Domain Restriction with Plural Definite Descriptions in Child Language

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Abstract

When we say that 'every student got an A' or 'the students got an A,' we typically do not mean that all the students in the entire world received an A. Rather, these expressions are subject to a phenomenon known as *domain restriction*: the context allows us to narrow down the set of individuals to a relevant or salient set, such as all of the students in the current class. In this research, we ask if children are able to do this, and if so, whether they are as flexible with universal quantifiers (*every*) as they are with plural definite descriptions (PDDs) (*the X*). The answer to this question will not only allow us to compare children's semantic and pragmatic knowledge to that of adults, but also attempt to explain why in some experiments, children appear to interpret PDDs non-maximally, in a way that is inconsistent with the semantics of PDDs and adult responses. We present a Truth Value Judgment Task in which participants wee a group, then a subset of a group is focused, and a description is provided with either a quantificational or PDD subject favoring reference to a property of the subset via a pragmatic process known as local presupposition accommodation (e.g. *Every bear is enjoying its treats/The bears are enjoying their treats*.). The participant's task was to indicate whether or not they agreed with the target sentence. Children responded to a puppet. We found that children were able to restrict the domain appropriately, more so with PDDs than universal quantifiers – the same pattern we observed with adults. Thus, young children can restrict the domain with PDDs, raising the possibility that non-maximal responses in earlier experiments may not all be attributed to an impoverished semantics, but rather to implicit domain restriction, a fully adult-like semantic process.

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1. Introduction

When someone says *every student got an A,* they do not mean to imply that every student in the entire world got an A; rather, they are speaking strictly of the set of salient referents in a given context. This phenomenon is known as quantification.

(1) The horses are eating their carrots.

Furthermore, the definite determiner *the* can also quantify over a subset of referents. When someone says (1), it is infelicitous in a context where no horses are eating carrots, but can be defined in a context where a subset of the horses are eating carrots, even if all of the horses in the context are not. This kind of restriction is called implicit domain restriction; it explains why determiners have an exhaustive interpretation in some cases and a non-exhaustive interpretation in other cases.

Previous research (Karmiloff-Smith 1979; Caponigro et al. 2012) has found that children under 6 years old do not interpret the plural definite description *the* maximally, and have thus concluded that young children do not have an adult-like interpretation of definite determiners. Similarly, in other research (Inhelder & Piaget 1964; Roeper & Matthei 1974; Philip 1995; Crain & Thornton 1998, among others) have concluded that 4 and 5-year olds interpret the quantifier *every* non-maximally, while 6 and 7-year olds interpret it maximally.

There has been much debate over why children, specifically at ages 4 to 6 years, are interpreting determiners so differently than adults, mainly why they do not pick out a maximal set in a context. We pursue an alternative explanation that they may be

implicitly restricting the domain to a subset of referents and therefore, do not have an impoverished semantics regarding the actual meanings of the determiner *the* and universal quantifier *every.*

2. Theoretical Background

This section will provide a brief summary of the relevant semantic and pragmatic linguistic theory of plural definite determiners and quantifiers.

2.1 Domain Restriction

2.1.1 Context-Dependency of Quantifiers

The semantics of quantifiers is in part determined by pragmatic content. The meanings of sentences containing lexical objects such as *every, none only, even, etc*. vary depending on the context, as seen in (3a) and (3b). Kasper (1987; 1992) concluded that presuppositions can determine the domain restriction of a given utterance. The common ground between the participants of a conversation creates the context set, which is the set of the possible worlds in which the common ground would be true (von Fintel 1994). As the hearer interprets a given sentence, they are able to restrict the domain to the salient referents, which means that they have limited the possible worlds that are compatible with the content of the utterance. There is a set S of possible situations, which each have maximal elements, which are the possible worlds (von Fintel 1994). By limiting the possible worlds the utterance can be referring to, it allows for the salient set of referents in a context to be represented in one's mind.

2.1.2 Quantifiers and Resource Domains

Quantifiers contain a hidden domain restriction within them, and we must calculate this restriction given the corresponding context. The process of domain restriction is a pragmatic phenomenon because it is taking the context in which an utterance was heard into account in order to highlight the domain of referents that are relevant for the given utterance. The domain of an utterance must be established in the context; otherwise, the hearer cannot be expected to read the mind of the speaker regarding what domain they have restricted their utterance to.

(2) Everyone had fun last night.

In (2), given a context that a group of friends went to a party last night, the quantifier *every* is clearly not quantifying over every individual in the whole world, but rather, over simply the group of people who went to the party last night. Natural language allows for this flexible definition of quantifiers, which allows one to evaluate the meaning of the same lexical word in various ways depending on the context of the utterance. This concept is called resource domain (Von Fintel 1994).

2.2 Semantics of Quantifiers

To explain the semantics of quantification, an example from Von Fintel (1994) is illustrated. ExP(x) means that there is some entity in the universe of discourse which has the property P. ∀xP(x) means that all entities in the universe of discourse have the property P. (3a) describes the use of the quantifier *every* in that it expresses the entire set

of cats as being cute. (3b) describes that the quantifier *some* expresses that only a subset of the entire set of cats is cute.

(3) a. Every cat is cute ⇒ ∀x (cat(x) → cute(x)) "Every individual x is such that if x is a cat then x is cute"

b. Some cat is cute ⇒ Ex (cat(x) & cute(x)) "Some individual x is such that x is a cat and x is cute"

2.2.1 Universal quantification

The universal quantifier *every* has a definite interpretation, meaning it has an empty intersection (Barwise & Cooper 1981). This means that if only some of the referents have a specified property, language does not allow universal quantifiers to describe such a context. Semantically, (3a) can only be interpreted as true if all of the cats in the whole world are being referenced. However, the process of domain restriction allows for an utterance containing a universal quantifier to be accepted when referencing only a group of salient individuals.

2.3 Pragmatics of Quantifiers

Pragmatics of quantifications allow for presupposition restraint, where the state of the subject of the utterance is constrained to some presupposed content. Given a sentence such as (4a), one must first be able to restrict the domain of the utterance to the set of dogs that is salient, as in (4b), so that they are aware that the sentence is not referring to every single dog in the entire world. However, they then must also be able to calculate the presupposition that the utterance is referring to only the subset of salient dogs that

have a treat, as in (4c), and then they will be able to accurately judge the sentence as true or false. Natural language accounts for these domain restrictions, so (4a) would be judged as a completely valid utterance, having calculated (4b) and (4c).

(4) a. Every dog is enjoying their treat.

b. Every dog, who is a dog in the set of dogs being discussed, is enjoying their treat.

c. Every dog, who is a dog in the set of dogs being discussed, and who has a treat, is enjoying their treat.

2.4 Semantics of Definite Determiners

Definite determiners asserts the existence and uniqueness of object *x.* When using the determiner *the,* it contributes to the *familiarity* and *uniqueness* of an object (Ahern & Stevens 2014), which means that you would typically not use *the* when there are multiple referents you are speaking of. ιx, cat (x) ∧ cute (x) simply means that there exists some cat that is such that it is a unique and it is cute. This differs from the quantifier *every* because it is only referencing a salient cat, and typically it is the context that makes that referent salient. You may say *the cat* even if there are multiple cats in a given context; however something in that context allows for the interpretation that you are only referencing one salient cat.

The bears the presuppositions of existence and uniqueness. The function of *the* is to pick out the individuals in a context. When the property is plural, the determiner is selecting a maximal set of individuals that satisfy the property in the situation *s.* (5)

describes that when the is combined with a property-denoting NP, it takes the situation s as its input, and returns the maximum number of referents that satisfy that property (Acton 2014).

(5) [the] = $\lambda f_{\langle e1st \rangle}. \lambda.s.\iota.x.(f(x)(s))$

The semantics of definite determiners provides a formula for how language picks out the maximal set of referents in a context. At least one individual must meet the description in order for the utterance to be a valid one; this is called semantic uniqueness (Abbott 2008). However, once you take context into account, pragmatics begins to play a significant role in the interpretation of the utterance.

2.5 Pragmatics of Definite Determiners

Once you begin to consider the goals of the speaker in making an utterance to a hearer, pragmatics begins to play a role. The speaker expects the hearer to be able to identify the referents of his utterance in the context provided. This is called referential uniqueness (Abbott 2008), where the speaker uses a definite description in order to refer to a particular subset or individual referent.

(6) a. The cows are in the field.

b. The cows are not in the field.

Löbner (2000) argued that a sentence such as (6a) is only true if all of the cows in the context are in the field, and (6b) is only true if all of the cows are not in the field. He

claims that if some of the cows are on the field and some are not, neither (6a) nor (6b) would be defined (Abbott 2008).

(7) a. All the cows are in the field.

b. All the cows are not in the field.

c. Not all the cows are in the field.

(7a) is not negated by (7b), but rather (7c). Löbner distinguishes plural definite descriptions with universal quantifications based on this distinction. Definite NPs and quantificational NPs are not defined in the same way based on the truth conditions of the context that must be met for each of them. Plural definite descriptions are certainly not defined as clearly as quantificational descriptions. However, natural language seems to allow for a sentence using a plural definite description to be defined even if only a subset of referents in a context contains a relevant property. For example, (6a) may still be accepted by adults and children in some cases, even if every cow in the context is not in the field, so this calls to question which pragmatic and semantic factors are being considered when interpreting a sentence with a plural definite description.

3. Experimental Background

This section provides an overview of relevant experimental research that has been conducted regarding both adults and children's interpretations of domain restriction using definite determiners and quantifiers. Adults seem to be able to restrict the domain to the salient referents in most cases, but research has provided evidence that the visual context

plays a role in how the quantifier *every* is interpreted. Children ages 4-5 typically do not interpret quantifiers and plural definite determiners in an adult-like manner, but there are gaps in some of the research, which leads to inconclusive implications of children's ability to restrict the domain.

3.1 Adult's Interpretation of Domain Restriction for Quantified Sentences

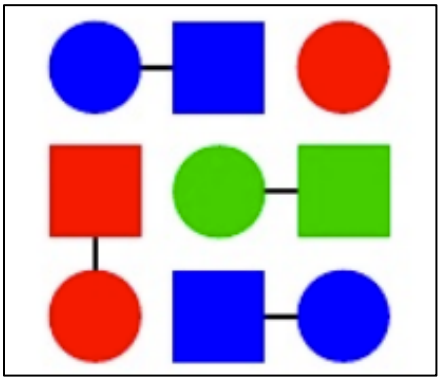
Van Tiel (2015) explored adult's interpretation of quantified sentences using the specific sentence form (7), where participants were presented with pictures of colored circles with some connected to their corresponding colored squares.

(7) Each of these *n* has the same color as the square to which it is connected.

The ability to restrict the domain to only those circles that are attached to a square is crucial in this truth value judgment task. Results showed that participants judged the quantified sentence to be true only 13% of the time for (8a), providing evidence that participants did not implicitly restrict the domain to only those circles that were attached to squares. The visual array of the circles and squares and the amount of colors significantly affected participants' ability to judge the quantified sentences as true. (8b), (8c), and the (8d) elicited true responses 35%, 68%, and 65% of the time, respectively. These results show that the presuppositions that arise from quantifiers are context-dependent.

(8)

a.



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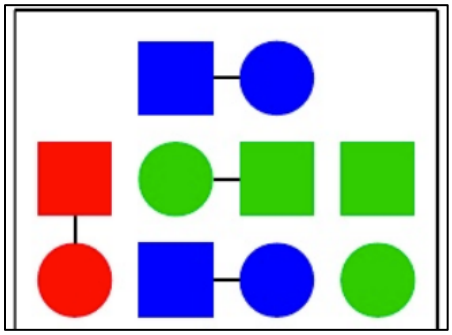

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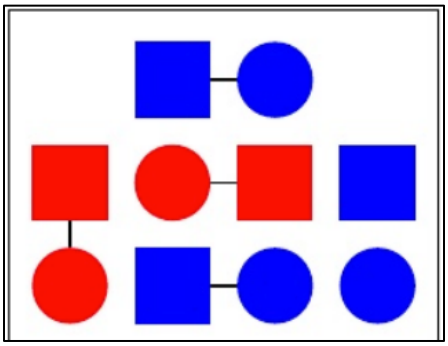
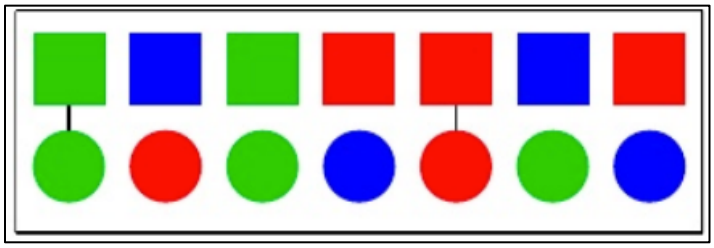


d.



