Input vs. Output in the Acquisition of Negative Polarity: The Curious Case of *any*[1]

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Abstract

This paper draws on the simple observation that young children acquire the constraints on NPIs with relative ease and speed, and, against the backdrop of existing theoretical proposals about licensing, identifies a fundamental learning puzzle. We will begin with an overview of the methods that have been used to tap into normally-developing English-speaking children's knowledge of NPI *any*; such methods have revealed evidence of adult-like knowledge of the licensing condition on *any* in children as young as 2-3 years of age. To address the question of how children get to this stage, I examine samples of caregiver input, and discuss how they reveal different kinds of evidence for *any*'s restricted distribution and its licensers. Importantly however, I argue that the caregiver input does not provide direct evidence of the underlying semantics of *any*. If only a subset of what must be acquired is present in the input, we are left with a puzzling learning problem about how children arrive at the target representation of NPIs such as *any*.

Keywords: Negative polarity; Acquisition; Child language; Learnability; Child-directed speech; NPI licensing

1 Introduction

While there has been a productive body of theoretical research examining the phenomenon of negative polarity, with many of the studies focusing on English *any* as a kind of token negative polarity item (NPI), there have been relatively few acquisition studies examining the development of NPIs such as *any* in child language. This paper is an attempt to bridge the gap between proposals in the theoretical semantics literature on the one hand, and the findings of child language studies on the other. After all, however numerous or diverse the accounts of NPI licensing on the market are, these must all contend with the simple fact that young children appear to acquire the constraints on NPIs with relative ease and speed.

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This paper has two primary goals: the first is to provide an overview of the methodologies that have been used to tap into normally-developing English-speaking children's knowledge of NPI *any*, and the kinds of conclusions that acquisition studies have reached; the second is to provide a much needed analysis of the kind of evidence that children receive for various properties of NPI *any* in their caregiver input. Putting together these two ingredients, i.e. what children know and what evidence might lead them to this knowledge, I will then identify a fundamental learnability question, set against the background of existing theoretical proposals about the nature of *any*. If our theoretical proposals are on the right track, there are certain properties of *any* that the child must come to have knowledge of; if these properties are to be derivable from evidence in the input, we expect to find certain kinds of evidence in the caregiver input. On the basis of a brief analysis of some parental speech samples, I will suggest that only a subset of what we might expect to find in the input is present, leading us to a puzzling learning problem: how do children arrive at the target properties of *any*? My aim here will not be to propose a solution to the learnability problem (see Tieu 2013 for one hypothesis), but rather to demonstrate that it is indeed a problem, on the assumption that every property of *any* must be derived from the input.

2 The Target of Acquisition

The small handful of acquisition studies on *any* that exist have investigated children's sensitivity to the licensing conditions on *any*. This mirrors the attention that has been devoted, in the theoretical literature, to characterizing environments that appear to license NPIs like *any* (see among many others, Fauconnier 1975, 1979; Ladusaw 1979; Linebarger 1987; Horn 1989; Kadmon and Landman 1993; Krifka 1995; Zwarts 1998; Giannakidou 1998, 2011; von Fintel 1999).[2] These environments extend well beyond the scope of negation:

(1) Ethan did not tell any stories.
(2) No student told any lies.
(3) Every student who has any sense will complete the extra credit assignment.
(4) If Jones submitted any abstracts, he will certainly be accepted.
(5) Sophie regrets giving Nick any of her money.
(6) Have you read any interesting papers lately?
(7) I wonder if Jesse has any sugar.

Note that whichever account of NPI licensing one adopts, this account must contend with the fact that young children must somehow acquire knowledge of the licensing condition; whether the licensing condition is innately specified or learned through experience with the input, children appear to demonstrate knowledge of licensing relatively early, as we will see.

[2] In this paper, I will abstract away from the free choice instantiation of *any*. See Tieu (2013) and Tieu, Romoli, Zhou, and Crain (to appear) for discussion of children's knowledge of free choice *any*.

Let's take the influential Fauconnier-Ladusaw hypothesis, according to which NPIs are licensed in the scope of downward-entailing (DE) operators (8), i.e. operators that have the logical property of validating set-to-subset inferences (9) (Ladusaw 1979, among others).[3,4]

(8) An NPI is only grammatical if it is in the scope of an α such that [[α]] is downward-entailing.

(9) A function of type $<\sigma,\tau>$ is downward entailing iff for all x,y of type σ such that $x \Rightarrow y$: $f(y) \Rightarrow f(x)$.

