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Abstract operators in early acquisition

Anne Vainikka

Thomas Roeper
University of Massachusetts Amherst

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ANNE VAINIKKA AND TOM ROEPER

1. Introduction

We wish to argue in this paper that abstract operators block extraction for children (as they do for adults), and that such operators are available in children's syntax already from about the age of three onwards. In particular, we will be concerned with abstract operators in purpose clauses and related constructions in the production data (for example, *And the chicken gave it to Bozo to eat*, Adam 3;4 file 28, see Appendix A) and in a comprehension experiment (for example *Where did the boy buy it to splash on his face?*). Given the early occurrence of these phonologically null but syntactically complex elements, we propose that the notion of an operator is something very basic in Universal Grammar and that this notion is available as soon as the appropriate syntactic position is available at S-structure.[2]

1.1. *Overt and abstract operators*

An operator may be lexically realized in the CP, as shown in (1), where the *wh*-operator is overtly realized as the *wh*-phrase *where:*

(1) *Mary asked* [*where*$_i$ *Joan ran* t_i].

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2. By distinguishing between the availability of positions at Logical Form (LF) and at S-structure, we are able to refer to universal properties of syntactic positions and projections (that is, those present at LF throughout acquisition) as well as language-particular properties specified at S-structure.

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In addition to lexically realized overt operators, it has been proposed for various constructions that they contain an abstract, phonologically unrealized operator. In this paper we will focus on the appearance of such abstract operators in child grammars.

Basically an abstract operator is required whenever there is a gap (that is, a missing argument) in a clause that is not a *wh*-trace, as in *tough*-movement constructions (Chomsky 1977) and in purpose clauses and parasitic gap constructions (Chomsky 1982; Contreras 1984). These are exemplified in (2a–2c), together with their structures (2a′–2c′).[3]

(2) a. *Joan is difficult to find a present for.*
a′. *Joan*$_i$ *is difficult* [Op$_i$ *to find a present for* e$_i$]
b. *Mary found a book to give to Joan.*
b′. *Mary found a book*$_i$ [Op$_i$ *to give* e$_i$ *to Joan*].
c. *Which book did Mary give to Joan without buying?*
c′. *Which book*$_i$ *did Mary give* t$_i$ *to Joan* [Op$_i$ *without buying* e$_i$]

The abstract operator (Op) in these constructions is licensed by a c-commanding, coindexed NP in the matrix clause. The operator is located in the Spec of CP of the embedded clause, and it binds an empty category in the embedded clause (a variable).[4] Thus the object gap is represented by a variable, and it receives its semantic content through co-indexation from the matrix NP via the operator. In this way, one overt NP can effectively function as two NPs.

In addition to the constructions exemplified in (2), abstract operators are generally also posited in relative clauses lacking an overtly realized relative operator, such as the examples shown in (3); cf. for example Browning (1987).

(3) a. *The man we met yesterday came back.*
a′. *The man*$_i$ [Op$_i$ *we met* e$_i$ *yesterday*] *came back.*
b. *The man to consult is here.*
b′. *The man*$_i$ [Op$_i$ *to consult* e$_i$] *is here.*

Note that the earlier example (2b) is ambiguous between the intended purpose clause reading corresponding to the structure given in (2b′) (the reading where the reason for finding the book is provided) and an infinitival relative reading of the type exemplified in (3b). In the relative clause reading of (2b) the *to*-clause is analyzed as modifying the object a *book*.[5] Due to this ambiguity

3. To simplify the structures, we will leave out the subject PRO.
4. We use the traditional representation of an empty operator. There remain important questions about the empty categories involved (see Kato 1994). It is quite possible that no variable is present and the child uses a null constant coindexed with the null operator, as proposed by Lasnik and Stowell (1991), and pursued in Rizzi (1992), Roeper and de Villiers (1992), Penner and Müller (1994) and Perez (1993).
5. Jones (1985: 20) provides a list of characteristics which distinguish the two constructions.

problem, we took care to include purpose clause stimuli which do not have the relative clause reading in our experiment (to be reported in section 3).

