

Children Compute More Ad-Hoc Implicatures from *a* than *the*: On the Interaction of Definiteness and Ad-Hoc Implicatures

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1. Introduction

Utterances are interpreted in light of competing alternatives that could have been said but were not. If a speaker utters a sentence when a stronger, more informative alternative could have been used instead, listeners typically infer that the more informative alternative is false. Such inferences are called quantity implicatures (Grice 1975, Horn 1972, Levinson 2000). This paper investigates children's ability to generate a certain type of quantity implicature, the contextual or "ad-hoc" implicature (Grice 1975, Hirschberg 1991). Unlike "scalar implicatures," which are quantity implicatures where the alternative propositions are generated by replacing certain lexical items with their scalemates (Horn 1972), in the case of ad-hoc implicatures, the alternative propositions are provided by the context. Consider an example from Stiller et al. (2015). Without a specific background context, saying *My friend has glasses* doesn't imply anything about what my friend *doesn't* have – this utterance can be true if my friend also has a hat or a book. However, in a context where there is a person with glasses and a hat and a person with only glasses, the utterance *My friend has glasses* seems to imply that the referent of *my friend* is the person with only glasses and no hat. Here, listeners seem to infer that *My friend has glasses and a hat* is false by virtue of it being an unmentioned but more informative alternative.

This paper investigates 4- and 5-year-old English-speaking children's generation of ad-hoc implicatures in contexts where a more informative, conjoined alternative is salient. Specifically, we are interested in how children interpret sentences such as (1a) and (1b) when uttered in situations like those depicted in Figure 1.

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- (1) a. Mary bought a striped sweater.
b. Mary bought the striped sweater.

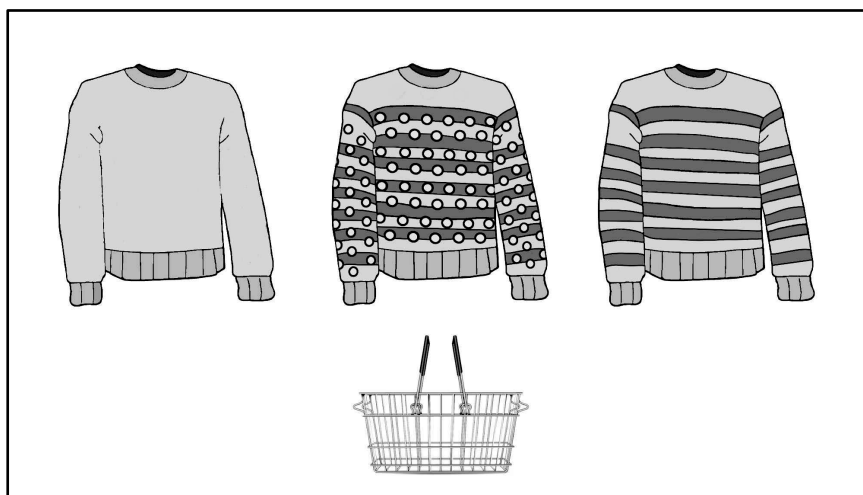


Figure 1: Mary went shopping. The shopping basket underneath a sweater indicated which sweater she bought. In this case, Mary bought the middle sweater, which is both striped and spotted (in contrast to the sweater on the right, which is only striped).

Figure 1 displays a context where two sweaters could be considered striped, although one sweater might best be described as striped *and* spotted. When Mary has bought the sweater that is both striped and spotted, intuitively (1a) seems to be a more acceptable description than (1b), an intuition that has been experimentally supported by data from English-speaking adults (Eliatamby & Tieu 2025a,b).

Given standard recipes for generating ad-hoc implicatures, this asymmetry in acceptability is unexpected, since both (1a) and (1b) should generate ad-hoc implicatures that lead to the inference that Mary bought a/the sweater that has only stripes. To see why, consider that because in the given context there are two sweaters that could technically be considered striped, uttering (1a) or (1b) should lead to computing ad-hoc implicatures using the alternatives in (2a) and (2b), respectively:

- (2) a. Mary bought a striped and spotted sweater.
b. Mary bought the striped and spotted sweater.

Negating (2a) and (2b) (i.e., treating them as false) and conjoining the outcomes to (1a) and (1b), respectively, would yield (3a) and (3b):

- (3) a. Mary bought a striped sweater and Mary didn't buy a striped and spotted sweater.
 b. Mary bought the striped sweater and Mary didn't buy the striped and spotted sweater.

