Overcoming Performance Issues:

Preschoolers Know When to Use *The*-Expressions in Production

Yuanfan YING*, Alexander WILLIAMS, Valentine HACQUARD, Jeffrey LIDZ

Department of Linguistics, University of Maryland, College Park

* Corresponding author: jackying@umd.edu

Abstract

Elicited production studies have suggested that children up to the age of 5 sometimes use singular *the*-expressions in non-adult-like ways, i.e., when the referent is not mutually known or not unique in the domain of reference. These production errors have often been attributed to children's deficiency in knowledge. In the present study, we assess whether young children systematically overuse *the*-expressions in production, as previous literature suggests, and whether their knowledge of *the*-expressions is adult-like. Across four studies, we showed that children produce singular *the*-expressions in an adult-like manner, both in natural and elicited speech. For natural speech, they use *the* at rates comparable to their mothers overall and across contexts (Study 1), with minimal referential failures (Study 2); adults presented with conversational snippets are equally successful in guessing determiners (*the* vs. *a*) used by children (2;0-5;0) and mothers (Study 3). For elicited speech, 3- to 4-year-olds are adult-like in producing determiners when provided with a better controlled task setup and a clear domain of reference – they only use *the* when the referent is mutually known and uniquely identifiable in the context (Study 4). These results suggest that children's production errors reported in the literature likely stem from performance issues with certain task setups, and we have little reason to believe that children have the wrong meanings for *the*-expressions or lack the pragmatic capacity to use it properly.

Keywords: *the*-expression, elicited production, domain of reference, task performance

1. Introduction

Learning to produce appropriate referring expressions is a challenging task for children. They need to tailor their referential forms to the listener by considering how identifiable the intended referent is within the shared knowledge or common ground. For instance, when an adult English speaker uses a singular definite description like *the mug* in the sentence *Give me the mug*, the speaker presupposes the *existence* of a *unique* mug within a contextually restricted domain (Russell, 1905), such that the mug is *familiar* or *identifiable* in the discourse or situation (Gundel et al., 1993; Heim, 1982; Roberts, 2003; Strawson, 1950).

Studies on English-learning children's acquisition of the definite determiner *the* reveal a puzzling asymmetry between production and comprehension. Children aged 3 to 5 are claimed to overuse definite *the*-expressions in contexts expecting indefinite *a*-expressions during elicited production, where the intended referent is either unfamiliar or non-unique (Emslie & Stevenson, 1981; Maratsos, 1976; Schaeffer & Matthewson, 2005, 2005; Schafer & de Villiers, 2000; van Hout et al., 2010; Warden, 1976; Wexler, 2011). Strikingly, they demonstrate adult-like comprehension of *the*-expressions even before they turn age two (Choi et al., 2018; Saylor & Ganea, 2007; Syrett et al., 2010). This paper investigates whether young children do systematically overuse *the*-expressions in production, as previous literature suggests, and whether their production errors with *the*-definites truly reflect deficient knowledge.

First, we examine whether the claim that children overuse *the*-definites is accurate. When we analyze children's production data across different studies, the evidence for systematic overuse becomes questionable. Children's rates of misusing *the*-definites vary widely depending on the experimental setup (van Hout et al., 2010). Additionally, many production studies lack

adult control groups for comparison, making it difficult to define the term *overuse* precisely. Without a clear baseline, it is unclear whether children are truly overusing "the".

Next, we explore whether children's production errors with *the*-definites are influenced by the tasks themselves. Recent studies using comprehension tasks suggest that children understand and respect the presuppositions of definite expressions (Aravind et al., 2023; Syrett et al., 2010). For example, children aged 3 to 5 understand that *the*-definites are inappropriate when the intended referent is not unique (Syrett et al., 2010). Furthermore, toddlers as young as 19 months exhibit looking responses that presumably indicate an early grasp of the distinction between "the" and "a" – they are aware of the speaker's visual perspective when interpreting singular definites like *the ball* (Choi et al., 2018). These findings imply that children have the correct meanings for "the" and are sensitive to the listener's knowledge – they have the ingredients for correctly producing definite expressions. It is therefore reasonable for us to speculate that the misuse of *the*-definites in elicited production may result from experimental artifacts. In fact, some studies that include adult control groups show that even adults with target knowledge of definite expressions produce them in certain contexts where definites might be considered inappropriate (Maratsos, 1976; Schafer & de Villiers, 2000; van Hout et al., 2010). It could be that children's knowledge of *the*-expressions is deficient, if we think production reveals true knowledge. It could also be that their knowledge is adult-like, if their production errors are essentially a matter of performance.

Our findings show that 3- to 4-year-olds have adult-like knowledge of *the*-expressions, supporting the idea that children's production errors are driven by specific task demands. In this work, we examine children's use of singular definites across both natural and elicited production contexts, drawing on two corpus studies (Study 1 and Study 2), one behavioral study with adults

(Study 3), and one elicited production study with children (Study 4). We find no conclusive evidence of systematic overuse of "the" by children. When considered alongside studies that reported overuse, our findings point to two key conclusions: 1) like adults, preschoolers distinguish subtle differences in the identifiability of a referent (unique vs. non-unique) when choosing determiners; 2) higher rates of misuse of *the*-expressions in prior production studies likely stem from unnatural experimental setups and unclear domains of reference.

2. Background

The meaning of the definite determiner *the* has long been debated, with theories seeking to clarify its appropriate use. Generally, speakers use 'the N' when they presuppose the existence of a relevant domain of Ns and refer to all its members, so *the mugs* is used to refer to all mugs in a contextually defined domain, and when N is singular, as in *the mug*, they treat the domain as having a single, unique member.

Strawson (1950) provides a useful perspective, noting that "the" is used either when a previous reference has been made or when the context allows the listener to identify the referent, even without a prior introduction. A common theory suggests that this context requires uniqueness, where the intended referent is the only entity that satisfies the noun N within a specific domain (Russell, 1905). For instance, (1) is acceptable only if there is exactly one ball in an understood domain of reference.

(1) The ball is missing.

However, the necessity of uniqueness is debatable. This is reflect in cases like (2).

(2) Mick grabbed a pebble from his collection. Then he put the pebble in a jar.

Multiple pebbles may exist in Mick's collection, yet *the pebble* is used appropriately – it refers to the one Mick grabbed. Similarly, sentences like (3) also challenge the strict need for uniqueness, suggesting that context-specific domain restriction may be at work.

(3) At the gold medal match, the Russian voted for the Russian. (Neale, 2004)

This has led to an alternative view that familiarity, rather than uniqueness, might suffice – using *the*-definites is appropriate when the referent is already familiar or identifiable in the context defined by the discourse, as in (2), or by the situation, as in (3) (Heim, 1982; Roberts, 2003).

In view of the debate, acquiring the correct usage conditions of "the" is a non-trivial task for children. They must identify the implicit presuppositions associated with "the", which often requires careful attention to context. Moreover, children may be confused when these presuppositions are sometimes accommodated in conversations, as in (4) (Abrusán, 2011; Roberts, 2003).

(4) John was murdered yesterday. The knife lay nearby. (Roberts, 2003)

This adds to the challenge of the acquisition task – children must infer consistent usage conditions of "the" from potentially noisy data (Aravind et al., 2023). To acquire the different ways in which *the*-definites can be used, they must be sensitive to both linguistic and pragmatic contexts. This sensitivity is crucial for navigating the complexities of the presuppositions associated with *the*-definites and for accurately interpreting the varying uses of "the" in diverse communicative situations.

Previous elicited production studies suggest that children often struggle to use *the*-definites appropriately. In certain production settings, children aged 3 to 5 tend to produce more inappropriate *the*-definites for intended referents that are neither unique nor familiar to the listener (Maratsos, 1976; Schaeffer & Matthewson, 2005; Schafer & de Villiers, 2000; van Hout

et al., 2010). A common explanation attributes children's misuse to egocentricity, meaning they are less skilled than adults in accurately assessing what their listeners know (Karmiloff-Smith, 1979; Maratsos, 1976). Other theories propose that these errors result from a fundamental misunderstanding of the meaning of "the", such as a failture to grasp the uniqueness requirement (Wexler, 2011), or they could be due to immature pragmatic reasoning skills (Schaeffer & Matthewson, 2005). However, recent comprehension studies indicate that children respond correctly to *the*-definites in comprehension tasks (Aravind et al., 2023; Syrett et al., 2010), even at 19 months of age (Choi et al., 2018). This creates a notable asymmetry between findings from elicited production and those from comprehension.

2.1 Hypotheses on children's knowledge of *the*-definitees

The apparent discrepancy between findings from elicited production studies and comprehension studies points to two hypotheses. Hypothesis 1 suggests that children's knowledge of *the*-expressions is deficient. In this view, their misuse in production reveals their immature or deficient grammar. Their success is limited to certain comprehension tasks, and their true, flawed understanding can only be exposed in production tasks targeting specific referential scenarios. According to this "deficient knowledge" hypothesis, children's production errors are tied to either underdeveloped cognitive skills (Karmiloff-Smith, 1979; Maratsos, 1976; Schaeffer & Matthewson, 2005) or incorrect linguistic meaning (Wexler, 2011).

Hypothesis 2 proposes that children's knowledge of *the*-expressions is adult-like. By this hypothesis, children's production errors are due to performance issues with artificial production setups. For this "task performance" hypothesis, the unnaturalness of particular experimental contexts may interfere with how both children and adults represent the restricted domain, which then boosts "inappropriate" uses of *the*-expressions. The idea is that children's deployment of

meanings of *the*-definites is fragile outside of natural production, and certain experimental contexts could encourage them to represent the restricted domain incorrectly.

To tease apart these hypotheses, it is crucial to examine children's use of definite and indefinite expressions in both natural speech and elicited production, as the two hypotheses make different predictions. The "deficient knowledge" hypothesis predicts that children will consistently overuse "the" in both natural and elicited settings, as production will expose their fundamentally immature understanding. The "task performance" hypothesis predicts that production errors should decrease significantly in more natural settings where task demands are removed, either in natural production or in elicited production with natural setups and clear domains of reference.

2.2 Reconsidering prior studies

Examing specific production studies might leave us with the impression that children overuse *the*-definites, as assumed by the "deficient knowledge" hypothesis. However, this overuse claim is questionable when we approach prior studies with caution.

When we compare children's rates of misusing "the" with those of adult control groups across different studies (Table 1), two key findings emerge: 1) children do not exhibit consistent rates of misuse, and 2) the baseline established by adult control groups appears questionable.

Table 1: The rate of misusing "the" reported in previous elicited production studies

Study	Children	Adult control groups
Maratsos (1974)	Exp: 17% (3yrs)	
Schafer & de Villiers (2000)	Cond 8: 49% (3yrs)	Cond 8: 30%
Matthewson et al. (2001)	72% (108/150)	16% (24/148)
Schaeffer & Matthewson (2005)	25% (19/76)	2% (2/113)
van Hout et al. (2010)	Exp 1: 50%	Exp 1: 17%
	Exp 2: 26%	Exp 2: 24%
de Cat (2013)	17% (age 2;6-3;3)	

Additionally, there is significant variability in misuse rates among both children and adults. To illustrate this, we plot the misuse data in Figure 1, which clearly shows the wide variance in both groups.

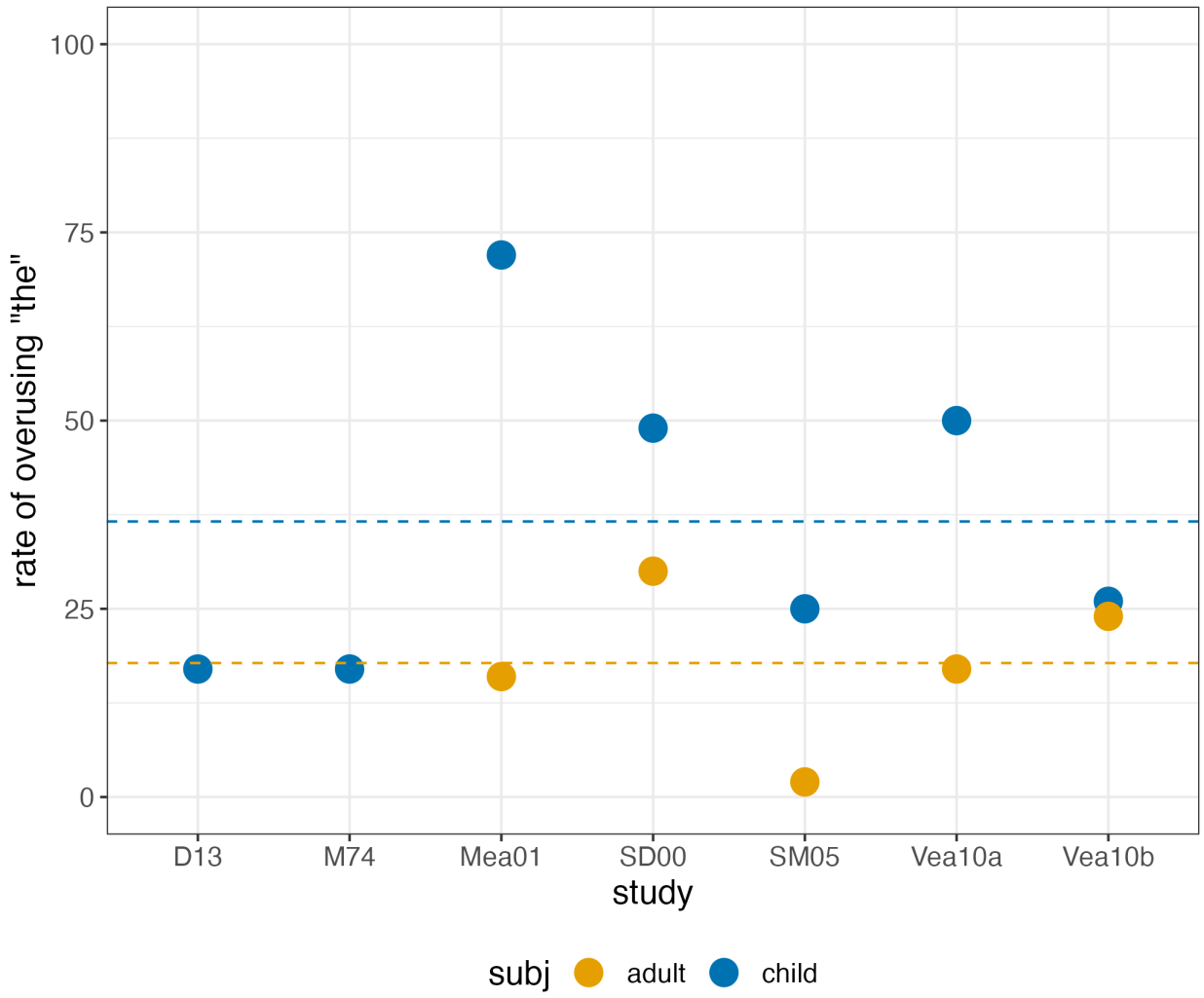

Figure 1: Rates of misusing "the" in previous elicited production studies (blue dotted line for children's mean and orange for adults')