It is inconclusive whether people responded negatively due to their inability to restrict the domain to only those circles that were attached to any square, or due to their intrinsic response being to restrict the domain to smaller subgroups of color. The 35% of people that responded false to (8b) might have done so due to one of the pairs of aligned green shapes being connected and the other pair being unconnected. However, most people responded true, so it seems as though the visual array of the shapes not being aligned with their corresponding color made it easier for people to restrict the domain to only those circles that are attached to a square. In (8b), there was only one circle-square pair that was unconnected, but these shapes were aligned and of the same color, which may have triggered people to only provide a true response if all correspondingly colored shapes are connected. (8c) also had one unconnected circle-square pair of the same color;

however, it elicited the most positive responses, which indicates that something about seeing fewer colors allows people to restrict the domain to only those circles that are attached to a square, instead of a domain where any circle-square pair that are the same color must be connected. This variation of restricting the domain seems to be dependent on the context of the situation provided, specifically visual display of the shapes in this example, but the query of exactly how adults are interpreting quantification of sentences in varying contexts remains unanswered.

3.2 Children's Interpretations of Plural Definite Determiners

Children have been found to interpret sentences containing plural definite determiners both maximally (Munn et al. 2006) and non-maximally (Karmiloff-Smith 1979; Caponigro et al. 2012). When they interpret them maximally, children require that the plural definite determiner is referring to the entire set present in the context, whereas when children process a non-maximal interpretation, the plural definite determiner only needs to be accurately referring to a subset in the context.

(9) The cats are enjoying their treats.

Sentence (9), for example, could elicit the maximal interpretation that all the cats present in the context, regardless of whether or not they possess a treat, are being referred to. (9) could also elicit the non-maximal interpretation that only the subset of cats that possess treats in the context are being referred to.

Munn et al. (2006) employed an act-out task in which the experimenter asked the child, "give me the frogs next to the barn." The results indicated that children gave the maximal amount of the relevant set 95% of the time, suggesting that children interpret plural definite determiners as referencing to the maximal set. However, as pointed out by Lyn Tieu et al. 2017, Munn et al. 2006 reported this percentage after excluding all children who only gave one item in response to the request. Surely, these children were interpreting the plural definite determine non-maximally, so excluding their data leaves room for questioning the implications of their study. Also, asking for "the frogs *next to the barn,"* already restricts the domain of the maximal set of frogs beyond just the definite determiner. The experimenter is specifying which frogs they are referring to, so it does not provide a context in which the child would rationally choose a non-maximal set to give to the experimenter. They did provide a context in which the frogs they were referring to were visually separated from the rest of the frogs, but the task itself was not specifically targeting the plural definite determiner; rather, it seemed to be testing children's ability to follow directions in the most competent sense possible.

Karmiloff- Smith (1979) conducted a series of experiments in order to investigate French-speaking children's production and comprehension of noun phrases, including plural definite determiners. The first experiment tested children between 4 and 11 years old and was conducted by two experimenters, where E1 would manipulate a set of objects, while E2 would have his back turned. The child's task was to direct E2 using only his words to replicate E1's action. For example, they might say *Il faut mettre les camions dans le garage* 'One must put the trucks in the garage' if E1 had moved trucks to the garage. The results showed that 4 and 5-year olds use *les* 'the' for 'pluralization,'

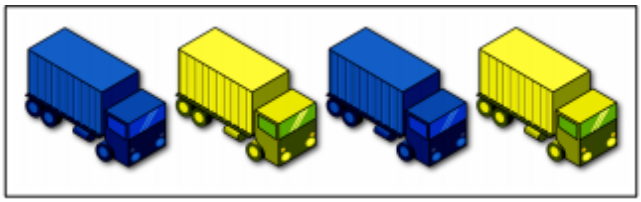
but not 'totalization,' meaning that they would interpret the plural definite determiner as referring to more than one item in the set of relevant items, but not necessarily to the entire set of items. In the second experiment, children were now asked to listen and follow the directions of the experimenter to replicate the actions. An example of a direction they would hear is *Mets les voitures au garage* 'Put the trucks in the garage.' The results indicated that again, 4 and 5-year olds interpreted the plural definite determiner to be in reference to plurality, but they would not interpret it maximally. The results further indicated that between ages 5 and 8, children add the universal description *tous* 'all' when trying to reference the entire set of referents, and that it is not until 8 years old that children begin to associate the plural definite determiner with pluralization and totalization simultaneously. This provides support for the conclusion that children ages 4- to 5- years old have an existential interpretation of the plural definite determiner and thus, interpret it non-maximally.

Caponigro et al. 2012 also investigated children's interpretations of plural definite determiners by conducting an act-out task for 4,5,6 and 7-year olds. The target sentences were, *Can you give me the things on the plate?* and *Can you give me what's on the plate?"* The experimenters also compared the responses to these target items with requests that contained the determiners *some, all* and a nonsense determiner *blick*. The results indicated that first, the question type impacted children's responses; the responses to requests which contained the plural definite determiner differed from the requests which contained *some* and *all.* This suggests that children are aware that there is a difference between the determiners *some, all,* and *the.* Additionally, the authors found that the 6 and 7-year olds responded similarly to adults and interpreted the plural definite

description maximally, whereas, the 4 and 5-year olds interpreted them non-maximally the majority of the time.

Tieu, Kriz, and Chemla conducted a study investigating 4- and 5-year old French-speaking children's interpretations of plural definite descriptions in both positive and negative sentences when presented with a GAP context,[1] such as (10) illustrates. The participants were asked to judge positive and negative sentences such as (11a) and (11b) as true or false given such contexts.

(10)



(11) a. The trucks are blue.

b. The trucks aren't blue.

Adult's and children's responses were divided into three categories: The first is those who acquire a homogenous interpretation of the plural definite description, which would indicate an adult-like pattern, where they would judge both (11a) and (11b) as false. Second, they could have an existential interpretation for the plural definite determiner, meaning that they will judge the positive sentences such as (11a) as true. Finally, they could have a universal interpretation of the plural definite determiner, which would lead

[1] A GAP context is referring to a context in which some of the objects have the property stated in the utterance and some do not.

them to judge (11b) as true because they require the entire set of referents to obtain the property of blue in order to accept the utterance as true.

The results indicated that 16 of the 22 adults displayed the homogenous response pattern and 6 displayed the universal response pattern. 16 out of the 24 children displayed the homogenous response pattern, while 8 displayed the existential response pattern. These results are relevant to the current study because they provide evidence that young children are interpreting plural definite determiners in an adult-like manner 67% of the time, while adults are doing so only about 73% of the time. The results also highlight that the main difference between how adult's and children are interpreting plural definite determiners is that children allow for a non-maximal interpretation, while adults do not. The explanation for children's behavior in this study as well as other previous studies (Karmiloff-Smith 1979, Caponigro et al. 2012) is that children may be restricting the domain to a subset of referents in a context, which is why they allow for a non-maximal interpretation of plural definite determiners.

Simon-Pearson & Syrett (2017) conducted an experiment investigating why children are more accepting of weaker interpretations of embedded questions. Children are more likely than adults to accept a conjunction containing both true and false information, so the study asks participants to assign a truth value to the speaker's statement, and then assess the speaker's knowledge based on this statement, using a ternary scale: doesn't know, kind of knows, and definitely knows. The experiment had two manipulations. The first was whether the subject of the conjuncts used a plural definite description or a bare plural, and the second was whether or not the second conjunct was false. A Truth Value Judgment Task and a Question-Answer Task were

employed. An experimenter presented a series of stories to the participant and narrated each story, where there were two distinct groups of characters and two different locations they could choose to go to. In each story, the characters would decide one by one where they wanted to go, and after they all moved to their desired locations, the participant would hear the target sentences, (12a) and (12b), for both the homogenous and non-homogenous conditions, as presented in (13).

(12) a. The red dinosaurs went to the bookstore and the green dinosaurs went to the bookstore, too.

b. The boys went to the art room, and the girls went to the art room, too.

(13)

Homogenous condition	**Non-homogenous condition**
	
(The) boys went to the art room, and (the) girls went to the art room, too.	*(The) red dinosaurs went to the bookstore, and (the) green dinosaurs went to the bookstore, too.*

Figure 1: Homogenous and non-homogenous conditions (within subject), with corresponding target conjunction sentences

Participants were asked to judge the truth value of these target sentences. Results showed that children were just as likely as adults to reject sentences in the non-homogenous conditions because these sentences contained false information, which provides evidence that they are aware of instances when the speaker has false beliefs. The subject type significantly effected adult's responses, where they rejected sentences containing false information based on the contexts provided. This is because the plural definite description is what requires homogeneity to be obeyed, where the entire set of characters needed to have a specified property in order for the target sentence to be judged as true. Children also rejected the target sentences containing false information, which indicates that children do require that the entire set of referents have a relevant property when presented with plural definite determiners, providing evidence that children interpret plural definite determiners maximally.

3.3 The Current Study

These experiments were designed to answer the ongoing question of whether or not young children, between about 4 and 5 years old, interpret plural definite determiners non-maximally. Research (Karmiloff-Smith 1979; Caponigro et al. 2012; Tieu, Kriz, & Chemla 2017) claims that this is because children do not begin to process definite determiners in an adult-like manner until about 6 or 7 years old, which is when children have shown to interpret them maximally. It is possible that children may lack the semantic knowledge associated with plural definite descriptions and this is why they allow for a non-maximal interpretation. However, it is possible that children are actually quantifying over a subset of referents; thus, this paper will investigate children's

capability to restrict the domain of referents to a subset in the context in an adult-like pattern. This paper focuses on three cases of domain restriction: the restriction of quantified sentences with connected objects as visuals, such as in Van Tiel (2015), quantified sentences with subgroups of referents, and definite sentences with subgroups of referents.

If children are able to restrict the domain in my study, they might have been doing so in these other studies as well; therefore, it might not be the case that they lack the semantic knowledge that plural definite descriptions elicit a maximal interpretation, but that they are actually capable of quantifying over a subset of referents. It is possible that children are picking out a maximal set and are restricting the domain to a subset of them based on features of the referents we are unaware of. This experiment manipulates the visual context by making an implicit set of referents salient, in order to target children's ability to restrict the domain and therefore, provide an alternative explanation to the conclusions of past research regarding children's interpretations of plural definite determiners.

4. Experimental Design

The studies discussed have left much room for further research regarding children's interpretation of implicit domain restriction. The new experiment was designed to test whether or not the visual context can make a subset of referents salient in a given context, and whether or not children have an adult-like interpretation of the determiners *the* and *every*.

4.1 Participants

Participants included a total of 32 children who were enrolled in preschools. There were 16 boys (50%) and 16 girls (50%) evenly distributed between the two conditions. Children's mean ages were 57.86 months (range = 46.49 – 69.31 months). A total of 10 children were excluded from the data; 5 had a yes-bias, 1 was a non-native speaker of English, 2 were too young, and 2 were too old. There were also 67 adult participants (age range 18 – 22 years old) who were enrolled in either a Linguistics or Cognitive Science course at Rutgers University- New Brunswick, and were compensated with course credit for their participation. 9 adults were excluded from the data due to non-native status, which was assessed through a demographic pre-screening. The adult participants were randomly assigned to 4 between subject conditions and children were randomly assigned to 2 between subject conditions. Informed consent forms were used containing information regarding procedures of the lab and voluntary participation.