Both (3a) and (3b) imply that the sweater Mary bought did not have both stripes and spots, which is incompatible with the situation depicted in Figure 1. That adults find (1a) more acceptable than (1b) therefore suggests that they do not generate ad-hoc implicatures as robustly when the referent is described using an indefinite article compared to when it is described using the definite article. This suggests that specific properties of these articles are blocking or facilitating the generation of ad-hoc implicatures. This in turn suggests that the semantic properties of lexical items have an influence on implicature computation.

Eliatamby & Tieu (2025a,b) propose two possibilities to capture the asymmetry between (1a) and (1b). One is that the uniqueness presupposition of the definite article triggers a "local" implicature (Fox 2007, Chierchia et al. 2012) within the scope of the DP, such that (1b) is ultimately interpreted as *Mary bought the striped and not spotted sweater*. Note that if we consider the sweater with both stripes and spots to be a striped sweater, then in the context shown in Figure 1, the uniqueness presupposition of *the striped sweater* in (1b) is not satisfied, since there are two striped sweaters. However, if the DP in (1b) means something like *the striped and not spotted sweater*, the presupposition of the definite is satisfied. This interpretation can be generated if the LF of (1b) contains an exhaustification operator (EXH) within the scope of the DP (see Mayr 2015). Thus, a local implicature may be triggered in (1b) to satisfy the presupposition of the definite article.

The second possibility is that DPs with the indefinite article recruit competing sets of alternatives that block implicature generation with the conjoined alternative. For example, if *striped* contrasts with *striped and spotted*, then an implicature can be generated which implies that (2a) is false. If, however, *striped* contrasts with *plain*, then there is no stronger alternative with which to generate an implicature, and therefore no implicature involving (2a) can be generated. Which alternative set is salient is plausibly influenced by context, but it might be that the indefinite article also invites one to consider a wider set of contextual alternatives. In the absence of a strong cue to contrast *striped* with *striped and spotted*, adults might be less willing to generate an implicature with the indefinite.

While children are known to have difficulty generating scalar implicatures that involve lexical scales such as *some-all* and *or-and* (Braine & Rumaine 1981, Noveck 2001, Chierchia et al. 2001, Papafragou & Musolino 2003, Gualmini et al. 2001, *inter alia*), children are better able to generate ad-hoc implicatures involving conjoined alternatives (Stiller et al. 2015, Yoon & Frank 2019, Foppolo et al. 2021).

In fact it seems that in some instances, children overgenerate ad-hoc implicatures in comparison to adults (Rees et al. 2023). At the same time, children do not have adult-like interpretations of *the* or *a* (Schafer & de Villiers 2000,

Schaeffer & Matthewson 2005, van Hout et al. 2010, Fuchs et al. 2019), and seem to accept the use of the definite article in situations where adults find its use infelicitous. Consequently, understanding how children interpret sentences such as (1a) and (1b) has the potential to shed light on the underlying representations of definite and indefinite articles and the role of lexical semantics in influencing implicature computation. In this paper, we present the results of a Truth Value Judgement Task (Crain & Thornton 2000) designed to test children's interpretation of such sentences.

The remainder of the paper is structured as follows: in Section 2 we summarize the findings of previous acquisition studies focused on ad-hoc implicatures and the definite and indefinite articles *the* and *a*. In Section 3, we describe a Truth Value Judgment Task designed to test how adult and 4- and 5-year-old English speakers interpret sentences such as (1a) and (1b). In Section 4, we discuss our results and outline some possible explanations for the findings, as well as directions for future research.

2. Previous Studies

2.1. Ad-hoc Implicatures

A large body of research has shown that children have difficulty generating scalar implicatures (Braine & Rumaine 1981, Noveck 2001, Chierchia et al. 2001, Gualmini et al. 2001, Papafragou & Musolino 2003, Barner et al. 2011, Katsos & Bishop 2011, Skordos & Papafragou 2016) that make use of alternatives that are generated by replacing lexical items with another from the same “scale” (Horn 1972). Noveck (2001), for example, found that 7-year-old French-speaking children treated (the French equivalents of) sentences such as *The penguin might be in the box* as an acceptable description of a scenario where conversational participants know the relevant penguin is definitely in the relevant box. Similar findings have been reported for other scales in a variety of languages, including *some-all* (Foppolo et al. 2012, among others), *or-and* (Chierchia et al. 2004, among others), and *start-finish* (Papafragou & Musolino 2003). Across these various studies, children reportedly accept the use of a weaker term in scenarios where the stronger term would be more informative and felicitous.