Summary statistics further support this observation. When we measure the relative dispersion of data within the two populations using the coefficient of variance (*CV*), the values for children and adults are very close, $CV_{children} = 0.569$, and $CV_{adults} = 0.59$. An independent samples test, the Mann-Whitney test, indicates that the two groups are not statistically distinguishable in their misuse rates across studies ($p = .102$). The wide variability in performance across both children and adults suggests that different task demands might significantly influence their referential

choice. Children's inflated rates of misuse may be tied to specific task demands, including unnatural setups for perspective-taking and unclear domains of reference.

Focusing exclusively on production studies with preschoolers may obscure the broader picture of how children's understanding of *the*-definites evolves over time. Recent works using comprehension tasks suggest that children have an adult-like understanding of *the*-definites from early on. For example, Syrett et al. (2010) found that when presented with two identical red balls, 3- to 5-year-old children consistently rejected or questioned an inappropriate request like *Give me the red one*, which violated the uniqueness requirement of "the". This indicates that children associate "the" with some notion of uniqueness of an object within a restricted domain. Similarly, Choi et al. (2018) demonstrated that by 19 months, children are considering the speaker's knowledge when interpreting "the". At a scene that naturally called for visual perspective-taking, 19-month-olds, but not 14-month-olds, looked significantly longer when a listener who heard *Give me the ball* grabbed a ball hidden from the speaker, rather than one that was visible to the speaker. This was not the case when the listener heard *Give me a ball*. In fact, additional evidence indicates that the perspective-taking skills necessary for interpreting definite expressions emerge early in life, even before children turn age two (Luo & Baillargeon, 2007; Moll et al., 2008; Saylor & Ganea, 2007).

It is important to note, however, that correctly responding to *the*-definites in comprehension tasks only provides indirect evidence for children's understanding of *the*-definites. The processes involved in comprehending *the*-definites may differ from those required for producing appropriate referring expressions. Children might correctly respond to definites by using heuristics for identifying the intended referent, without fully considering the presuppositions associated with *the*-expressions. Therefore, production studies are essential to

determine whether children use appropriate referential forms in communication, taking into account whether the intended referent is uniquely identifiable within the context of reference.

2.3 This paper

In this paper, we present new evidence supporting children's adult-like grammar for *the*-expressions. They use *the*-definites appropriately in natural speech as well as natural elicited production. We argue that their adult-like grammar is nevertheless masked by unnatural setups in prior production tasks.

Across four studies, we demonstrate that children do not systematically overuse "the", whether in natural speech or in natural elicited production. In natural speech, children follow their mothers' patterns of determiner use overall and across different clause types and syntactic environments, and their rate of miscommunications due to inappropriate use of "the" is low and comparable to that in adult-adult interactions. Additionally, when naïve adults are given only limited linguistic context, they are equally accurate at guessing determiners (*the* vs. *a*) used by children as those used by their mothers in conversation. Furthermore, in a new elicited production task designed to minimize task demands in production setups, children consistently produced appropriate determiners based on whether the intended referent was uniquely identifiable within the context.

3. Study 1: Overall distribution of *the*-definites in natural production

We begin with a corpus study to compare the frequency of singular *the*-definites produced by children and their mothers in natural speech. This coarse analysis helps us to assess whether there are noticeable signs of children misunderstanding the meaning of "the" or having insufficient perspective-taking skills. Specifically, we look at the distribution of singular definites in the form "the N" used by children vs. their mothers. Do children truly produce singular

definites more frequently than their mothers? Do children and mothers produce these definites in the same linguistic environments? To gain a fuller understanding of children's use of singular definites, we present their proportions both overall and across syntactic contexts.

3.1 Method

The distributional analysis of singular definites is based on several CHILDES corpora, including Brown (1973), Soderstrom et al. (2008), Suppes (1974), and Valian (1991). These corpora provide a large sample of data, with 27 children from a broad age range (1;0-3;11), consisting of a total of 912,530 words and 254,753 sentences.

In our analysis, we focus specifically on singular definites produced by children and mothers, as these require a choice between a definite or an indefinite determiner. We analyzed instances of singular definites in the form of "the N_{SG}", while excluding plural definites, since plurals either require "the" for definite referents or no determiner for indefinite referents.

To determine whether children overuse singular definites, we used mothers' input as a baseline and compared the proportion of "the N" used by the two groups. The proportion of "the N" is calculated by dividing the count of "the N_{SG}" by the combined count of "a/an N_{SG}" and "the N_{SG}". We excluded other determiner alternatives (e.g., demonstratives like *this* and *that*) from the denominator, given that *the* and *a* are typically contrasted in elicited production studies. This analysis helps us examine whether the overuse of "the" observed in previous elicited production studies is also present in natural speech.

3.2 Results

In general, children use a lower proportion of singular definites than their mothers across all age groups, as shown in Figure 2.

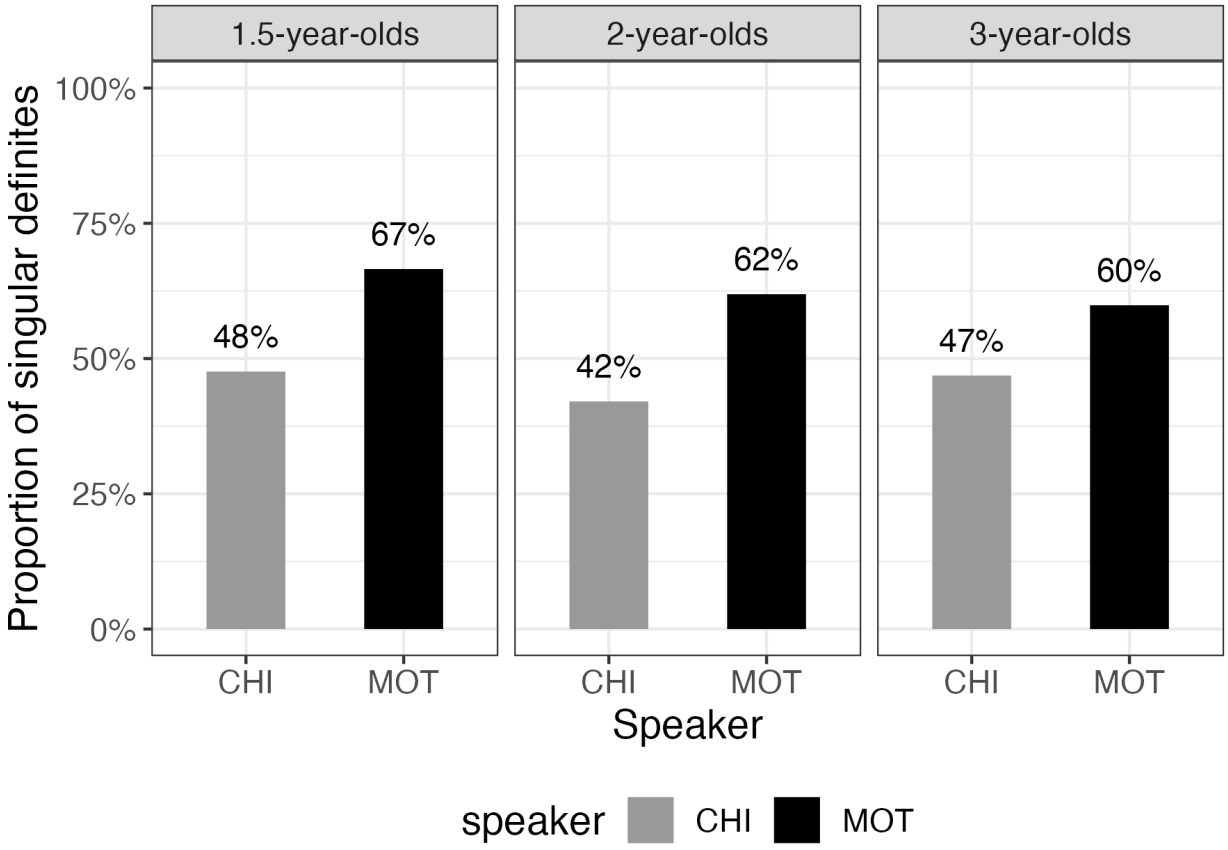

Figure 2. Overall proportion of singular *the*-definites by age

Specifically, children use the definite determiner (as opposed to the indefinite determiner) about half of the time, whereas mothers use it more frequently, in over 60% of their utterances. This higher usage of "the N" by mothers may reflect their more dominant role in directing the child's attention to previously mentioned or familiar objects during conversations. The absence of overuse in children is also evident when we examine individual data from our two-year-old corpora, as depicted in Figure 3.

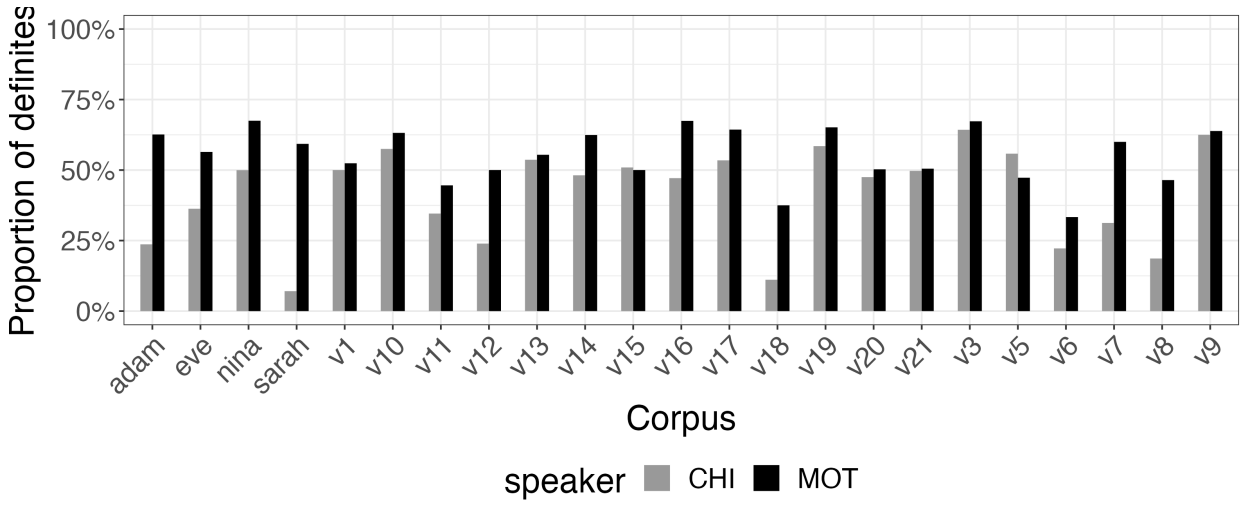

Figure 3. Overall proportion of singular *the*-definites by 2-year-old corpus

Considering potential pragmatic differences across clause types and syntactic environments, we further explore two questions: 1) Are children sensitive to these pragmatic differences and do they show varying proportions of definite usage in the relevant contexts? 2) Do children use definites in an adult-like manner? To address these questions, we analyzed definite usage across different clause types (declaratives vs. interrogatives) and syntactic environments (subjects vs. objects vs. fragments).

First, we found that children closely follow their mothers' patterns of determiner use across clause types (declaratives/statements vs. interrogatives/questions; see Figure 4).