4.2 Materials

The experiment employed a Truth Value Judgment Task (TVJT) (Crain & Thornton 1998), which consisted of a 1 training trial, 6 control trials, 9 experimental trials for target sentences investigating domain restriction using either the universal quantifier *every* or the definite description *the*, and 2 experimental trials for target sentences investigating domain restriction via local accommodation. For adults, two out of the four conditions used the plural definite determiner *the* as the subject for target sentences, and the other two conditions used the universal quantifier *every*. Two of the conditions made the subset more salient via movement that separated it from the rest of

the plurality, and the other two did not. Children were only run in the two conditions in which the subset was made salient.

4.3 Procedure

The experiment was conducted using a PowerPoint presentation to present the visual contexts to both adults and children. The experimenter used a puppet when administering the experiment to children, but no puppet was used with adult participants. A response sheet was used to indicate the participant's response to each target utterance along with their justifications. Adult participants were given the response sheet and asked to indicate whether they agree or disagree with the target utterances provided in a TVJT along with providing justifications. The experiment began with a training trial to help familiarize participants with its structure and their task. The experimenter would then read a sentence structured as (14a), followed by a certain number of the characters receiving some object *x*. The characters and objects chosen were all easily identifiable by the children, which was important in providing justifications. The experimenter would utter (14a) and then give only three out of the six characters the desired object *x*, and they would give it one by one, while narrating their actions by saying (14b), followed by (14c) as they move either the subset or the entire set to another part of the screen. The experimenter would then utter the target sentence (14d) or (14e) depending on which condition they are in. An illustration such as the one shown in Figure 1 would be displayed in front of the participant.

(14) a. Look at these pigs. The pigs would like an apple.

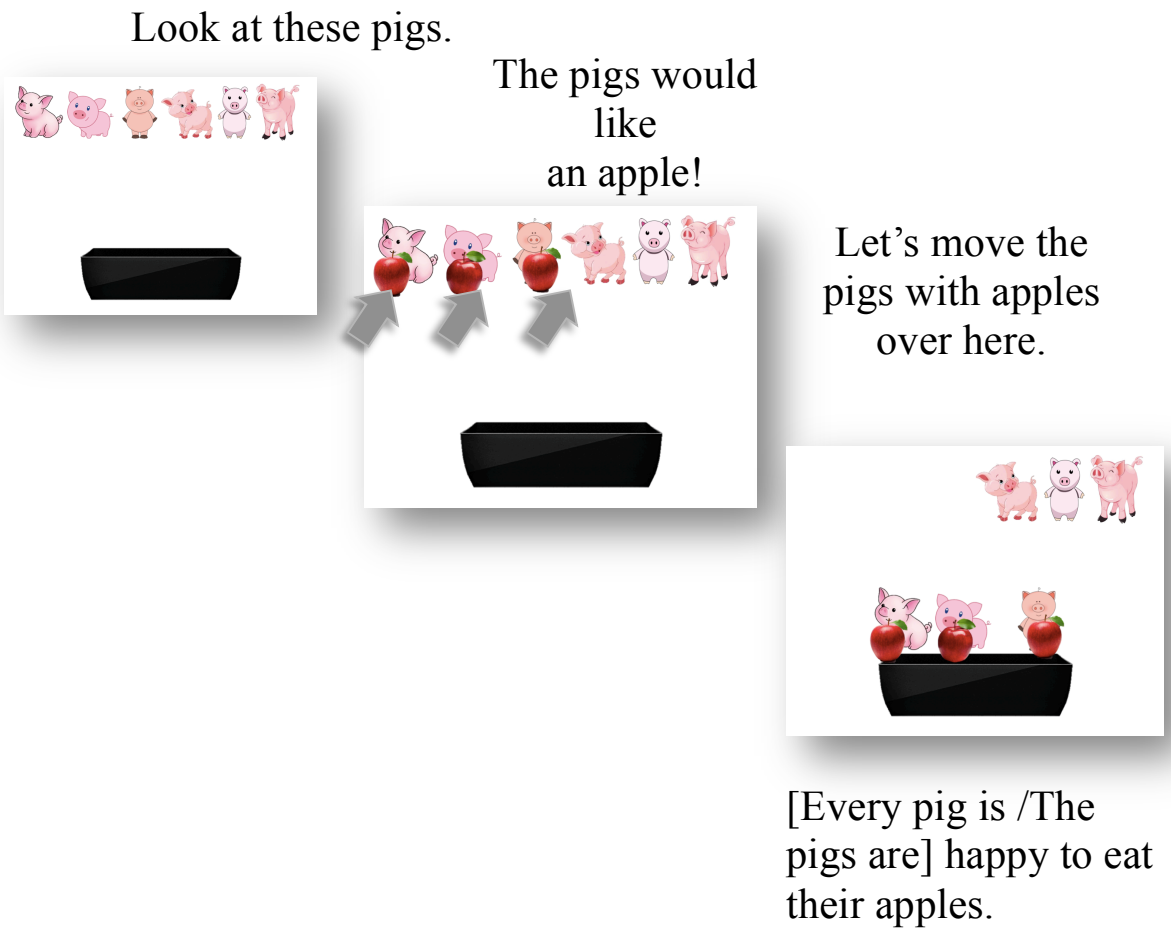
b. This one gets an apple, this one gets an apple, and this one gets an apple.

c. Now lets move the pigs with apples over here.

d. The pigs are enjoying their apples.

e. Every pig is enjoying its apple.

Figure 1 shows what the experimenter says during each trial and how the participants see three out of six pigs receive an apple, and then only the subset of of pigs who received apples move to the desk.



The experiment was divided into four between-subject conditions based on 2 factors: subject (plural definite determiner vs. quantifier) and plurality subset (all movement versus subset movement). In the all-movement conditions, the entire set of characters would move to another location on the screen, as shown in Figure 1, and then the experimenter would utter the target sentence. In the subset-movement conditions, only those characters that received some desired object *x* would move to another location on the screen, as shown in Figure 2, and then the experimenter would utter the target sentence. The idea here was that by moving only the subset of characters that received the object, it would provide a context for the participant in which they could visualize the separation of the referents with the object from the ones without the object; then we would be able to determine whether they are capable of restricting the domain to the subset of the entire set of referents.

In each of these conditions, the experimenter either uttered a target sentence containing the plural definite determiner *the*, as indicated in (14d), or the quantifier *every*, as indicated in (14e). The idea being investigated here was whether either or neither or these words would be sufficient enough to quantify over the subset of referents with the object *x* and allow the participant to judge the target sentence as true.

The experiment also contained six control trials, which used the universal quantifier *every* to ensure the child was assigning the correct semantic interpretation to the universal quantifier, so that when semantics calls upon to quantify over the entire set of referents, they know to do that; otherwise, the results would be inconclusive because the child would not have the correct understanding of the meaning of the quantifier in the

experimental trials. The experiment contained control trials where all the characters received an item and control trials where one character did not receive an item.

The experiment also contained two experimental trials modeled after Van Tiel (2015), in which there was a visual array of attached and unattached items of various colors on the screen, and the experimenter would utter target sentences (15a) and (15b), and (16a) and (16b) would be displayed. The participant's task was exactly the same for these trials. These trials were included to investigate whether there was a correlation to how they responded to these and the sentences targeting domain restriction to a subset of characters. They required local accommodation to restrict attention to the salient objects.

(15) a. Every spoon are the same color as the bowl to that it is in.

b. Every balloon is the same color as the present to which it is attached.

(16)

a. 

b. 

In order to avoid a potential yes bias in fear of telling Experimenter 1 that they are wrong, a puppet uttered the target sentences to child participants. Experimenter 1 explained prior to the onset of the experiment that the puppet wants to be told if they are wrong, so it is okay to say that they do not agree with him. The other change made before running with children was to ensure the verbs being used in the target sentences would not be interpreted too literally or cause any confusion for the child. For example, the target sentence *Every pig is excited to eat his apple* was changed to *Every pig is happy to eat his apple* in order to avoid the child's potential response that they cannot tell whether or not they are excited. All of the pigs were smiling, so it was not difficult for the child to assume they were happy. Experimenter 2 recorded the child's responses and justifications on their response sheet.

4.4 Predictions

The first prediction we made was that the conditions that used the plural definite determiner *the* would elicit more positive responses that the conditions that used the quantifier *every*. This is due to the exhaustive interpretation associated with *every*, and the varying interpretation associated with *the*.

The second prediction we made was that the conditions in which only the subset of referents moved to another part of the screen would elicit a more positive response because the characters with objects are being made salient and thus, would provide a visual context that might be easier to interpret as non-exhaustive.

Our third prediction is that children will judge the sentences using *every* in the two replicated Van Tiel (2015) trials as true more so than they will judge the sentences using *every* in the other experimental trials. This is because we predict that more children will be able to restrict the domain of referents to only those items that are in fact attached. In the other trials, *every* is likely to produce a maximal interpretation.

4.5 Results

The results indicate a significant difference between the determiners for both adults and children, and an almost significant difference between the movement factor. Age was shown to be a significant factor as well.

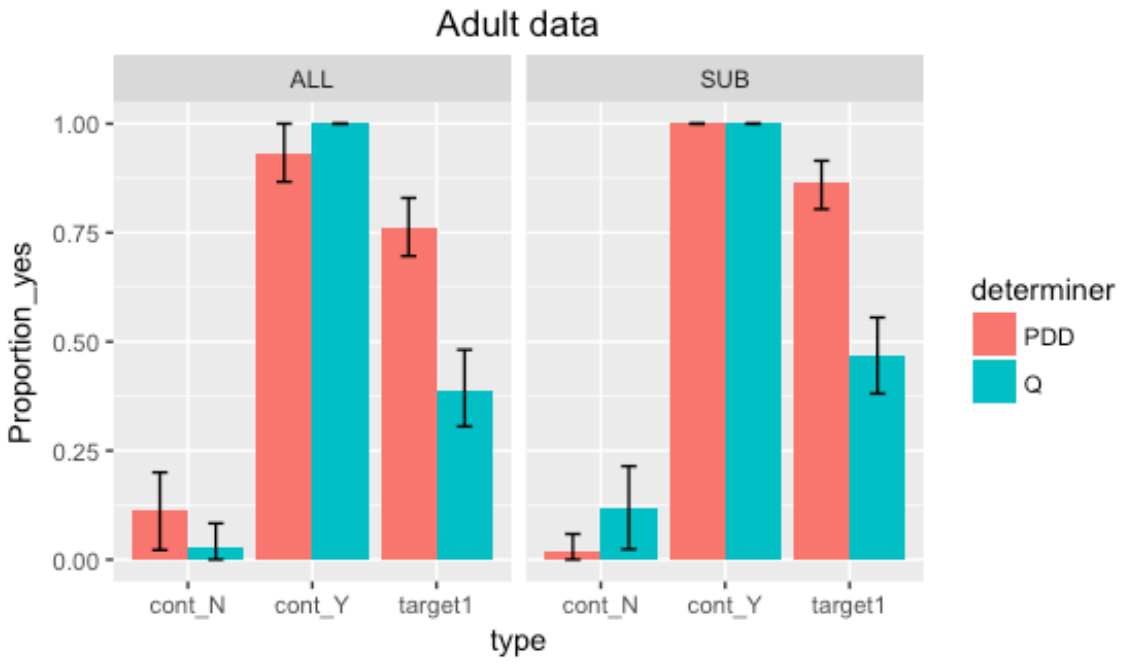


Figure 3 shows that the plural definite determiner elicited the most positive responses in both the entire set movement and subset movement conditions.

There is a significant main effect for the determiner used. The plural definite determiner resulted in more yes-responses than the quantifier, and more yes-responses in the subset movement condition than the entire set movement condition. However, the movement had no significant effect in either the plural definite determiner condition (X = 1.6988, df = 1, p-value = 0.1924), or in the quantifier condition (X = 1.6824, df = 1, p-value = 0.1946).

