examples originally introduced by Heim (1982):

- (7) I dropped ten marbles and found all of them, except for one.  
 (a) It is probably under the sofa.  
 (b) # The marble is probably under the sofa.
- (8) I dropped ten marbles and found only nine of them.  
 (a) ?? It is probably under the sofa.  
 (b) # The marble is probably under the sofa.  
 (examples adapted from Roberts, 2003: 335)
- (9) A woman entered from stage left. Another woman entered from stage right.  
 (a) #The woman / The FIRST woman / The SECOND woman was carrying a basket of flowers.  
 (b) She was carrying a basket of flowers, while #the woman/ the FIRST woman/ #the SECOND woman led a goat.  
 (examples from Roberts, 2003: 324)

In (7), the missing marble is made sufficiently salient, so that referring to it with the pronoun 'it' is natural, even though there are more marbles in the context. Using an underspecified definite NP 'the marble' violates uniqueness. In contrast, in (8), the missing marble is not sufficiently

salient, so that using ‘it’ to refer to it seems inappropriate, while using an underspecified definite NP is equally inappropriate as in (7). The only difference between (7) and (8) is the explicit mention of the missing marble. Example (9) highlights a similar point; the pronoun ‘she’ in (9b) can only refer to the lastly introduced woman, so the more salient one. This becomes evident by looking at the continuations of the sentence. Using an underspecified DP ‘the woman’ is still inappropriate, because the uniqueness requirement of the definite article is not satisfied by salience. Roberts (2003) takes these examples as a case in point that the definite article is not sensitive to salient discourse referents, but that third person pronouns are. Roberts’ formal analysis assumes the same lexical entry for ‘the’ as in (5) and the following lexical entry for pronouns (see (10)).

- (10)  $\llbracket it \rrbracket = \lambda f_{\langle e,t \rangle} : \exists x[f(x) = 1 \& SALIENT(x) \& \forall y[SALIENT(y) \rightarrow y \leq_{SAL} x]]$ .  
 $\iota x[f(x) = 1]$
- (11)  $\llbracket SALIENT \rrbracket^c = \lambda x.x$  is among the salient discourse referents in context  $c$
- (12) The ordering  $\leq_{SAL}$ : For all  $a, b$  that are discourse referents in  $c$ :  $a \leq_{SAL} b$  if (a)  $b$  is strongly familiar and  $a$  is weakly familiar, (b)  $b$  pertains to a more immediate Question under Discussion (QUD) than  $a$ , (c)  $b$  is more prominent than  $a$  regarding grammatical relations such as topic/focushood etc. (adapted from Roberts, 2003: 334)

We will assume Roberts’ (2003) analysis for pronouns and the definite article for the purposes of this paper.

### 2.3. Familiarity

Let us briefly discuss one further contextual requirement that has been identified for definites, specifically in its comparison with indefinites. Most famously, Heim (1982) argues that the definite article should be associated with familiarity, i.e., that the referent of definites has to be already established in the previous discourse. This is different for indefinites, where the referent can be newly introduced into the discourse. Heim gives examples that demonstrate the adequacy of the novelty/familiarity distinction: In (13), the first sentence with the indefinite NP ‘a wine glass’ introduces a new referent in the discourse that can then be taken as a referent for the definite article in the second sentence ‘the glass’. However, if we try to use the indefinite article in order to refer to this already introduced wine glass, we get an inappropriate utterance; ‘A glass’ in (14) can’t refer to the previously introduced wine glass (for more details regarding the familiarity constraint on definites, see Roberts, 2003).

- (13) A wine glass broke last night. The glass had been very expensive.
- (14) A wine glass broke last night. # A glass had been very expensive.  
 (examples from Roberts, 2003: 296)

Familiarity applies to both definites and pronouns. In (15) below, the pronoun ‘it’ can be used in the second sentence to refer back to the wine glass introduced by the indefinite in the first sentence, just like the definite in (13).

- (15) A wine glass broke last night. It had been very expensive.

To sum up, the contextual requirement of familiarity differentiates definites and pronouns from indefinites. The uniqueness and salience conditions differentiate definites from pronouns: definites require their referent to be unique, but not necessarily salient, while for third person pronouns, it is the other way around: their referent has to be salient, but not necessarily unique. Rather, it is unique by virtue of being the most salient referent in the discourse. In this paper, we will focus on the latter two requirements and ask if three-year-olds are aware of definites' uniqueness requirement and third person pronouns' salience requirement.

#### 2.4. Previous Work

Previous studies have looked at pronouns and definites separately. For pronouns, it has been observed that children start producing pronouns very early on and roughly seem to understand them by two years of age (see e.g., Cruttenden, 1977; Shipley and Shipley, 1969; Chiat, 1981; Huxley, 1970; Halliday, 1975; Charney, 1980; Loveland, 1984; Moyer et al., 2015).