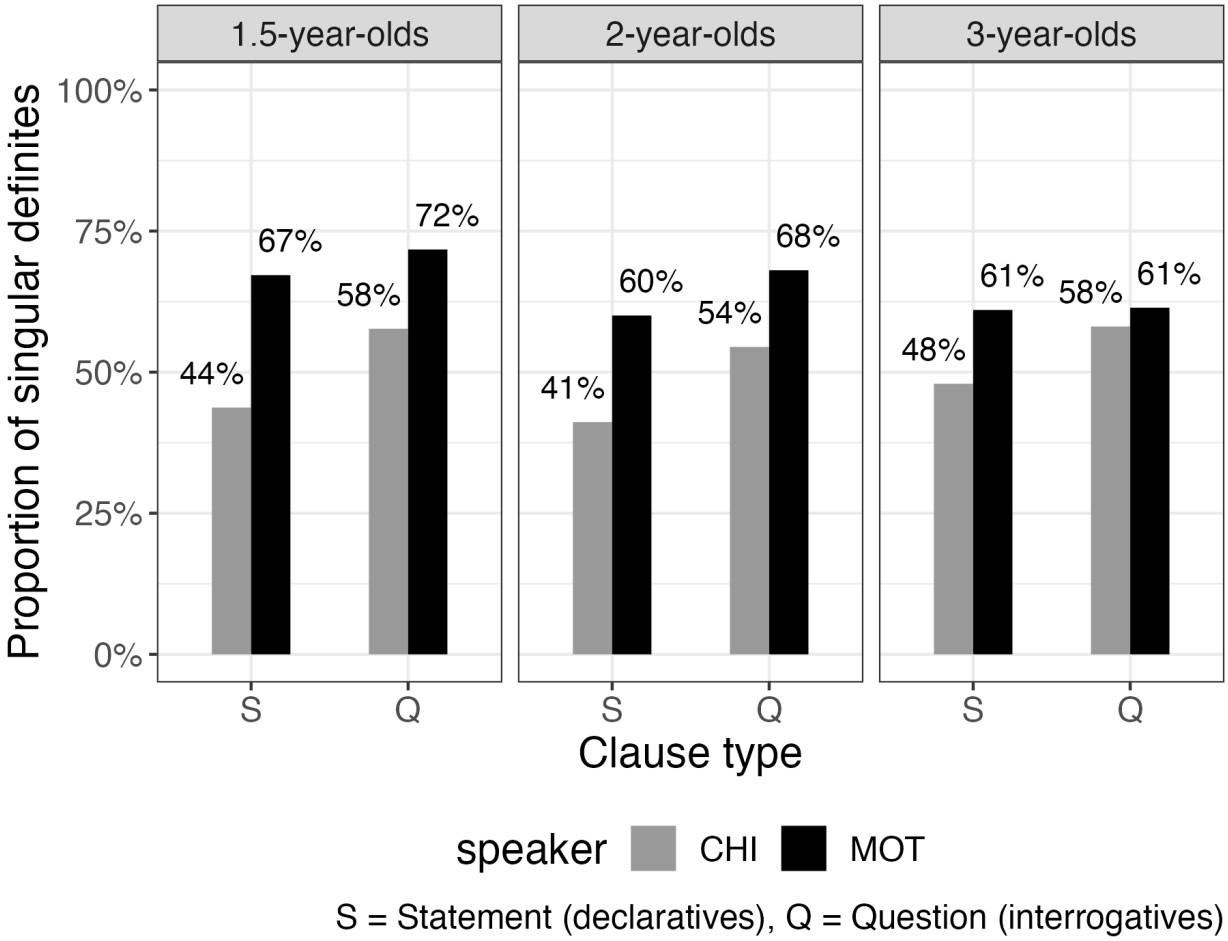

Figure 4. Proportion of singular the-definites across clause types (S for statements/declaratives vs. Q for questions/interrogatives) by age

There is no evidence that children overuse definites compared to their mothers' baseline usage. Second, when examining children's determiner use in declarative clauses across different syntactic positions (i.e., subjects, objects, and fragments), we again find no evidence of overuse (see Figure 5).

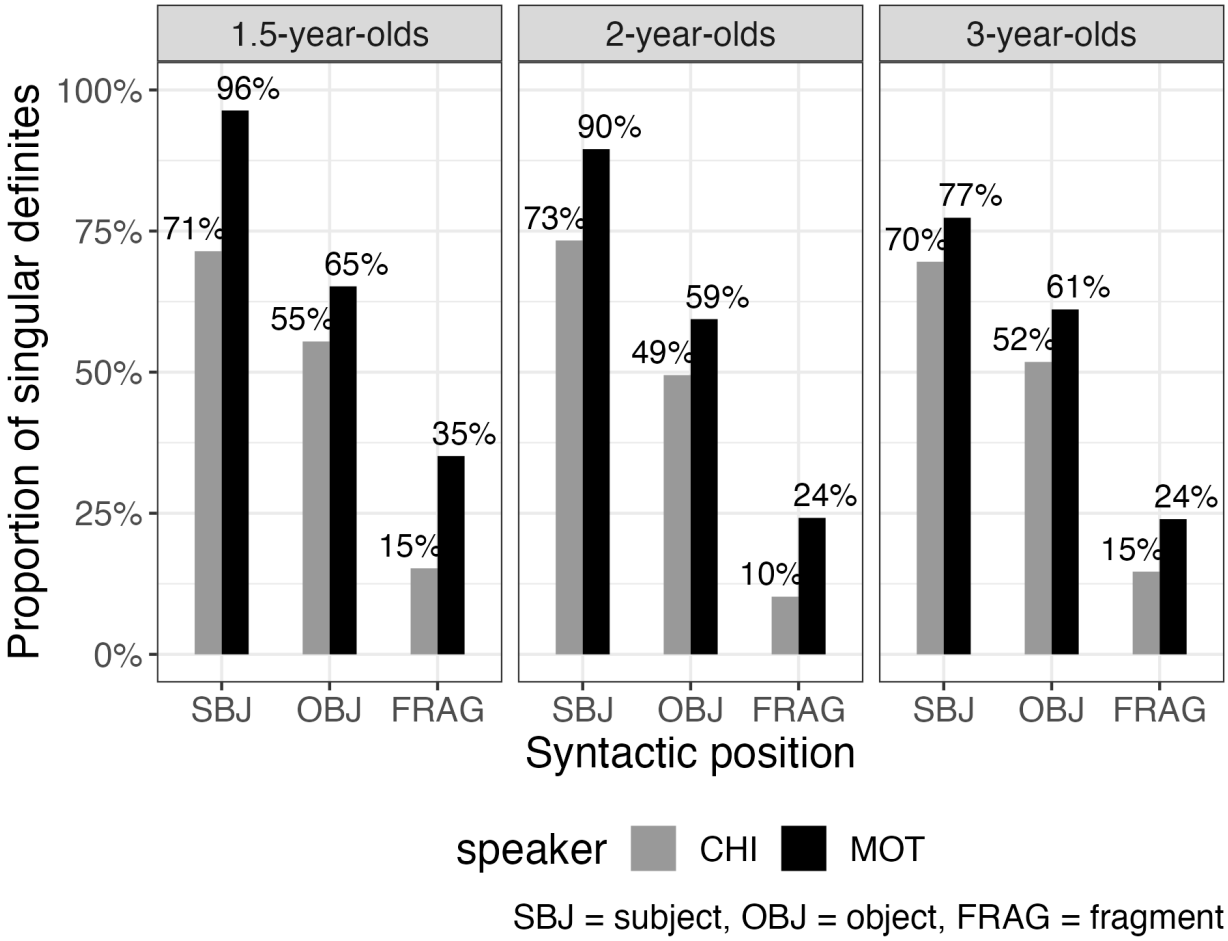

Figure 5. Proportion of singular *the*-definites across syntactic positions

Moreover, children use more singular definites for subjects than for objects, mirroring their mothers' patterns. That is, children's usage patterns align with the general observation that in English, subjects typically refer to entities mentioned earlier in the discourse (Prince, 1992).

One concern is that children's rate of definites might be underestimated relative to their mothers' due to young children frequently producing noun phrases (NPs) without determiners (e.g., Hyams, 1996). If children tend to drop determiners more often for definites than for indefinites, excluding these null determiners could significantly impact their overall rate of definites. To explore this, we calculated the instances of null determiners in children's speech (see Table 2).

Table 2: Revised rate of definites (excluding fragment NPs)

Age (year)	#Def	#Ind	#Null	(Def+Null)%
1	209	166	550	82.1
2	1,364	1,342	2,599	74.7

If we consider all null determiners as potential definites, the revised rates of definites for 1-year-olds and 2-year-olds increase to 82.1% and 74.7%, respectively—higher than their mothers' rates of 66.5% and 60.2% in the same corpora. However, if we assume that all null determiners are definites, this would overestimate children's definite usage, as some of these null determiners in object positions are grammatical (5), and others seem to involve indefinite drop (6).

(5) I want coffee. (Valian, 1991: 01;09;25)

(6) I take walk. (Brown, 1973: Eve, 01;09;00)

To obtain a more accurate estimate of potential definites among children's null determiners, we factored in their distribution of definites across different syntactic environments. We recalculated children's revised rates of definites by including in the numerator null determiners that could have been definites ($N_{\text{null as def}}$) probabilistically (8), i.e., based on the rates of definites produced in subject ($\text{rate}_{\text{def-sub}}$) and object ($\text{rate}_{\text{def-obj}}$) positions (7).

(7) $N_{\text{null as def}} = N_{\text{null-sub}} \times \text{rate}_{\text{def-subj}} + N_{\text{null-obj}} \times \text{rate}_{\text{def-obj}}$

(8) $\text{rate}_{\text{revised def}} = (N_{\text{def}} + \mathbf{N_{\text{null as def}}}) / (N_{\text{def}} + N_{\text{ind}} + N_{\text{null}})$

The revised rates of definites for 1- and 2-year-olds then become 58.2% and 52.1%, respectively, both lower than their mothers' rates of 66.5% and 60.2% in the respective corpora. Therefore, when using this finer-grained estimate, children do not appear to overuse definites in their natural production.

In summary, we find no clear evidence of overuse in children's natural speech. Across different clause types and syntactic positions, children's distribution of singular definites aligns closely with that of their mothers.

4. Study 2: Rate of *the*-driven miscommunications in natural production

In this section, we evaluate the quality of children's use of *the*-definites. If children misunderstood the meaning of "the", we would expect them to use it inappropriately, leading to communication breakdowns. Specifically, if children used "the" in contexts where its presuppositions were not satisfied or could not be accommodated, their listeners would likely be confused about the referent or seek clarification.

To assess whether miscommunications induced by "the" are common in natural speech, we compare the rates of such miscommunications in mother-child interactions with those in adult-adult interactions. We calculate the rate of misuse of "the" by 1- and 2-year-olds and compare it to that of adults. If children's understanding of "the" is non-adult-like, we would expect to see a higher rate of miscommunications, with children's misuse of "the" frequently causing listener confusion or prompting requests for clarification.

4.1 Method

The rate of *the*-driven miscommunications was analyzed using CHILDES corpora, including Brown (1973), Soderstrom et al. (2008), Suppes (1974), and Valian (1991), while the rate for adult-adult interactions was calculated using the CALLHOME corpus (Kingsbury et al., 1997).[1]

[1] The CALLHOME corpus consists of 120 unscripted, 30-minute telephone conversations between native English speakers, primarily involving family members or close friends. This is particularly relevant because the corpora we selected for analyzing children's miscommunication rates also involve interactions between mothers and their children, who are familiar with each other. The CALLHOME corpus includes a total of 301,805 words and 28,967 sentences.

For children, we focused on miscommunications involving singular definites, where the choice of determiner is between "the" and "a/an". For adults, we expanded the scope to include both singular and plural definites to capture a more comprehensive view of their miscommunication scenarios. In the analysis of mother-child interactions from CHILDES, sentences containing 'a/an N_{SG}' or 'the N_{SG}' were extracted using CLAN commands and functions.

For the analysis of adult-adult interactions in the CALLHOME corpus, sentences with referring expressions were extracted using a Python script[2]. To identify cases of *the*-driven miscommunications, we searched for question marks, as a sign for clarification, within 1-3 lines following the target line containing the definite expression. We then manually reviewed these cases to confirm that they were true instances of miscommunication. To do so, we expanded the context and checked if they genuinely involved clarification questions.

4.2 Results

We first analyzed the use of "the N" by 1-year-olds and found only 1 instance of misuse out of 205 cases (0.49%), with no instances of miscommunication. Many of the uses of "the N" by 1-year-olds were repetitions of their mothers' utterances or followed the mothers' initial mention of "N". After excluding these 14 repeated cases from the total, the misuse rate remained low at 0.52% (1 out of 191).

Next, we examined the use of "the" by 2-year-olds and found only 0.39% (10 out of 2,575) instances of miscommunication driven by "the". We identified two types of misuse: unfamiliar reference (8 cases) and non-unique reference (2 cases). (9) shows a case of unfamiliar reference, and (10) a case of non-unique reference.

[2] Many thanks to Weihang Wang and Sathvik Nair for helping with the script.

(9) CHILD: What's the people doing?

MOTHER: What people?

CHILD: The people there.

MOTHER: There aren't any people out there.

(Brown, 1973: Eve, 02;02;00)

(10) CHILD: Hey, where's the truck? I need …

INVESTIGATOR: Where's the what?

MOTHER: The truck?

CHILD: Yeah.

MOTHER: There's two trucks.

(Brown, 1973: Eve, 02;02;00)

In adult-adult interactions, we found only 0.13% (4 out of 3,121) instances where "the" led to miscommunications. All these cases were due to unfamiliar reference. (11) is one example of this type of case.