In contrast, children as young as 2 years have been shown to be capable of generating ad-hoc implicatures, particularly those involving a more informative, conjoined alternative (Stiller et al. 2015, Horowitz et al. 2018, Yoon & Frank 2019, Foppolo et al. 2021). For example, Horowitz et al. (2018) found that in a referent selection task, 4-year-olds interpreted *On the cover of my book, there are cats* to mean that the cover of the speaker's book has only cats, and not parrots. Here, children have inferred that the more informative, unsaid alternative *On the cover of my books, there are cats and parrots* is false, which leads them to infer that the intended referent is the book with only cats. Similarly, Yoon & Frank (2019) asked children between 2 and 5 years of age to choose the best referent for sentences such as *Elmo's lunchbox has an apple*. Even the 2-year-olds chose a lunchbox with only an apple, instead of a lunchbox with both an apple and an

orange, as the referent. Children even seem to overgenerate ad-hoc implicatures in comparison to adults. Rees et al. (2023) found that unlike adults, 4- and 5-year-olds do not think that a sentence such as *There is an octopus* is an adequate description of a scene with both an octopus and a duck.

Studies investigating children's generation of ad-hoc implicatures have not specifically focused on the role of definiteness, although both definite and indefinite DPs have been used in the relevant experiments. Stiller et al. (2015) tested utterances containing a definite DP, e.g., *My friend has glasses*. Foppolo et al. (2021) tested utterances containing an indefinite DP, e.g., *On my bed there is a teddy bear*. Horowitz et al. (2018), Yoon & Frank (2019), and Rees et al. (2023) also used utterances containing indefinite DPs, as described above.

It is worth noting that all of these studies used some version of a referent/picture selection task, which by virtue of being a preferential task, might not reveal all the subtleties of children's interpretations. For adult participants, Eliatamby & Tieu (2025a) found that while there is an asymmetry in how (1a) and (1b) are interpreted in a Truth Value Judgment Task – where participants have to assess a speaker's use of (1a)/(1b) as right or wrong in a context such as Figure 1 – this difference collapses in a referent selection task. When adult participants were asked to choose the sweater that best matches the sentences in (1a) and (1b), participants chose the sweater with only stripes at similar rates for both sentences. If such task-specific effects extend to children, the use of referent selection tasks may in fact mask subtle construction-specific differences in how children generate ad-hoc implicatures. The Truth Value Judgment paradigm might provide more fine-grained insights into the factors that affect children's generation of ad-hoc implicatures.

2.2. The Definite and Indefinite Articles

A number of studies have shown that 4- and 5-year-olds have a non-adult-like understanding of both definite and indefinite articles (Maratsos 1974, Schafer & de Villiers 2000, Schaeffer & Matthewson 2005, van Hout et al. 2010, Fuchs et al. 2019). Of most relevance to our study is the overuse or over-acceptance of the definite article in situations where it does not pick out a unique referent. Maratsos (1974) used an elicitation task to investigate whether English-speaking 3- and 4-year-olds could distinguish specific and non-specific reference, and whether they could take into account the referential knowledge of the listener. He found that 4-year-olds “egocentrically” overproduced definite noun phrases in contexts where an indefinite noun phrase would have been appropriate, suggesting they have difficulty tracking their listener's referential knowledge.

As another example, Schafer & de Villiers (2000) asked children questions such as the one in (4).

- (4) Three ducks and two dogs were walking over a bridge. One of the animals fell off and said, “Quack!” What was it?

Between 41% and 64% of 4- to 5-year-olds responded with *the duck*, even though multiple ducks were introduced in the discourse.

Experiment 2 from van Hout et al. (2010) tested English-speaking 3- to 5-year-olds' understanding of the familiarity feature of the definite. Children were first shown a picture of a dad giving a baby a balloon, while another man off to the side holds a bunch of balloons. The children were then told: *The Dad gave the baby a balloon*. In a second picture, one balloon held by the man off to the side flew away. Children were then asked: *Did the balloon fly away?* Children responded *yes* 80% of the time. While this is more directly a test of the familiarity property of the definite article, it suggests that children are willing to accept or use the definite article in situations where there is a salient referent present in the context, or one that has been mentioned in the discourse. If the uniqueness presupposition of the definite is what is driving adults' rejection of (1b), we might expect that children, in contrast, are more willing to accept (1b).