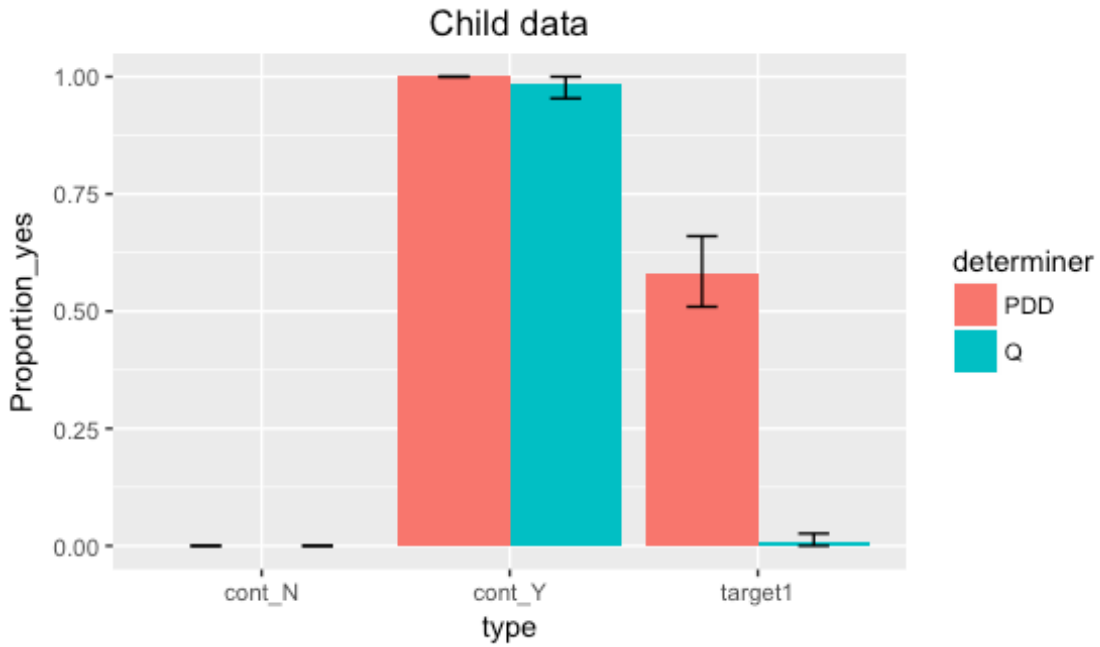


Figure 4 shows that children responded yes close to 0% of the time for the quantifier condition and about 56% of the time for the plural definite determiner condition.

This illustrates a significant main effect (X = 65.774, df = 1, p-value = 5.058e-16) of which determiner was used in the target sentences. Both were ran in the subset movement condition only.

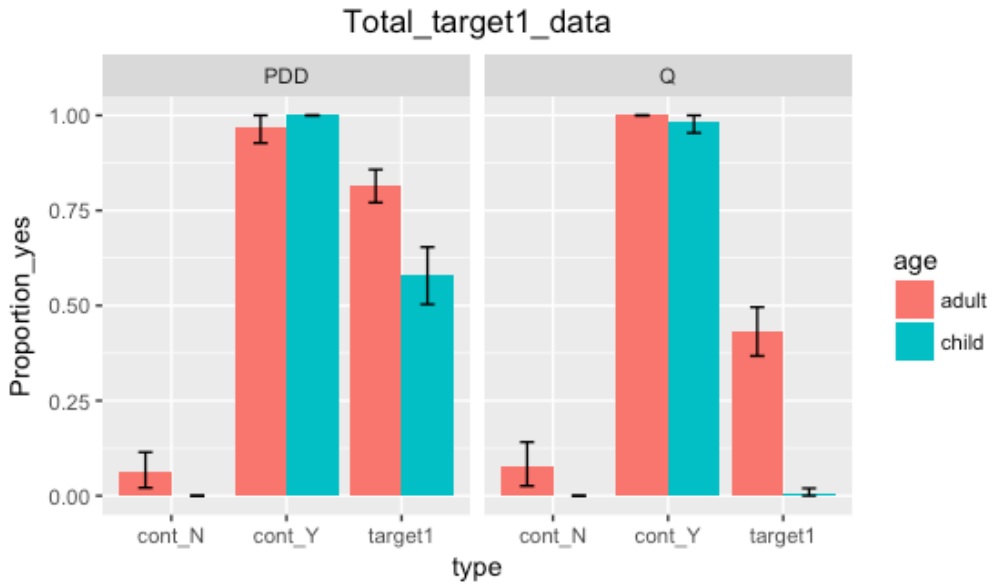


Figure 5 shows the overall proportion of yes responses for children versus adults. Adults responded positively about 78% and 45% of the time for plural definite determiner and quantifier conditions, respectfully.

This shows the overall results of all target 1 trials, where the plural definite determiner was resulted in more yes-responses than the quantifier for both adults and children; however, there was a greater difference in the proportion of yes-responses for adults and children, where children rejected target sentences using the quantifier almost 100% of the time. There was a significant main effect of the determiner in both the subset movement condition (X = 23.014, df = 1, p-value = 1.608e-06) and in the all movement condition (X = 21.063, df = 1, p-value = 4.445e-06). The overall main effect for the movement variable was not significant (X = 3.0455, df = 1, p-value = 0.08096), but was very significant for the determiner variable (X = 43.802, df = 1, p-value = 3.633e-11).

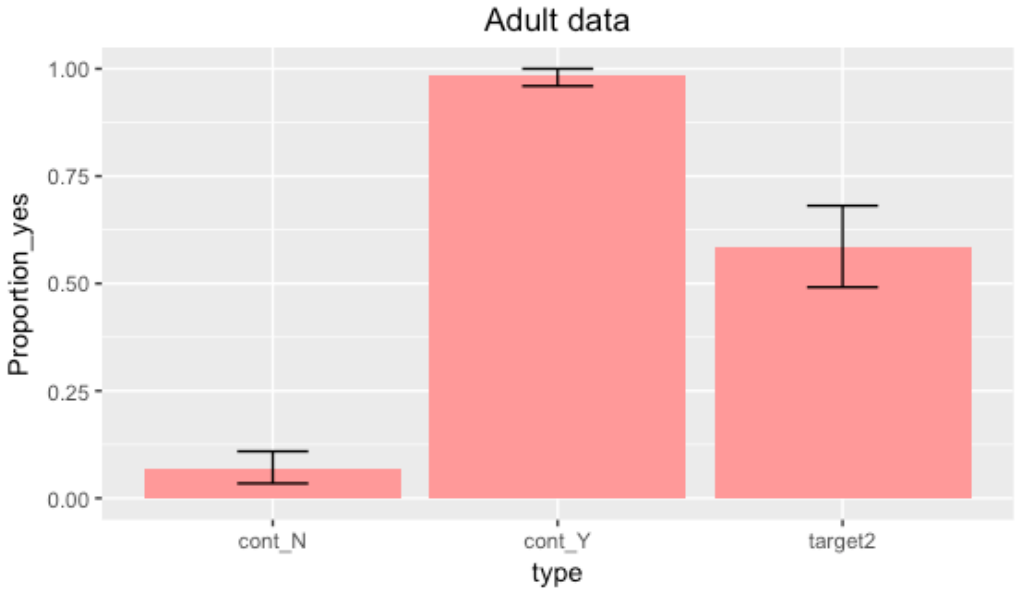


Figure 6 shows adult's responses to the target questions that focused on local accommodation.

Adults responded positively about 55% of the time. The difference between control (y) and target 2 is significant (X = 75.255, df = 1, p-value < 2.2e-16).

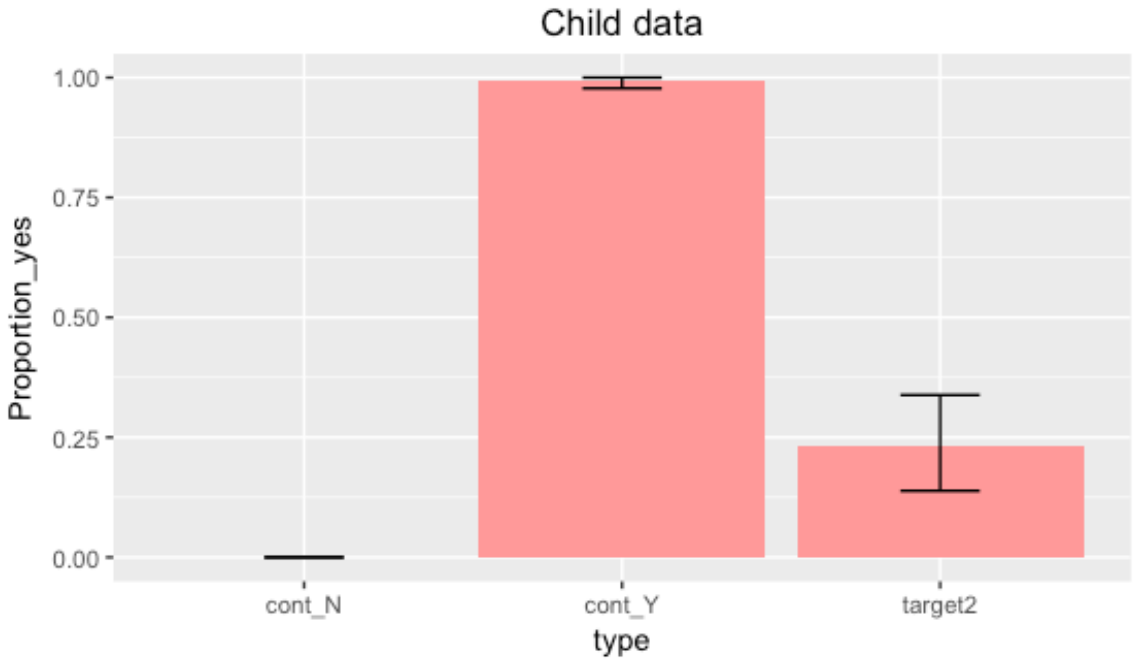


Figure 7 shows children responding to the target questions focused on local accommodation.

It illustrates children's responses to target 2 utterances, where they judged them as true about 24% of the time. There was a significant main effect of type (X = 8.8576, df = 1, p-value = 0.002919).

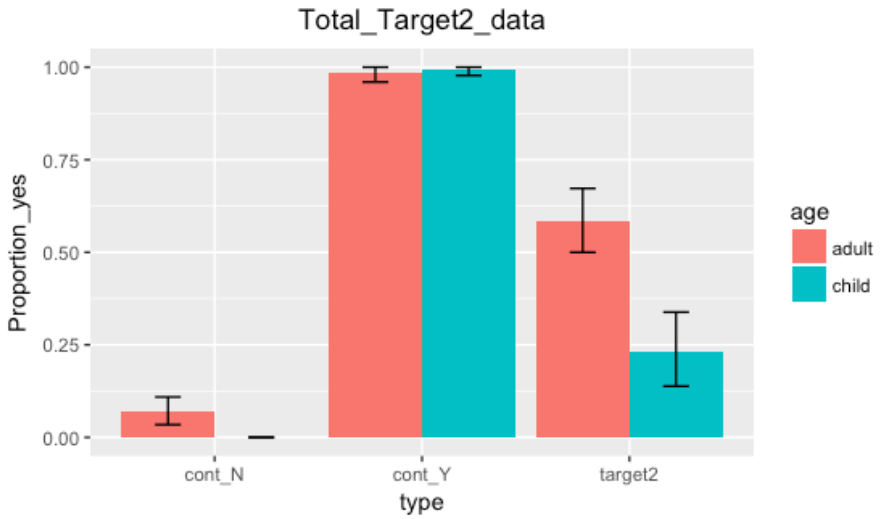


Figure 8 shows the comparison of positive responses from children versus adults for the target sentences targeting local accommodation.

It shows the overall significant difference of adults' yes- responses from the children's yes-responses to target 2 utterances. Adults judged them as true more than children. There was a significant main effect of age on responses to target 2 utterances (X-squared = 21.08, df = 1, p-value = 4.405e-06).