(von Fintel 1999:100)

To produce and comprehend *any* in an adult-like manner, children must have knowledge of the licensing condition in some form. While existing acquisition studies have mainly focused on whether children respect NPI licensing conditions, it's worth breaking the licensing condition down into further component ingredients that the child might also need to have knowledge of. For example, on the DE account, knowledge of the licensing condition also requires knowledge of DEness, or the set of DE operators. Unless the learner could generalize to the set of DE operators, she would have to learn about individual licensers on a case-by-case basis. In this respect, Gualmini and Crain (2002) have argued that data indicating relevant entailment relations are unlikely to be available in sufficient quantity; that is, children cannot learn interpretive principles solely on the basis of positive evidence. Instead, these authors suggest that young children have innate knowledge of De Morgan's laws and entailment relations.

In addition to the logical property of DEness, children must also acquire certain properties of the structural dependency relation that holds between *any* and its licensing operator. For example, *any* must be c-commanded by its licenser (10)-(11); moreover, this dependency relation is not clause-bounded (12). Although I will not delve into cross-linguistic variation with respect to the structural aspect of licensing, it is worth noting that such variation entails learning: the child must learn any language-specific aspects of the licensing condition. For example, in contrast to what the English (11)-(12) demonstrate, Korean allows subject NPIs and does exhibit a clausemate restriction on licensing (unless the NPI is the subject of a stative predicate) (cf. Lee 1993).

(10) Jude doesn't have any homework today.

(11) *Any student doesn't have homework today.

(12) John didn't say that Mary would write anything.

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[3] For example, while the negative quantifier *no* NP is DE (i) and licenses *any* (ii), the existential quantifier *some* NP is not DE (iii) and fails to license *any* (iv).

(i) No chefs cooked pizzas ⇒ No chefs cooked margherita pizzas

(ii) No chefs cooked any pizzas

(iii) Some chefs cooked pizzas ≠> Some chefs cooked margherita pizzas

(iv) *Some chefs cooked any pizzas

[4] In this paper, I focus on the learnability of a licensing condition that is stated purely in terms of monotonicity. See, however, Horn (this volume) for some arguments that NPI licensing often depends not on what is entailed or implicated, but on what is asserted or at issue. I leave aside the very interesting question of how the learner's sensitivity to the distinction between at issue and non-at-issue content may impact the acquisition of NPI licensing.

In the acquisition studies we'll shortly review, little has been said beyond the requirement of NPI licensing, but no less essential are *any*'s syntactic category and distribution: *any* usually surfaces as an indefinite determiner with a noun phrase complement (13), the latter of which can be elided (14); it can occur within a noun phrase as part of a complex indefinite (15)-(16); finally, it can be used as a modifier of the comparative *more* (17)-(18).

(13) Jess doesn't have any milk.
(14) Jess doesn't have any.
(15) Nick didn't see anyone.
(16) Nick didn't write anything.
(17) Winston doesn't have any more milk.
(18) Don't do that anymore.

In terms of *any*'s contribution to the truth conditions of a sentence in which it appears, children must also acquire its existential quantificational force, i.e. they must know how to interpret it as an existential within the scope of negation.

There is an additional semantic/pragmatic aspect of *any* that has in recent years received considerable attention: domain widening. Kadmon and Landman (1993), Krifka (1993), Chierchia (2006, 2013), and others, have discussed the observation that *any* seems to create stronger statements than equivalent statements containing a plain indefinite such as *a* (particularly when *any* is stressed):

(19) a. Ethan doesn't have a dish.
b. Ethan doesn't have ANY dishes.
(20) a. Jesse doesn't have sugar.
b. Jesse doesn't have ANY sugar.
(21) a. A child could solve that problem.
b. ANY child could solve that problem.

According to Kadmon and Landman, *any* has the lexically specified semantic property of widening the domain of quantification; this property goes hand in hand with *any*'s pragmatic function of strengthening the assertion. Consider the example in (19). (19a) might be taken to mean that Ethan doesn't have a particular kind of dish; imagine that I am preparing a nice dinner party at Ethan's house and, as I pull out a roast from the oven, am looking for a fancy serving dish. I might interpret (19a) as indicating that he doesn't have a fancy serving dish. But if I protest and say that any old plate will do, hearing an utterance of (19b) will then invite the interpretation that Ethan doesn't have any kinds of dishes, neither fancy serving dishes nor plain old regular dishes. Thus the domain has been widened from one containing fancy serving dishes, to one including regular plain dishes.