Children also do not seem to have an entirely adult-like mastery of the indefinite article, although previous studies have focused on the newness property of the indefinite article. For example, Schafer & de Villiers (2000) asked children questions such as (5).

- (5) Emily has two pets, a frog and a horse. She wanted to ride one of them, and so she put a saddle on it. Guess which. / What was it?

Up to around 30% of the time, 4- and 5-year-olds responded with the indefinite *a horse*, suggesting they didn't always associate the indefinite with unfamiliar referents.

Fuchs et al. (2019) presented children with pictures of two animals of the same type, and a man pointing at one of them. One of the animals would be sitting, and the other would be running. In one type of trial, the man was pointing at a sitting cat, and children heard: *Tom is pointing at a cat. Is a cat running away?* 4- and 5-year-olds responded *yes* only 26% to 40% of the time, in contrast to adults, who accepted 87% of the time. While the familiarity/newness distinction does not play a central role in our study, children's non-adult-like behavior in these previous studies suggests that properties of both the definite and indefinite article are still being acquired at ages 4 and 5.

3. The Current Study

Previous studies have revealed that 4- and 5-year-olds are capable of generating ad-hoc implicatures, but also that their semantic understanding of both the definite and indefinite articles seems to be non-adult-like. In this study, we examine children's interpretation of sentences such as (1a) and (1b) in contexts like Figure 1, to probe how ad-hoc implicatures interact with the semantic properties of these determiners.

3.1. Participants

Thirty-nine English-speaking children (3;10–5;09, $M=4;09$) and 60 adult controls participated in the experiment. Child participants had English as a first language (as reported by their parents) and were attending a primary school in Toronto, Canada. Adult participants were recruited through Prolific (<https://www.prolific.com/>) and were self-reported English native speakers located in Canada, the USA, or the UK. Definiteness (whether the target sentences contained definite or indefinite descriptions) was a between-subject variable, and participants were randomly assigned to the two conditions (children: 20 definite, 19 indefinite; adults: 30 definite, 30 indefinite).

Only those participants who displayed at least 75% accuracy on the control and filler trials were included in the analysis.

3.2. Procedure

Participants completed a Truth Value Judgment Task (Crain & Thornton 2000), where they had to assess whether a puppet's descriptions of depicted scenarios were right or wrong. Upon beginning the session, participants were given a back story about characters who were shopping at the store. For each trial, they first saw a picture containing three items with a shopping basket indicating which of the three objects was purchased. They then watched a pre-recorded video of a puppet describing what the character had purchased. Child participants had to tell the experimenter whether the puppet was right or wrong. Adult participants, who completed the Qualtrics survey remotely (with no researcher intervention) had to indicate whether the puppet was right or wrong by clicking on 'Yes' and 'No' buttons. Child participants were periodically asked for justifications when they said the puppet was wrong.

3.3. Materials

Each trial contained pictures of three everyday items (e.g., sweaters, dresses, bags, etc.), with a picture of a shopping basket underneath one of the items. For target and control trials, each picture contained the same type of item, one of which could be described as plain, one of which had one salient property (e.g., striped, spotted, rainbow-colored), and one of which had two salient properties (e.g., striped and spotted, striped and rainbow-colored). The two-property item always shared a property with the one-property item (for example, Figure 1 contains a *striped* sweater and a *striped and spotted* sweater). A bunny puppet appeared via pre-recorded videos to provide descriptions of the pictures, using a sentence such as *Mary bought a/the striped sweater*. Participants in the definite condition heard definite descriptions (e.g., *the striped sweater*) while participants in the indefinite condition heard indefinite descriptions (e.g., *a striped sweater*).

Participants received six critical 1-adjective targets, in which the puppet's description contained one adjective, while the shopping basket appeared

underneath the item that had the mentioned property plus one other one (as in the example in Figure 1). Participants were expected to reject these sentences if they generated an ad-hoc implicature.