1.2. *Overt operators block extraction in adult English*

In adult English, an overt *wh*-operator blocks extraction, as shown in (4):[6]

(4) a. *When did Mary ask who Joan left with?*
a′. *When*$_{i/*k}$ *did Mary ask* t_i [*who*$_j$ *Joan left with* t_j t_k]
b. *When did Mary ask how far Joan ran?*
b′. *When*$_{i/*k}$ *did Mary ask* t_i [[*how far*]$_j$ *Joan ran* t_j t_k]

In both questions, the answer can only concern the time of Mary's asking; the time of Joan's leaving or running is not a possible answer. This, according to standard assumptions, is due to the presence of the *wh*-operator in the embedded CP which blocks extraction. More specifically, *who* in (4a) and how far in (4b) occupy the Spec of CP position, and this position can therefore not be used for cyclically moving another *wh*-phrase *(when)* from the embedded clause.
If there is no operator, long distance *wh*-extraction is fine, as shown in (5a) below — resulting in an ambiguous question — while in the otherwise comparable example (5b) an operator blocks extraction:

(5) a. *Where did Mary say Joan biked with her friend?*
a′. *Where*$_{i/j}$ *Mary say* t_i [*Joan biked with her friend* t_j]?
b. *Where did Mary say who Joan biked with?*
b′. *Where*$_{i/*k}$ *did Mary say* t_i [*who*$_j$ *Joan biked with* t_j t_k]

There are two possible answers to (5a), while the only possible response to (5b) is the location of Mary's saying.

Since the (attempted) extraction in (4)–(5) involves extraction out of an embedded clause that is uncontroversially an argument of the matrix verb, the crucial factor that determines whether extraction is possible can be straightforwardly taken to involve the presence vs. absence of an operator. In a similar fashion, we would also expect abstract operators to block extraction, as will be discussed below. However, when the embedded clause is an adjunct, extraction may be blocked due to a general constraint on extracting out of adjuncts, independent of an abstract operator (cf. Huang's 1982 Constraint on Extraction Domains). In the following we will attempt to keep separate the two possible reasons for blocking extraction (adjuncthood versus operator).

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6. A set of so-called discourse-linked *wh*-phrases, typically involving *which,* behave differently from other *wh*-phrases in terms of extraction; these will not concern us in this paper.

1.3. *Abstract operators block extraction in adult English*

Before turning to a discussion of extraction out of abstract operator constructions, it is important to address the question of which structures block extraction due to the adjunct status of the embedded clause and which ones involve an abstract operator blocking extraction. In fact, as has been pointed out by Hegarty (1992), extraction out of adjuncts is not always blocked, suggesting that the Constraint on Extraction Domains (CED) should undergo revision. Consider the contrast in (6):

(6) a. **What book*$_i$ *did John go to town* [*after he read* t_i]?
b. ?*What book*$_i$ *did John go to town* [*in order to buy* t_i]?

In both examples an adjunct is involved. In the latter case, however, the rationale clause seems to be "drawn to" the higher verb and therefore behaves more like a complement.[7]

Assuming, however, that the basic generalization captured by the CED holds, in the case of parasitic gaps it is impossible to determine whether extraction is blocked by the abstract operator or due to the adjunct status of the clauses containing a parasitic gap. Similarly, it cannot be determined whether extraction from relative clauses containing an abstract operator is blocked due to the adjunct status of relative clauses, or due to the abstract operator. In the *tough*-construction, however, the embedded infinitival is clearly a complement of the adjective, and extraction therefore should not be blocked based on the CED. After demonstrating that extraction is blocked even out of *tough*-complements, we consider the status of purpose clauses.

1.3.1. *The* tough*-movement construction.* Consider the following examples:

(7) a. *Joan is difficult to find a present for at the flea market.*
a′. *Joan*$_i$ *is difficult* [Op_i *to find a present for* e_i *at the flea market*].
b. ?**Where is Joan difficult to find a present for?*
b′. *Where*$_{*j}$ *is Joan*$_i$ *difficult* [Op_i *to find a present for* e_i t_j]′?

