From nounphrase ellipsis to verbphrase ellipsis: The acquisition path from context to abstract reconstruction

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1.   Introduction

The rules of grammar allow us to reconstruct arguments even from limited linguistic form. Such is the case of ellipsis. This very common device of language requires adults and children to exercise pragmatic inference by connecting what they hear either to discourse or context. A sentence like "put it there" requires us to compute where "there" is. Almost every sentence or dialogue contains elliptical reference. If you ask "do you want that" and get the answer "yes", it must mean "yes I want that" not "yes I'm going outside". This paper investigates whether children rely on pragmatic inference or language discourse to interpret elliptical utterances. The analyses herein, and the new data presented, suggest that children move from a pragmatic approach to a linguistic one during the course of development. If we say: "here's cake, want some" the child might fix "some" the way he determines the meaning of "there" by just looking around, while the adult does it by sticking in cake after some to get some cake. Put differently, suppose the child understands "want something" for "want some" and guesses that the topic is the cake she sees and says "yes." She would have the right answer obtained through the wrong means. These two totally different strategies divide the world's languages. In Huang (1982)'s terms the "hot" languages refer to context, where "cool" languages require reference back to discourse. These are broad terms that refer to how easily a particular language allows reference to

context. However, it has very specific grammatical consequences: arguments are deletable in "hot" languages where they are required in "cool" languages. A simple example, often found as an L2 error, is the sequence: "here's a donut. Do you want?" In English one must say "do you want it", but not in Chinese. It is possible that children begin by assuming that all languages are "hot" and therefore context-dependent, which is what many acquisition researchers have intuitively asserted early context-dependence.

Adult lack of awareness about ellipsis often leads to discourse gridlock with children, still struggling with the intricacies of reconstruction. Consider this dialogue (Roeper, 2007):

(1)   Mother: Do you want some milk or do you want some juice?
      Child: I milk juice [?]
      Mother: Huh?
      Child: Milk juice.
      Mother: No, you can either have one or the other. You can('t) have both.
      Child: Milk juice.

The child can obviously not deal with *one or the other, but not both*, which must be reconstructed as "one of the milk or juice or the other of the milk or juice but not both the milk and the juice." This seems quite a task for the child.

1.1   Child Ellipsis

Jensen & Thornton (2007) report examples of successful production from Nina (2; 3 years of age) of some NP-ellipses in cases like:

(2)   Mother: Whose hat is that?
      Nina: Mrs. Wood's

In this case, the *hat* is implied after "Mrs. Wood's __". But, full control of ellipsis is much more complex as Wijnen, Roeper & van der Meulen (2003) have shown with Dutch children some of whom reconstruct the argument but not the adjunct in:

(3)   Three girls are in the sandbox. Are two __ upsidedown?
      Scene: two girls *outside the sandbox* are upsidedown.

Adults reply "no" because they reconstruct "are two [girls in the sandbox] upsidedown", while 4-year-olds often say"yes," because they reconstruct only: are *two [girls] upsidedown*. Both 3-year-old Dutch and 4-year-old English-speaking children said "yes" more than 80% of the time. When children were presented with a similar scene in which children were standing in a normal position in the sandbox and two *adults* were standing upsidedown *outside* the sandbox, their "yes" answers appropriately decreased to 36% (3-year-old Dutch children) and 27% (4-year-old English children). However 36% "yes" means that even some younger children will allow a free contextual reference to the object [two *free pronoun* ⇒ *adults*], if two adults are upsidedown anywhere. This is the first evidence that Nounphrase Ellipsis (NPE) can be challenging for children, especially 3-year-olds. The evidence below directly supports this.

1.2   Adult Ellipsis

To avoid the sin of understating the child's ultimate task, let us consider what kind of knowledge of ellipsis the adult has. First, languages do not always allow the same forms of ellipsis. In Japanese one can say:

(4)   I want a hat or I want to go and Bill wants
       ⇒ [a hat or to go].

       In English we have to add either an object '*one*' or '*to*':

(5)   I want *one* or I want *to*

       This difference will prove important below. Virtually no other language allows Verbphrase Ellipsis (VPE) with just dangling *to*. These distinctions immediately imply that there will be an acquisition path that requires triggering evidence for the child to see each of them.
       In general, there are three ingredients that can actually interact: 1) pragmatic reference (above), 2) syntactic reconstruction (copying what is said) and 3) an abstract semantic form which captures variable behavior (below). We could paraphrase these options as:

(6)   a. look at context, or
       b. copy exactly what occurred, or
       c. project a meaning, Logical Form, which captures hidden relations, like "bound variables." Bound-variables occur in many places, but a simple examples is with quantifiers like: *every boy lost his hat*, where every/his are pariwise bound (= each boy lost a different hat, his own).