In addition to the six critical targets, participants also received 12 unambiguous controls and four unambiguous fillers. Participants received two clearly true and two clearly false 1-adjective control trials, in which the puppet's description contained one adjective, and clearly matched the purchased item (e.g., the purchased sweater had only stripes) or mismatched the purchased item (e.g., the purchased sweater was plain, or had both stripes and spots). Participants also received two clearly true and two clearly false 2-adjective control trials in which the puppet's description contained two adjectives, which clearly matched (e.g., the purchased sweater had both stripes and spots) or mismatched (e.g., the purchased sweater was plain, or only had spots but not stripes) the purchased item. Participants also received two clearly true and two clearly false plain control trials in which the participant's description mentioned the plain item (e.g., *a/the plain sweater*), and what was bought was either plain (true target) or had one or two unmentioned properties (false target). Finally, the two true and two false fillers contained three distinct items (e.g., a doll, a car, and a book), and the puppet's description either matched or mismatched the item that was purchased.

In total, each participant received two training trials, six critical target trials, and 16 unambiguously true/false controls and fillers. The experimental trials were presented in two blocks, with trials completely randomized within each block. The first block contained the critical target trials, plain controls, false 1-adjective controls, and fillers; the second block contained the true and false 2-adjective controls, which corresponded to the stronger alternative that would be used to generate an ad-hoc implicature, and the true 1-adjective trials, which matched the strengthened interpretation. This block design was implemented in order to prevent priming of the stronger alternative and priming of the strengthened representation that would be the result of generating the implicature (see Rees et al. 2023).

3.4. Results

All 39 children and 54 of the 60 adults (28 definite, 26 indefinite) scored at least 75% accuracy on control and filler trials and were included in the analysis. For these participants, accuracy was above 91% across all unambiguous control and filler types (see Figure 2).

Performance on the critical targets is displayed in Figure 3. In response to these critical 1-adjective trials, adults and children displayed opposing behavioral patterns. Recall that rejection of a target trial implies that an ad-hoc implicature was computed. Adults rejected sentences containing the definite article (e.g., *Mary bought the striped sweater*) more frequently than sentences containing the indefinite article (e.g., *Mary bought a striped sweater*) (definite: $M=68\%$, $SD=40\%$; indefinite: $M=32\%$, $SD=38\%$). Children, on the other hand, rejected sentences with the indefinite more frequently than sentences with the definite (definite: $M=47\%$, $SD=36\%$, indefinite: $M=72\%$, $SD=29\%$).

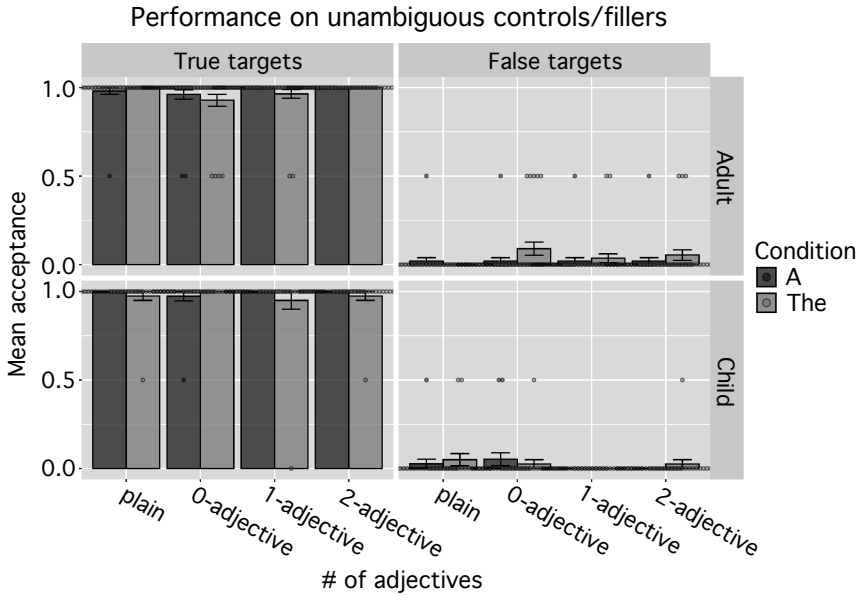


Figure 2: Mean rate of *yes* responses on unambiguous control and filler trials, across conditions and groups. Dots represent individual participant means.