The infinitival complement in (7a) and (7b) contains an abstract operator which licences the gap after the preposition *for,* and which is co-indexed with *Joan* in the matrix clause. Extraction of a *wh*-phrase from the embedded clause is at best marginal, as shown in (7b). This difficulty in extraction can be explained by assuming that the abstract operator behaves similarly to the overt *wh*-operator

7. Alternatively, extraction in (6b) may be fairly good due to the absence of an operator, whereas *after* may act as a temporal operator in (6a).

discussed above; it occupies the Spec of CP position and prevents a *wh*-phrase from moving through that position.[8]

In a comparable construction without *tough*-movement an operator is presumably not posited, and extraction is possible, as shown in (8b). The ease of extraction in such examples validates our assumption that the embedded infinitival is a complement of the adjective, rather than an adjunct.

(8) a. *It is difficult to find a present for Joan at the flea market.*
b. *Where is it difficult to find a present for Joan?*
b′. *Where*$_i$ *is it difficult* [*to find a present for Joan* t_i]*?*

Compare also extraction of an argument *wh*-phrase in the two constructions, where it is very clear that the *wh*-phrase is associated with the embedded clause (rather than possibly modifying the matrix predicate):[9]

(9) a. **What is Joan difficult to find for?*
a′. *What*$_{*j}$ *is Joan*$_i$ *difficult* [Op_i *to find* t_j *for* e_i]*?*
b. ?**Who is a present difficult to find for?*
b′. *Who*$_{*j}$ *is a present*$_i$ *difficult* [Op_i *to find* e_i *for* t_j]*?*

Note that example (9a) involves a crossing dependency, where the chain headed by *what* and the chain headed by *Joan* cross. This may give rise to a parsing difficulty which, when combined with a blocking operator, results in a very unacceptable sentence. Examples (9b) and (7b) above, on the other hand, involve nested dependencies; however, extraction is still blocked by the abstract operator. (10) provides the comparable examples without an abstract operator, where extraction is fine:

(10) a. *What is it difficult to find for Joan?*
a′. *What*$_i$ *is it difficult* [*to find* t_i *for Joan*]*?*

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8. Certain instances of the *tough*-movement construction with an operator seem to allow a long distance interpretation:

   (i) *When is the book fun to read to the children?*

   However, in such examples it may not be possible to tease apart the short distance interpretation (that is, the time of having fun) and the long distance interpretation (the time of reading). We therefore assume that examples of this sort involve short distance movement which does not cross an operator.

9. Since extraction of argument *wh*-phrases is sometimes possible out of *wh*-islands, one might argue that abstract operator constructions should also allow extraction of argument *wh*-phrases, contrary to what is suggested by the examples in (9). However, extraction over an overt argument *wh*-phrase is difficult or impossible (cf. acquisition data supporting this claim reported in de Villiers, Roeper and Vainikka 1990). As the abstract operator in the *tough*-construction is co-indexed with an argument (for example with the complement of *for* in [9a] and with the complement of *find* in [9b]), we would expect it to behave like an argument *wh*-phrase and block extraction.

b. *Who is it difficult to find a present for?*
b′. *Who*$_i$ *is it difficult* [*to find a present for* t_i]*?*

Since extraction out of the complement clause of *difficult* is possible in (10), this again shows that the *to*-infinitival is indeed a complement of the adjective rather than an adjunct. If the *to*-clause were an adjunct, extraction should be ruled out by the CED, independent of the presence of an operator. Rather, only the examples with an abstract operator disallow extraction.

1.3.2. *Purpose clauses.* Before attempting to determine the argument/adjunct status of purpose clauses, let us first discuss the extraction data. Consider (11):

(11) a. *Mary hid it in the closet to give to Joan at the party.*
a′. *Mary hid it*$_i$ *in the closet* [Op_i *to give* e_i *to Joan at the party*].
b. *Where did Mary hide it to give to Joan?*
b′. *Where*$_{j/*k}$ *did Mary hide it*$_i$ t_j [Op_i *to give* e_i *to Joan* t_k]*?*

Extraction of the *wh*-adjunct where in (11b) is impossible from the purpose clause; thus, only the short distance interpretation is possible in (11b).