(11) A: You know, spent panting and spending every second of the day, w- with him only. You know what I'm saying and that probably part of the reason that it would be nice to actually stay with him is that **you could also go and visit the sights** or whatever and g- and...

B: Where? What are you talking about?

A: In Japan.

In summary, Study 2 does not support the claim that children overuse "the" in natural production. The rate of miscommunication driven by "the" in mother-child interactions is low

and comparable to that in adult-adult interactions, both being well below 1%. Therefore, the data does not support the idea of overuse of "the" by children.

5. Study 3: Guessing determiners

The absence of miscommunication observed in Study 2 may be due to mothers accommodating their children's use of definites. To evaluate children's use of determiners more objectively, we need to involve adults who were not part of the conversations and thus are less likely to accommodate the presuppositions.

In Study 3, we aim to determine whether children's use of determiners is adult-like by conducting a determiner-guessing experiment, using Dieuleveut et al.'s (2022) adaptation of the Human Simulation Paradigm (Gillette et al., 1999). This method, as demonstrated by Dieuleveut et al. (2022), can assess whether children's use of certain words is adult-like and capture the nuances of adult-like-ness of children's use of different subclasses of words.

We presented adult participants with excerpts from mother-child conversations and asked them to select either definite "the" or indefinite "a" for a missing determiner used by either a child or a mother. Our first goal is to determine if adults can accurately guess the definites used by mothers. If they can correctly predict mothers' use of definites, it indicates that the context, combined with adults' understanding of determiners, provides sufficient information for accurate determiner choice by adults (mothers in this case). Conversely, if children misuse definites, adults should perform worse at predicting children's determiners, as the contexts in which children misuse definites would likely lead to indefinite choices by adults.

5.1 Predictions

If children overuse definite determiners, we expect adults to be less accurate in predicting children's use of definites compared to predicting mothers'. On the other hand, if children do not

overuse definite determiners, we expect no significant difference in adults' accuracy of predictions for children's versus mothers' use of definites.

5.2 Method and Materials

Participants were recruited via Amazon Mechanical Turk (AMT), and the experiment was conducted using PCIbex farm (Zehr & Schwarz, 2018). The task took approximately 15 to 20 minutes. Each participant completed 40 trials, including 10 trials with definites, 10 with indefinites, and 20 fillers. To ensure participants were engaged, one-fifth of the trials (8 trials) were followed by comprehension questions (i.e., simple memory questions).

The materials consisted of snippets from mother-child conversations involving 23 pairs (children aged 2;1;4 to 4;11;2). These snippets were randomly selected from Gleason's corpora in CHILDES (80,347 words; Menn & Gleason, 1986).[3] To better capture cases of misusing "the" if any, we ensured that both "the" and "a" were viable options for their subsequent noun so that the participants' choice of either determiner would be based solely on contextual information. To do this, we excluded items biased toward either determiner. Items were removed if they included: 1) repetitions, such as echoing, speaker disfluency, and finishing another speaker's sentence; 2) idiomatic expressions (e.g., *wait a minute*) or collocations; or 3) plural or uncountable nouns.

5.3 Procedure

Before starting the experiment, participants received two practice trials to familiarize themselves with the process. They learned that: 1) they needed to press the spacebar to reveal each line of conversation in progression, 2) they would choose between two options for the blank at the end of each conversation, and 3) they would occasionally answer comprehension questions to ensure

[3] The conversation took place in recorded lab sessions, where children and mothers interacted with new objects. This is good for our purpose, as we are interested in exploring how children register new referents in a dynamic common ground.

they understood the context. Figure 6 shows a sample test trial, where participants chose a determiner from options including target determiners (e.g., *the* vs. *a*), filler determiners (e.g., *this* vs. *that*), or mixed determiners (e.g., *the* vs. *this*).

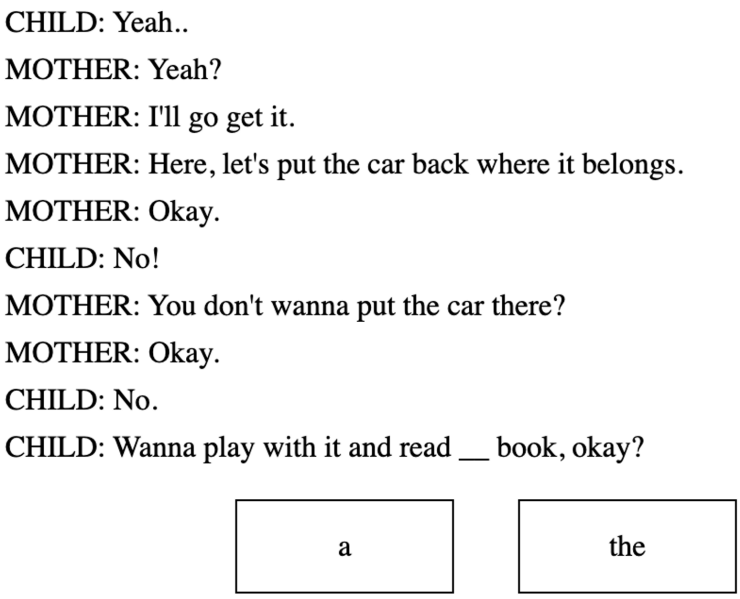

Figure 6. A sample test trial during Study 3

5.4 Participants

240 participants (127 males and 105 females; mean age: 41.3) were recruited via AMT. Data from 211 participants (109 males, 94 females, and 2 unspecified; mean age: 41.9) were included in the analysis. Participants who scored below 75% on the comprehension questions were excluded from the final dataset.

5.5 Results

We analyzed the rate of correct guesses for mothers' use of definites as a baseline to evaluate children's use of definites. Adults predicted mothers' definites above chance for conversations from all age groups (2-year-olds: $V = 666$, $p < .001$; 3-year-olds: $V = 780$, $p < .001$; 4-year-olds:

$V = 389$, $p < .001$). Their accuracy rates were 0.9 ($N = 36$, $SD = .096$) for 2-year-olds, 0.895 ($N = 39$, $SD = .102$) for 3-year-olds, and 0.765 ($N = 31$, $SD = .236$) for 4-year-olds.

Adults also predicted children's definites above chance for conversations from all age groups (2-year-olds: V = 595, p < .001; 3-year-olds: V = 595, p < .001; 4-year-olds: V = 595, p < .001). Their accuracy rates were 0.844 ($N = 36$, $SD = .144$) for 2-year-olds, 0.857 ($N = 35$, $SD = .127$) for 3-year-olds, and 0.894 ($N = 34$, $SD = .110$) for 4-year-olds. Crucially, in no age group were adults significantly better at predicting mothers' definites than children's (2-year-olds: $W = 516$, $p = .124$; 3-year-olds: $W = 571.5$, $p = .212$; 4-year-olds: $W = 726.5$, $p = .007$**) (Figure 7).[4]

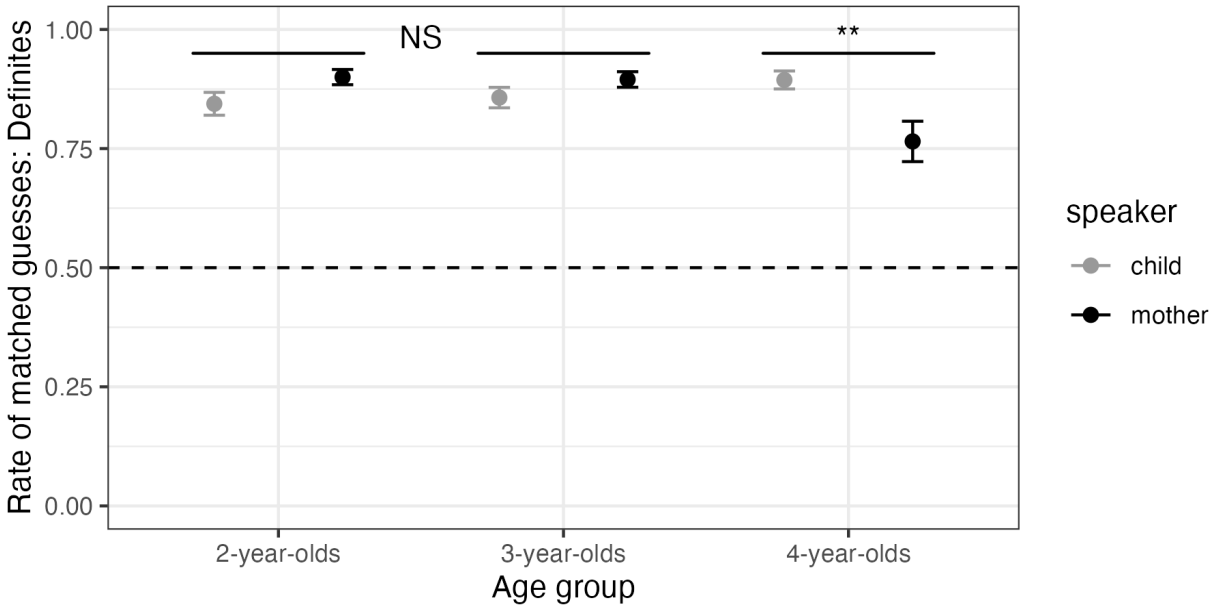

Figure 7. Rate of correct guesses for definites by speakers by child age

[4] The Wilcoxon test was used to test whether adults were above chance at guessing definites for each condition, and the Mann-Whitney U test was for testing whether adults performed better with either child or mother utterances. These non-parametric tests were used, as the data did not follow normal distribution.

One might suspect that adults' accurate predictions could be due to a general bias toward choosing definites, which would suggest poorer performance with indefinites. However, this is not supported by our data (Figure 8).

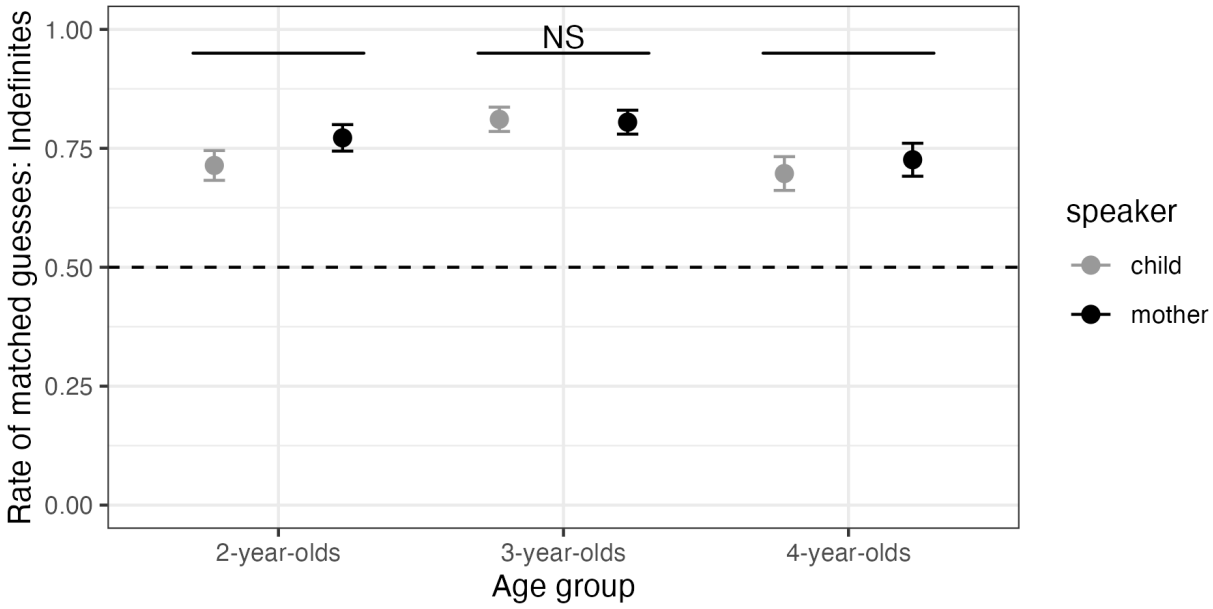

Figure 8. Rate of correct guesses for indefinites by speakers by child age

Adults were also above chance in predicting indefinites used by both children (2-year-olds: $V = 593.5$, $p < .001$; 3-year-olds: $V = 527$, $p < .001$; 4-year-olds: $V = 511.5$, $p < .001$) and mothers (2-year-olds: $V = 587$, $p < .001$; 3-year-olds: $V = 768$, $p < .001$; 4-year-olds: $V = 385$, $p < .001$). Furthermore, adults were not significantly better at predicting mothers' indefinites compared to children's (2-year-olds: $W = 526$, $p = .163$; 3-year-olds: $W = 703.5$, $p = .819$; 4-year-olds: $W = 498$, $p = .704$).

Additionally, participants generally showed agreement in their determiner choices for most test items, whether the determiners were used by children or mothers (Figure 9).