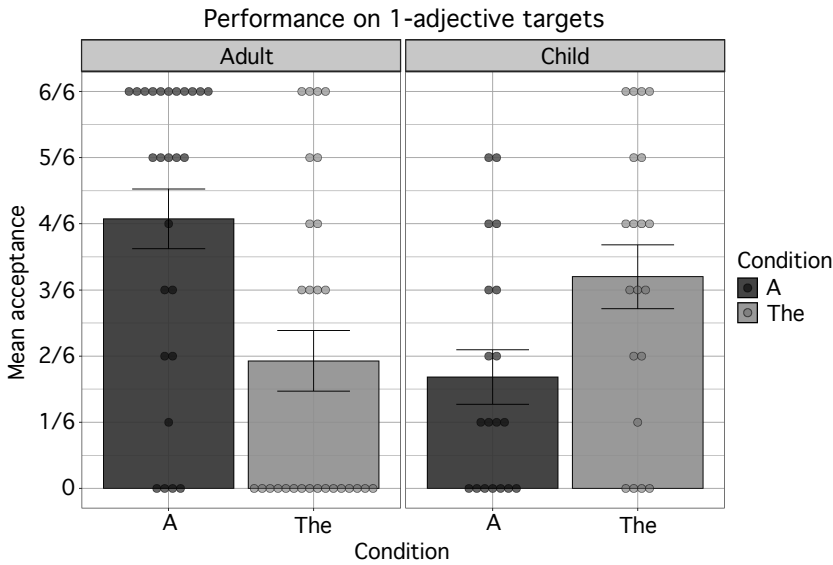


Figure 3: Mean proportion of *yes* responses on critical target trials, across conditions and groups. Dots represent individual participant means.

To statistically test this interaction, we fit mixed-effect logistic regressions using the *glmer* package in R (Bates et al. 2015, R Core Team 2025), using backwards elimination to find the best model. Our maximal model fit participants' responses as a function of determiner type (definite vs. indefinite), age group (child vs. adult), and their interaction, as fixed effects. Participant ID and Item Number were fit as random intercepts. Removing the interaction variable led to a significantly worse model fit ($\chi^2(1)=17$, $p<.0001$) and higher AIC (528.64 vs. 513.64) and BIC (518.64 vs. 501.64) scores, providing evidence that the maximal model was superior to the model without the interaction.

FDR-adjusted pairwise comparisons showed that children were significantly more likely to reject indefinite sentences than adults ($\beta=4.23$, $p=.002$), while adults were significantly more likely to reject definite sentences than children ($\beta=2.6$, $p=.04$). Comparing determiners within each group, children were more likely to reject indefinite sentences than definite sentences ($\beta=2.51$, $p=.04$), and adults were more likely to reject definite sentences than indefinite sentences ($\beta=4.33$, $p=.002$).

4. Discussion

Children and adults show opposite patterns of behavior in their interpretation of sentences such as (1a) and (1b). Children appear to generate *more* ad-hoc implicatures than adults from sentences containing indefinite descriptions (1a), while they generate *fewer* implicatures than adults from sentences containing definite descriptions (1b). The findings raise two puzzles: why do children compute more ad-hoc implicatures from indefinite descriptions compared to definite descriptions, and why do children seem to compute more ad-hoc implicatures for indefinite descriptions compared to adults?

4.1. The Definite/Indefinite Asymmetry

With respect to the definite article, one possibility is that children treat *the* as ambiguous between definite and demonstrative interpretations. Note that in a context such as the one depicted in Figure 1, a sentence such as *Mary bought that striped sweater* seems both acceptable and true, suggesting that the demonstrative noun phrase does not generate an implicature. This would be consistent with previous studies on children's interpretation of the definite article, where it appears that they ignore its uniqueness presupposition and accept its use if there is some matching referent (Schafer & de Villiers 2000, van Hout et al. 2010). Anecdotally, upon hearing *the*-NP, children seemed to fixate on, for example, the sweater with a basket underneath it (whereas for *a*-NP, they seemed to compare the two striped sweaters). This raises the possibility that children might treat *the*-NP deictically, with the shopping basket functioning as a kind of pointing gesture. This would generate an interpretation akin to: *Mary bought that striped sweater*, which would be true in the critical contexts. If *a* does not allow for this "demonstrative" interpretation, this could explain why children accepted *the* more than *a*.