According to Kadmon and Landman, *any* is licensed in DE environments because it is precisely in such environments that widening the domain yields a stronger assertion. For example, a negative assertion that quantifies over some domain entails the equivalent assertion quantifying over a smaller subdomain. Building on such intuitions (as well as the proposal outlined in Krifka 1995), Chierchia (2006, 2013) proposes that *any* activates a set of (sub)domain

alternatives corresponding to more restricted domains of quantification available in the context.[5] Additionally, *any* triggers obligatory exhaustification of these alternatives. What are the alternatives of a sentence containing *any*? They correspond to the same sentence, but with the domain of quantification replaced with one of *any*'s possible subdomains. Exhaustification then leads to the exclusion of any alternatives that are not entailed by the assertion. Crucially, while exhaustification succeeds in DE environments, it leads to a logical contradiction in non-DE environments (see Chierchia 2013 for details). This is how it comes to be that the NPI is restricted to DE contexts.

Finally, Chierchia proposes that when *any* is contrastively focused, the domain of *any* is contrasted with more restricted domains available in the context (e.g., that of a plain indefinite, as in the contrast between (19a) and (19b)); thus we feel that *any* is quantifying more widely.[6] To be able to carry out this kind of 'domain widening', the child must therefore have knowledge of the following: (i) knowledge that *any* activates subdomain alternatives (i.e. the nature of *any*'s alternatives) (ii) knowledge of how to exhaustify these alternatives; (iii) knowledge of contrastive focus.

Summarizing then, the child who comes to have target knowledge of NPI *any* must acquire a diverse set of properties: its syntactic category and distribution, its licensing condition, the nature of its focal alternatives, exhaustification with respect to these alternatives, and how to invoke contrastive focus.[7] Let us now turn to some acquisition studies that have attempted to determine whether (and when) children are target-like with respect to NPI *any*.

3 Measures of Children's Knowledge of NPI *any*

3.1 Spontaneous Production

Let us begin with a study of children's spontaneous production of NPI *any*. Some experimental methods such as the Truth Value Judgment Task (TVJT) (Crain & McKee 1985; Crain & Thornton 1998) are notoriously difficult to conduct with children younger than 3;00 and are typically only successful with children who are older than 3;06; but looking at how children

[5] In example (19) for example, the largest domain of quantification might include fancy serving dishes, plain serving dishes, and plain old regular plates. In such a context, subdomain alternatives would include {fancy serving dishes, plain serving dishes}, {fancy serving dishes}, {plain serving dishes, regular plates}, {regular plates}, etc. In other words, the subdomain alternatives correspond to the more restricted domains of quantification made available in the context.

[6] In other words, domain widening occurs when *any* is contrastively focused. This accounts for the observation that in the absence of contrastive focus, i.e. in out-of-the-blue contexts, *any*'s domain can be contextually restricted just like that of a plain indefinite. This addresses concerns raised in Arregui (2008) for example, who presents data showing that *any* does not always widen the domain as expected. In a similar vein, Dufley and Larrivée (2010) argue that the scalar endpoint meaning of *any*, i.e. the *even the least*/*even a single* meaning apparent in the typical examples of domain widening, is not a part of *any*'s core meaning. As Chierchia (2013) remarks, domain widening might more accurately be construed as potential for domain widening; on his proposal, it is contrastive focus that determines when domain widening actually arises. See Tieu and Lidz (2014) for relevant experimental data.

[7] It is important to note that these properties may not actually have to be learned independently of each other; on an analysis like Kadmon and Landman's or Chierchia's, *any*'s restricted distribution (i.e. to DE environments) will fall out from its need to widen the domain (Kadmon and Landman 1993) or its requirement that its alternatives be exhaustified (Chierchia 2006, 2013).

younger than 3;06 behave with respect to *any* can show us whether children's earliest hypotheses are different from those of older children (and of adults). To accomplish this, we can look to spontaneous speech transcripts, a prime source of evidence regarding younger children's linguistic knowledge.

In Tieu (2010, 2013), I presented an analysis of the spontaneous speech transcripts of 40 children acquiring American and British English as a first language (the 40 corpora are available on the CHILDES database (MacWhinney, 2000)). I reported data from 18 American children, covering the age range 0;11,04-5;02,12, and 22 British children aged 1;08,22-4;11,20. In determining whether the children were target-like in their knowledge of *any* from the point at which they began to produce it spontaneously and productively,[8] I discussed two aspects of the children's spontaneous production data: (i) quantitatively, I examined their rates of licensed vs. unlicensed *any*, which provided an indication of, among other things, whether the children were target-like in their knowledge of the licensing condition on *any*; (ii) qualitatively, I examined the environments in which *any* appeared, and in particular, the diversity of licensers, which indicated whether the children genuinely had productive knowledge of *any* (and its licensing condition).