By using the object pronoun *it* in (11) we prevent the infinitival relative reading (cf. example [3b] and Jones 1985: 20). Pronouns generally cannot function as heads of relative clauses (for example **It which I had seen* versus *The book which I had seen,* or **It to read* versus *The book to read*). Thus, the string *it to give to Joan* in (11b) cannot be interpreted as an infinitival relative, and the clear adjunct status of relative clauses cannot be invoked as an explanation for the ungrammaticality of (11b).

When the extracted *wh*-phrase is an argument,[10] as in (12b), the resulting question is ungrammatical since the only possible interpretation would be the long distance one, which is blocked: [11]

(12) a. *Mary bought it to give to Joan.*
a′. *Mary bought it*$_i$ [Op_i *to give* e_i *to Joan*].
b. **Who did Mary buy it to give to?*
b′. *Who*$_{*j}$ *did Mary buy it*$_i$ [Op_i *to give* e_i *to* t_j]*?*

On the other hand, in examples that are superficially similar to (11b) and (12b) above but lack an operator, long distance extraction is possible, as shown in (13):

10. As in the *tough*-construction, the abstract operator is co-indexed with an argument (the embedded object in [12a]). Thus, the ungrammaticality of (12b) does not provide evidence for the adjuncthood of the purpose clause; cf. note 7 for discussion.
11. Note that the ungrammatical reading of neither (11b) nor (12b) involves crossing dependencies, and therefore a parsing explanation is not sufficient to rule these examples unacceptable.

(13) a. *Where did Mary tell her to give it to Peter?*
a′. *Where*$_{i/j}$ *did Mary tell her* t_i [*to give it to Peter* t_j]*?*
b. *Who did Mary decide to give it to?*
b′. *Who*$_i$ *did Mary decide* [*to give it to* t_i]*?*

We have seen that extraction out of a purpose clause is not possible. Extraction may be blocked either by the abstract operator, or due to the CED — to the extent that purpose clauses can be shown to be adjuncts. In fact, Jones (1985: 56–59) argues that purpose clauses are adjuncts, based on Dowty's (1982) criteria of syntactic and semantic optionality. On the other hand, Canac-Marquis has recently argued that purpose clauses involve "extended A(rgument)-chains", and therefore they cannot be true adjuncts (Canac-Marquis 1993, 1994). Even under Dowty's criteria, there is a class of matrix verbs that subcategorize for a purpose clause (cf. Bach 1982). Consider the examples in (14):[12]

(14) a. *John chose his sister to discuss politics with.*
a′. *John chose his sister*$_i$ [Op_i *to discuss politics with* e_i].
b. *John has his mother to give his laundry (to).*
b′. *John has his mother*$_i$ [Op_i *to give his laundry to* e_i].
b″. *John has his mother*$_i$ [Op_i *to give* e_i *his laundry*].
c. *John used this spice to put into the food.*
c′. *John used this spice*$_i$ [Op_i *to put* e_i *into the food*].

Extraction is blocked even in such argument-like purpose clauses, as shown in (15):[13]

(15) a. **What did John choose his sister to discuss with?*
b. **What does John have his mother to give (to)?*
c. **Where did John use this spice to put?*

Compare the above with (16)–(18), where there is no operator and extraction is possible:

(16) a. *John chose to discuss politics with his sister.*
b. *What did John choose to discuss with his sister?*

(17) a. *John has to give his laundry to his mother.*
b. *What does John have to give to his mother?*

12. These examples cannot be infitival relatives by the criteria discussed by Jones (1985) and others; in particular, the matrix object can be pronominalized, and a relative clause modifying the object precedes the purpose clause.
13. Note that the ungrammaticality of the examples in (15) cannot be accounted for by invoking crossing dependencies: although (15a) and one version of (15b) (with the preposition *to*) involve crossing dependencies, (15c) and the other version of (15b) involve nested dependencies.

(18) a. *John used to put this spice into the food.*
b. *Where did John use to put this spice?*

Since extraction is not possible even in a construction where the matrix verb clearly subcategorizes for the purpose clause — as in (15) above — simply alluding to the CED is not sufficient. The presence of an abstract operator, on the other hand, straightforwardly accounts for the extraction data.