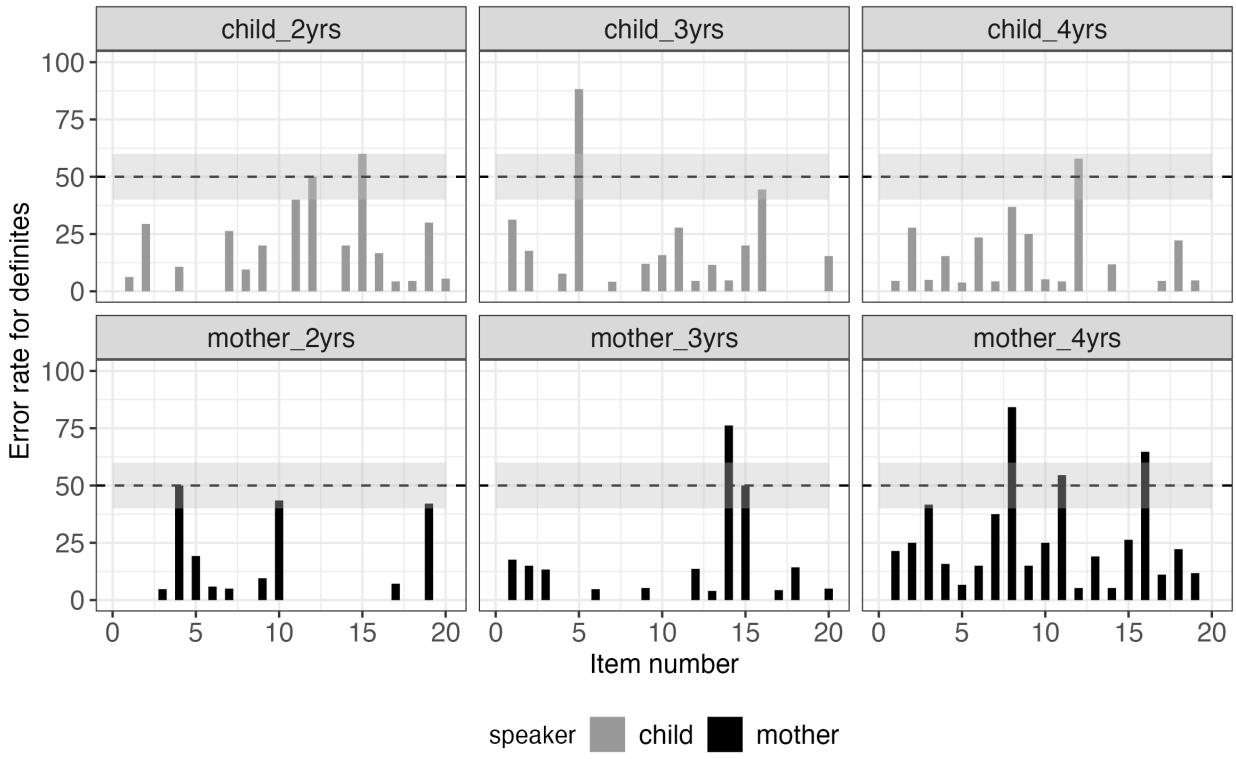

Figure 9. Adults' error rates for definites by item, speaker, and child age

We used gray to mark regions with an accuracy range between 40% and 60% to highlight items with significant disagreement (i.e., a near 50-50 split among participants). The figure shows very few items with such wide disagreement. Our examination of items with the highest mismatch rates revealed only one potential case of misusing "the" by children.

In summary, our results suggest that children use singular definites in a manner consistent with adult usage in natural production, as evidenced by adults' high accuracy in predicting definites used by both children and their mothers.

6. Study 4: Use of *the*-definites in conversational elicited production

In the first three studies, we observed that in natural production, children often use referring expressions in ways similar to adults. While natural production provides valuable insights into children's language use, it has certain limitations. During mother-child interactions, the common

ground tends to be less dynamic and more predictable, which might make it easier for children to assess what their listener knows. In other words, children's adult-like usages might be limited to mostly easy cases in natural production, so natural production scenarios might be insufficient to expose their underlyingly deficient grammar.

Nonetheless, our findings from the first three studies suggest that unnatural setups may be responsible for the overuse of *the*-expressions in prior production studies. As discussed in the background section, we suspect that two factors might be at issue in boosting children's use of inappropriate *the*-definites in prior studies: 1) unnatural setups for perspective-taking, and 2) unclear domains of reference.

We conduct Study 4 to investigate this "task-related performance" hypothesis and test its prediction – children's misuse of *the*-definites will decrease significantly in a production task where the abovementioned task demands are controlled for. For this purpose, we adopt a conversational elicited production paradigm, aiming to create a more natural setup and a clear domain of reference.

6.1 Method

Participants in this task need to consider the perspective of the listener and assess whether the intended referent is uniquely identifiable within the domain of mutually known referents. The task setup involves Kermit the frog, who cannot see objects on the other side of a wall, while the participants can, so Kermit needs some help from participants to tell him what's behind some walls (Figure 10).

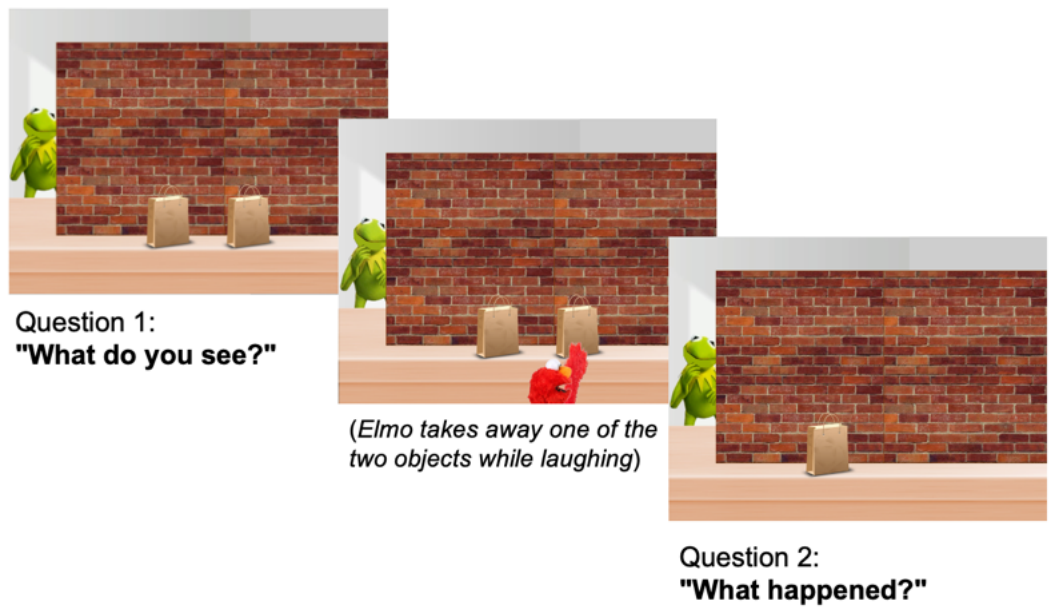

Figure 10. Experimental setup

To ensure that participants understand the procedure and are comfortable with the setup, we begin with three practice trials before the main task, each involving just one object behind the wall. In the first two trials, Kermit only asks Question 1, *What do you see?* After the participant responds, Kermit says, *Okay, thank*s. The third trial differs from the previous two in that after the participant answers Question 1, Elmo appears, takes away the object, and laughs. Kermit then asks, *Wait. Did you hear something? It sounded like someone's behind the wall. Who was it?* This question ensures participants understand the situation. Finally, Kermit asks Question 2, *What happened?* so that the participant knows what question to expect during the test trials.

The test trials include two trial types, where participants see two objects, either unique (e.g., a bottle and a mug) or non-unique (e.g., two identical bags). Kermit first asks, *What do you see?* (Question 1). We expect this to elicit indefinite responses (e.g., *a bottle and a mug* or *two bags*) regardless of the trial type (i.e., unique vs. non-unique trial), since the referents are unfamiliar to the listener (Kermit) and not within the shared visual common ground between Kermit and the participant. Next, Elmo appears on the other side of the wall and takes away one

of the objects, while laughing. Kermit then asks, *What happened?* (Question 2). Here, we expect participants to respond with definites for unique referents (e.g., *Elmo took the mug* if there's only one mug) but indefinites for non-unique referents (e.g., *Elmo took a bag/one of the bags* if there are two bags).

Our design reduces task demands in the following aspects. First of all, our task involves turn-taking in elicitation, which mimicks natural production and helps maintain the natural flow of speech. Additionally, as Kermit cannot see what's behind the wall and there's no referents in the visual common ground, it's clear to participants that the task requires visual pespective-taking, which has been proven to work for even infants (Brezack et al., 2021; Choi et al., 2018; Luo & Baillargeon, 2007). Moreover, we create a clear domain of reference (the area behind the wall) and provide visual support for the referents, so the memory load is minimized (van Hout et al., 2010). Furthermore, we control for the saliency of the intended referent. When Question 2 (*What happened?*) is asked, Elmo already took the intended referent away, so it's not visually salient, and discourse-wise, *What happened* also serves as a neutral prompt from an ignorant listener (Kermit), targeting the broader context (i.e., what occurred behind the wall) rather than the specific identity of the stolen object.

We employ a 2 (Trial type: unique vs. non-unique) × 2 (Question: 1 vs. 2) × 2 (Age: adult vs. children) within-subjects design. If children's knowledge of "the" is adult-like, we expect their use of definites to vary based on Trial type and Question, without any interaction effect with Age. Responses coded as definites include pronoun *it*, "the N" (e.g., *the box*), "the Adj N" (e.g., *the left box*), "the N PP" (e.g., *the box on the left*), and responses coded as indefinites include "a/an N" (e.g., *a box*), "one N" (e.g., *one box*), "one of the Ns" (e.g., *one of the boxes*).

6.2 Participants

The participants involved 34 children (15 males) between the ages of 3;4;15 and 5;0;23 (mean: 4;4;17). They were recruited from preschools in the greater Washington, DC, area and were included in the final sample only if they heard English during at least 80% of their waking hours. We analyzed data from trials where children responded to both questions (*What do you see?* and *What happened?*). We recruited aonther 23 undergraduate students at University of Maryland, College Park as adult controls.

6.3 Results

Our results indicate that children (N = 34), just like adults (N = 23), respect the presuppositions of "the". For Question 1 (*What do you see?*), both adults and children always used indefinites in their responses, when the intended referents were unfamiliar to the listener (Figure 11).

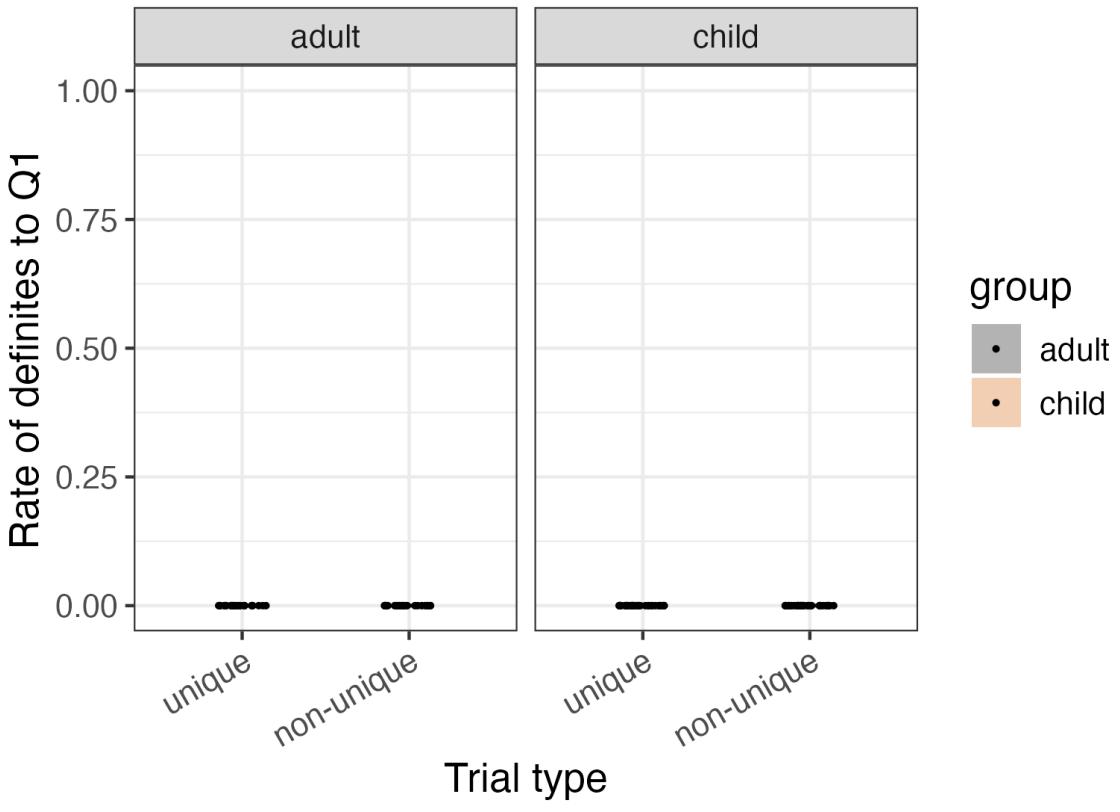

Figure 11. Rate of definites for Question 1 (adults vs. children)

For Question 2 (*What happened?*), they mostly used definites (89.2%, *SD* = .262; adult control: 99.3%, *SD* = .035) to refer to a unique referent and much less so (28.3%, *SD* = .368; adult control: 27.5%, *SD* = .416) for a non-unique one (Figure 12).