NPI *any* is not a particularly high-frequency construction. To avoid distortion due to low denominators in the calculation of error rates, I focused primarily on 26 children, namely those who produced at least 15 instances of NPI *any*. For these 26 children, the mean error rate was 3%.[9] I took this result to be strongly suggestive that these children were target-like in their knowledge of the licensing condition on *any*; they were able to limit the distribution of *any* to appropriately licensed environments such as the scope of negation:

(22) FAT: I'll look I don't think paper wings are a good idea (.) Abe.
CHI: come on I can't find anything else.
(Abe, Kuczaj corpus; Transcript 133 (3;09,12), Line 469)

Both the American and British groups made very few NPI licensing errors, and any sparse errors were interspersed among adult-like usage of the NPI.[10]

Negation was often the first licenser to appear, and it was also the most frequently occurring licenser of *any*. In light of this, in attempting to assess children's knowledge of the DE licensing condition on *any*, it is worth verifying that the children did not simply memorize *any* as forming a lexicalized chunk with sentential negation. To do so, we can look at the diversity of licensers in the transcripts. Recall that the licensers of *any* extend well beyond negation; for example, the antecedents of conditionals, lexical expressions such as *without* and *never*, adversative predicates

[8] By spontaneous, we mean that the child can produce the NPI of her own accord; this excludes productions where the child is merely imitating or repeating another speaker's production of the NPI, as well as cases where the NPI is deliberately elicited from the child (as it would be in an experimental setting, for example). By productive, we mean moreover that the child is able to produce the construction in novel contexts (e.g., with different nouns); this excludes productions where the child might produce the NPI as part of a memorized nursery rhyme, for example.

[9] For individual error rates, as well as a more detailed analysis of the kinds of structures children produced, please see Tieu (2010, 2013).

[10] In other words, there was no evidence for a developmental stage during which the NPI was consistently unlicensed. Grammatical uses of the NPI generally appeared from the onset of the NPI.

such as *sorry* and *regret*, and matrix and embedded polar questions all license *any*.[11] A child's distribution of licensers in her spontaneous production could provide a useful indicator of whether the child has generalized to a licensing condition such as the DE condition, or whether the child is only capable of using *any* when paired with sentential negation, perhaps as a sort of lexicalized unit.

Let us consider as an example the data for Abe (Kuczaj corpus, Kuczaj, 1977), who produced a sizeable sample of *any*. Abe produced a total of 228 instances of NPI *any* in declarative environments, 217 (=95.18%) of which involved licensing by sentential negation. But he also produced other licensers, such as negative quantifiers, *never*, *without*, *if*-conditionals, *in case*-conditionals, and comparative constructions.[12] Qualitatively, it appears that Abe was adult-like in his knowledge that licit licensers of *any* include operators other than sentential negation. In other words, he was able to generalize to the class of DE operators as licensers. Abe's early productions of *any* were not limited to declaratives either; some of his earliest productions of *any* appeared in questions (e.g., *Are there any more over there?* at age 2;06,18).[13]

Summarizing then, the children under study exhibited a target-like distribution of *any* in their spontaneous production. Whenever they produced *any* spontaneously, they did so in a target-like manner. Moreover, the child Abe was able to use *any* with DE operators beyond sentential negation. The surface distribution of *any* thus implicates productive knowledge that *any* must occur in the scope of an appropriate licenser.

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[11] According to one proposal, there are at least three classes of NPIs, licensed accordingly by three classes of licensers that differ by "negative strength" (Zwarts 1998). While DE operators satisfy the De Morgan's laws in (i-ii), anti-additive operators satisfy (i-iii), and anti-morphic operators satisfy (i-iv):

(i) $f(x) \quad f(y) \rightarrow f(x \wedge y)$
(ii) $f(x \vee y) \rightarrow f(x) \wedge f(y)$
(iii) $f(x) \wedge f(y) \rightarrow f(x \vee y)$
(iv) $f(x \wedge y) \rightarrow f(x) \vee f(y)$

This classification of licensers is interesting from a learnability perspective because it places the classes of licensers in a subset-superset relation (anti-morphic operators are also anti-additive and DE, while anti-additive operators are also DE but not anti-morphic). A learnability question that arises is whether children might resort to a conservative widening strategy, according to which they start off with the narrowest (most conservative) hypothesis, and only widen the set of licensers on the basis of positive evidence. This question has been investigated in Dutch (van der Ziel 1996) as well as in Mandarin (Lin, Weerman, and Zeijlstra 2013). As concerns *any*, I argued in Tieu (2010) that English-speaking children appear not to resort to such a strategy in their acquisition of NPI licensing.