Song and Fisher (2003) tested whether children demonstrate sensitivity to discourse prominence in their interpretation of pronouns in a series of four experiments. Three-year-olds listened to a story accompanied by two screens simultaneously showing pictures of two discourse referents. In the story, the two discourse referents were mentioned equally often; however, only one of them was made prominent. A pronoun in the target sentence either referred to the prominent referent or to the other referent.<sup>2</sup> Experiment 1 tested elicited imitation, and Experiments 2 to 4 tested preferential looking by measuring children's fixation on the correct discourse referent. Results confirm that three-year-olds look at the prominent discourse referent right away when hearing a pronoun, while only later switching to the new referent in contexts. Adult controls confirm these results. However, the design in Song and Fisher (2003) leaves open the possibility that children do not really understand the salience requirement of the pronoun, but that they look at the protagonist of the story only because their attention was first drawn to the protagonist, no matter which requirements guide the interpretation of the pronoun. In our study we will test children's understanding of the salience requirement of pronouns further in ways that avoid this possible confound.

For definites, studies report considerable flexibility in the production and comprehension of the definite article compared to the indefinite article: children seem to be overly permissive of using and accepting definites in contexts where they should be unavailable because their uniqueness presupposition is not satisfied (cf. Karmiloff-Smith, 1979; Schaeffer and Matthewson, 2005; Schafer and de Villiers, 2000; van Hout et al., 2010). Importantly, children's difficulty mostly arises in cases where they are expected to use indefinites as opposed to definites.

<sup>2</sup>Control target items included a definite NP that referred to the referent in question. Note, however, that the presence of the NP argument of the definite article prevents us to conclude anything for the influence of prominence on the definite article per se.

Van Hout et al. (2010) report on two experiments of children's production and comprehension of the definite versus indefinite article at the age of 3;1 to 5;8. In the comprehension task, truth value judgments were elicited by showing children a sequence of two pictures where, in the first picture, a unique referent is singled out (i.e., the picture shows a baby with her father, holding one balloon, standing next to another person holding several balloons). In the second picture one of the balloons in the background, i.e., a new referent, flies away. Then, children were asked a question either including a definite or indefinite article (i.e., 'Did the balloon/a balloon fly away?'). The target answer should be negative when the definite article is used, as the old referent, i.e., the balloon in the dad's hand, doesn't fly away. In parallel, the answer should be positive when the indefinite article is used, as indeed the new referent flies away. Children give a positive answer when the indefinite article is used, but also when the definite article is used, even though it is not the familiar, old referent which flies away. Adults answered mostly target-like. The results of the production study match these results. Overall, children seem over-permissive with definites: they tend to accept sentences with definites referring to a non-familiar referent. A possible confounding factor in this experiment is that the mere depiction of the flying balloon is sufficient to make it familiar: children zoom in on that part of the scene. Furthermore, a limitation of a truth value judgment task like this one is that children may want to be charitable and accept a description that is not completely appropriate to make the sentence true. In our study, we will use a selection task instead, to probe children's sensitivity to the uniqueness requirement of definites: if children are sensitive to this requirement, the use of a definite should lead them to pick a unique object, in contrast to an indefinite.

To sum up, we see that children seem to understand the conditions of use of pronouns early on: they understand that third person pronouns refer to a discourse salient entity as early as age three. On the other hand, children seem to struggle with the conditions of use of the definite article vs. the indefinite article up to seven years of age. In our experiment, we further probe children's comprehension of pronouns and definites and contextual requirements of these within a single experiment, using a simple selection task, incorporating novel words and novel objects. We ask whether (i) children are sensitive to salience when encountering a pronoun vs. a definite or an indefinite, and (ii) children are sensitive to uniqueness when encountering a definite vs. a pronoun or an indefinite.

### **3. The Experiment**

#### **3.1. The Task**

As the focus of this experiment is on children's understanding of the contextual requirements associated with definites and pronouns, our goal was to test this within the same task, by manipulating salience and uniqueness. As a control condition, we also included indefinites. In previous work, the comparison between definites and indefinites has proven to be difficult for children. We used a selection task using novel words to label unfamiliar objects, to get children to use information provided by the use of the construction (pronoun vs. definite vs. indefinite) to select the right object. Indeed, with a novel word, children cannot make inferences based on the meaning of the NP complement: they need to base their inferences on the articles or pronouns used in a given context.

### 3.2. The Design

Children are presented with three unfamiliar objects (pictures of objects unlikely to be familiar to children, e.g., a tube cutter, a bagpipe, or an exotic fruit) as toys. One of the toys is different from the other two. This setting establishes uniqueness in the case of the one unique object. Then, the experimenter draws attention to either the unique object, one of the non-unique objects, or none of the objects. This way, we capture salience.

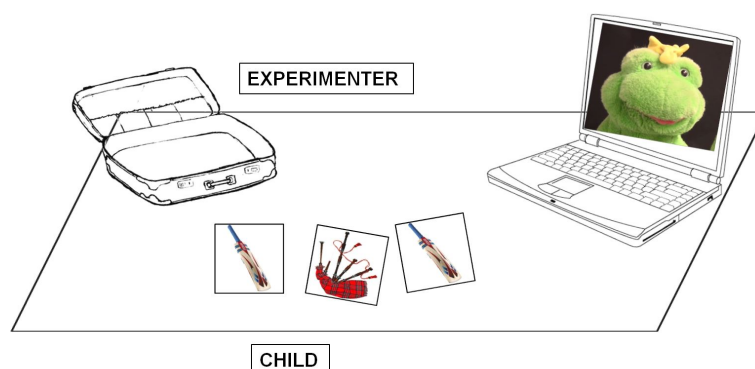


Figure 1: Study Setup

Specifically, the experiment is set up as a game (see Figure 1): Froggy is visiting his grandmother but has forgotten to bring toys. So the experimenter asks the child if they should pack a suitcase for Froggy together. In order to find out which toys Froggy wants, the experimenter and the child Skype with Froggy. The experimenter displays three cards with pictures of unfamiliar objects, Froggy's toys, and draws attention to one of the toys. Then, Froggy gives his clue in the form of a sentence like the following. After this, the child picks one of the three toys and puts it in the suitcase.