Overall, out of the 16 children in the quantifier condition, all 16 rejected target sentences using *every* as the subject. Out of the 16 children in the plural definite description condition, 7 rejected all of the test sentences. Of these 7 children, 2 accepted at least 1 of the 2 test sentences modeled after Van Tiel (2015). The remaining 9 children in the plural definite description condition accepted all test sentences, and of these 9, 5

accepted at least 1 of the 2 test sentences modeled after Van Tiel (2015). There was no correlation of age in these results; however, it seems that there might be a correlation between how children responded to the two types of test sentences.

4.6 Discussion

The results indicated that both adults and children were able to restrict the domain to the salient referents in the plural definite determiner conditions. In the quantifier conditions, children did not implicitly restrict the domain, and thus, rejected the target utterance almost 100% of the time. 33% of the children who rejected the target sentences using the universal quantifier justified their response by pointing to the characters who did not have an object *x*. This indicates that although they did not restrict the domain further to the subset of referents with object *x*, they still restricted the domain to the people or animals on the screen. Adults were able to restrict the domain in the quantifier entire set movement and subset movement condition about 32% and 48% of the time, respectively. Children and adults in the plural definite determiner and subset movement condition were able to restrict the domain 55% and 79% of the time, respectively, indicating that *the* elicits a higher ability to restrict the domain to a subset of referents than *every* does.

Furthermore, results showed a distinct difference between younger and older willingness to accept sentences whose subjects contained plural definite descriptions, where a higher proportion of older children judged plural definite descriptions as true, while young children judged them as false. This finding contradicts previous findings where younger children were interpreting plural definite descriptions non-maximally and

older children were interpreting them maximally. In this study, older children were patterning with adults and interpreting them non-maximally, while younger children were interpreting them maximally. This provides evidence that domain restriction may be playing some role in whether children interpret plural definite descriptions maximally or non-maximally.

The second interesting finding is that the movement variable was almost significant for adults, which means that making the subset of referents salient visually could have a much stronger effect for children; the entire set movement conditions were not run with children because since it was insignificant for adults, we wanted to give children the best possible chance of highlighting the salient referents. This leaves a window open for further investigation of the extent to which the visual context affects children's interpretations of *every* and *the*. Given that children rejected the target utterances at a close to 100% rate, the results would probably not be significantly different in the entire set movement condition; however, there could have been a noticeable difference between the entire set versus subset movement conditions in the plural definite determiner conditions, where they may reject utterances more when the entire set moves. Despite this, it is still evident that children as young as 4 years old are able to restrict the domain to a salient subgroup of referents.

Finally, the target 2 trials' responses provided interesting results. Adults were able to restrict the domain of these sentences 54% of time, while children were able to 24% of the time. Although adults still implicitly restrict at a significantly higher rate than children in these types of scenarios, children were still able to restrict the domain in these sentences which contained *every* more than the sentences that contained *every* in the

quantifier condition of the target 1 trials. It is important to note that only about half of the adult participants judged these utterances as true, so it is not true that adults restrict the domain in quantified sentences 100% of the time. This finding provides evidence that children are aware of the fact that *every* can be restricted to only quantify over a subset of referents, and thus, implies that children do understand that *every* can have a maximal interpretation at times, and a non-maximal interpretation in other contexts. The results did not deviate significantly from the results of Van Tiel (2015) in the condition using the context illustrated in (15d). In Van Tiel (2015), 65% of adults accepted the target sentence, and 55% of adults accepted the target sentences in the current study. These comparable results provide additional evidence that adults are only restricting the domain of these types of sentences a little more than half the time. The lower percentage of children accepting these sentences is expected because the sentences had a more complicated structure than the other types of target sentences.

Sample justifications from children who rejected sentences containing the universal quantifier and for children who accepted sentences using the plural definite description are provided in (15) and (16), respectively. Some of these provide concrete evidence that the children did not require an exhaustive interpretation of sentences containing the plural definite description in order to accept it. Some of them did not specifically mention anything like this; however, justifications like *Because they love yarn* may indicate that the child has already restricted the domain to the cats who have the yarn, and they are justifying their response by focusing on the part of the sentence that specifies the cats are happy because they already intrinsically restricted the domain to the cats with the yarn. Also, justifications like *Cause they're at the table* may indicate

the children's attention to the fact that the characters with and without object *x* were visually separated and thus created two subgroups of referents. On the other hand, the justifications provided by children when rejecting sentences containing the universal quantifier all point out the fact that there are some characters in the context that did not receive object *x*. This indicates that children are unwilling to accept sentences that contain the universal quantifier that are not referring to the entire set characters in the context. This clear difference in responses between the two types of sentences demonstrates children's semantic knowledge of the different subjects.

Furthermore, examples of adult's justifications for rejecting and accepting sentences containing the universal quantifier are provided in (17) and (18), respectively, and justifications for rejecting and accepting plural definite descriptions are provided in (19) and (20), respectively. The justifications for rejecting sentences with the universal quantifier all emphasize the fact that the entire set of characters must possess the relevant characteristic in order for the sentence to be judged as true. The sentences containing plural definite descriptions were sometimes rejected due to the adults interpreting *the* as referring to the maximal set of referents in the context, so some of the justifications emphasized that *some* of the characters did not obtain object *x*. There were also some justifications that were not relevant to the subject itself, but the verb in the sentence, such as the participant being unable to determine whether or not the pigs were excited.

Finally, (21) and (22) and (23) and (24) provides examples of justifications for adult's and children's responses to the types of sentences that targeted their ability to restrict via local accommodation. Children who accepted these sentences provided very

similar justifications as adults, so this indicates that they do have the ability to restrict the domain when adults do.

4.4.1 Justifications

(17) Children Justifications for Rejecting Quantified Sentences

a. Every girl is holding her fan.

1. (No) because three of them don't. (52.6 mo.)

2. (No) because you forgot these girls. (63.6 mo.)

b. Every cat is playing with its yarn.

1. (No) because this cat is not playing with the yarn. (52.9 mo.)

2. (No) because those three don't have yarn. (53.3 mo.)

c. Every butterfly is enjoying its orange slices.

1. (No) because you forgot to give these. (63.6 mo.)

2. (No) because those three don't have it. (54.8 mo.)

(18) Children's Justifications for Accepting Plural Definite Descriptions

a. The pigs are happy to eat their apples.

1. (Yes) because three have apples. (68.7 mo.)

2. (Yes) because those ones have them. (59.0 mo.)

b. The dogs are playing with their toys

1. (Yes) because they all have them. (59.0 mo.)

2. (Yes) because they all have toys. (63.1 mo.)

c. The boys are eating their pizza.

1. (Yes) because those guys are eating pizza, those three are not. (63.1 mo.)

2. (Yes) because they each have one. (59.0 mo.)

(19) Adult's Justifications for Rejecting Universal Quantifiers

a. Every bear is enjoying its treat.

1. (No) because only three of the bears have treats.

2. (No) because not every bear has a treat to enjoy.

b. Every girl is holding her fan.

1. (No) because not every girl got a fan, so not every girl is holding one.

2. (No) because some girls are not holding a fan.

c. Every pig is excited to eat its apple.

1. (No) because not all pigs have apples.

2. (No) because three pigs don't have apples.

(20) Adult Justifications for Accepting Universal Quantifiers

a. Every bear is enjoying its treat.

1. (Yes) because there is a new group of bears with treats.

2. (Yes) because every bear with a treat is enjoying it.

b. Every pig is excited to eat its apple.

1. (Yes) because there is a new group physically separate that consists of pigs that are eating apples.

2. (Yes) because every pig with an apple is excited to eat it.

c. Every cat is playing with its yarn.

1. (Yes) because every cat with a ball of yarn is playing with her own ball.

2. (Yes) because if they got yarn, they are playing with it.

(21) Adult's Justifications for Rejecting Plural Definite Descriptions

a. The girls are holding their fans.

1. (No) because not every girl is holding one.

2. (No) because not every girl has a fan. Every pair has one.

b. The boys are eating their pizza.

1. (No) because only three out of the six boys got pizza.

2. (No) because not all boys have a slice.

c. The dogs are playing with their toys.

1. (No) because not all got a toy.

2. (No) because not all dogs have toys to play with.

(22) Adult's Justifications for Accepting Plural Definite Descriptions

a. The girls are holding their fans.

1. (Yes) because those with fans are (no universal quantifier).

2. (Yes) because the girls that received fans are holding fans.

b. The butterflies are enjoying their orange slices.

1. (Yes) because there are butterflies eating oranges.

2. (Yes) because the ones who have orange slices are enjoying them.

c. The owls are snacking on their crackers.

1. (Yes) because it doesn't say all.

2. (Yes) because the owls who got crackers are snacking.

(23) Adult's Justifications for Rejecting Local Accommodation Sentences

a. Every balloon is the same color as the present to which it is attached.

1. (No) because the blue balloon has an orange and green has yellow.

2. (No) because not every present matches its attached balloon.

b. Every spoon is the same color as the bowl that it is in.

1. (No) because the colors don't match.

2. (No) because there are three bowls that don't have spoons.

(24) Adult's Justifications for Accepting Local Accommodation Sentences

a. Every balloon is the same color as the present to which it is attached.

1. (Yes) because only the green and orange ones are attached.

2. (Yes) because there are two balloons attached to presents.

b. Every spoon is the same color as the bowl that it is in.

1. (Yes) because only two spoons are in a bowl and those match.

2. (Yes) because only two spoons are in a bowl and those match.

(25) Children's Justifications for Rejecting Local Accommodation Sentences

a. Every balloon is the same color as the present to which it is attached.

1. (No) because this one has string and that one doesn't. (52.9 mo.)

2. (No) because all of them are not attached also 2nd and 5th different colors. (61.7 mo.)

b. Every spoon is the same color as the bowl that it is in.

1. (No) because two aren't the same color as the bowl. (64 mo.)

2. (No) because first doesn't have the same color, but fourth does. (55.8 mo.)

(26) Children's Justifications for Accepting Local Accommodation Sentences

a. Every balloon is the same color as the present to which it is attached.

1. (Yes) because orange balloon, orange present, green balloon, green present. (69.3 mo.)

2. (Yes) because sixth matches and first matches (48.7 mo.)

b. Every spoon is the same color as the bowl that it is in.

1. (Yes) because some are…two spoons are in the bowl. (59.9 mo.)

2. (Yes) because the red one goes into the red bowl. (48.7 mo.)

5. General Discussion

The broader implications of these results indicate that children may have been restricting the domain of referents in previous research and do not have an impoverished semantics regarding selecting the maximal set. Restricting the domain requires that one has the necessary semantic and pragmatic components. Since children demonstrated an ability to restrict the domain in this study, it is possible that children were restricting the domain when adults were not in previous studies. Even in the condition in which used the universal quantifier, where children did not restrict the domain to the characters with object *x*, their justifications still provide evidence that they had already restricted the domain to the characters on the screen. None of the children provided a justification referencing characters not within the context of the screen, which means that they do allow for domain restriction even when rejecting the target sentences; they seem to be

less flexible with additional restriction when a universal quantifier is used. Further restriction is less likely if you have already restricted the domain, especially when using a universal quantifier. Children did not accept the universal quantifier because they were quantifying over the entire set of referents, instead of just those with object *x*. It was surprising that adults did not restrict the domain for the universal quantifier at a very high rate either; this provides further evidence that perhaps since adults also had already restricted the domain to the characters on the screen, it made them less willing to restrict even further. This could support the explanation that children's semantic knowledge is not as underdeveloped than adults as previously thought to be.

Furthermore, these results provide an alternative explanation to conclusions regarding children's interpretation of the plural definite determiner *the* (Caponigro et al. 2012). Perhaps it is not that children have an underdeveloped understanding of the semantics of the word *the*, but that they are simply implicitly restricting the domain to a subset of referents, where their understanding of the determiner allows for a non-maximal interpretation. This does not necessarily mean that they have an impoverished semantics, but that they may be restricting the domain to a salient subset in certain contexts. It is unclear if children obtain the same knowledge of semantics and pragmatics as adults do, but if part of what they are doing is restricting the domain, it provides evidence supporting an alternative explanation for why children were sometimes picking out a maximal set and sometimes picking out a non-maximal set in previous studies, such as in Caponigro et al. (2012). This experiment provides empirical evidence that children treat universal quantifiers and plural definite determiners differently, so they have an understanding of the semantics of the words.