1.3   VP-ellipsis in Acquisition

If we take a cross-linguistic perspective, we find that NPE is by far more common than VPE in the world's languages and therefore by classical typological reasoning, it should be more available to children. In particular, the varieties of VPE in English, particularly the hanging *to* (e.g., I want to) are virtually unknown elsewhere and should prove a challenge to children. We will suggest below that an efficient *Interface Preference* may be allied with, or in fact, explain this preference.
       VPE has received the most attention in both linguistic theory and acquisition (e.g., Foley, del Prado, Barber & Lust, 2003, Lust & Foley, 2004, Postman, Foley, Santerlmann & Lust, 1997, Thornton & Wexler, 1999). It involves the reconstruction of an entire VP, including Verb, object, and modifiers:

(7)   Every man painted his car carelessly, and so did every boy
       ⇒ [paint his car carelessly]

       There are two properties of special interest here: the pronoun his and the adjunct *carelessly*. The adjunct *carelessly* can be either included, as above, or substituted for: [and

so did every boy __ *carefully*). *His* allows *sloppy-identity*, which means it may or may not switch reference from every *man's* car to every *boy's* car. A crucial feature is that the antecedents (every man, boy) are higher in the tree (c-commanding) than their possessives (his). In addition, each link involves an entire set of people (men, boys). It is commonly represented with a semantic device called *lambda abstraction* (which pulls out a common property from two clauses into an abstract structure):

(8)   Oscar bites his Banana and Bert does __ too.

       Classic derivation of the sloppy reading (Williams, 1977):

(9)   a. Derived VP rule:
           Oscar $[_{VP} \lambda x(x\ bites\ his\ banana)]$ and Bert does $[_{VP}[_V\ e][_{NP}[N\ e]]]$ too
       b. Variable rewriting rule:
           Oscar $[_{VP} \lambda x(x\ bites\ his\ banana)]$ and Bert does $[_{VP}[_V\ e][_{NP}[N\ e]]]$ too
       c. VP rule (= VP copy): Oscar $[_{VP} \lambda x(x\ bites\ his\ banana)]$ and Bert does $[_{VP} \lambda x(x\ bites\ his\ banana)]$ too

It is this bound-variable property which some beautiful experiments have investigated with children by Barbara Lust, showing apparently, that they control the *variable-binding* entailed at Logical Form. Every other semantic theory entails some kind of additional abstract level of representation (see discussion in Foley et al. (2003)) where they also propose a syntactic instead of a semantic analysis for VPE. Foley et al. (2003) claimed that children have correct VPE make these observations surprising: "how is it that competence for both types of interpretation (sloppy and strict) appears to be acquired so early and simultaneously, with no developmental lags between them? Why would this be so if the types of interpretation involve qualitatively different representations and derivations, as suggested in previous proposals? For example, if differentiation of pronoun types in syntax (Fiengo & May, 1994) is necessary to generate the two types of interpretation, what predicts early and simultaneous access of the two pronoun types? Why, given earlier representations, would the sloppy interpretation be so strongly preferred, the strict interpretation so much less frequent, in spite of the grammatical availability of both? (p.71)" Significantly, there is a contrast: quantificational sentences involve such an extra layer of semantic structure, while bare object cases do not:

(10)   I want some __.

       This sentence can be resolved, from this perspective, by pure copying without that extra level, which is why NPE is radically different from VPE. However for Japanese it has been argued that NPE is a subpart of VPE, which we show below[1] .

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[1]These claims remain controversial (see Johnson, 2008, Tomioka, 2008, Hardt, 1992, 1999, 2008). Our goal is to contribute to this discussion by showing that acquisition evidence and a simple interface principle argue in behalf of the view that a simple PRO form can be involved. We do not assume that the current formulations for adult grammars will prove perfect for the representation of child grammars. This may lead to the claim that the adult grammars should be revised to make a connection to the acquisition path more

This will develop into the core of our hypothesis: NPE is inherently simpler for the child and therefore precedes VPE. Once we have laid out further facts about English, here is where the analysis is leading: If the VPE cases are related to the NPE cases, then, apparent bound-variable interpretations may not require the extra layer of structure. In addition, children may *convert* VPE that they hear into NPE, which has consequences for the experiment below. We argue that there is a path indicating that they do not have variable-binding at first, simply apparent variable-binding, and that their predictions ought to be a more intricate path. Their syntactic proposal moves in this direction as well, but does not include the crucial possibility of free pronominal reference.