- (16) *Pack the blicket in the suitcase!*
- (17) *Pack a blicket in the suitcase!*
- (18) *Pack it in the suitcase!*

The Skype session is a video of Froggy that the experimenter pauses while interacting with the child. In order to give the impression that Froggy is taking an active part in the conversation, experimenter and Froggy exchange some introductory remarks at the beginning. We tested children in a between-subjects design, separating participants into two groups. Group 1 heard either the definite or indefinite article; Group 2 heard the definite article or the pronoun 'it'.

In examples (19) to (21), we provide some sample target interactions within Group 1, comparing the definite and the indefinite article. We include three context conditions, alternating which toy the experimenter pays special attention to:

- (19) Context 1: No Extra Attention  
 Experimenter: [*experimenter doesn't point to any toy*] Froggy, which toy do you want us to pack?  
 Froggy: Pack {the blicket/ a blicket} in the suitcase.
- (20) Context 2: Attention to Unique Toy  
 Experimenter: [*experimenter points to the unique toy*] Oh, look at this one! I really like its color, it's red! Froggy, which toy do you want us to pack?  
 Froggy: Pack {the gorp/ a gorp} in the suitcase.
- (21) Context 3: Attention to Non-Unique Toy  
 Experimenter: [*experimenter points to one of the non-unique toys*] Oh, look at this one! I really like its shape, it's funny! Froggy, which toy do you want us to pack?  
 Froggy: Pack {the glark/ a glark} in the suitcase.

The same context conditions were used for the second group, but Froggy would use either definites or the pronoun 'it' (see (22) below).

- (22) {No Extra Attention/ Attention to Unique Toy/ Attention to Non-Unique Toy}  
 Froggy: Pack {the blicket/ it} in the suitcase.

In Table 1, we summarize how the design of the study reflects the theoretically derived contextual requirements. In the first context, where none of the toys is singled out by the experimenter, only uniqueness is given, as the visual setting singles out one of the toys. In the second context, the experimenter draws attention to the unique toy: here, both uniqueness and salience are given and target the same toy. In the third context, the experimenter draws attention to one of the two non-unique toys. Thus, uniqueness and salience are in competition: while the experimenter establishes a non-unique toy as salient, the pure visual context provides a different toy that meets the uniqueness requirement.

|  | Uniqueness | Salience |
|--|------------|----------|
| Context 1: No Extra Attention          | Yes        | No       |
| Context 2: Attention to Unique Toy     | Yes        | Yes      |
| Context 3: Attention to Non-Unique Toy | No         | Yes      |

Table 1: Contextual Requirements as met in the Experiment

### 3.3. Methods

To make sure that children are able to perform the task in general, we included four trials where the toys presented were familiar, using familiar labels. For the actual experimental trials, we included four trials per condition with a 2x3 design, with two construction conditions (definite/indefinite article or definite article/pronoun) and three context conditions (no attention, attention to unique toy, attention to non-unique toy). We also included 4 control trials where Froggy wants the child to pick a toy without giving a clue. These control trials checked whether



children would pick toys by preference of location only, e.g., if they would always pick the rightmost toy. The order of trials was pseudo-randomized and was the same for all participants. Our measure for the statistical analysis was the percentage to which children would pick the unique toy.

### 3.4. Subjects

We tested 38 participants, 13 participants in group 1 (7 female, 6 male), 15 participants for group 2 (8 female, 7 male); 10 participants were excluded because they did not finish the study. All participants were between 2;11 and 3;11 years old (mean age: 3;4) and were tested in the Project of Children's Language Learning at the University of Maryland. They were all native speakers of English. In addition, we tested an adult control group with the same material and setup. These were all native speakers of English. 6 participants were tested at the University of Maryland and 18 participants were tested at the University of Tübingen. Participants from each location were distributed evenly over the two groups. The age range of adults was 19 to 37 years with a mean age of 22 years. Female/male ratio was 1:1.

### 3.5. Predictions

#### 3.5.1. Group 1: Definites vs. Indefinites

Our measure as a basis for the statistical analysis is the selection of the unique toy. If children have an adult-like understanding of the uniqueness requirement of definites, we expect that they should pick the unique toy whenever the definite article is used, irrespective of which toy is being made salient. Regarding the indefinite article, we expect children to be at chance at picking the unique toy. If children have an adult-like understanding of the uniqueness requirement and they are able to compute a scalar implicature that the speaker should have used the definite article if the unique toy was intended, they should pick one of the two non-unique toys. However, given that children have difficulty computing implicatures at this age (see e.g., Pouscolous, 2012; Papafragou & Musolino, 2003; Geurts, 2010; Guasti et al., 2005), we expect that they will be at chance in picking the unique toy or one of the two non-unique toys. We set the chance level here at 33%, because children can pick from three choices.