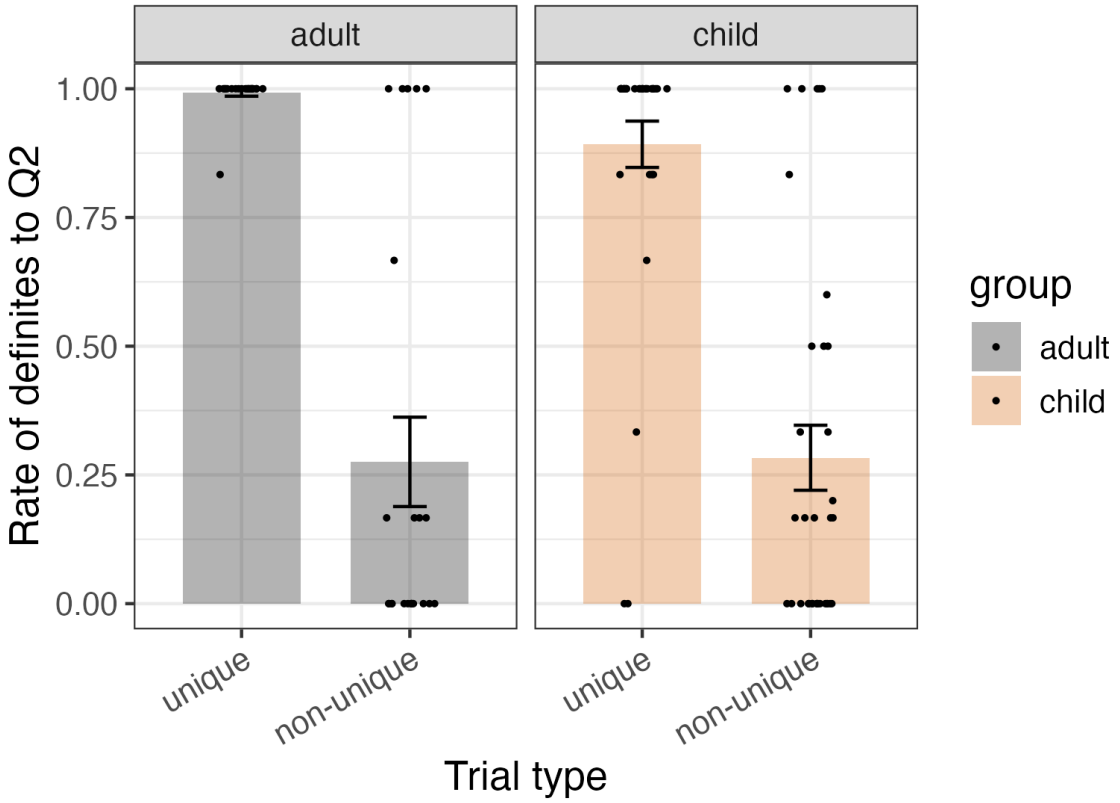

Figure 12. Rate of definites for Question 2 (adults vs. children)

A 2×2×2 mixed ANOVA confirms that children as a group behave as adults in their rate of definite responses. We find significant main effects of Trial Type ($F(1, 55) = 59.8$, $p < .001$) and Question ($F(1, 55) = 154.365$, $p < .001$) but not Age. The interaction is significant between Trial Type and Question ($F(1, 55) = 59.8$, $p < .001$) but not with Age. To check whether there is an age difference among children, we test whether children's rates of definite responses correlate with their age in days. Our results suggest no such correlation for either unique referents (Figure 13), $r = 0.19$, $p = .27$, or non-unique referents, $r = -0.24$, $p = .168$ (Figure 14).

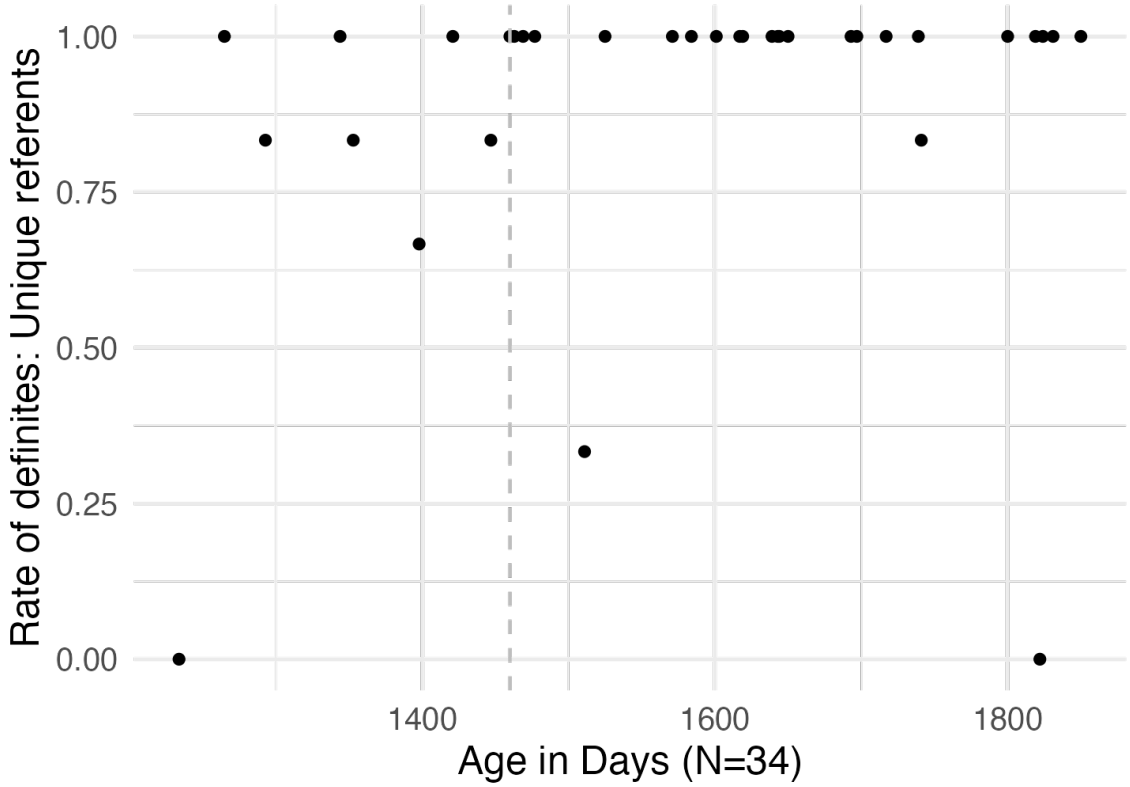

Figure 13. Rate of definites for unique referents by age in days

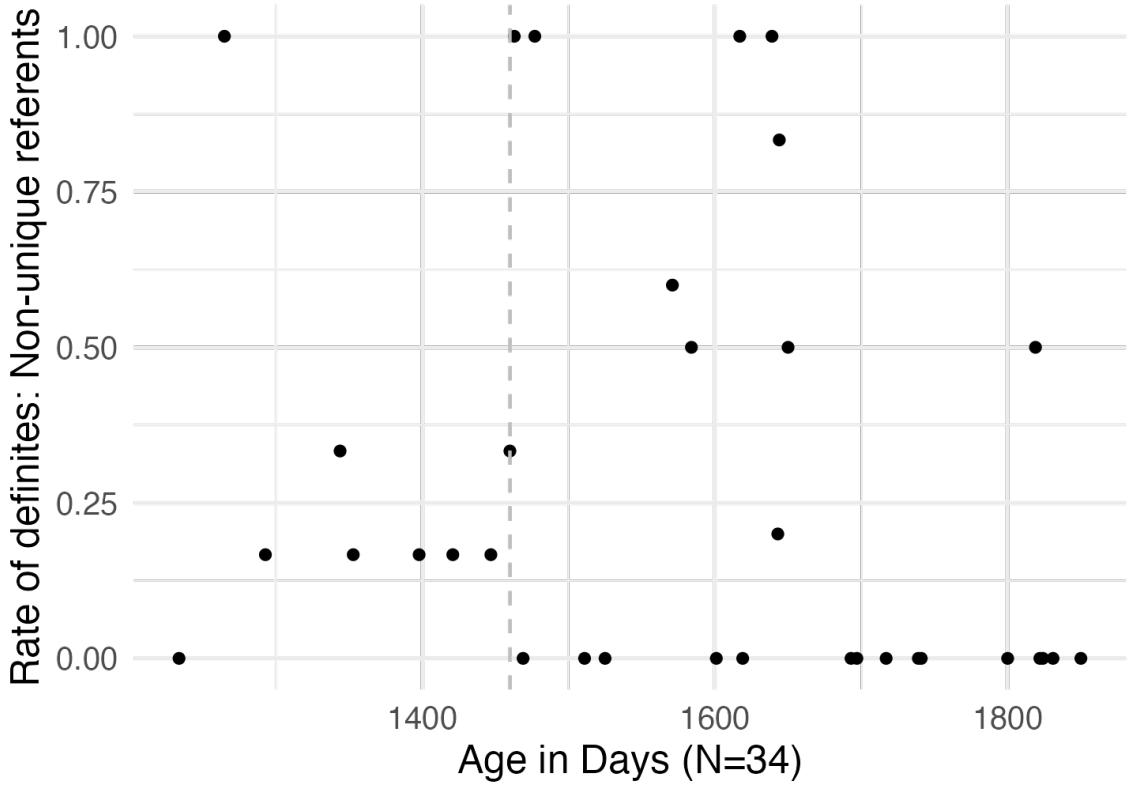

Figure 14. Rate of definites for non-unique referents by age in days

Children's specific responses to Question 1 and 2 confirm that their choice of referring expressions depends on both the type of the question and the uniqueness of the referent. For Question 1 (*What do you see?*) asking children to introduce two unfamiliar referents, they predominantly used singular forms for unique referents but plural forms for non-unique ones (Figure 15).

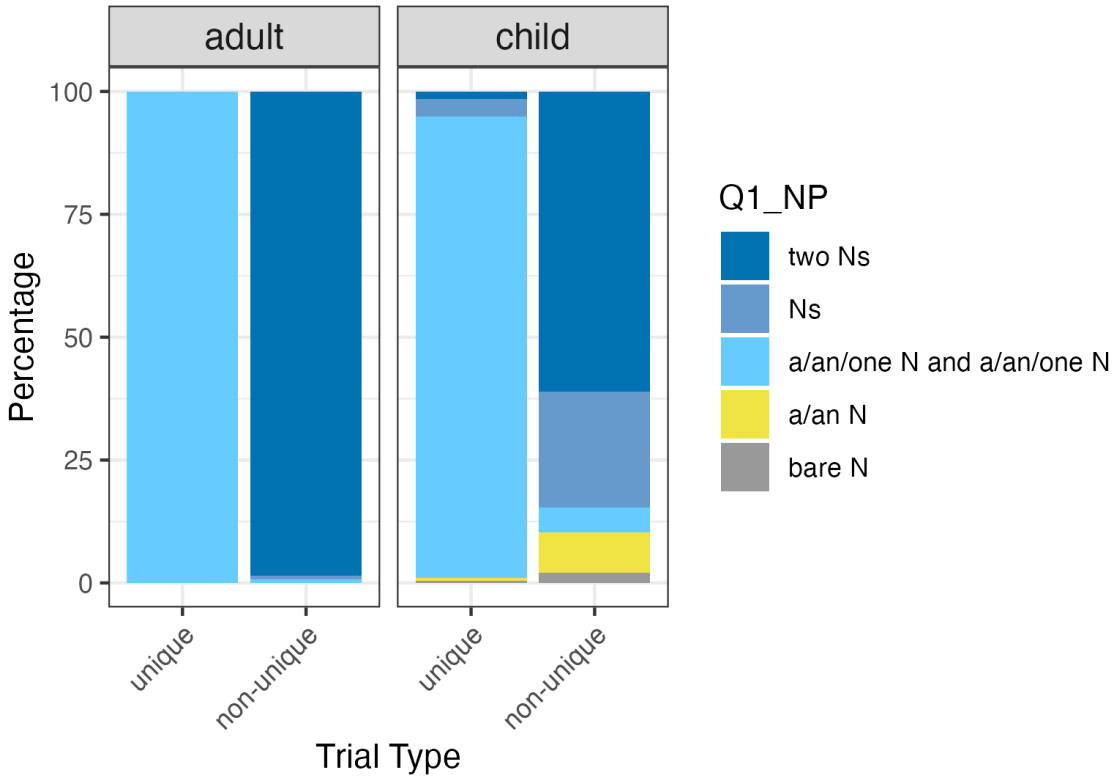

Figure 15. Percentage of NP forms to Question 1 by Group and Trial Type

For Question 2 (*What happened?*) asking children to refer to one of the two referents, children used *the*-definites 82.2% of the time (162 out of 197 utterances) for unique referents. However, this usage dropped to 13.8% (27 out of 195 utterances) for non-unique ones (Figure 16).