2.   Connections to Quantification in Acquisition

This approach, detailed below, would fit other evidence that quantificational aspects of meaning are acquired later (e.g., Roeper, Strauss & Pearson, 2006). In a word, children acquire collective "all" before the age of 2 years, but real quantifier-variable structures such as "every N" (*every boy has a hat*) do not appear reliably until 4 to 5 years of age. It means that 2- to 3-year-old children, at least for ellipsis, may not yet engage higher order semantic structure. These data would be consistent with the idea that NPE may precede VPE in acquisition.

By "higher order semantic structure," we refer to a family of semantic theories which express the quantificational relation with either an entire layer of structure or an extra operation of abstraction or extraction. All the theories argue for something extra in the semantics.

2.1   Theoretical Background

In an excellent introduction, Johnson (2008) alerts us to the fact that variable-binding might be illusory, a perhaps crucial clue to envisioning the acquisition path. We need to walk through the examples to appreciate their force (Evans, 1977):

(11)   When John cooks something, he won't acknowledge what he can't, and when he bakes something, he won't either.[2]

This has to be reconstructed as: *won't* acknowledge what he can't [bake] *either*. This reconstruction is an exact copy of the prior VP, except for the last verb (cook) which gets a substitution (bake). This requires a hidden pronominal form for the verb, so we can substitute *bake* for *cook*. It is not a bound-variable substitution like with "his" and lacks a c-commanding *verb* higher in the tree. It can be argued that the same kind of operation is at work with other cases where the c-command requirement is not met:

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explicit. In other words, our goal is to formulate the connection between VPE and NPE for children in its own terms. In particular, it can be argued that the same semantic reconstruction is involved in both NP and VP ellipsis. However we argue that the acquisition path favors a theory which makes a fundamental distinction between pronominal reference to context and variable semantic reconstruction. Another alternative is to argue that a child version of NPE exists with simple copying, no distinct LF, and then it is replaced by a more sophisticated form. (Thanks to Kyle Johnson for help in clarifying these and other points.)

[2]Example discovered by Dan Hardt and Bernard Schwartz independently.

(12)   The police officer who arrested John insulted him and the one who arrested Bill did too.
[⇒ insult him = Bill]

Here the crucial antecedents *John* and *Bil*l are buried in relative clauses so they fail the c-command requirement, of an NP higher in the tree, and yet we still have a seeming "bound variable" effect:

(13)   "the pronoun *him* contains a hidden description that makes it equivalent to, say, the expression *that guy* and this creates the illusion that there is a bound pronoun in the ellipsis = the police officer who arrested John insulted [him - that guy who got arrested]."

What may seem like an arcane example opens an important acquisition option: could the child, as we have hinted, have a simple free pronoun with definite reference instead of a bound-variable? This would make a combination of simple copying plus a pragmatic reference to context a plausible first stage for the child, without an LF form of Bound variables, but a *trace* and an empty pronoun instead:

(14)   John washed his car and Bill did *v* [*wash* [*pronoun*]] too.

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            VP
           /  \
          V    V
          |   /  \
          t  NP   V
             |    |
            pro  too
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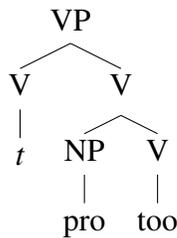
A *trace* requires copying the exact word *wash*, and a true pronoun like (did wash *it* too) would get identical reference (John's car).

However, the empty pro also has the potential to pick out a *new* object from context. Unlike a *trace*, it does not copy its reference from the higher clause. Thus it would not be bound to discourse for children, who could use context, although it would be discourse-bound for adults. This means that it could get an extra meaning beyond the other noun: it could mean Bill washed *Fred's* car. To put this in very simple terms, fixing the pronoun reference should require nothing more semantically complex than fixing deictic reference if one says "wants that".

Theoretical claims have some bite when they make specific predictions:

(15)   Claim: children project a simple missing object for VPE and NPE in early stages.