The difference between expected behavior with definites vs. indefinites leads to an expected main effect of construction type in Group 1: the unique toy should be selected more often across all three context conditions when Froggy uses the definite article than when Froggy uses the indefinite article (see Figure 2).

Regarding the definite article, we estimate that the visual context should suffice in establishing the visually unique toy as the only available referent for the definite article in the 'No Extra Attention' context (see the leftmost black column). Accordingly, if children are adult-like in their comprehension of the definite article, they should pick this toy. However, as no other contextual clue is given, they may not be at ceiling.

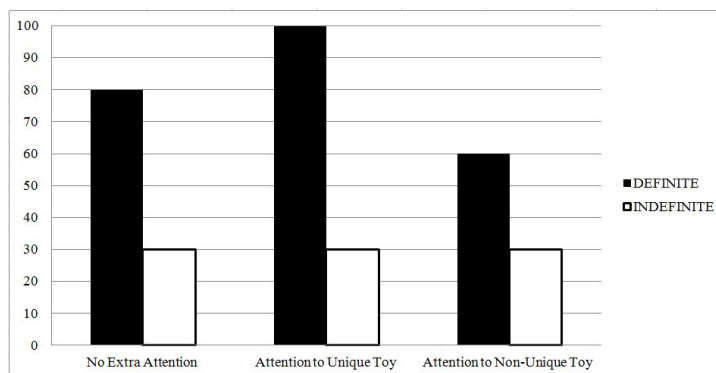


Figure 2: Selection of the Unique Toy: DEF/INDEF Predictions

When the experimenter pays special attention to the visually unique toy ('Attention to Unique Toy', middle black column), the visual context is reinforced through the behavior of the experimenter, who makes the already visually unique toy salient by talking about it. In this case, the unique toy is both unique and salient and so children should be at ceiling when hearing the definite article.

Lastly, when the experimenter draws attention to one of the two non-unique toys ('Attention to Non-Unique Toy', rightmost black column), the visual context is competing with the actions of the experimenter: while visually, the unique toy stands out, the experimenter singles out one of the two non-unique toys as the salient one. When hearing the definite article, children could stick to the visually unique toy and choose that one as the referent, but they could also reinterpret the definite article in picking out that toy which is unique by virtue of having been talked about by the experimenter. Note that this interpretation of the situation goes along a standard interpretation of the definite article. We expect that children should stick to the visual context no matter the manipulations made by the experimenter. However, due to the strong competition, they may pick the unique toy to a lesser extent when hearing the definite article than in the other two contexts, while still being above chance.

### 3.5.2. Group 2: Definites vs. Pronouns

We expect different results for Group 2. Here, children should pick the salient toy when Froggy utters a pronoun, irrespective of whether the toy is the visually unique one. On the other hand, when children hear the definite article, they should still pick the visually unique toy no matter the context and behave as the children encountering the definite article in Group 1. This leads to an expected interaction between construction and context type (see Figure 3). The type of context should play a much bigger role for pronouns than for definites, as only for pronouns, the choice of referent depends on salience and salience differs from context to context, while (at least visual) uniqueness stays the same.

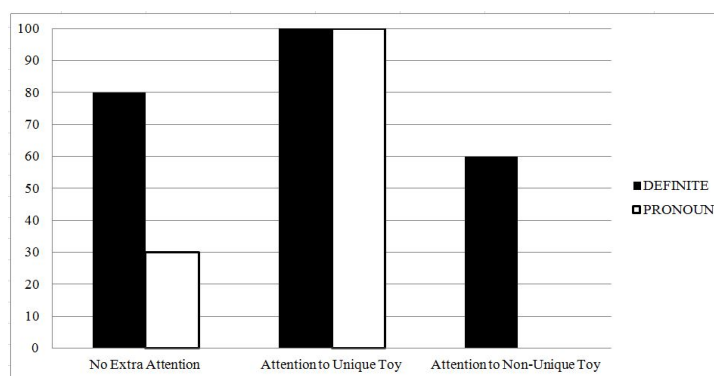


Figure 3: Selection of the Unique Toy: DEF/PRO Predictions

More specifically, in the ‘Attention to the Unique Toy’ context (two middle columns), the visual context and the experimenter’s manipulation both target the unique toy, thus children should always be at ceiling picking it both when hearing the definite article and the pronoun, as the unique toy is the salient toy.

When the experimenter draws special attention to one of the two non-unique toys (two right-most columns), we still expect children to be above chance in picking the visually unique toy when hearing the definite article (see the black column). However, with the pronoun, they should never pick the unique toy when one of the other toys is made salient, so here we expect children to never pick the visually unique toy (see the white column, or rather its absence).

Lastly, when the experimenter doesn’t draw attention to any toy (two leftmost columns), the context doesn’t meet the salience requirement. When Froggy uses a pronoun out of the blue, we expect children to be at chance in picking the unique toy, as nothing else in the context can guide their choice (see white column). The expectations for the definite article are the same as for Group 1. Children should be above chance in picking the unique toy, as the visual context satisfies the uniqueness presupposition.