6. Conclusion

The current experiment investigated adult's and children's interpretations of the plural definite determiner *the* and the quantifier *every*, given a context in which the subset of referents being described were made salient in the entire set of referents. It also investigated adults' and children's interpretations of sentences containing *every* that described a visual context modeled after Van Tiel (2015). The movement variable was not significant for adults, so it was not run with children in order to provide them with the best chance of highlighting the subset. The determiner variable provided significantly different results for both children and adults, indicating that *every* is more often associated with a universal interpretation, while *the* is associated with an existential interpretation, which demonstrates children's knowledge of the semantics of the words. Children answered yes in the plural definite determiner and quantifier conditions more than 75% and less than 1% of the time, respectively, illustrating their ability to restrict the domain, and their semantic understanding of the different determiners. Evidently, due to the lack of research regarding implicit domain restriction in children, this research has provided an alternative explanation to children's behavior in previous studies, regarding their intrinsic ability to restrict the domain to a subset of salient referents.

7. References

Abbott, Barbara. 2008. Issues in the semantics and pragmatics of definite descriptions in English. In Jeanette Gundel and Nancy Hedberg, eds., Reference: Interdisciplinary Perspectives, 61–72. Oxford: Oxford University Press.

Ahern, C. A., & Stevens, J. (2014, March 28). How Uniqueness Guides Definite Determiner Processing.

Caponigro, I., Pearl, L., Brooks, N., and Barner, D. (2012). Acquiring the meaning of free relative clauses and plural definite descriptions. Journal of Semantics, 29:261–293.

DelliCarpini, M. (2002). Developmental Stages in the Semantic Acquisition of Quantification by Adult L2 Learners of English: A Pilot Study.

Karmiloff-Smith, A. (1979). A functional approach to child language: a study of determiners and reference. Cambridge studies in linguistics 24. Cambridge University Press, Cambridge.

Lobner, S. (2000). Polarity in natural language: predication, quantification and negation in particular and characterizing sentences. Linguistics and Philosophy, 23:213–308.

Miller, K., & Schmitt, C. (2004). An Experimental Study on Child Comprehension of Spanish Indefinites and Bare Singulars.

Munn, A., Miller, K., and Schmitt, C. (2006). Maximality and plurality in children's interpretation of definites. In Bamman, D., Magnitskaia, T., and Zaller, C., editors, Proceedings of the 30th Annual Boston University Conference on Child Language Development, pages 377–387, Somerville, MA. Cascadilla Press.

Simon-Pearson & Syrett. Assessing Truth and Knowledge: How Children Differ From Adults in Assessment of Truth Values and Speaker Knowledge. (2017).

T. R., Strauss, U., & Pearson, B. Z. (2005, November). The Acquisition Path of the Determiner Quantifier Every: Two Kinds of Spreading.

Tiel, B. V. (2015, February 7). When "all the five circles" are four: New Exercises in Domain Restriction.

Tieu, L., Kriz, M., & Chemla, E. (2017, January 13). Children's acquisition of homogeneity in plural definite descriptions.

Von Fintel, Kai-Uwe, "Restrictions on quantifier domains" (1994). *Doctoral Dissertations Available from Proquest*. AAI9434544.

8. Appendices

8.1 Scripts

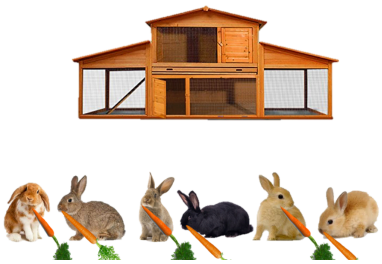
Condition 1: Plural Definite Determiner with Subset Movement:

TRAINING
1.
Look at these squirrels.
The squirrels would like an acorn.
(3 out of 4 get acorn)
Every squirrel has an acorn.

EXPERIMENTAL SESSION
1.
Look at these girls.
The girls would like a book.
(3 out of 4 get a book)
Every girl is reading a book.

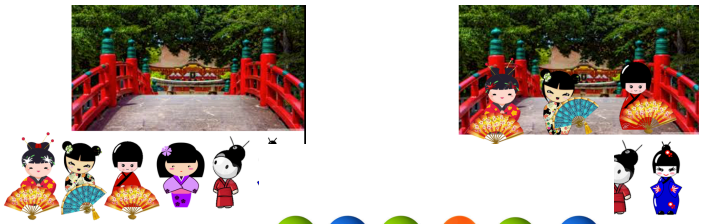
2.
Look at these bears.
The bears would like a treat.
(3 out of 6 get a treat)
Let's move the bears with treats over here.
The bears are enjoying their treats.

3.



Look at these rabbits.
The rabbits would like a carrot.
(6 out of 6 get a carrot)
Every rabbit is munching on a carrot.

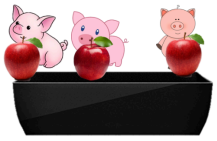
4.
Look at these little girls.
The girls would like a fan.
(3 out of 6 get a fan)
Let's move the girls with fans over here.
The girls are holding their fans.



5.
Look at these balloons and presents.
Every balloon is the same color as the present to which it is attached.

6.
Look at these penguins.
The penguins would like a cup of hot cocoa.
(3 out of 4 get a cup of hot cocoa)
Every penguin has a cup of hot cocoa.

7.
Look at these pigs.
The pigs would like an apple.
(3 out of 6 get an apple)
Let's move the pigs with apples over here.
The pigs are happy to eat their apples.

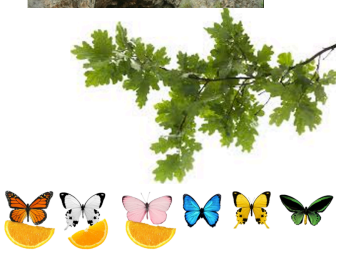


8.
Look at these cats.
The cats would like a ball of yarn.

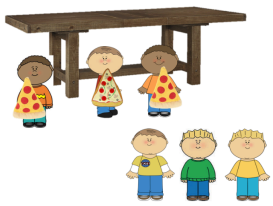
(3 out of 6 get a ball of yarn)
Let's move the cats with yarn over here.
The cats are happy with their balls of yarn.

9.
Look at these tigers.
The tigers would like a ball.
(4 out of 4 tigers get a ball)
Every tiger was given a ball.

10.
Look at these butterflies.
The butterflies would like an orange slice.
(3 out of 6 get an orange slice)
Let's move the butterflies with orange slices over here.
The butterflies are enjoying their orange slices.



11.
Look at these boys.
The boys would like a slice of pizza.
(3 out of 6 get a slice of pizza)
Let's move the boys with pizza over here.
The boys are eating their slices of pizza.



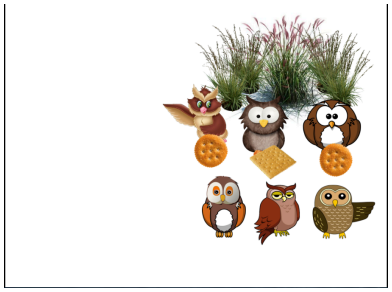
12.
Look at these cows.
The cows would like a ribbon.
(4 out of 4 cows get a ribbon)
Every cow was given a ribbon.

13.
Look at these dogs.
The dogs would like a toy.
(3 out of 6 get a toy)

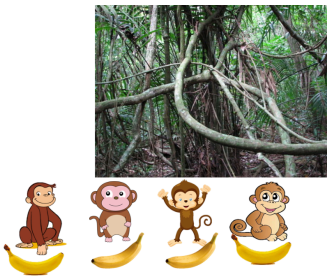
Let's move the dogs with toys over here.
The dogs are happy with their toys.

14.
Look at these spoons and bowls.
Every spoon is the same color as the bowl that it is in.

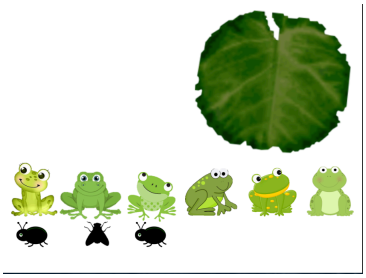
15.
Look at these owls.
The owls would like a cracker.
(3 out of 6 get a cracker)
Let's move the owls with crackers over here.
The owls are snacking on their crackers.



16.
Look at these monkeys
The monkeys would like a banana.
(4 out of 4 get a banana)
Every monkey has a banana.



17.
Look at these frogs.
The frogs would like a bug.
(3 out of 6 get a bug)
Let's move the frogs with bugs over here.
The frogs are enjoying their bugs.



Condition 2: Quantifier with Subset Movement:

TRAINING
1.
Look at these squirrels.
The squirrels would like an acorn.

(3 out of 4 get acorn)
Every squirrel has an acorn.

EXPERIMENTAL SESSION

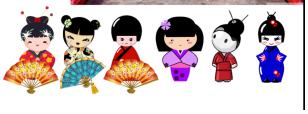
1.
Look at these girls.
The girls would like a book.
(3 out of 4 get a book)
Every girl is reading a book.


2.
Look at these bears.
The bears would like a treat.
(3 out of 6 get a treat)
Let's move the bears with treats over here.
The bears are enjoying their treats.



3.
Look at these rabbits.
The rabbits would like a carrot.
(6 out of 6 get a carrot)
Every rabbit is munching on a carrot.

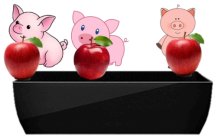

4.
Look at these little girls.
The girls would like a fan.
(3 out of 6 get a fan)
Let's move the girls with fans over here.
The girls are holding their fans.

5.
Look at these balloons and presents.
Every balloon is the same color as the present to which it is attached.

6.
Look at these penguins.
The penguins would like a cup of hot cocoa.
(3 out of 4 get a cup of hot cocoa)
Every penguin has a cup of hot cocoa.

7.
Look at these pigs.
The pigs would like an apple.
(3 out of 6 get an apple)
Let's move the pigs with apples over here.
The pigs are happy to eat their apples.



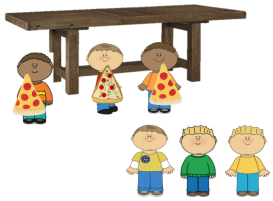
8.
Look at these cats.
The cats would like a ball of yarn.
(3 out of 6 get a ball of yarn)
Let's move the cats with yarn over here.
The cats are happy with their balls of yarn.

9.
Look at these tigers.
The tigers would like a ball.
(4 out of 4 tigers get a ball)
Every tiger was given a ball.

10.

Look at these butterflies.
The butterflies would like an orange slice.
(3 out of 6 get an orange slice)
Let's move the butterflies with orange slices over here.
The butterflies are enjoying their orange slices.

11.
Look at these boys.
The boys would like a slice of pizza.
(3 out of 6 get a slice of pizza)
Let's move the boys with pizza over here.
The boys are eating their slices of pizza.

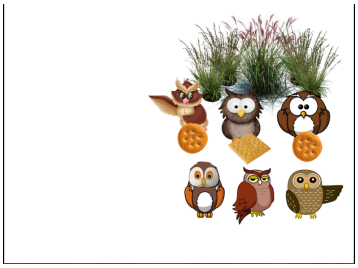


12.
Look at these cows.
The cows would like a ribbon.
(4 out of 4 cows get a ribbon)
Every cow was given a ribbon.

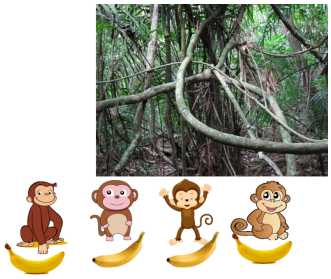
13.
Look at these dogs.
The dogs would like a toy.
(3 out of 6 get a toy)
Let's move the dogs with toys over here.
The dogs are happy with their toys.

14.
Look at these spoons and bowls.
Every spoon is the same color as the bowl that it is in.

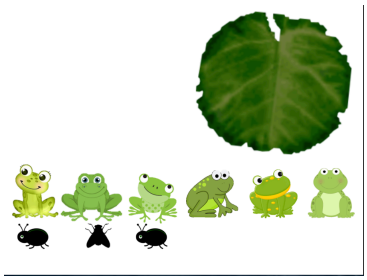
15.
Look at these owls.
The owls would like a cracker.
(3 out of 6 get a cracker)
Let's move the owls with crackers over here.
The owls are snacking on their crackers.