Furthermore, even if a typical purpose clause were an adjunct, it is surprising that extraction from purpose clauses is completely impossible since it turns out that extraction from rationale clauses is marginally possible.[14] Rationale clauses (that is, *in order to*-clauses) differ from purpose clauses in the following ways: (a) there is no gap in a rationale clause; (b) rationale clauses are more clearly adjuncts than purpose clauses are (in the sense that they are never subcategorized for); and (c) extraction from a rationale clause appears to be easier than from a purpose clause. Consider the following example (cf. also [6b] above):

(19) a. ?*Who did John write a book (in order) to help?*
b. *Who*$_i$ *did John write a book* [*in order to help* t_i]*?*

Example (19), involving extraction of an argument from a rationale clause, is marginally possible, in contrast with comparable examples of purpose clauses such as (20):

(20) ?**Who did John buy a book to read to?*

We conclude that extraction out of rationale clauses is marginally possible because rationale clauses do not involve an abstract operator which would block movement; to the extent that extraction out of rationale clauses is ungrammatical, this is due to the adjunct status of rationale clauses (that is, the CED). Extraction out of purpose clauses is ungrammatical regardless of whether the particular purpose clause is an argument or an adjunct; the crucial factor for extraction is the presence of an operator corresponding to the gap in the purpose clause.

In adult English, then, both overt operators and abstract operators block *wh*-movement. In the remainder of the paper we will concentrate on data from child English. In section 3 below we will present results from an experiment on abstract operators in purpose clauses suggesting that these operators block extraction for children, as has been shown for overt operators in previous research. In section 2 we will argue — based on naturalistic diary data — that abstract operators are posited by children as soon as the CP-projection is available. In the last section, we will discuss some theoretical ramifications of our results.

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14. Tim (age 6) produced the following example of extraction from an adjunct:
(i) *What*$_i$ *did you try to make me laugh by doing* t_i*?*

2. Abstract operators and other CP-elements in child grammar

2.1. *The emergence of CP*

Various authors have argued for delays in the emergence of the CP projection (Lebeaux 1988; Radford 1990; Clahsen 1991; Meisel 1991; Rizzi 1991; Tracy 1992; Weissenborn and Haverkort 1991; Müller 1994 and Vainikka 1993). We hypothesize that UG should allow for the postulation of an operator (with barrier effects) once the CP is fully available in the syntax, but before this point operator structures are not expected.

Based on diary data from four children in the CHILDES database (cf. MacWhinney and Snow 1985 and Brown 1973), Vainikka 1993 observed that there is a fixed point in the production data collected from these children before which complementizers are not used at all, and before which *wh*-movement does not seem to be productive.[15] That is, it appears that constructions typically associated with the CP are not used before a certain point. Furthermore, the first instances of productive *wh*-movement (and some complementizers) share a peculiar property: Vainikka found that although the children otherwise used nominative subjects and Infl-elements, they did not do so in the earliest instances of *wh*-questions which contained an overt subject; instead, these *wh*-questions had an oblique subject and tended to lack any Infl-material.

Since oblique subjects are associated with the Spec of VP position (as Vainikka argues for an earlier stage of acquisition), it appears that the subject in the early *wh*-constructions remains in the Spec of VP, rather than raising to the Spec of IP as it normally does (cf. also Deprez and Pierce 1993 for the idea that the subject may remain in the Spec of VP position in the early grammar). If it can be assumed that the *wh*-phrase exceptionally occupies the Spec of IP position, this would explain why the subject does not raise to Spec of IP in these examples. If the CP projection were fully available already at this point, we would expect *wh*-phrases to occur in the Spec of CP, rather than in the Spec of IP.

Why would a child not use CP if it is supplied by UG? The primary reason would be that language-particular features of UG have not yet been acquired. Linguistic theory indicates that there are points of language-particular variation in the constraints and parameters concerning the CP projection. For instance, it is possible in Old English to say *which that* while modern English has a constraint against a doubly-filled Comp. One could, however, imagine a scenario under which some form of CP is present at LF even if it does not appear in the observable production data. Roeper (1992) suggests that all grammars contain

15. Only a few formulaic or semi-formulaic *wh*-questions are attested in the production data at this point, for example *What's that?* and *Where going?*; cf. Vainikka 1993 for a detailed discussion.

a CP-projection representing illocutionary force. Since the CP is the node where questions, declaratives, and exclamatives are indicated and since children's language obviously exhibits these modes from an early point, one can argue that these distinctions are present at the LF level but will not appear at S-structure until language-particular parameters are set. Once the parameters are set, the child will have a CP-projection fully available in the syntax.