### 3.6. Statistical Analysis

The binary dependent variable UNIQUE (1 = unique object; 0 = non-unique object) was analyzed according to a 2x3 design with a Generalized Linear Mixed Model (GLMM) with a logit link function in R (R Core Team (2014)). The two fixed factors were the three-level factor CONTEXT (No Attention, Attention to Unique Toy, Attention to Non-Unique Toy) crossed with the two-level factor CONSTRUCTION (Gr. 1: definite vs. indefinite article; Gr. 2: definite article vs. pronoun); intercepts of participants and items were used as random factors. The ‘No Attention’ condition was determined as a reference condition for the three-level factor CONTEXT, i.e., the two contrasts compared the ‘Attention to Unique Toy’ and the ‘Attention to Non-Unique Toy’ to the ‘No Attention’ condition.

### 3.6.1. Results Definites vs. Indefinites

Overall, the main finding for Group 1 is that **no main effect of construction** can be observed (see Figure 4). If children were sensitive to the uniqueness presupposition of the definite article, we would expect them to pick the unique toy across all three contexts significantly more often when Froggy uses the definite article than when he uses the indefinite article. However, they pick the unique toy to the same extent regardless of which article is used. We observe a statistically significant contrast ( $p = 0.0265$ ;  $z\text{-value} = 2.22$ ;  $SE = 0.418$ ) comparing the context where the unique toy is made salient with the context where nothing is made salient. Here, the selection of the unique toy only depends on which toy has been made salient in the context, no matter which construction is used. These results mean that either children are not sensitive to the uniqueness presupposition of the definite article, or our task does not provide a strong enough clue for uniqueness.

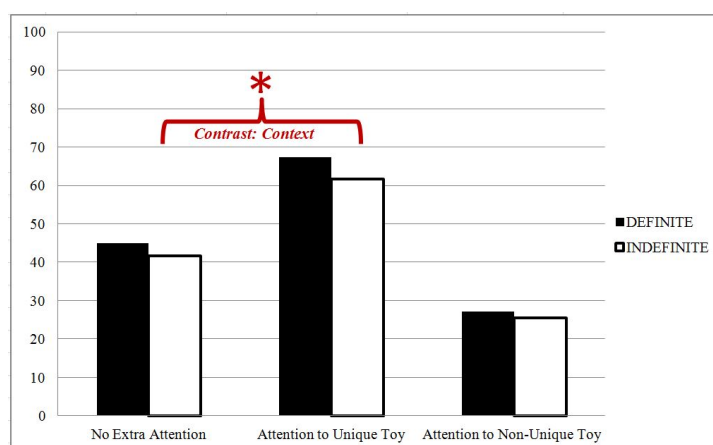


Figure 4: Selection of the Unique Toy: DEF/INDEF, Three-year-olds, Original Material

More specifically, in the context ‘No Extra Attention’ (two leftmost columns), children pick the unique toy roughly 40% of the time both when the definite and when the indefinite article is used. This is not statistically different from chance.<sup>3</sup> This finding suggests that the visual context alone is not a strong enough clue for uniqueness or, as stated above, that children have not mastered the uniqueness requirement yet. In the ‘Attention to Unique Toy’ context, children are significantly above chance in picking the unique toy. However, this is the case whether the definite or the indefinite article is used. In the ‘Attention to Non-Unique Toy’ condition, children behave as in the ‘No Extra Attention’ context, they are roughly at chance in picking the unique toy, both when Froggy utters the definite or the indefinite article. In other words, the visually unique toy doesn’t serve as a clear referent in the case of the definite article, but neither does the salient toy.

<sup>3</sup>In addition to the GLMM and in order to assess whether the relative frequencies in the context conditions (irrespective of CONSTRUCTION) deviate significantly from chance, we computed the confidence intervals for each context condition in each group. If the logit-transformed guessing probability of one third (transformed:  $-0.693$ ) lies beyond the confidence interval, we consider the frequency to differ significantly from guessing.

Overall, these results suggest one of three possibilities. Either three-year-olds have not mastered the uniqueness presupposition yet, or the visual context is not sufficient in singling out the unique toy, or our material is not fit to test children's sensitivity to uniqueness adequately. With respect to this third possibility, one methodological concern that arises is the way the toys are presented, as pictures on flashcards. The two non-unique toys are represented by two identical pictures. This could lead to a reasoning where these two toys are interpreted as two tokens of the same type of toy and that there being two of them does not really matter, because Froggy identifies the type of toy he wants to pack. In this case, the distinction between unique and non-unique toys vanishes completely and the visual context wouldn't meet uniqueness as a contextual requirement at all. Consequently, the only clue available for both constructions would be whether one of the two types of toys is made salient. Participants would just pick whichever toy is made salient.

Surprisingly, the adult results overall replicate the results of the children: there is no main effect of construction. Adults also pick the unique toy to the same extent regardless of which construction is used. The contrast between the two contexts 'No Extra Attention' and 'Attention to Unique Toy' observed with children is also significant in the adult data: the selection of the toy depends on which one is made salient.