16.
Look at these monkeys
The monkeys would like a banana.
(4 out of 4 get a banana)
Every monkey has a banana.



17.
Look at these frogs.
The frogs would like a bug.
(3 out of 6 get a bug)
Let's move the frogs with bugs over here.
The frogs are enjoying their bugs.



Condition 3: Plural Definite Determiner with Entire Set Movement:

TRAINING
1.
Look at these squirrels.
The squirrels would like an acorn.
(3 out of 4 get acorn)
Every squirrel has an acorn.

EXPERIMENTAL SESSION
1.
Look at these girls.
The girls would like a book.

(3 out of 4 get a book)
Every girl is reading a book.

2.
Look at these bears.
The bears would like a treat.
(3 out of 6 get a treat)
Let's move the bears over here.
The bears are enjoying their treats.

3.
Look at these rabbits.
The rabbits would like a carrot.
(6 out of 6 get a carrot)
Every rabbit is munching on a carrot.

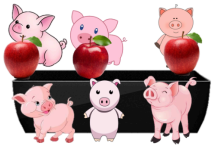
4.
Look at these little girls.
The girls would like a fan.
(3 out of 6 get a fan)
Let's move the girls over here.
The girls are holding their fans.

5.
Look at these balloons and presents.
Every balloon is the same color as the present to which it is attached.

6.
Look at these penguins.
The penguins would like a cup of hot cocoa.

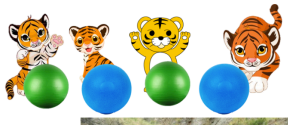
(3 out of 4 get a cup of hot cocoa)
Every penguin has a cup of hot cocoa.

7.
Look at these pigs.
The pigs would like an apple.
(3 out of 6 get an apple)
Let's move the pigs over here.
The pigs are happy to eat their apples.



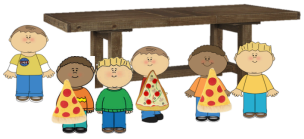
8.
Look at these cats.
The cats would like a ball of yarn.
(3 out of 6 get a ball of yarn)
Let's move the cats over here.
The cats are happy with their balls of yarn.

9.
Look at these tigers.
The tigers would like a ball.
(4 out of 4 tigers get a ball)
Every tiger was given a ball.



10.
Look at these butterflies.
The butterflies would like an orange slice.
(3 out of 6 get an orange slice)
Let's move the butterflies over here.
The butterflies are enjoying their orange slices.

11.
Look at these boys.
The boys would like a slice of pizza.
(3 out of 6 get a slice of pizza)
Let's move the boys over here.
The boys are eating their slices of pizza.

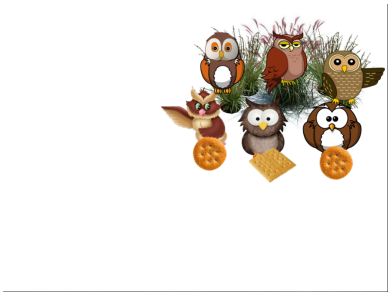


12.
Look at these cows.
The cows would like a ribbon.
(4 out of 4 cows get a ribbon)
Every cow was given a ribbon.

13.
Look at these dogs.
The dogs would like a toy.
(3 out of 6 get a toy)
Let's move the dogs over here.
The dogs are happy with their toys.

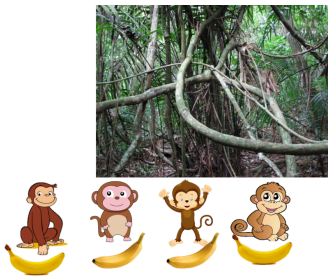
14.
Look at these spoons and bowls.
Every spoon is the same color as the bowl that it is in.

15.
Look at these owls.
The owls would like a cracker.
(3 out of 6 get a cracker)
Let's move the owls over here.

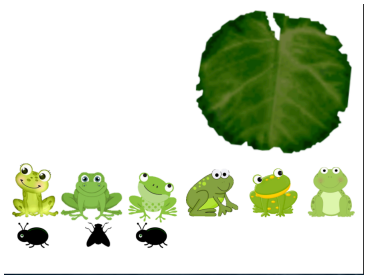


The owls are snacking on their crackers.

16.
Look at these monkeys
The monkeys would like a banana.
(4 out of 4 get a banana)
Every monkey has a banana.



17.
Look at these frogs.
The frogs would like a bug.
(3 out of 6 get a bug)
Let's move the frogs over here.
The frogs are enjoying their bugs.



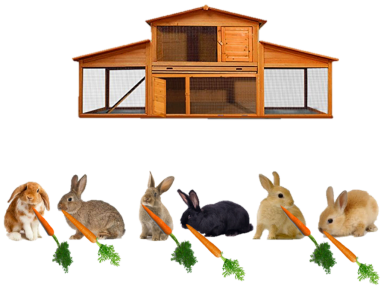
Condition 4: Quantifier with Entire Set Movement:

TRAINING
1.
Look at these squirrels.
The squirrels would like an acorn.
(3 out of 4 get acorn)
Every squirrel has an acorn.

EXPERIMENTAL SESSION
1.
Look at these girls.
The girls would like a book.
(3 out of 4 get a book)
Every girl is reading a book.

2.
Look at these bears.
The bears would like a treat.
(3 out of 6 get a treat)
Let's move the bears over here.
Every bear is enjoying her treat.

3.
Look at these rabbits.
The rabbits would like a carrot.
(6 out of 6 get a carrot)
Every rabbit is munching on a carrot.

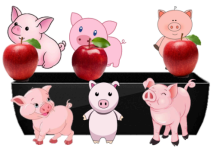


4.
Look at these little girls.
The girls would like a fan.
(3 out of 6 get a fan)
Let's move the girls over here.
Every girl is holding her fan.

5.
Look at these balloons and presents.
Every balloon is the same color as the present to which it is attached.

6.
Look at these penguins.
The penguins would like a cup of hot cocoa.
(3 out of 4 get a cup of hot cocoa)
Every penguin has a cup of hot cocoa.

7.
Look at these pigs.
The pigs would like an apple.
(3 out of 6 get an apple)
Let's move the pigs over here.
Every pig is happy to eat his apple.

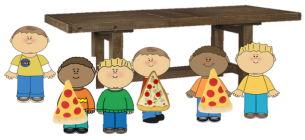


8.
Look at these cats.
The cats would like a ball of yarn.
(3 out of 6 get a ball of yarn)
Let's move the cats over here.
Every cat is happy with her ball of yarn.

9.
Look at these tigers.
The tigers would like a ball.
(4 out of 4 tigers get a ball)
Every tiger was given a ball.

10.
Look at these butterflies.
The butterflies would like an orange slice.
(3 out of 6 get an orange slice)
Let's move the butterflies over here.
Every butterfly is enjoying her orange slice.

11.
Look at these boys.
The boys would like a slice of pizza.
(3 out of 6 get a slice of pizza)



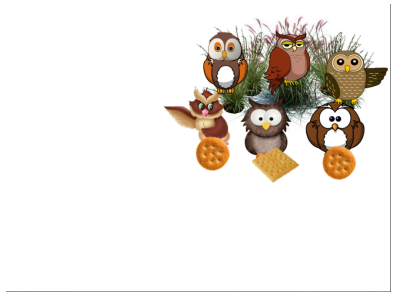
Let's move the boys over here.
Every boy is eating his slice of pizza.

12.
Look at these cows.
The cows would like a ribbon.
(4 out of 4 cows get a ribbon)
Every cow was given a ribbon.

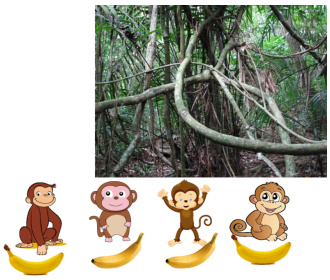
13.
Look at these dogs.
The dogs would like a toy.
(3 out of 6 get a toy)
Let's move the dogs over here.
Every dog is happy with his toy.

14.
Look at these spoons and bowls.
Every spoon is the same color as the bowl that it is in.

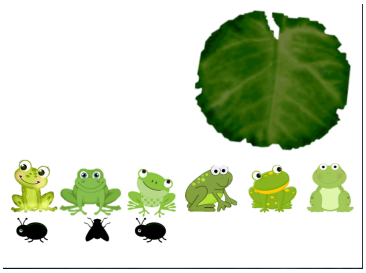
15.
Look at these owls.
The owls would like a cracker.
(3 out of 6 get a cracker)
Let's move the owls over here.
Every owl is snacking on his cracker.



16.
Look at these monkeys
(4 out of 4 get a banana)
The monkeys would like a banana.
Every monkey has a banana.



17.
Look at these frogs.
The frogs would like a bug.
(3 out of 6 get a bug)
Let's move the frogs over here.
Every frog is enjoying his bug.



8.2 Child Response Justifications

Child response justifications for judging plural definite descriptions as true, followed by participant number and age in months

a. The bears are enjoying their treats.

i. (points to 3 bears with treats) (41, 69.3)

ii. Because they have them. (40, 68.7)

iii. Three of the bears have treats. (39, 79.2)

iv. These have treats. (43, 65.2)

v. They have treats. (68, 59)

vi. Because these are bears. (67, 59)

vii. Because those guys are eating them. (71, 59.9)

b. The girls are holding their fans.

i. (points to bottom 3 girls) (41, 69.3)

ii. Three do and three don't. (40, 68.7)

iii. (points to three with fans) (39, 79.2)

iv. Because its in their hand. (43, 65.2)

v. (points to upper 3 girls) (62, 56.7)

vi. These have fans. (68, 59)

vii. Because those girls are holding them. (72, 63.1)

viii. Because they are in the porch. (71, 59.9)

c. The pigs are happy to eat their apples.

i. (points to pigs with apples) (41, 69.3)

ii. Three have apples. (40, 68.7)

iii. Three of the pigs have apples. (39, 79.2)

iv. Because those ones have them. (68, 59)

v. They have apples. (67, 59)

vi. Because those are happy, those are not. (72, 63.1)

vii. Because pigs with apples. (71, 59.9)

d. The cats are happy with their yarn.

i. (points to three with yarn) (41, 69.3)

ii. These have one and these don't. (40, 68.7)

iii. Every cat has one. (points to cats on the rug) (39, 79.2)

iv. (points to three with yarn) (43, 65.2)

v. Because those ones have yarn (68, 59)

vi. Because they are playing with it, two orange and two gray. (71, 59.9)

e. The butterflies are enjoying their orange slices.

i. Because they have orange slices (pointing to three with them) (40, 68.7)

ii. Three of the butterflies have orange slices. (39, 79.2)

iii. (points to three with orange slices) (43, 65.2)

iv. Because they have oranges. (68, 59)

v. Because those are enjoying it. (72, 63.1)

vi. They are eating them right now. (71, 59.9)

f. The boys are eating their pizza.

i. Yes, because they have pizza. (40, 68.7)

ii. Every boy have pizza slice (points to boys at the table) (39, 79.2)

iii. Because they're at the table. (43, 65.2)

iv. Because they each have one. (67, 59)

v. Because those guys are eating pizza, those three are not. (72, 63.1)

g. The dogs are playing with their toys.

i. Because they're all playing happily. (42, 74.39)

ii. (points to three with yarn) (41, 69.3)

iii. They have toys. (40, 68.7)

iv. Every dog has a toy. (39, 79.2)

v. Because they all have them. (68, 59)

vi. Because they all have toys. (72, 63.1)

h. The owls are snacking on their crackers.

i. Every owl has crackers. (39, 79.2)

ii. Because they are all in the same house. (67, 59)

iii. Because those owls have crackers. (72, 63.1)

iv. They have crackers. (pointing to ones with crackers) (40, 68.7)

i. The frogs are enjoying their bugs.