[12] Note that the large proportion of licensing by sentential negation does not necessarily mean that the child was going through a stage where he was restricted to the use of negation as a licenser. The prominence of negation as a licenser was also reflected in the parental production. Abe's father was an active conversational partner in 209 of the 210 transcripts in the corpus; 81 of his 87 (=93.10%) NPI *any* in declaratives involved licensing by sentential negation. An anonymous reviewer also points out the relevance of the observation that some of the contexts for polarity items develop later than others; for example, conditionals tend to appear later in child speech than negation.

[13] I will not discuss licensing in questions here, but refer the reader to Nicolae (2013) for an exhaustification-based proposal that unifies licensing in declaratives and interrogatives.

3.2 Elicited Production and Comprehension

We can also find experimental evidence from children's elicited production that converges with the spontaneous production data. O'Leary and Crain's (1984) study (reported in Gualmini, 2004) used an elicited production paradigm with 11 children aged 4;04-5;04, to evoke DE and non-DE environments in the children's responses. These authors found that in the condition shown in (23), children never produced *any* outside the scope of negation, i.e. in a positive declarative, even when *any* appeared in the prompt. In contrast, children had no problem producing *any* when it could appear in the scope of negation, as in (24).

(23) Situation: Some dogs were hungry, and every dog eventually ate some food.
   a. Test sentence: Only one dog got any food.
   b. Experimenter prompt: What really happened?
   c. Children's responses: No, every dog got some food!
      (Children did not produce: *No, every dog got any food!)

(24) Situation: Some dogs are hungry; only one dog decides not to eat.
   a. Test sentence: Every dog got some food.
   b. Experimenter prompt: What really happened?
   c. Children's responses:
      No, this dog did not get any food!
      No, this dog did not get some food!

(Gualmini 2004:960)

On the comprehension side, a small handful of studies have made use of the TVJT to investigate children's knowledge of the licensing condition on NPI *any*. One such study examined children's comprehension of NPI *any* in questions. Thornton (1995) tested 10 children aged 3;06-4;11 on their comprehension of questions containing NPI *any* and negation such as the following:

(25) a. Did any of the turtles not buy an apple?
   b. Didn't any of the turtles buy an apple?

Thornton found that the children had no problem interpreting *any* with respect to negation, pointing to the turtle that hadn't bought an apple 93% of the time in response to (25a), and to the turtle(s) that had bought an apple 85% of the time in response to (25b). Such a finding suggests that by 3;06, children are correctly interpreting *any* as an existential in questions and under negation.

Another TVJT experiment conducted by Xiang, Conroy, Lidz, and Zukowski (2006) examined 17 children's comprehension of negatively quantified statements containing the indefinites *a*, *some*, and *any*. These researchers created contexts that would bias towards a wide scope reading of the indefinite (26), and found that while children were able to access the wide scope reading of *a* and *some* some of the time, they consistently interpreted *any* as taking narrow scope with respect to negation.

(26) Hi, my name is Joe. I am eating dinner. My mom said I have to eat all my dinner before I can have dessert. I really don't like peas. But I guess they are healthy. Ok, I

will try and eat them. There, I did a pretty good job. There are only a few peas left, and those ones are mushy. I don't think I am supposed to eat the mushy peas. I will probably get my dessert!

Puppet: I was listening to the story, and I know what happened!

Condition 1: Joe didn't eat a pea.
Condition 2: Joe didn't eat some peas.
Condition 3: Joe didn't eat any peas.

Such a finding provides further evidence that children are sensitive to *any*'s licensing condition: in comprehension, they restrict *any* to the scope of negation, and do not allow it to outscope its licenser.

4 The Learnability Question

Based on the measures of production and comprehension described in the small handful of studies outlined in the preceding sections, we can conclude that children between 3-4 years of age have knowledge that *any* is a polarity-sensitive indefinite determiner with a restricted distribution. Children as young as two years of age spontaneously produce *any* in well-licensed environments, displaying a target-like distribution of *any*, with extremely low error rates. Children as young as 3;06, under experimental conditions, demonstrate target-like knowledge of the syntax and structural licensing condition on *any*, producing and interpreting *any* as an existential in the scope of a DE licenser. On top of this, the fact that children know how to restrict the distribution of *any* to DE environments suggests (albeit indirectly) that children have knowledge of the lexical widening/strengthening requirement (on Kadmon and Landman's account) and/or the requirement for obligatory exhaustification of domain alternatives (on Chierchia's account); after all, on the Kadmon and Landman/Chierchia-style approach, it is a property of *any*'s lexical semantics that derives its restricted distribution.[14] Thus the general conclusion we can draw from the collective set of studies is that by 4 years of age, children have some rather sophisticated knowledge of *any*. The next question is how they come to have this knowledge. A rather obvious answer one might proffer is that they can "learn" these properties from evidence in the input. To investigate the plausibility of this answer, we can examine the input for the kinds of evidence that are available to children.