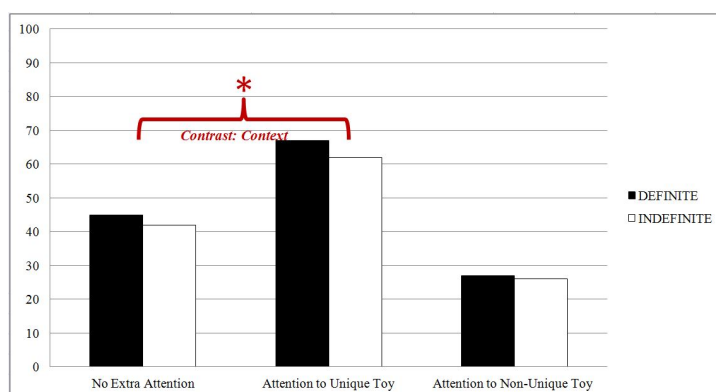


Figure 5: Selection of the Unique Toy: DEF/INDEF, Adults

The percentages in Figure 5 are almost identical to those in Figure 4: adults are at chance in picking the unique toy both when hearing the definite and indefinite article when nothing is made salient and when one of the two non-unique toys is made salient (see the black and white columns on the leftmost and rightmost side, respectively). The percentage of picking the unique toy increases when the unique toy is made salient, but here once again, this increase is observed for the definite and the indefinite article alike. This increase is significant for the comparison between the 'No Extra Attention' and the 'Attention to Unique Toy' context ( $p < 0.05$ ;  $z$ -value = 2.44; Standard Error = 0.43).

Given that adults failed to pick the unique toy when the definite is used, it is possible that our material wasn't fit to test the difference between the definite and indefinite article, and we cannot conclude anything about children's sensitivity to the uniqueness presupposition of definites. We attempt to address this methodological concern in a follow-up study, reported on in section 3.6.3 below.

### 3.6.2. Results Definites vs. Pronouns

Overall, the results from Group 2 matched our expectations (see Figure 6): children pick the salient toy more often when hearing a pronoun than when hearing a definite.

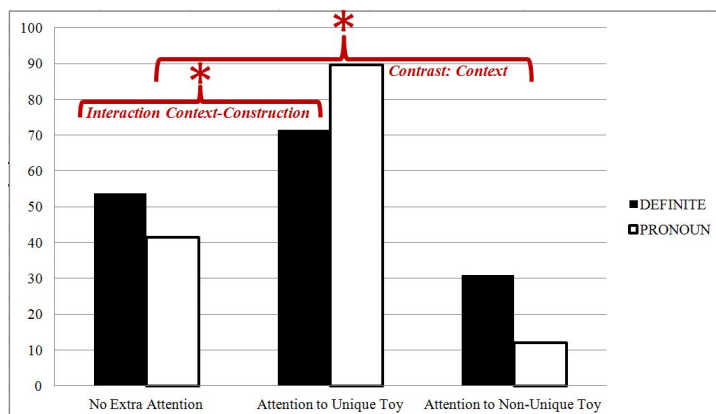


Figure 6: Selection of the Unique Toy: DEF/PRO, Three-year-olds, Original Material

First, there is a significant contrast between the 'No Extra Attention' context and the 'Attention to Non-Unique Toy' context ( $p = 0.041$ ,  $z$ -value =  $-2.04$ , Standard Error =  $0.53$ ). In the former, children generally pick the unique toy more often than in the latter. This is to be expected because at least in the pronoun case in the 'Attention to Non-Unique Toy' context, children only pick the unique toy 15% of the time, because it is not the salient toy. When Froggy uses the definite article in this context, children are still at chance in picking the unique toy. In the 'No Extra Attention' context, children are significantly above chance in picking the visually unique toy both when they hear the definite article and the pronoun 'it'. Comparing the 'No Extra Attention' context and the 'Attention to Unique Toy' context, we find a significant interaction between context and construction ( $p = 0.035$ ;  $z$ -value =  $2.11$ ; Standard Error =  $0.82$ ). The percentages of when children pick the unique toy when hearing the definite article (the two black columns on the left and in the middle) differ slightly across the two contexts. In other words, the additional contextual manipulation of making the already visually unique toy salient increases their choice for the unique toy slightly when hearing the definite article. However, it increases considerably when they hear a pronoun (see the two white columns on the left and in the middle). This finding is compatible with our expectations: only when the visually unique toy is made salient it is the appropriate referent for the pronoun. When nothing is made salient, there is also no appropriate referent for the pronoun. Overall, the results for Group 2 match our expectations.

The adult data for Group 2 (Definite Article vs. Pronouns) also looks promising (see Figure 7). We again observe that between the 'No Extra Attention' and the 'Attention to Non-Unique Toy' context, there is a significant interaction regarding context type and construction ( $p < 0.01$ ,  $z$ -value =  $-3.15$ , Standard Error =  $0.79$ ): adults, like three-year-olds, pick the salient toy more often when a pronoun is used than when the definite article is used.