This leads to an experimental prediction (see Roeper, 2007), which in fact has been borne out: children might have too free a reference here, the definite reference could be to the higher NP *or* to context itself, which is where we intuitively believe that children start. Matsuo (2007) and Vasić, Avrutin & Ruigendijk (2007) showed that Japanese and Dutch children allowed exactly *a third reference* for:

(16)   John washed his car, and so did Bill.

where Bill washed *Fred's* car, quite at odds with adult English (but not Japanese)[3] This goes beyond what adults allow, but it suggests that the apparent bound-variable reading, justifying the LF, may have a different origin that does not require the LF, but requires greater leaning on context, which acquisition theorists have often intuitively assumed.

2.2   Japanese Ellipsis

In fact, recent theoretical work in Japanese (Hoji, 1998, Otani & Whitman, 1991, Sugisaki, 2007) has proposed precisely that VPE has NPE inside of it and it is linked to the kind of construction not found in English:

(17)   John wants a car and Fred wants ₋₋ too.

That is, in effect, Japanese extracts the noun part of the VPE and allows it to be a pronoun, possibly filled in by context (predictable as a "hot" language), and notably, does not carry the adjunct form with it. Thus the Japanese equal to this sentence:

(18)   John can paint a car carefully, but Bill can't.

can get the reading *can't paint a car* instead of a quite different *can't paint a car carefully* which we find in English where we still presuppose that a car gets painted. We have in effect:

(19)   Bill didn't paint [NP = free pronoun]

and the adverb remainder (carefully) of the VP may not reconstruct at all (if child English is like Japanese, then we should predict the same non-inclusion of adverbs by English children, suggesting an obvious experiment.)

Saito (2003) has provided arguments, based on sensitivity to subjacency, that this empty category is not a pro, but a form of *argument deletion*. For our purposes, the important point is that reference to context is required to fill the object rather than a form of sloppy identity[4].

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[3]Matsuo used examples like:

(1)   Kuma-san-ga   aoi   osakana-o mitukemasita.
       bear-Mr.-NOM blue fish-ACC find-PAST

       'The bear found a blue fish,

(2)   Sosite, tora-san-mo   [NOSAKANA-O] mitukemasita.
       And   tiger-Mr.-ALSO fish-ACC   find-PAST

       and the tiger did [$_{VP}$find a fish], too'

where the tiger found a pink fish, not a blue one, but this is acceptable. From her data, she relegates this to a minor possibility for younger children, but that is exactly the stage we are seeking to capture.

[4]This interesting claim raises questions for the theory of empty categories and increases the set of options to which a child might be sensitive. Other contexts exist where argument-deletion might apply, but the challenge is then to prevent the child from overgeneralizing them.

(20) John bir arabay   dikkatlice boyuyor, fakat Bill boyayamyor.
     John a   car-ACC carefully pat,   but   Bill can't-paint

     'John paint the car carefully, but Bill can't paint ----'

Turkish does not allow using "can't" without the verb. However, one can still read the sentence similar to Japanese either *can't paint a car* or *can't paint a car carefully*.

Adult English, however, has the classic form of NPE which is simply the deletion of an object:

(21) John has bananas. Bill wants some [bananas]

It still does not allow the bare *and John wants [free Obj]*. In contrast, the use of bare verb "want" is possible in Turkish.

(22) John'ın muları var. Bill de istiyor [muz].

     'John has bananas. Bill wants [bananas] too.'

In Turkish, it is possible to use "want" without an NP. IN non-elliptical sentences, one might say either "Bill wants [some bananas]" or "Bill wants [bananas]."

Now we need to take a closer look at NPE.

2.3   Nounphrase Ellipsis

How does NP-ellipsis really work? NPE, while simpler than VPE, also involves, for adults, some licensing relations which vary across languages.[5] We do not allow NPE after adjectives:
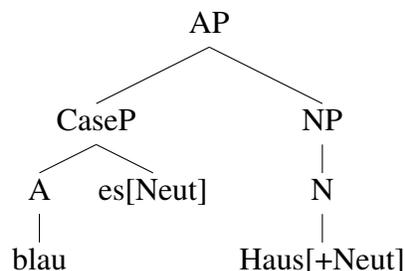
(23) John has a big blue house, *and John has a small red.

However, Germanic languages do because they have an agreement element that is morphologically marked:

(24) John hat ein blaues Haus und Fritz ein kleines rotes--.

Here, the adjective rot (red) carries a neuter marker (-es), which agrees with the object noun Haus (neuter *house*).