Though space limitations will prevent me from providing a fuller analysis of parental speech samples, I will present a partial examination here of two samples, namely the paternal production from the Kuczaj corpus (Kuczaj 1977) and the maternal production from the Lara corpora (Rowland & Fletcher 2006) (see Tieu 2013 for more details).[15] First off, *any* does not appear to

[14] Even if we assume that the restricted distribution of *any* falls out of its semantics however, unless we specifically test children's sensitivity to domain widening, we cannot rule out the possibility that children are merely mimicking the superficial distribution of *any* without deeper generalizations about its semantics. To address this, Tieu (2013) investigates more precisely children's knowledge of domain widening, reporting that 4-year-olds as a group interpret *any* as quantifying more widely than plain indefinites. For the purposes of the present discussion, I will simply assume that a restricted distribution implies knowledge of *any*'s semantics, and direct the reader to these references for the appropriate experimental evidence.

[15] These two corpora contain relatively large numbers of transcripts (compared to the other English monolingual corpora on CHILDES).

be very frequent in child-directed speech (if we can take the CHILDES corpora as representative). In the Kuczaj corpus, we see that *any* appears in roughly 1.02% of all of Abe's father's utterances (130/12,753 total utterances). In the Lara corpus, *any* appears in roughly 0.54% of all of Lara's mother's utterances (428/78,701). Whatever must be learned from the input must be done so on the basis of such numbers in the input. This isn't a priori problematic, particularly if the properties that are informative to the child learner are robustly "observable" in all (or most) of the instances of *any*. Let us therefore look more qualitatively at the kinds of information that child-directed utterances of *any* may provide to the child.

Qualitatively, as can be seen in the examples in (27) and (28), the children appear to receive positive evidence for the following properties: (i) the determiner/modifier status of *any*; (ii) the c-command requirement on licensing; (iii) the non-clause-bounded nature of the licensing relation. First, *any* consistently showed up as either a determiner or modifier of the comparative adverb *more*. Second, all parental productions of NPI *any* in declarative statements involved *any* being c-commanded by a DE operator. While licensing by sentential negation was most prominent (accounting for 65% of cases of NPI *any* in Abe's father's sample and 81% in Lara's mother's sample), licensing by other DE operators was also attested (accounting for about 3-5% of cases of NPI *any*). As the sentences in (28) show, the parental input also provided positive evidence that *any* in an embedded clause can be licensed by a negation in the higher clause.[16]

(27) a. FAT: we don't have any hot chocolate. (Kuczaj, Transcript 118, L. 19)
b. FAT: we didn't get you any new socks. (Kuczaj, Transcript 166, Line 448)
c. FAT: I don't think we have any more. (Kuczaj, Transcript 110, Line 619)
d. MOT: he hasn't got any feet. (Lara, Transcript 98, Line 559)
e. MOT: Lara hasn't got any shoes on. (Lara, Transcript 100, Line 252)
f. MOT: you don't need any more. (Lara, Transcript 119, Line, 3621)

(28) a. FAT: I don't think that there's anything cooking in that pan (.) Abe.
(Kuczaj, Transcript 23, Line 53)
b. FAT: I don't think we have any honey (.) Abe.
(Kuczaj, Transcript 182, Line 308)
c. MOT: I do think anybody can really. (Lara, Transcript 101, Line 8953)

Finally, we might also say that examples like those in (27) and (28), when uttered in contexts which presumably make the sentences true and felicitous, will also be informative as concerns the existential quantificational force of NPI *any*. Presumably Abe's father uttered (27a), for example, in a context where there was no hot chocolate. Assuming that (children can assume that) parents are truthful, children can come to know what *any* contributes to the truth conditions of sentences in which it appears by relying on sentence-meaning pairs in context.

Taking stock then, we have so far seen that the input provides relatively clear evidence for the fact that NPI *any* has a restricted distribution. NPI *any* may not be highly frequent, but its occurrence in particular kinds of environments, i.e. downward-entailing ones, is quite

[16] It is worth noting that almost all such instances of a matrix negation and an embedded NPI *any* in Abe's father's speech involved neg-raising predicates such as *think*. Neg-raising sentences are often interpreted as though the negation appears in the embedded clause. While the grammatical status of the construction is controversial, I will simply assume a semantic/pragmatic analysis (cf. Bartsch 1973; Gajewski 2007) whereby the negation is indeed base-generated in the matrix clause, with the internal negation reading generated via a presupposition.

consistent.[17] It is perhaps not surprising then that in the samples of spontaneous production that we analyzed, and on the elicited production and comprehension tasks, 3- and 4-year-old children were able to restrict *any* to the scope of operators such as negation.[18]