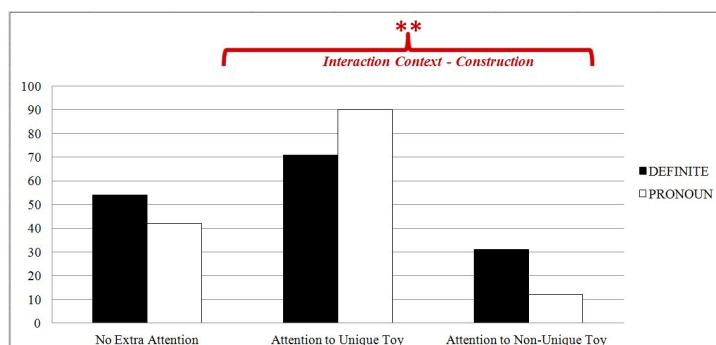


Figure 7: Selection of the Unique Toy: DEF/PRO, Adults

Specifically, in the ‘No Extra Attention’ context, adults are slightly above chance in picking the unique toy both when they hear a definite article and a pronoun (see the two leftmost columns, black for the definite article, white for pronouns). In turn, when one of the two non-unique toys is made salient (two rightmost columns), their selection of the unique toy decreases. The interaction arises because this decrease is more dramatic for pronouns than for a definite: adults almost never pick the unique toy when they hear a pronoun and the salient toy is one of the two non-unique toys (about 10% of the time, see the rightmost white column). They are, however, still at chance in picking the unique toy when they hear the definite article (see rightmost black column). In the ‘Attention to Unique Toy’ context, adults are clearly above chance in picking the unique toy in both cases, meaning when the definite article is used (black column in the middle) and when a pronoun is used (white column in the middle). However, the percentage in the pronoun case is slightly higher. Overall, the results of the adult sample match our expectations.

### 3.6.3. Results Follow-Up Study

To address the methodological concerns discussed for Group 1, we conducted a follow-up study, in which we tweaked the material to prevent the type/token confusion: we cut out all the toys to make them appear more life-like and we changed one of the two non-unique toys slightly, for instance by changing the color or by adding small dots or stripes to them. With this manipulation we hoped to create a situation where, even though the two non-unique toys can be identified as being the same type of toy, there are two distinct tokens of this toy and because of their differences, Froggy must be referring to the token rather than the type of toy when he says which toy he wants to pack.

We tested 12 native speakers of English (7 female, 5 male) in the Project of Children's Language Learning at the University of Maryland, between the ages of 3;0 to 3;11 (mean age: 3;6).

The statistical analysis reveals that changing the material does not change children's behavior (see Figure 8). We observe the same contrast ( $p = 0.047$ ,  $z$ -value = 1.98, Standard error = 0.45) when nothing is made salient compared to when the unique toy is made salient. Whether Froggy uses the definite or the indefinite article, children pick the unique toy more often when it is made salient. An additional statistical test revealed that the difference between the original sample and the follow-up sample did not reach significance.

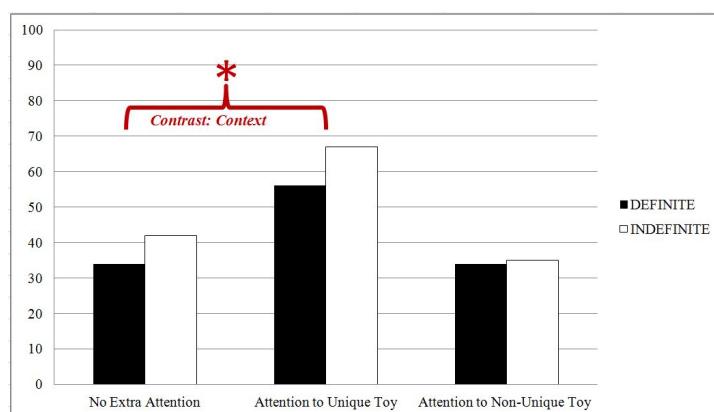


Figure 8: Selection of the Unique Toy: DEF/INDEF, Three-year-olds, New Material

While the change in material did not alter children's behavior, it remains to be determined whether it will lead to an improved performance in adults. Pending these results, we can conclude that three-year-olds are not sensitive to the uniqueness requirement of definites, or that our task is not able to detect their sensitivity.

### 3.7. Discussion

Overall, the results of our experiment suggest that three-year-olds are adult-like in their comprehension of the salience requirement: salience, defined here as the experimenter's attention to one of the available toys, guides the children's choice when they hear a pronoun, but less so when they hear the definite article. This behavior is mirrored by the choices made by the adult controls. However, it is not clear whether three-year-olds are sensitive to the uniqueness requirement, or whether the set-up of the experiment can capture uniqueness in the first place, as the adult controls failed to pick the unique toy when hearing a definite article and failed to pick at random when hearing the indefinite article. Changing the material to prevent type/token confusions did not alter children's responses.

There are, however, additional problems with the material that could make it unfit for testing for uniqueness with adults: the toys represented on the cards are objects existing in the real world. While these should be unusual enough for children not to know or recognize them, adults clearly know a majority of these objects and their names. This alters the experiment, even though the experimenter makes clear that Froggy is a funny guy who has his own names for these toys. Still, just by virtue of the toys being known to the adults, their reasoning could be different in that they might wonder which connection there could be between the object, its real world name, and its fantasy name. In other words, while a novel word task is quite



natural for young children, it may be unnatural for adults, especially if the objects are familiar. If they reason this way, then the grammatical input of the definite article or the indefinite article becomes less important. This extra-linguistic factor could only be excluded if we would present them with truly novel objects. We leave this manipulation for future research.

Another basic problem with the set-up of the experiment could lie in the disregard of familiarity. We have excluded the requirement of familiarity from this study, as both pronouns and the definite article require their referents to be familiar. However, all the toys in the experiment are unfamiliar to the child and they are only established as familiar through drawing attention to them. Thus, especially in the 'No Extra Attention' context, introducing the toys visually could be insufficient to establish familiarity, and thus referring to the unique toy with a definite article might seem odd in the first place. This factor could influence the choice in the 'Attention to Non-Unique Toy' context, where the visually unique toy might not be familiar on the basis of the visual situation alone, and thus could be disregarded as a competitor for the salient toy. However, results of previous studies (e.g., van Hout et al., 2010) show that the visual context makes a referent familiar in guiding children's interpretation.