i. All three frogs are smiling. (41, 69.3)

ii. All three frogs have bugs. (39, 79.2)

iii. They're eating them. (pointing to three with bugs) (43, 65.2)

iv. Because they have them. (68, 59)

Child Response Justifications for Rejecting Plural Definite Descriptions, followed by participant number and age in months

a. The bears are enjoying their treats.

i. Because these three. (pointing at bottom three) (38, 68.6)

ii. Because three don't have. (27, 61)

iii. (points at bottom 3) (56, 48.8)

iv. Because those three don't have treats. (60, 48.7)

v. Those three don't have any. (65, 60.7)

vi. They're not eating any. (pointing at bottom ones) (66, 59)

vii. Not all of them have treats. (64, 61.7)

b. The girls are holding their fans.

i. She's not holding it. (42, 74.39)

ii. Cause these three don't have fans. (38, 68.6)

iii. Cause three don't have. (27, 61)

iv. (points at three girls who don't have fans) (56, 48.8)

v. Because these three girls don't have fans. (60, 48.7)

vi. Those three don't have any. (65, 60.7)

vii. These girls don't have any. (66, 59)

viii. Because not all of them have fans. (64, 61.7)

c. The pigs are happy to eat their apples.

i. Because these two left out. (38, 68.6)

ii. Because three don't have apples. (27, 61)

iii. (points at three without apples) (56, 48.8)

iv. Because those pigs don't have some apples. (60, 48.7)

v. They didn't get any apples. (66, 59)

vi. Not all of them are eating apples. (64, 61.7)

d. The cats are happy with their yarn.

i. Because these three are left out. (38, 68.6)

ii. Because three don't have one. (27, 61)

iii. (points at 3 without) (56, 48.8)

iv. Because those three cats don't have a ball of yarn. (60, 48.7)

v. Those three, they don't have any. (65, 60.7)

vi. The don't have. (66, 59)

vii. Not all of them have yarn. (64, 61.7)

e. The butterflies are enjoying their orange slices.

i. These three are without. (38, 68.6)

ii. They don't have an orange. (27, 61)

iii. (points at three without orange slices) (56, 48.8)

iv. Because these three butterflies don't have some oranges. (60, 48.7)

v. Those three, they don't have. (65, 60.7)

vi. Not all of them got one. (64, 61.7)

f. The boys are eating their pizza.

i. These 3 don't have pizza. (38, 68.6)

ii. (points to 3 without) (56, 48.8)

iii. Because three boys don't have some pizza. (60, 48.7)

iv. Those three, they don't have any. (65, 60.7)

v. Three didn't get any. (64, 61.7)

g. The dogs are playing with their toys.

i. Because these three don't have a toy. (38, 68.6)

ii. Because those 3 dogs don't have some toys. (60, 48.7)

iii. Those three don't. (65, 60.7)

iv. Not all of them got one. (64, 61.7)

h. The owls are snacking on their crackers.

i. Because those three don't have crackers. (38, 68.6)

ii. Because this one doesn't have one, and this one doesn't have one, and this one doesn't have one. (27, 61)

iii. Because those three owls don't have some crackers. (60, 48.7)

iv. Those three, they don't have any. (65, 60.7)

v. Three didn't get any. (64, 61.7)

i. The frogs are enjoying their bugs

i. These three don't have bugs. (38, 68.6)

ii. Because three don't. (27, 61)

iii. (points at the ones with no bug) (56, 48.8)

iv. Because those three frogs don't have some bugs. (60, 48.7)

v. Those three, they don't have any. (65, 60.7)

vi. They didn't get any. (66, 59)

vii. Three of them didn't get any. (64, 61.7)

Child Response Justifications for Rejecting Universal Quantifiers, following participant number and age in months

a. Every bear is enjoying its treat.

i. Because these not (pointing to bottom three bears) (15, 50.1)

ii. because these (pointing at bottom 3) (06, 54.4)

iii. Look, there's no bears eating treats there. (23, 64.0)

iv. The three over there (pointing to bears without treats) (36, 52.6)

v. Those, they don't have them. (35, 54.4)

vi. Because that one, they don't have it. (34, 54.8)

vii. All of these bears don't have any treats. (37, 50.1)

viii. This one doesn't have a treat, this one doesn't have a treat, and this one doesn't have a treat. (26, 52.9)

ix. Because these bears are upset because they didn't get a treat. (25, 52.9)

x. Three don't have one. (29, 64.0)

xi. Those don't have one. (31, 53.3)

xii. Because you forgot three more bears. (30, 63.6)

xiii. (points to ones without treats) (32, 60.4)

xiv. Because those three don't have a treat. (69, 55.8)

xv. Only one, two, three. (70, 64.5)

b. Every girl is holding her fan.

i. Because these are not. (pointing to girls at the bottom) (15, 50.1)

ii. Because look, they don't have fans. (pointing) (06, 50.0)

iii. Because these. (points) (23, 64.0)

iv. Because three of them don't. (36, 52.6)

v. That one doesn't. (35, 54.4)

vi. Because those three don't have one. (34, 54.8)

vii. Because these girls don't. (37, 50.1)

viii. (points to girls who don't have fans) (03, 40.8)

ix. Because this one doesn't have a fan, and this one doesn't have a fan, and this one doesn't have a fan. (26, 52.9)

x. Because they don't (pointing) (25, 52.9)

xi. Because three don't have fans. (29, 64.0)

xii. Because those ones don't have one. (31, 53.3)

xiii. Because you forgot these girls. (30, 63.6)

xiv. Because they don't have fans. (32, 60.4)

xv. Because those girls don't have fans. (69, 55.8)

xvi. Because only one, two, three. (70, 64.5)

c. The pigs are happy to eat their apples.

i. (pointing to pigs with no apple) (15, 50.1)

ii. These pigs (pointing to pigs with apples) (06, 50.0)

iii. You see. (pointing to pigs with no apples) (23, 64.0)

iv. These ones don't. (36, 52.6)

v. Those ones don't. (35, 54.4)

vi. Because those three don't have them. (34, 54.8)

vii. Because these don't. (37, 50.1)

viii. (points to the three that have apples) (03, 40.8)

ix. This pig doesn't have an apple, this pig doesn't have an apple, and this pig doesn't have an apple. (26, 52.9)

x. Because those don't. (25, 52.9)

xi. Three don't have apples. (29, 64.0)

xii. Those three don't have any. (31, 53.3)

xiii. Forgot to give apples to these pigs. (30, 63.6)

xiv. (points to pigs without apples) (32, 60.4)

xv. Those three pigs don't have. (69, 55.8)

xvi. Because one, two, three (70, 64.5)

d. The cats are playing with their yarn.

i. (pointing to cats with no yarn) (15, 50.1)

ii. Because that (pointing to cats with no yarn) (06, 50.0)

iii. Look. (pointing to cats with no yarn) (23, 64.0)

iv. Three don't. (36, 52.6)

v. That one doesn't. (35, 54.4)

vi. Because those three don't have that. (34, 54.8)

vii. Because these don't. (37, 50)

viii. (points to the three that have yarn) (03, 40.8)

ix. Because this cat doesn't have yarn, this cat doesn't have yarn, and this cat doesn't have yarn. (26, 52.9)

x. Because this cat is not playing with yarn. (25, 52.9)

xi. Three don't have yarn. (29, 64.0)

xii. Those three don't have yarn. (31, 53.3)

xiii. Forgot to give yarn to those (pointing). (30, 63.6)

xiv. They don't have yarn. (32, 60.4)

xv. Those three don't have balls of yarn. (69, 55.8)

xvi. Because one, two, three. No, no, no. (70, 64.5)

e. The butterflies are enjoying their orange slices.

i. (pointing to butterflies with no orange) (15, 50.1)

ii. (pointing) (06, 50.0)

iii. See. (pointing) (23, 64.0)

iv. No, cause three don't. (36, 52.6)

v. That one don't. (35, 54.4)

vi. Because those three don't have it. (34, 54.8)

vii. Because these don't. (37, 50.1)

viii. These ones don't. (03, 40.8)

ix. Because this one doesn't have one, this one doesn't have one and this one doesn't have one. (26, 52.9)

x. Because this butterfly wants an orange, this butterfly wants an orange, and this butterfly wants an orange. (25, 52.9)

xi. Three don't have orange slices. (29, 64.0)

xii. Those three don't have. (31, 53.3)

xiii. You forgot to give these. (30, 63.6)

xiv. They have no oranges. (32, 60.4)

xv. Because those three butterflies don't have orange slices. (69, 55.8)

xvi. Because one, two, three. They have orange slices. (70, 64.5)

f. The boys are eating their pizza.

i. Because (pointing to boys with no pizza) (15, 50.1)

ii. (pointing to boys with no pizza) (06, 50.0)

iii. (pointing to boys with no pizza) (23, 64.0)

iv. No, because three don't. (36, 52.6)

v. That one don't. (35, 54.4)

vi. Because those three don't have it. (34, 54.8)

vii. Because these don't. (37, 50.1)

viii. Because some of them don't have pizza. (26, 52.9)

ix. Because this boy wants pizza, this boy wants pizza, and this boy wants pizza. (25, 52.9)

x. Three don't (29, 64.0)

xi. Those three don't have. (31, 53.3)

xii. You forgot these boys. (30, 63.6)

xiii. That, no pizza (32, 60.4)

xiv. Those three boys don't have slices of pizza. (69, 55.8)

xv. Because one, two, three (70, 64.5)

g. The dogs are playing with their toys.

i. Because these don't have (pointing) (15, 50.1)

ii. Because that (pointing to dogs with no toys) (06, 54.4)

iii. (pointing to dogs without toys) (23, 64.0)

iv. Because three don't. (36, 52.6)

v. That one doesn't. (35, 54.4)

vi. Because this one does, and this one does, but these don't. (37, 50.1)

vii. Because this dog doesn't have a toy, this cat doesn't have a toy, and this dog doesn't have a toy. (26, 52.9)

viii. Because they want a toy (pointing). (25, 52.9)

ix. Three don't have toys. (29, 64.0)

x. Those three don't have toys. (31, 53.3)

xi. You forgot those dogs. (30, 63.6)

xii. They don't have toys. (32, 60.4)

xiii. Because those puppies don't have toys. (69, 55.8)

h. The owls are snacking on their crackers.

i. (pointing to owls with no crackers) (15, 50.1)

ii. (pointing to owls with no crackers) (06, 50.0)

iii. (pointing to owls with no crackers) (23, 64.0)

iv. Because three don't (36, 52.6)

v. That one don't. (35, 54.4)

vi. Because these three don't have it. (34, 54.8)

vii. These do have crackers, but these don't. (37, 50.1)

viii. (points to the ones who don't have crackers) (03, 40.8)

ix. This one doesn't this one doesn't, and this one doesn't. (26, 52.9)

x. (points to ones without) (25, 52.9)

xi. Three don't have crackers. (29, 64.0)

xii. Those ones don't have a cracker. (31, 53.3)

xiii. Because you forgot to give those owls. (30, 63.6)

xiv. They don't have crackers. (32, 60.4)

xv. Those three don't have crackers. (69, 55.8)

i. The frogs are enjoying their bugs.

i. (pointing to frogs at the bottom) (15, 50.1)

ii. (pointing to frogs at the bottom) (06, 50.0)

iii. (pointing to frogs at the bottom) (23, 64.0)

iv. (pointing to frogs at the bottom) (24, 52.3)

v. Because three don't. (36, 52.6)

vi. That one don't. (35, 54.4)

vii. Because those three don't have it. (34, 54.8)

viii. Because these do, but these don't. (37, 50.1)

ix. That one don't (pointing) (03, 40.8)

x. This one doesn't have a bug, this one doesn't have a bug, and this one doesn't have a bug. (26, 52.9)

xi. Because this one wants a bug, this one wants a bug, and this one wants a bug. (25, 52.9)

xii. Because three don't have bugs. (29, 64.0)

xiii. Those don't have bugs. (31, 53.3)

xiv. Because you forgot to give those ones bugs. (30, 63.6)

xv. Because they don't have bugs. (32, 60.4)

xvi. Those three frogs don't have bugs. (69, 55.8)