But let us now turn our attention to the semantics of *any*. Recall Kadmon and Landman's proposal that *any* widens the domain of quantification, which yields stronger assertions only in DE environments. Is there any evidence in the input that explicitly ties *any* to domain widening or assertion-strengthening? Alternatively, recall Chierchia's account, on which exhaustification of *any*'s domain alternatives is semantically consistent only in DE environments. Is there any evidence in the input that could indicate to the child that: (i) *any*'s alternatives are in fact domain alternatives; (ii) *any*'s alternatives must be exhaustified;[19] or (iii) *any*'s domain can be contrasted with more restricted domains in the context (yielding the familiar 'widening' effect in cases of contrastive focus)? We are assuming (on the basis of the observation that young children can appropriately license *any*) that by 4 years, children have this complex semantic knowledge of *any*. Could this knowledge be derived from evidence in the input?

The clearest type of evidence in the input one might imagine for indicating that *any* has the possibility of quantifying more widely would be cases of contrastive focus, precisely of the kind made famous in Kadmon and Landman's paper: examples where *any* follows (and is clearly contrasted with) a more restricted plain indefinite statement. The contexts surrounding the examples in (27) and (28) did not obviously satisfy this property. Searching through the rest of the parental samples of *any* yields only one potential case of widening:

(29) FAT: you mean you didn't do anything at all all day long ?

(Abe, Transcript 75, Line 218)

Examples like (29) might well be helpful in pointing out the exhaustive nature of *any*, but it's unclear how useful they are in actuality, considering we can only find one such instance across all of Abe's father's uses of *any* (and Lara's mother's). Moreover, the example in (29) is perhaps not the best example upon which to hinge the acquisition of domain widening with *any*, given it also contains *at all* and *all day long*, the former of which is itself considered an NPI.

To obtain a greater diversity of parental speech samples, I further searched within the Warren corpus (Warren-Leubecker 1982; Warren-Leubecker and Bohannon 1984) (also available on CHILDES), which contains 20 transcripts of play sessions involving 20 different children: half of each session involved the child playing with the mother, the other half involved the child playing with the father. Even searching across this larger range of parents, children, and play

[17] To be clear, children receive consistent positive evidence of *any* in the appropriate licensing environments. But in order to rule out the possibility of NPIs in non-licensing environments, the child might also have to rely on indirect negative evidence. Note also the subtle tension here between the observation that *any* is a relatively infrequent construction, and the observation that it is licensed almost always in the same way when it does occur. While it is difficult to determine the minimal required frequencies the child must perceive in her input in order to acquire a target construction, what we do know is that the observed frequencies reported here must be sufficient for successful acquisition of the restrictions on *any*.

[18] Again, I have opted not to discuss licensing in questions here (which accounts for 16-30% of NPI *any* across the two parental speech samples); I simply assume the exhaustification-based analysis proposed in Nicolae (2013), according to which licensing of *any* is parallel in declaratives and questions.

[19] Additionally, one might question whether there is any evidence that could be informative as to how to carry out the exhaustification of alternatives.

situations, I found only the following potential case of contrastive focus/widening (out of a total of 29 different instances of NPI *any* across the 20 transcripts):[20]

(30) MOT: no, the rabbit is silent.
CHI: only they can make rabbit noise.
MOT: well, what kind of rabbit noise?
CHI: oo!
MOT: no, I don't think the rabbit makes any noise.
(Warren, George transcript, Line 456)

Here is one way to look at the learning situation: of the 577 instances of NPI *any* across the Lara, Kuczaj, and Warren corpora combined, we have found only two instances of apparent widening. Thus roughly 0.35% of NPI *any* appearing in the input concretely demonstrates domain widening. Contrast this with the roughly 75% of NPI *any* occurring in the scope of sentential negation. What I want to emphasize here is the overwhelming imbalance in the nature of the evidence for the different dimensions of *any* (licensing vs. domain widening). Of course, from the perspective of the adult grammar, *any* does not need to widen the domain. Recall that in out-of-the-blue contexts without contrastive focus, *any* should be very much interchangeable with a plain indefinite. But the problem from the learnability perspective is that if *any* hardly ever widens the domain in child-directed speech, it's not clear how the child can learn that it *can* widen the domain in situations of contrastive focus.

Here is where we stand: while there does appear to be evidence for certain properties of *any* (for example, its syntactic category, its structural licensing condition, and its quantificational force), there is very little evidence that explicitly ties *any* to the potential for domain widening. How then could children ever acquire the domain widening property? This is the puzzling learning problem that the child learner must face, if indeed she must learn this property from the input.