In Table 1, we provide a summary of the development of the CP in the data from three children.[16] *No CP at S-structure* refers to the data prior to complementizers and *wh*-movement; *CP not yet fully* available refers to the files in which the early *wh*-phrases with oblique subjects were found; and CP fully available refers to files in which oblique subjects are no longer used, and *wh*-movement and complementizer usage are productive. The files are reproduced in Appendix A.

Table 1. *Availability of overt CP (adapted from Vainikka 1993)*

child	no CP at S-structure	CP not yet fully available	CP fully available
Sarah	–2;7 (file 22)	2;7–3;1 (file 23–46)	3;2 (file 47)
Adam	–2;8 (file 11)	2;8–3;0 (file 12–19)	3;0 (file 20)
Nina	–2;2 (file 13)	2;2–[2;5] (file 14–31)	[by] 2;9 (file 32)

Note: no data available for Nina between 2;5 and 2;9

2.2. *Purpose clauses in the production data*

2.2.1. *Sarah and Adam.* In an effort to determine whether these children produced constructions with abstract operators, we searched their data for instances of purpose clauses involving 10 common verbs.[17] We found 78 instances of potential purpose clauses in the data of Adam, Sarah and Nina; we expect that future research on other common verbs (such as *see, take,* and *have*) will reveal more examples. The following examples were found in Sarah's data:

(21) a. *He didn't have some(thing) to eat.* [file 51, age 3;3]
b. *Here's some water. To drink.* [file 61, age 3;5]
c. [Mother: *We have nothing to eat.]*
No. And to drink. [file 79, age 3;10]

16. Data from the fourth child studied by Vainikka (1993), Eve, is consistent with the data from the other children. However, there is very little data from her for each of the stages due to the fact that she seems to have passed through the stages very quickly.
17. The following (embedded) verbs were searched for: *drink, eat, get, make, play, read, ride, watch, wear* and *use*.

d. *I want somethin(g) to eat.* [file 96, age 4;2]
e. [Father: *What's homely mean?*]
She don't get no one to play with. [file 127, age 4;10]

These five examples are all of the examples found in Sarah's data consisting of a *to*-infinitival (for any of the 10 verbs searched) followed by an object gap. It is difficult to determine (using Jones' 1985 criteria) whether these are instances of purpose clauses or infinitival relatives.[18] Either way, however, these examples suggest that Sarah is using a construction with an abstract operator (cf. discussion in section 1). Furthermore, the other children produce unambiguous purpose clauses in their early data.

Note that all of Sarah's examples occur after the point at which, according to Vainikka's independent criteria, Sarah productively uses the CP projection (age 3:2); cf. Table 1.

In Adam's data, altogether 32 relevant examples were found (excluding repetitions and imitations). Consider the following dialogue from Adam's file 22 (age 3:1):

(22) Ursula: *Did you find some tiny ones?*
a. Adam: *Those are not peas to eat.*
Ursula: *No, because they weren't cooked.*
b. Adam: *No. They not to eat. Why they not to cook?*
Mother: *They are to cook, but they are not cooked yet.*

This dialogue contains the first relevant examples found in Adam's data (for the verbs searched) of *to*-clauses with an object gap. The examples in (22b) (*They not to eat* and *Why they not to cook?*) lack a potential head of a relative, and thus seem to be instances of the purpose clause structure.