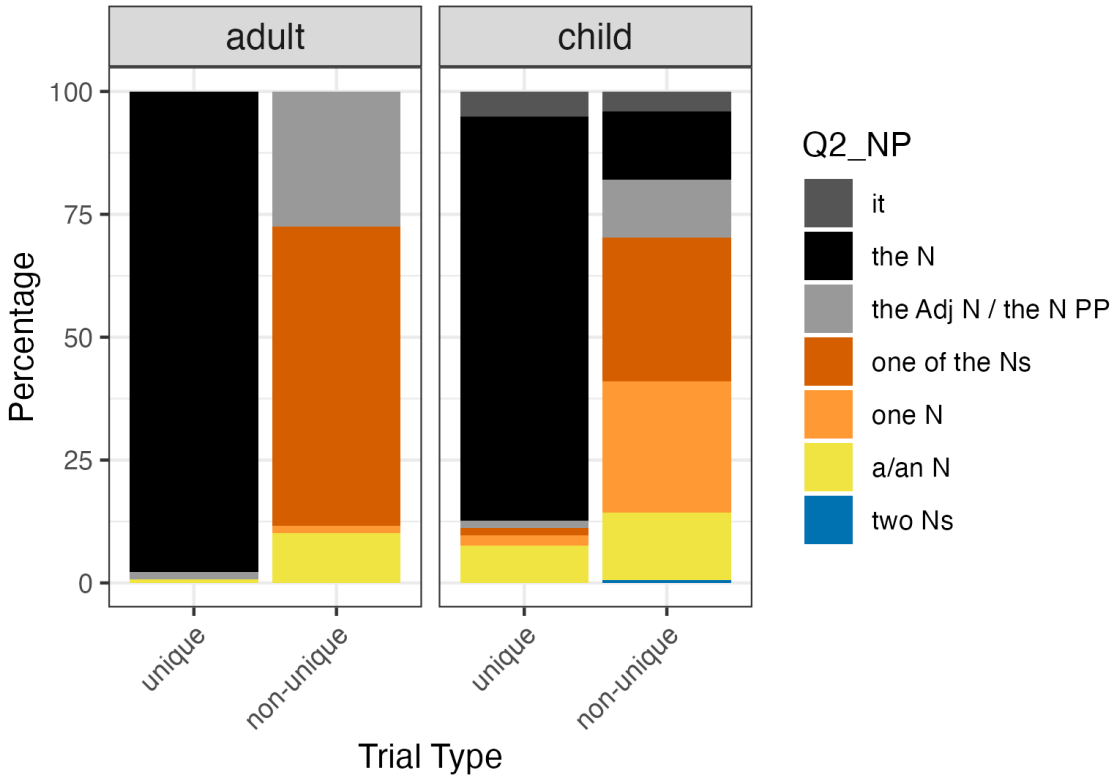

Figure 16. Percentage of NP forms to Question 2 by Group and Trial Type

When we look closer at individual data, systematic misuse of "the N" was limited only to 3 children (out of 34) in the sample (Figure 17).[5] This suggests that most children know that using "the N" is inappropriate to pick out non-unique items.

[5] Unlike other children who produced much fewer errors, these three children showing systematic overuse of *the*-expressions seemed to represent narrower, non-holistic domains of reference. That is, they have restricted the domain to a singular object, as their responses to Question 1 (*What do you see?*) at a scene with two non-unique objects (e.g., *two boxes*) were oftentimes a singular NP (e.g., *a box*) or conjoined NPs (e.g., *a box and a box*). This is consistent with the idea that failure in identifying the target domain maybe responsible for children's overuse of *the*-expressions in prior studies.

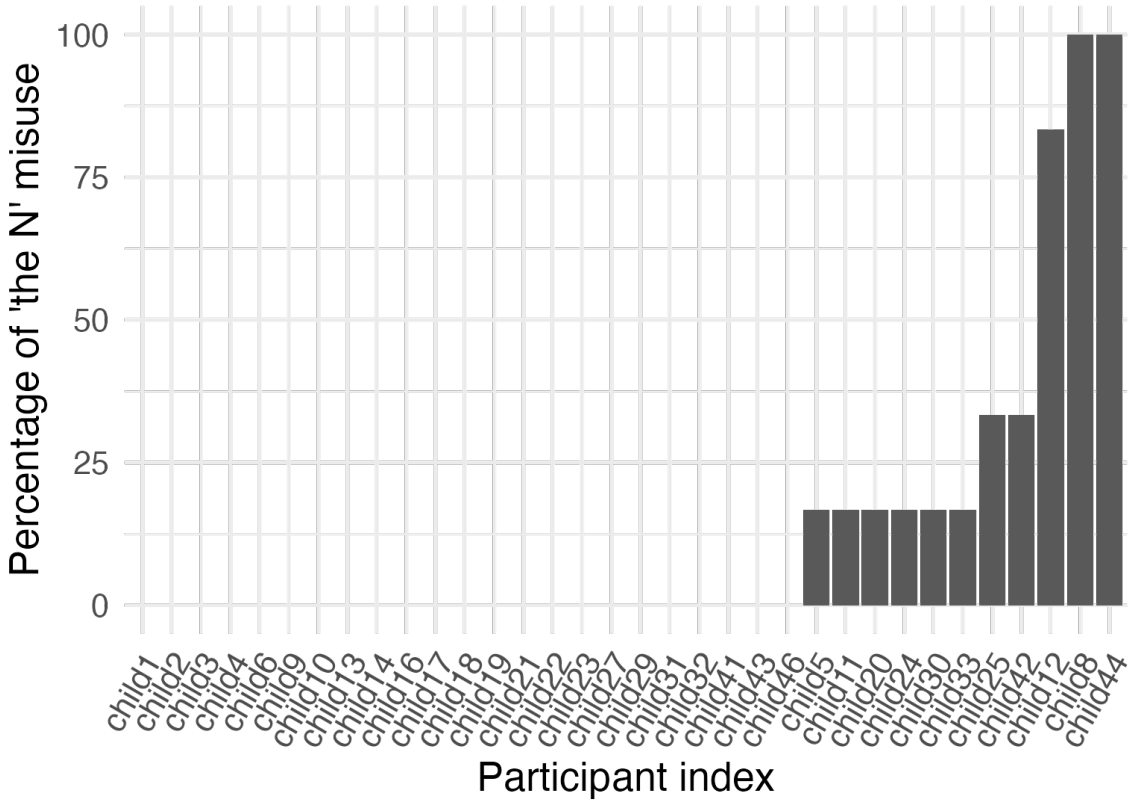

Figure 17. Percentage of misuse of "the N" by individuals for non-unique referents

In sum, our results suggest that like adults, children respect the presuppositions of *the*-expressions and use *the*-definites appropriately in an elicited production task with better controlled setup and domain of reference. They consistently used indefinites to introduce two unfamiliar referents to a conversation, and when referring to one of the two referents, they used *the*-definites only when the intended referent was uniquely identifiable within the domain of reference.

7. Discussion

Our findings across four studies offer converging evidence that children consistently use *the*-definites in an adult-like manner. We found no systematic misuse of singular definites in children's production in either natural or elicited settings, contrary to previous claims about overuse (Emslie & Stevenson, 1981; Maratsos, 1976; Schaeffer & Matthewson, 2005; Schafer &

de Villiers, 2000; van Hout et al., 2010; Warden, 1976; Wexler, 2011). In natural speech, children generally do not use singular definites more frequently than their mothers; instead, their use of definites and indefinites aligns closely with their mothers' across various clause types and syntactic environments. Notably, the rate of miscommunication driven by *the*-definites in child-mother interactions is extremely low, comparable to that observed in adult-adult conversations. Additionally, naïve adults are equally accurate in guessing *the* or *a* used by children and their mothers, given snippets of mother-child conversations. Moreover, in an elicited production task with a better controlled setup and domain of reference, even 3- and 4-year-olds behave adult-like in producing referring expressions, using *the*-definites only when the intended referent was uniquely identifiable within the domain of reference.

Our findings caution against over-interpreting production errors observed in children as evidence of flawed knowledge. When comparing the rates of misusing *the*-expressions in our study to those in the literature, we found that our rates of misuse were the lowest both for unfamiliar referents (Figure 18) and for non-unique referents (Figure 19).