My aim here is not to propose a solution to this learnability problem, but rather to demonstrate that it is indeed a problem (on the assumption that every property of *any* must be derived from the input). On the one hand, it must necessarily be the case that if the child is relying on evidence in the input to acquire the target properties of *any*, then the evidence that is available in the input is sufficient for this purpose; after all, children eventually arrive at the target, and they must do so with what they are given, however infrequent the relevant evidence may be. In this particular case, this means that the available evidence is sufficient to lead children to the generalization that *any* is a potential domain widener (i.e. that it activates domain alternatives and that its domain may be larger in contrast to more restricted domains available in

[20] In fact the example in (30) is potentially quite a nice example of domain widening, because the context makes quite clear the contrast between rabbit-specific noises and more general noises. Note the importance of the larger discourse context in highlighting the property of domain widening. As pointed out to me by Pierre Larrivée, one approach to explaining how polarity restrictions are acquired may lie in investigating the rhetoric dimension of polarity, along the lines of Horn (this volume). On this approach, if rhetorical moves (such as the presentation of stronger rejections) indeed define polarity, the learning task might correspond to the learning of these rhetorical moves. For another possible approach that investigates development by looking beyond the word and logico-formal level, see Beaupoil et al. (this volume) for a discussion of children's development of negation in the context of the relation between actions, gestures, and speech to express negation. I leave for future research an investigation of how children might acquire target polarity restrictions by attending to both the rhetoric and gestural dimensions of polarity and negative assertions.

the context). Given we cannot find evidence explicitly tying *any* to domain widening, whatever the informative cue is, one hypothesis is that it must indirectly tie *any* to domain widening. Our analysis of the parental speech samples seems to suggest that *any*'s restricted distribution is probably its most salient, observable property in the input. This might lead one to suggest that the restricted distribution is the critical cue that somehow leads the child to generalizations about *any*'s semantics. But this is clearly circular: children need the target semantics to derive *any*'s restricted distribution, but the most robust cue that is meant to lead them to *any*'s semantics is its restricted distribution.

If we maintain the assumption that every property of *any* must be derived from the input, including its semantics, it seems we cannot get very far off the ground. This is not to say that the evidence that is available in the input plays no role in leading the child to generalizations about *any*'s target semantics; rather I suggest that we have to grant the child certain interpretive mechanisms to begin with (e.g., exhaustification of alternatives), if acquisition is to get off the ground at all. These interpretive mechanisms are exactly the objects that seem to be lacking in the input. I leave for future work the question of how granting certain innate semantic mechanisms, together with the available evidence in the input, leads the child to the target semantics.[21]

5 Conclusion

In this paper, we have considered the acquisition of the NPI *any* in normally-developing monolingual English-speaking children. In doing so, we have presented several pieces of evidence for children's target-like knowledge, from a variety of sources. Spontaneous production is an excellent source of data to study young children's linguistic hypotheses, and we saw that children as young as two years of age produce *any* in a target-like manner. Elicited production, on the other hand, allows us to constrain the context in such a way that we can elicit exactly the target structure we are interested in. The elicited production measure we saw also suggested that young children are quite good at restricting *any* to appropriate licensing environments. The TVJT experiments we saw demonstrated that 4-year-olds know how to interpret *any* as an existential in the scope of negation and in questions. Moreover, we inferred that 4-year-olds also have knowledge of *any*'s semantics, as it is this semantics that is claimed to be responsible for its restriction to DE environments. Thus these divergent measures all converged on the same conclusion: children by the age of 4 have very sophisticated knowledge of *any*, including fairly complex semantic knowledge that allows them to interpret it in an adult-like manner.

In the last section, I raised the question of how children come to have this knowledge. More importantly, this is a *how*-question that is posed against the backdrop of a potentially insufficiently rich input: the kind of semantic knowledge that children presumably end up with is exactly the kind of information that appears to be lacking in the child-directed speech. The *how*-question is not one that has been frequently addressed in previous studies on the acquisition of *any*, and it is not one to which I have offered an answer in this paper. But it is an important one, as its answer will have implications for the study of language acquisition more generally. Negative polarity by its nature lies at the crux of logic and grammar; the child has to pick up the syntactic pieces and the semantic pieces of negative polarity in order to arrive at the target. This study leads me to suggest that the evidence for abstract semantic mechanisms such as exhaustification appears to be far from transparent in the input: it is not obvious how surface

[21] See Tieu (2013) for an elaborated proposal in this respect.

strings containing an NPI can lead the child to generalizations about mechanisms such as exhaustification of the NPI's alternatives. In this respect, understanding how children can acquire something as subtle and complex as polarity sensitivity will shed light on the nature and process of language acquisition more generally.

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