(25)

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                          AP
                  _____|_____
                 |                 |
              CaseP               NP
             __|__                 |
            |     |                N
            A    es[Neut]          |
            |                      |
           blau                 Haus[+Neut]
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[5]See Lobeck (1995) for a comprehensive discussion of NPE.

The two [+Neut] markers are in Agreement and the Agreement relation then licenses the deletion of the Noun. This analysis entails the presence of higher structure in the Determiner Phrase, which being particular to some languages, requires acquisition (see Wijnen et al., 2003).

English has such higher structure for Numerals as well:

(26)   John has a hat, and Bill has five __.

Note that what must be provided to license an empty object is the plural: has (five [+pl] (hat)[+pl]).

So English has an invisible form of plural engaging the same kind of Agreement found in German. Evidence for this view comes from work on *one* by Sugisaki (2005).

2.4   Naturalistic data on *one* ellipsis

Sugisaki provides extensive acquisition evidence that the Numeral licenser is present for very young children when they use one (only one exception in CHILDES), children never say **five ones*, but easily say *blue ones* because the adjective without a plural marker in English does not license the empty object, but the numeral does ("I have five"). He uses this as an argument against the idea that one is just a pronoun as is often argued when children say: I want one. Sugisaki[6] shows that one should occupy the same Numeral position in a DP as when they say I want two, which obviously licenses an empty N. With an extensive study of early production, Sugisaki presents that children always use bare Numerals to license missing objects. Children do not say **five ones*, it follows that *one* is excluded because it occupies the same Numeral position prior to the Noun as five. If *one* is like *five*, then it also licenses an empty object elliptically: one [N] and five [N].

3.   Our Experiment: Preferential Looking Paradigm and Ellipsis

Now, where does our experiment fit in? Our goal is to take the first steps in contrasting VPE and NPE, and to explore methods that might allow experimentation, especially anti-pragmatic experiments with young children where we might see what a child's initial assumptions are about ellipsis.

3.1   The Initial State

Our somewhat intricate analysis leads to a vision of the child's initial state, the Default assumptions about how ellipsis should work. While the earliest stages may be a kind of inferential "guess" based on everything available, what does the child do when she a) recognizes that something structural is missing, and b) seeks to model it on the immediately previous utterance? This step itself, logically, requires an assumption, namely that it is precisely the immediately preceding utterance from which information must be taken. There is another option: take the information from *Context*.

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[6]Lombert-Huesca (2002) in Sugisaki:"one is inserted as a Last-Resort operation when it is necessary to give phonological support to the Number affix that would be stranded otherwise"

This idea needs to be more carefully situated. In particular, it is an aspect of the interface between grammar and pragmatics. One natural, but not necessary, hypothesis is that one expects *modular homogeneity* to be preferred to any representation that seems to involve an interface with other mental abilities. Consider the idea intuitively: A phonological analysis should be easier than a simultaneous phonological and syntactic analysis. Coordinating your hands and feet should be harder than just coordinating your hands. However, biology offers the opposite as well: instant, well-defined interactions between different organs, like the heart and the lung. Suppose we say that grammar, particularly acquisition, favors a one-step connection between syntax and context. That is the comprehension system is most efficient when it can project a reference for a sentence with minimal further syntactic and semantic operations. Let us state this informally.

3.2   Interface Principle

Our argument is that the child seeks an immediate connection between sentences and context with a minimum of extra mental operations on the linguistic object.

(27)   *Interface Principle*: there is a one-step connection between syntactic representation and contextual interpretation.

Ultimately, the adult will prefer a within-language interpretation of ellipsis over a contextual one: connect an ellipsis site to previous verbal discourse rather than visual context. However, pressure toward efficient referential interpretation makes this Interface Principle plausible.[7]

This intuitive statement is programmatic and far from adequate because the presupposed syntax or semantics may still be non-obvious in making the contextual connection. For instance, if I say: "that" as compared to "drink that," *that* is not interpreted alone, but requires the verb *drink* to choose the right object. Nevertheless, this principle can be a useful starting point. Our argument now leads to this prediction, if NPE involves use of a pronoun which enables this efficient interface, then NPE should be easier and then, possibly, if Japanese or Turkish is the model, the child may use NPE as a part of VPE to reconstruct what is missing.