#### 4. Conclusion

This experiment tested whether three-year-olds are adult-like in their comprehension of the different contextual requirements for the use of definites and pronouns. Following Roberts (2003), we assume that definites require uniqueness, while pronouns require salience. Our results show that children are adult-like in their sensitivity to salience in their comprehension of pronouns, compared to definites. However, they failed to show sensitivity to the uniqueness requirement on the use of definites. We leave to future research whether this failure is due to an experimental artifact or reflects a genuine delay in children's comprehension of the use of the definite article.

#### References

- Charney, R. (1980). Speech Roles and the Development of Personal pronouns. *Journal of Child Language* 7: 509–528.
- Chiat, S. (1981). Context-Specificity and Generalization in the Acquisition of Pronominal Distinctions. *Journal of Child Language* 8: 75–91.
- Clark, E. (2016). *First Language Acquisition*. Cambridge: Cambridge University Press.
- Cruttenden, A. (1977). The acquisition of personal pronouns and language 'simplification'. *Language and Speech* 20(3):191–197.
- Elbourne, P. (2005). *Situations and Individuals*. Cambridge, MA: MIT Press.
- Elbourne, P. (2013). *Definite Descriptions*. Oxford: Oxford University Press.
- Geurts, B. (2010). *Quantity Implicatures*. Cambridge: Cambridge University Press.
- Guasti, M.T., G. Chierchia, S. Crain, F. Foppolo, A. Gualmini and L. Meroni (2005). Why Children and Adults Sometimes (but not always) Compute Implicatures. *Language and Cognitive Processes* 20(5): 667–696.
- Halliday, M.A.K. (1975). *Learning how to mean: Explorations in the Development of Language*. London: Edward Arnold.

- Heim, I. and A. Kratzer (1998). *Semantics in Generative Grammar*. Oxford: Blackwell.
- Huxley, R. (1970). The Development of the Correct Use of Subject Personal Pronouns in Two Children. In G.B. Flores d'Arcais and W.J.H. Levelt (Eds.) *Advances in Psycholinguistics*. Amsterdam: North-Holland.
- Karmiloff-Smith, A. (1979). *A Functional Approach to Child Language: A Study of Determiners and Reference*. Cambridge: Cambridge University Press.
- Loveland, K.A. (1984). Learning about Points of View: Spatial Perspective and the Acquisition of 'I/you'. *Journal of Child Language* 11(3):535–556.
- Moyer, M., K. Harrigan, V. Hacquard and J. Lidz (2015). 2-year-old's comprehension of personal pronouns. *Online Supplemental Proceedings of the 39<sup>th</sup> Boston University Conference on Language Development*.
- Munn, A., K. Miller and C. Schmitt. (2006). Maximality and Plurality in Children's Interpretation of Definites. In D. Bamman, T. Magnitskaia and C. Zaller (Eds.) *Proceedings of the 30<sup>th</sup> Boston University Conference on Language Development*. Somerville: Cascadilla Press. 377–387.
- Papafragou, A. and J. Musolino (2002). Scalar Implicatures: Experiments at the Semantics-Pragmatics Interface. *Cognition* 86(3): 253–282.
- Patel-Grosz, P. and P. Grosz (2017). Revisiting pronominal typology. *Linguistic Inquiry* 48 (2): 259–297.
- Postal, P. (1966). On so-called 'Pronouns' in English. In F. Dinnen (Ed). *Report on the Seventeenth Annual Round Table Meeting on Linguistics and Language Studies*. Washington, DC: Georgetown UP. 177–206.
- Pouscoulous, N. (2013). Early Pragmatics with Words. In F. Liedtke and C. Schulze *Beyond Words. Content, Context, and Inference*. Berlin: de Gruyter. 121–144.
- Roberts, C. (2003). Uniqueness in Definite Noun Phrases. *Linguistics and Philosophy* 26:287–350.
- R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.
- Schaeffer, J. and L. Matthewson (2005). Grammar and Pragmatics in the Acquisition of Article Systems. *Natural Language and Linguistic Theory* 23(1):53–101.
- Schafer, R. and J. de Villiers (2000). Imagining Articles: What a and the Can Tell us About the Emergence of DP. In S.C. Howell, S.A. Fish, and T. Keith-Lucas (Eds.) *Proceedings of the 24<sup>th</sup> Boston University Language Development Conference*. Somerville: Cascadilla Press. 609–620.
- Shipley, E.F. and T.E. Shipley (1969). Quaker Children's Use of thee: A Relational Analysis. *Journal of Verbal Learning and Verbal Behaviour* 8:112–117.
- Snyder, W. (2007). *Child Language. The Parametric Approach*. Oxford University Press: Oxford University Press.
- Song, H. and C. Fisher (2005). Who's 'she'? Discourse Prominence Influences Preschoolers' Comprehension of Pronouns. *Journal of Memory and Language* 52:29–57.
- Stalnaker, R. (1978). Assertion. *Syntax and Semantics* 9, 315–332.
- Van Hout, A., K. Harrigan, and J. de Villiers (2010). Asymmetries in the Acquisition of Definite and Indefinite NPs. *Lingua* 120:1973–1990.