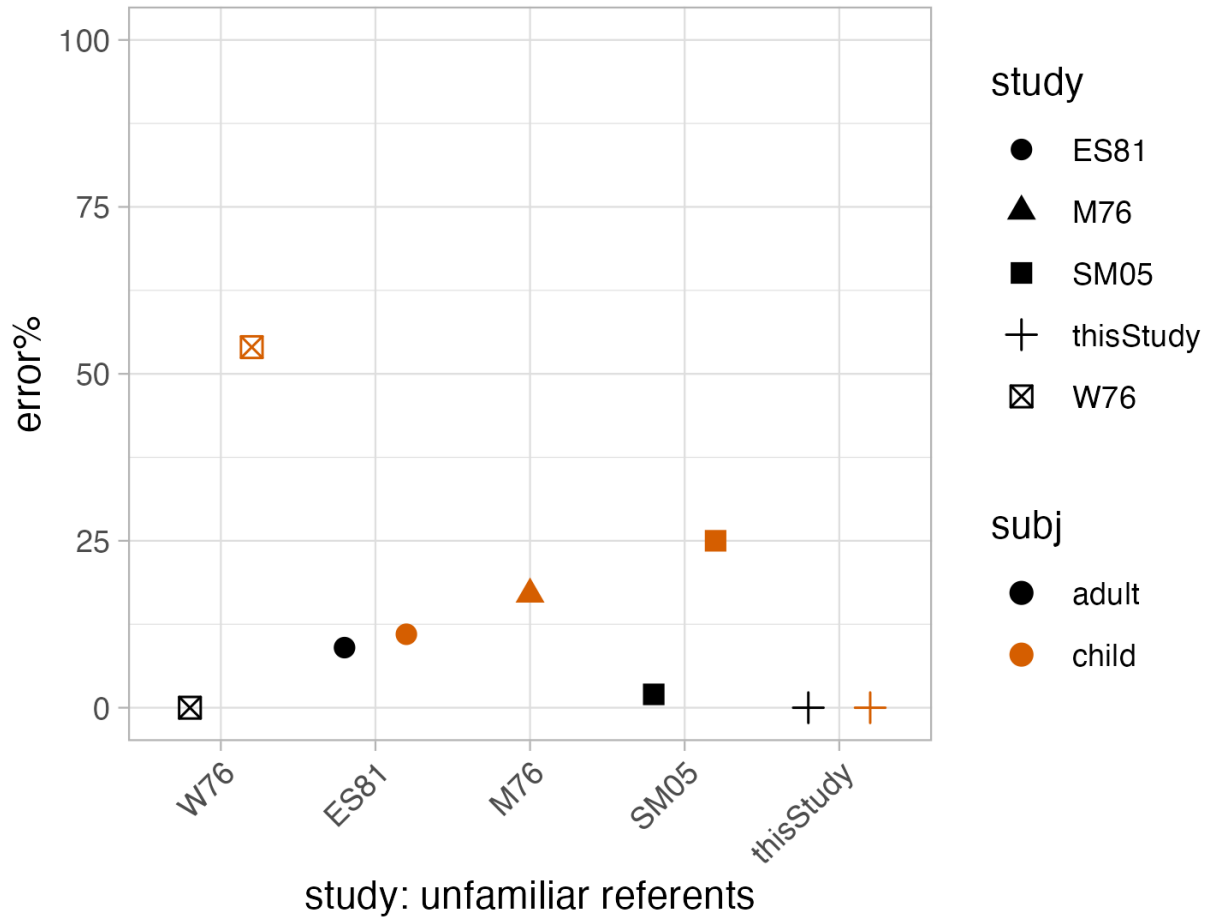

Figure 18. Percentages of "the N" errors across studies for unfamiliar referents

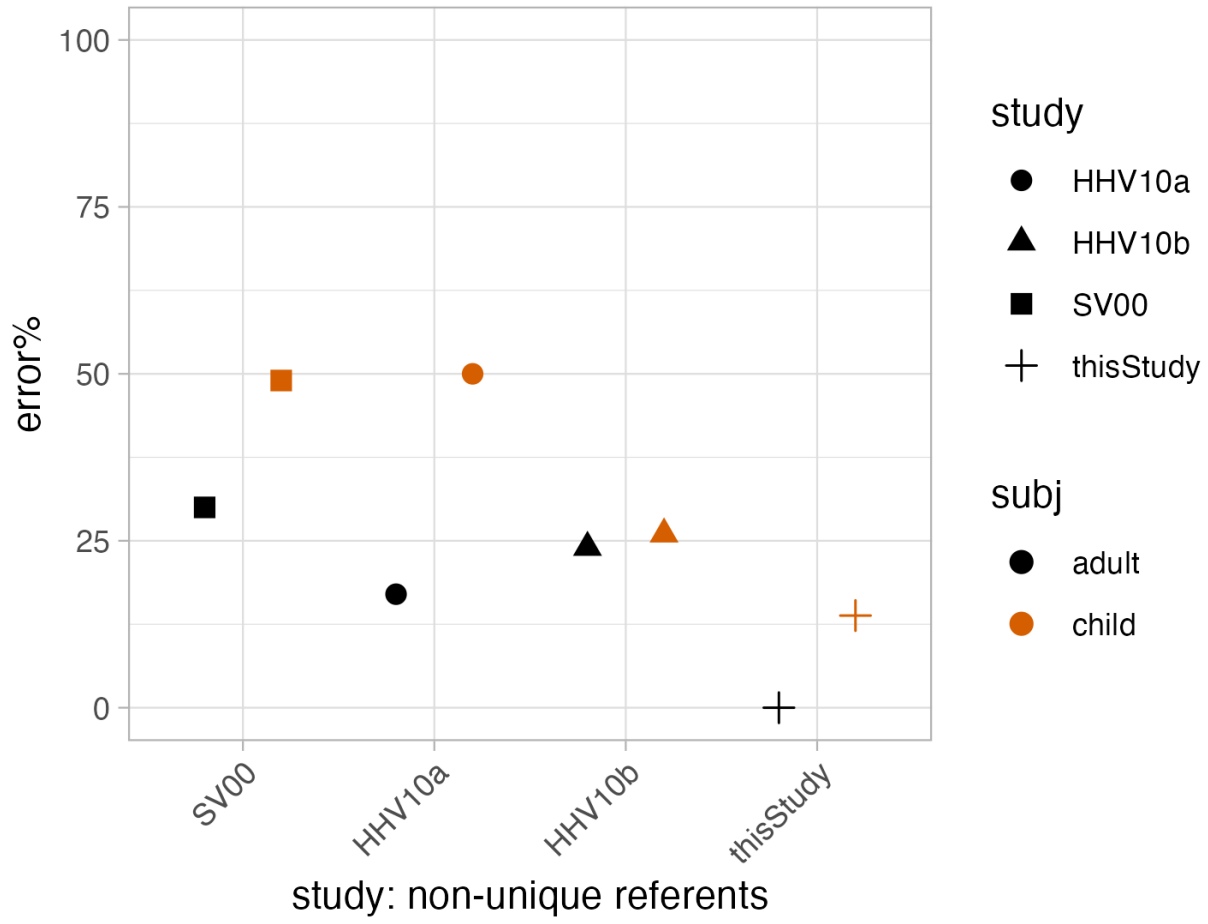

Figure 19. Percentages of "the N" errors across studies for non-unique referents

Previous research has often attributed children's misuse of singular definites across studies to systematic immaturity, suggesting that children are egocentric (Karmiloff-Smith, 1979; Maratsos, 1976), linguistically immature (Matthewson et al., 2001; Schafer & de Villiers, 2000; van Hout et al., 2010; Wexler, 2011), or pragmatically incompetent to differentiate between interlocutors' knowledge states or to integrate shared knowledge into their use of referring expressions (Schaeffer & Matthewson, 2005). However, what has been largely overlooked is the influence of task demands, which might have caused children to behave differently than they would in more natural setups and even led to variable performance in adult control groups. Precise methodologies are crucial in uncovering young learners' linguistic competence.

We propose two key factors that likely contributed to children's overuse of singular *the*-expressions reported in the literature: 1) unnatural setups for perspective-taking, and 2) unclear domains of reference.

Regarding unnatural setups, many prior tasks did not provide children with clear motivations for perspective-taking. For instance, storytelling tasks (Emslie & Stevenson, 1981; Warden, 1976) are not suited for perspective-taking. Children's primary goal is to narrate the story, while the listener's role is minimal, offering little reason for the child to engage in perspective-taking. Similarly, story completion (Maratsos, 1976) does not pass as a natural task for perspective-taking. The experimenter often leaves the last bit of a story for a child to complete, creating an abrupt and unnatural shift from the role of a storyteller to that of a listener for the experimenter. To motivate perspective-taking, our task creates a natural setup, where visual perspective-taking is a clear component of the task, and where speaker-hearer roles are clearly defined and consistent. With the setup controlled for, we show that even 3-year-olds take the perspective of the listener in choosing determiners.

Unclear domains of reference also lead to higher rates of misuse. In some tasks, the intended referent is highlighted visually (e.g., through touching in Karmiloff-Smith, 1979) or through discourse (e.g., Schafer & de Villiers, 2000), which can lead children to narrow the domain of reference to a singular referent, boosting their use of *the*-expressions. Additionally, unclear domains of reference may also arise in tasks that require children to track or memorize quantities in a story without visual support (Schafer & de Villiers, 2000), or ones that present a picture with multiple items, making it difficult for children to restrict the target domain for reference (van Hout et al., 2010). To reduce these potential demands on identifying the domain of reference, our task presents a clear and consistent domain of reference, namely the area behind

a wall. Moreover, participants have visual access to the dynamics of just two objects (e.g., two boxes) within that domain, which greatly minimizes their memory load in representing the domain. When we address these concerns about the domain of reference, our results suggest that like adults, 3- to 4-year-olds consider the unique identifiability of the intended referent in producing *the*-expressions.

When considered more broadly, our findings suggest that while children have the necessary pragmatic skills, they are prone to production errors when a task lacks key elements of genuine communication. This aligns with a recent study which found that children could adjust the informativeness of their event descriptions to what their listener could see, but only when both the child and the listener were actively engaged in a collaborative game (Grigoroglou & Papafragou, 2019). In less interactive contexts – where there is no clear addressee or motivation to be a cooperative speaker – children might be less inclined to adjust their referring expressions to the listener's needs, as the fine-tuning of referential forms requires additional effort.

Our research also provides new insights into how abstract meanings develop in children, particularly in relation to their cognitive abilities. Children's knowledge of "the" grows fast. By 11 months, they have perceived the forms of determiners (Shi et al., 2006); a few months later, they use them to categorize novel nouns (Mintz, 2006); by 19 months, they have learned to use speaker knowledge to restrict the domain of reference (Choi et al., 2018). Our work adds another piece to the puzzle, showing that children demonstrate adult-like usage patterns in early production. They are capable of considering the knowledge state of their listeners and adapting their referential choices accordingly across various contexts. Unlike previous studies that report frequent misuse of singular *the*-expressions by children, we observed a very low incidence of such misuse in our production study. Even when examining individual data, these errors were

confined to very few participants. This suggests that the pragmatic competence required to navigate presuppositions of *the*-definites, often subtle and backgrounded, is present from an early age for most children. This also aligns with other research indicating children's early ability to engage in perspective-taking, both in non-linguistic (Luo & Baillargeon, 2007) and linguistic contexts (Saylor & Ganea, 2007).

Taken together, our work provides consistent evidence that children produce singular *the*-expressions in an adult-like manner, both in natural and elicited speech. To do so successfully, they must assess the knowledge states of their listeners and select an appropriate referential form for listeners to identify the intended referent within a specific context. By creating a natural setup and a clear domain of reference, we find that even 3- to 4-year-old children demonstrate an adult-like understanding of *the*-definites. This implies, contrary to prior overuse claims in the literature, that we have little reason to believe that children have the wrong meanings for *the*-expressions or lack the pragmatic capacity to use it properly.

References

Abrusán, M. (2011). Predicting the presuppositions of soft triggers. *Linguistics and Philosophy*, *34*(6), 491–535. https://doi.org/10.1007/s10988-012-9108-y

Aravind, A., Fox, D., & Hackl, M. (2023). Principles of presupposition in development. *Linguistics and Philosophy*, *46*(2), 291–332. https://doi.org/10.1007/s10988-022-09364-z

Brezack, N., Meyer, M., & Woodward, A. L. (2021). Three-year-olds' Perspective-taking in Social Interactions: Relations with Socio-cognitive Skills. *Journal of Cognition and Development*, *22*(4), 537–560. https://doi.org/10.1080/15248372.2021.1901713

Brown, R. (1973). *A first language: The early stages*. Harvard University Press.

Choi, Y. jung, Song, H. joo, & Luo, Y. (2018). Infants' understanding of the definite/indefinite article in a third-party communicative situation. *Cognition*, *175*, 69–76. https://doi.org/10.1016/j.cognition.2018.02.006

De Cat, C. (2013). Egocentric definiteness errors and perspective evaluation in preschool children. *Journal of Pragmatics*, *56*(1), 58–69. https://doi.org/10.1016/j.pragma.2012.08.002

Dieuleveut, A., van Dooren, A., Cournane, A., & Hacquard, V. (2022). Finding the force: How children discern possibility and necessity modals. *Natural Language Semantics*, *30*(3), 269–310. https://doi.org/10.1007/s11050-022-09196-4

Emslie, H. C., & Stevenson, R. J. (1981). Developmental Aspects of Communication: Young Children's Use of Referring Expressions. In P. Werth (Ed.), *Conversation and Discourse: Structure and Interpretation*. St. Martins Press.

Gillette, J., Gleitman, H., Gleitman, L., & Lederer, A. (1999). Human simulations of vocabulary learning. *Cognition*, *73*(2), 135–176.

Grigoroglou, M., & Papafragou, A. (2019). Interactive contexts increase informativeness in children's referential communication. *Developmental Psychology*, *55*(5), 951–966. https://doi.org/10.1037/dev0000693

Gundel, J. K., Hedberg, N., & Zacharski, R. (1993). Cognitive Status and the Form of Referring Expressions in Discourse. In *Source: Language* (Vol. 69, Issue 2, pp. 274–307).

Heim, I. R. (1982). *The semantics of definite and indefinite noun phrases* [PhD Thesis]. University of Massachusetts Amherst.

Hyams, N. (1996). The underspecification of functional categories in early grammar. In H. Clahsen (Ed.), *Generative perspectives on language acquisition* (pp. 91–128). John Benjamins Publishing Company.

Karmiloff-Smith, A. (1979). *A functional approach to child language: A study of determiners and reference*. Cambridge University Press.

Kingsbury, P., Strassel, S., McLemore, C., & McIntyre, R. (1997). CALLHOME American English transcripts, LDC97T14. *Philadelphia: Linguistic Data Consortium*.

Luo, Y., & Baillargeon, R. (2007). Do 12.5-month-old infants consider what objects others can see when interpreting their actions? *Cognition*, *105*(3), 489–512. https://doi.org/10.1016/j.cognition.2006.10.007

Maratsos, M. P. (1974). Preschool children's use of definite and indefinite articles. *Child Development*, *45*(2), 446–455.

Maratsos, M. P. (1976). *The use of definite and indefinite reference in young children: An experimental study of semantic acquisition*. Cambridge University Press.

Matthewson, L., Bryant, T., & Roeper, T. (2001). A Salish stage in the acquisition of English determiners: Unfamiliar `definites'. *University of Massachusetts Occasional Papers in Linguistics*, *27*(1), 9.

Mintz, T. H. (2006). Finding the verbs: Distributional cues to categories available to young learners. *Action Meets Word: How Children Learn Verbs*, *31*, 63.

Moll, H., Richter, N., Carpenter, M., & Tomasello, M. (2008). Fourteen-month-olds know what "we" have shared in a special way. *Infancy*, *13*(1), 90–101.

Neale, S. (2004). This, that, and the other. In M. Reimer & A. Bezuidenhout (Eds.), *Descriptions and Beyond* (pp. 68–188). Oxford University Press.

Prince, E. F. (1992). The ZPG letter: Subjects, definiteness, and information-status. In W. C. Mann & S. A. Thompson (Eds.), *Discourse descriptions: Diverse linguistic analyses of a fund-raising text* (pp. 295–325). John Benjamins.

Roberts, C. (2003). Uniqueness in definite noun phrases. *Linguistics and Philosophy*, *26*, 287–350.

Russell, B. (1905). On denoting. *Mind*, *14*(56), 479–493.

Saylor, M. M., & Ganea, P. (2007). Infants interpret ambiguous requests for absent objects. *Developmental Psychology*, *43*(3), 696–704. https://doi.org/10.1037/0012-1649.43.3.696

Schaeffer, J., & Matthewson, L. (2005). Grammar and pragmatics in the acquisition of article systems. *Natural Language & Linguistic Theory*, *23*(1), 53–101.

Schafer, R., & de Villiers, J. G. (2000). Imagining articles: What *a* and *the* can tell us about the emergence of DP. In S. C. Howell, S. A. Fish, & T. Keith-Lucas (Eds.), *Proceedings of the 24th annual Boston University conference on language development* (Vol. 2, pp. 609–620). Cascadilla Press.

Shi, R., Cutler, A., Werker, J., & Cruickshank, M. (2006). Frequency and form as determinants of functor sensitivity in English-acquiring infants. *The Journal of the Acoustical Society of America*, *119*(6), EL61–EL67.

Soderstrom, M., Blossom, M., Foygel, R., & Morgan, J. L. (2008). Acoustical cues and grammatical units in speech to two preverbal infants. *Journal of Child Language*, *35*(4), 869–902.

Strawson, P. F. (1950). On Referring. In *New Series* (Vol. 59, Issue 235, pp. 320–344).

Suppes, P. (1974). The semantics of children's language. *American Psychologist*, *29*(2), 103–114.

Syrett, K., Kennedy, C., & Lidz, J. (2010). Meaning and context in children's understanding of gradable adjectives. *Journal of Semantics*, *27*(1), 1–35.

Valian, V. (1991). Syntactic subjects in the early speech of American and Italian children. *Cognition*, *40*(1–2), 21–81.

van Hout, A., Harrigan, K., & de Villiers, J. (2010). Asymmetries in the acquisition of definite and indefinite NPs. *Lingua*, *120*(8), 1973–1990. https://doi.org/10.1016/j.lingua.2010.02.006

Warden, D. A. (1976). The influence of context on children's use of identifying expressions and references. *British Journal of Psychology*, *67*(1), 101–112. https://doi.org/10.1111/j.2044-8295.1976.tb01501.x

Wexler, K. (2011). Cues don't explain learning: Maximal trouble in the determiner system. In E. Gibson & N. J. Pearlmutter (Eds.), *The processing and acquisition of reference* (pp. 15–42). MIT Press.

Zehr, J., & Schwarz, F. (2018). *PennController for internet based experiments (IBEX)*.