3.3   Acquisition Path

So now we can formulate an acquisition path for ellipsis:

1. Free unpredictable inference on context = guess what the parent means.

2. Correct NPE: project missing object from previous sentence or context.

3. Incorrect VPE Reconstruct verb from the previous sentence by copying, but project open empty object [=Japanese Nounphrase-ellipsis]

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[7]See Hardt (2008) for arguments that discourse representations can carry over sloppy-identity readings. This argument also enlarges the interpretation of ellipsis beyond the c-command domain, just as our use of Context does.

4. Adult stage: VPE copy full VP in ellipsis site, project bound variable structure in semantics.

 a) Disallow free reference to context.

 b) Allow recursive embedded structures to reconstruct.

Our experiment is consistent with this projected path, but covers only a portion of it. The experiment sets up either the verb or the object as the point of contrast and provides the child with both. Our experiment involved minimal pair [want to/want one] and identical events with a Preferential Looking Paradigm (PLP) using pointing as the dependent variable (Golinkoff, Hirsh-Pasek, Cauley & Gordon, 1987, Hirsh-Pasek & Golinkoff, 2006):

Children and adults could indicate their interpretation of the elliptical sentences by pointing to a screen. Each of the two sides of the screen is consistent with a different interpretation of the linguistic input. Participants were presented 6 video clips (two introductory and four test trials) involving live actions performed by adult actors on a large television. Importantly, the video clips were identical for both noun and verb ellipsis conditions; only the auditory stimulus varied. The pivotal device here is contrasting visual situations where we have different verbs with the same noun or different nouns with the same verb. In the picture Ali eats a banana and the child hears, "Ali is eating a fruit. Look she is eating fruit." Then, the child hears, "Now Hannah wants one" or "Now Hannah wants to."

(28) a. wants one ⇒ one banana.

 b. wants to ⇒ to eat fruit.

(28a) should lead to a picture where Hannah holds or waves a banana. (28b) should lead to a picture where Hannah eats a fruit (= a different fruit, an orange).

If the child takes (a) for both, then they are giving an NPE response to both NPE and to VPE contexts. That is, they convert *wants to* into just *wants* with an empty noun after it (want empty pronoun] instead of a missing verb complement (to [eat fruit]) The Appendix shows the full list of stimuli. Two introductory trials familiarized children with the testing procedure and the fact that they would be asked to point. This was followed by four blocks of test trials comprised of a video of the setting event (12 sec) and a pair of split-screen test events (12 sec). In between each trial, children's attention was heightened by introducing a 3-second inter-trial interval showing a giggling baby face in the center of the screen.

Now we review the exact sequence. In the introductory phase, children saw a truck and a doll on the split-screen for 6 seconds and from the speaker they heard 'Look! Can you find the truck? Where is the truck?' The second introductory clip was of a man dancing for 6 seconds on the full screen after which the same man was seen dancing on one side of the split-screen and drinking on the other side for 12 seconds. Children heard 'Can you find dancing? Where is he dancing? Point to dancing!' At test, children saw a saw a full screen of an adult doing an act. For example, they were presented an adult eating a banana. After the intertrial interval, children were shown a pair of events on a split-screen. On one

side, the girl was eating an orange (same verb-different noun) while on the other side, she was waving a banana (same noun-different verb). In Nounphrase Ellipsis condition, while watching the full screen children heard 'Alli is eating a banana.' At split-screen phase, they heard, 'Point to the picture where Hannah wants *one*.' On the trials that have mass nouns, children were asked to 'Point to the picture where Hannah wants *some*.' Similarly, at Verbphrase Ellipsis condition, while watching the adult eating a banana, children heard 'Alli is eating a fruit,' after which they heard 'Point to the picture where Hannah wants *to*' in split-screen. The use of the term 'fruit' allowed us to offer two fruit choices so that "eat fruit" would refer only to the act of eating. Only the first pointing the child did was accepted as the child's response.

3.4   Results

The results suggest that even adults found our elliptical tasks challenging. Only 83% and 88% of the correct responses were given for Nounphrase and Verbphrase ellipses, respectively. While these levels are well above chance, they suggest that reconstructing elliptical sentences with the minimal contexts provided here is a difficult task. Yet, adults are clearly in command of the grammatical markers we selected. Both 3- and 4-year-old children showed some sensitivity to elliptical sentences. This fact is interesting in and of itself given how infrequently children hear precisely these structures in the input (although most dialogues contain some kind of ellipsis). Four-year-olds were responded at adult levels for both Nounphrase and Verbphrase ellipsis (77% vs. 75 %, respectively). Three-year-olds, in contrast, were only successful in Nounphrase ellipsis (76% vs. 56%, NPE and VPE, respectively) where 50% is a chance result. This suggests that developmentally, NPE is slightly easier than verbal ellipsis. For example, when they heard 'Alli is eating an apple and Hannah wants one', they inferred the meaning that one refers to 'an apple.' Similarly, when they heard 'Alli is eating a fruit and Hannah wants *to*,' 4-year-olds, but not 3-year-olds interpreted the "*to*" as referring to the act of eating.
      That is, if we look at Table 1, we find that