The lack of the implicature with the demonstrative reading may be because of the “zoom-in” properties of demonstratives, where in contexts that have many potential referents, the situation of evaluation is restricted such that uniqueness is satisfied (Wolter 2006). For example, in a shop with multiple striped sweaters, saying *Mary bought that striped sweater* accompanied by a pointing gesture allows a speaker to pick out one particular sweater, possibly one that is striped and spotted. In such a case, an implicature would not be generated because an implicature cannot contradict what is literally asserted. What develops as children become adult-like is the knowledge that *the* is not ambiguous, and that demonstrative interpretations must be denoted by *that*. If true, this predicts that (successful) rejection of sentences like (1b) will correlate with more adult-like behavior in other tasks testing the understanding of the definite article.

With respect to the indefinite article, three possibilities seem plausible. First, it may be that children more liberally generate local ad-hoc implicatures due to a general preference for local implicature interpretations. Some evidence for such a preference comes from Bill et al.’s (2021) study of children’s interpretation of existential quantifiers within the scope of a universal quantifier. Bill et al. found that children interpret sentences such as *Every pig carried some of his rocks* as implying that every pig failed to carry all of his rocks. This suggests they are interpreting *some* to mean *some but not all*, an interpretation that is only possible if a local implicature is generated within the scope of the universal quantifier *every* (i.e., generating the interpretation *Every pig was such that he carried some but not all of his rocks*). Adults, on the other hand, interpreted such sentences as implying the weaker claim that *not every pig carried all of his rocks*. This latter interpretation is consistent with the *not all* implicature being generated globally (see also Chemla & Spector 2011 for discussion of the different possible interpretations and how they are generated). If children more liberally compute local implicatures, and local implicatures can be generated within the scope of the DP, this could explain their rejection of sentences such as (1a).

The second possibility is that children more liberally compute global ad-hoc implicatures from indefinite descriptions compared to adults. Evidence for this possibility comes from Rees et al. (2023), who used a “better picture” paradigm in which participants had to determine whether a given description matched either a visible picture or some “better”, unseen picture. For a sentence such as *There is an octopus* in a scene with both an octopus and a duck, 4- and 5-year-olds opted for the better picture option 64% of the time, compared to adults who selected it 30% of the time. This seems to suggest that children, but not adults, interpreted *There is an octopus* to mean something like *There is an octopus and nothing else*.

A third possibility is that for adults (but not children), the rate of implicatures for the indefinite may be suppressed by sensitivity to other alternatives. If for adults the indefinite article recruits competing sets of alternatives, this could block implicature generation using the (intended) conjoined alternative. For example, if adults contrast not just *striped* and *striped-and-spotted* sweaters, but also *striped* and *plain (non-striped)* sweaters, this competition between different sets of alternatives could impede computation of the target ad-hoc implicature. If 4- and 5-year-old children are less likely to recruit competing sets of alternatives, and in

particular if they do not consider *plain* to be a contrastive alternative to *striped*, they might be expected to generate more of the target ad-hoc implicatures compared to adults.

4.2. Truth Value Judgments vs. Referent/Picture Selection Paradigms

As we noted in Section 2, previous studies investigating children's ability to generate ad-hoc implicatures from conjoined alternatives have mostly used some version of a referent or picture selection paradigm (e.g., Stiller et al. 2015, Horowitz et al. 2018, Yoon & Frank 2019, Foppolo et al. 2021, Rees et al. 2023). These studies typically reveal that children will select a referent or a picture consistent with the generation of an ad-hoc implicature, for constructions involving both definite and indefinite noun phrases.

Our results using the Truth Value Judgment Task paradigm suggest that certain patterns of behavior might be masked by the use of a referent/picture selection task. In line with this, Eliatamby & Tieu (2025a) report that while adult participants accept sentences such as *Mary bought a striped sweater* more frequently than sentences such as *Mary bought the striped sweater* in scenarios where the purchased sweater is both striped and spotted, when asked to select the nominal referent of these sentences (in a referent selection task), adults almost always choose the sweater that only has stripes, regardless of which article is used. The selection task therefore appears to mask an interpretive asymmetry between definite and indefinite descriptions, one that is nonetheless observable when participants are asked to provide truth value judgments.

More work is needed to fully understand the relationship between different tasks and the mechanisms driving participants' responses. Future research could more systematically investigate the asymmetry we have observed here, using a variety of tasks, to shed light on the mechanisms that drive the generation of ad-hoc implicatures under different kinds of task demands.

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