(29)   5 ⇒ 3 or 4 correct, which means they understand VPE
       3 ⇒ chance because they get half of them right
       8⇒ 0 or 1, which means from 75-100% of the time children point to the form with an identical noun (banana). This group among the youngest group is not operating by chance, but choosing NPE analysis instead of a VPE analysis. Their grammar is exactly what we would predict if the child VPE reconstruction contains a structure like:

(30)   wants to = V [pronoun] = want [free pronoun] where eating is ignored, but the empty pronoun is linked to context and NPE so that it is like want one and the identical banana noun is chosen rather than the adult:

(31)   wants to = [eat fruit]VP where a person reconstructs eat fruit which allows any object in the picture, like *orange*.[8]

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[8]The (30) choice actually would allow a one [anything] reading, but that was not made available in

Age group	Nounphrase Ellipsis Condition "one" - 3 trials				Verbphrase Ellipsis Condition "to" - 4 trials				
	0 correct	1 correct	2 correct	3 correct	0 correct	1 correct	2 correct	3 correct	4 correct
3-year-olds (n = 16)	1	1	6	8	2	6	3	3	2
4-year-olds (n = 16)	2	2	2	10	1	0	3	5	7
Adults (n = 10)	0	2	1	7	0	0	1	3	6

Table 1: The number of correct responses (max = 3 and min = 0 and max = 4 and min = 0, in nominal ellipsis and verbal ellipsis conditions, respectively) by children and adults.

Our analysis includes an important child alteration. In order to convert a VPE into an NPE, the child would have to ignore *to* - the most unusual part of English- that is to ignore the Inflectional Phrase (IP) link indicated by *to* (i.e., want to $\Rightarrow$ want). If they do so, they would have exactly the Japanese form:

(32)   John wants a hat, and Bill wants ___ too.

Preliminary results from Turkish replication of the study indicated that both 3- and 4-year-olds found these elliptical sentences ambiguous. Both NPE and VPE might be interpreted in different ways:

(33)   Alli muz   yiyor. Hanna bir tane   istiyor.
        Alli banana eating. Hanna one wanting.
        'Alli eats a banana. Hanna wants one.'

"One" in Turkish sentence usually refers back to the object 'banana.' However, a slightly possible option is that it might signify 'eating a banana.' So, when the child could not find 'eating a banana,' but eating an apple, she might point at the eating action. The VPE is exactly the same as Japanese case:

(34)   Alli muz   yiyor. Hanna istiyor.
        Alli banana eating. Hanna wanting.
        'Alli eats a banana. Hanna wants.'

Turkish children would go either NP or VP ellipsis in this kind of sentence; because there is no IP indicating that it is the verb that is elided from the sentence. This is very

our experiment, but would be expected for young children given similar results from Wijnen et al. (2003) where [three girls $\Rightarrow$ and two [adults] upsidedown) for a group of younger children.

similar to the recent theoretical work in Japanese (Hoji, 1998, Otani & Whitman, 1991, Sugisaki, 2007), which claims that VP ellipsis has NP ellipsis in it. Thus, the Turkish sentence without"to" might indicate the dropping of the object 'banana', the verb 'want' or the VP 'want a banana.' In our approach, children should prefer a simple missing object and refer to the context to decide what object is missing.

Evidence from Jensen & Thornton (2007) reveal that children avoid this ellipsis of IP. They report that children do not answer wh-questions like:

(35)   "Who ate the ice cream?" with "Dad did" but tend to use full sentences or more than
        is necessary:
        Mother: Who did you feed?
        Nina: Feed the llama (T3, 1;11)
        Mother: What is the little girl holding?
        Nina: Holding a flower (T3, 1;11)

In addition, Foley et al. (2003) show repetition evidence that young children will leave out exactly the IP information:

(36)   Model: Grover licks his ice-cream and Big Bird does too. Child: Grover lick his
        ice-cream and Big Bird too (age 2; 11, Foley, Pactovis & Lust (submitted))

The child repeats both clauses but drops the IP information [-s, does] from them. This is exactly equivalent to dropping *to* from *want to* thereby converting an English VPR ellipsis into a kind of Japanese NP-ellipsis. The eight young children appear to do precisely that: they do not choose the verb, rather the identical noun screen, just as they do for NPE cases (want one).

4.   Conclusions

In conclusion, our experiment points the way toward seeing an intricate acquisition path for ellipsis which begins with a strong contextual assumption about reconstructing missing NP's, then applies that analysis to IP + VP reducing it to a Japanese variety VPE, where the object is interpreted by NPE. Finally, as is to be expected if VPE involves higher order quantification, the child comes to understand that bound-variable structure is allowed, which permits a variable understanding of pronouns like his but excludes a completely free reference to context for understanding the missing NP. The argument is stronger because we have drawn common conclusions from radically independent means of linguistic analysis: cross-linguistic work, a variety of experiments, naturalistic data, and intuition-based theoretical reasoning. These analyses collectively re-inforce each other while none alone provides a full analysis. This is the deepest and strongest kind of scientific reasoning. The Preferential Looking Paradigm ultimately offers a chance to look at the very earliest forms of elliptical understanding without a layer of conscious reasoning. Eye-movements, even less connected to the unknown impact of consciousness than pointing, may be able to re-inforce this conclusion with even younger children. This work expands the arguments of Hirsh-Pasek & Golinkoff (2006) about the different status of Nouns and Verbs in the

acquisition process. In particular, it argues for a contextual available for Nounphrases as opposed to Verbphrases when examined with the structural diagnostic tool of ellipsis. In addition, it has led to a simple but intuitive claim, the Interface Preference Principle, about how and when a child uses Context to interpret sentences. It has always been obvious that Context serves to validate grammatical interpretations. We argue that it plays a critical role at early stages in giving interpretations to sentences with logical gaps that are a step ahead of where a child's grammar is.

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From nounphrase ellipsis to verbphrase ellipsis

1.   Video and audio stimuli for both nominal and verbal ellipsis test trial blocks.

	Video	Nominal Condition Audio	Verbal Condition Audio
Test 1	Full screen: Alli eating a banana	Alli is eating a banana. Look, Alli is eating a banana! Hey, Alli is eating a banana.	Alli is eating a fruit. Look, Alli is eating a fruit! Hey, Alli is eating a fruit.
	Split screen: Hannah eating orange on; Hannah waving banana	Point to the picture where Hannah wants one! Show me the picture where Hannah wants one. Point to where Hannah wants one!	Point to the picture where Hannah wants to! Show me the picture where Hannah wants to. Point to where Hannah wants to!
Test 2	Full screen: Alli pouring milk.	Alli is pouring milk. Look, Alli is pouring milk! See, Alli is pouring milk.	Alli is pouring a drink. Look, Alli is pouring a drink! See, Alli is pouring a drink.
	Split screen: Hannah drinking milk; Hannah pouring juice.	Point to the picture where Hannah wants some! Show me the picture where Hannah wants some. Point to where Hannah wants some!	Point to the picture where Hannah wants to! Show me the picture where Hannah wants to. Point to where Hannah wants to!
Test 3	Full screen: Alli walking a toy dinosaur in front of her.	Alli is walking a dinosaur. Look, Alli is walking a dinosaur! See, Alli is walking a dinosaur.	Alli is walking a toy. Look, Alli is walking a toy! See, Alli is walking a toy.
	Split screen: Hannah kissing a dinosaur; Hannah walking bear.	Point to the picture where Hannah wants one! Show me the picture where Hannah wants one Point to where Hannah wants one!	Point to the picture where Hannah wants to! Show me the picture where Hannah wants to. Point to where Hannah wants to!
Test 4	Full screen: Alli bouncing stuffed cow on her lap.	Alli is bouncing a cow. Alli is bouncing a cow! Wow, Alli is bouncing a cow.	Alli is bouncing an animal. Alli is bouncing an animal! Wow, Alli is bouncing an animal.
	Split screen: Hannah bouncing stuffed lion; Hannah turning (in a circle, facing forward) a stuffed cow.	Point to the picture where Hannah wants one! Show me the picture where Hannah wants one Point to where Hannah wants one!	Point to the picture where Hannah wants to! Show me the picture where Hannah wants to. Point to where Hannah wants to!