Consider also the following examples produced by Adam before the age of four (a complete listing of Adam's examples is provided in Appendix A):

(23) a. *Let's have something to read.* [file 24 age 3;2]
b. *Those are for me to eat.* [file 27 age 3;3]
c. *And the chicken gave it to Bozo to eat.* [file 28 age 3;4]
d. *I want some toys to play with.* [file 29 age 3;4]
e. *We looking for some food to eat.* [file 32 age 3;6]
f. [Mother: *Is that an oboe they're playing?*]
I never seen that to play. [file 40 age 3;11]
g. *I want something else to play with.* [file 41 age 3;11]

18. All of Sarah's examples involve indefinite quantified NPs such as *something* and *no one* which readily lend themselves to the restrictive relative reading (although a purpose clause reading is also possible). The predominance of such examples in the production data may indicate that an abstract operator is easier to posit for a relative clause than it is for a purpose clause. We will leave open the question of why this should be the case.

Of these examples, (23a/d/e/g) are ambiguous between the purpose-clause-reading and the infinitival relative reading. However, since a pronoun cannot act as the head of a relative clause, examples (23b), (23c) and (23f) unambiguously have a purpose clause structure. Furthermore, the examples involving a preposition such as (23d) and (23g) suggest that the gap following the P is indeed bound by an operator (rather than being, say, a small *pro*) since [P + gap] is only found in potential operator constructions; examples such as **I want to play with* (where there is no NP in the matrix clause to license an operator) were not found in Adam's data.

Adam's operator constructions begin to occur shortly after the point at which CP is fully available in his grammar (age 3;0 — cf. Table 1). That is, for both Sarah and Adam no potential operator constructions were found in the files preceding the point at the CP becomes productive in the syntax (based on the development of *wh*-movement and complementizers), while several examples are attested in the months following the crucial point.

2.2.2. *Nina's purpose clauses.* According to Table 1, Nina uses the CP projection productively by the age of 2;9. However, since there is no data available between 2;5 and 2;9 (due to a summer vacation), Vainikka (1993) was not able to determine exactly when the CP-related constructions emerged. Nina's first examples of potential purpose clauses with an object gap occurred immediately before the summer vacation, at the young age of 2;5:

(24) a. [Mother: *What is that?*]
A bone. For the dogs to eat. For those dogs to eat.
[file 29 age 2;5.26]

b. *And the spaghetti for the dogs to eat.* [file 29 age 2;5.26]

c. *Mashed potatoes. Eat the food. Good food — to eat.*
[file 31 age 2;5.28]

It appears from these examples that Nina was in the process of acquiring the purpose clause/infinitival relative construction before the gap in the data occurred; it is likely that she was also close to having a productive CP in her grammar, given that the CP was clearly productive when she returned from her vacation.

The total number of relevant examples found in Nina's data is 41 (all before the age of 3;4 when data collection stopped); a complete listing is provided in Appendix A. The following are some of the examples occurring before the age of three:

(25) a. *He sayed he has something to play with for me.* [file 34 age 2;9.26]

b. *This is for the dog to eat.* [file 35 age 2;10.6]

c. *He doesn't like nothing to eat.* [file 35 age 2;10.6]

d. *We don't have any more blocks to make.* [file 36 age 2;10.13]

e. *I give them some play dough to eat, Mommy.* [file 36 age 2;10.13]
f. *Let's leave 'em out here for us to play with.* [file 37 age 2;10.21]
g. *The tea and sugar is in there for her to drink.* [file 38 age 2;10.28]
h. *Here's another blanket for this dolly to wear on tonight.*
You can wear this blanket on tonight. [file 39 age 2;11.6]

Of these examples uttered by Nina, (25a/c/d/e) might be instances of either one of the operator constructions: infinitival relatives or purpose clauses. Examples (25b) and (25f), on the other hand, are unambiguous purpose clauses since there is no potential head for an infinitival relative (cf. discussion in section 1). As with Adam, prepositions followed by a gap only seem to occur in operator constructions (that is, we found no examples of the form **I want to play with* in Nina's data, either); therefore, (25a) and (25h) presumably also involve a gap requiring an operator to bind it. Furthermore, examples (22g) and (22h) would be straightforward as purpose clauses and quite far-fetched as infinitival relatives, considering Nina's overall production data (for example [25g] as an infinitival relative would correspond to *The tea and sugar is in there which is for her to drink.*

Again, as with Adam and Sarah, the operator constructions occur in Nina's data at about the same point at which the CP projection becomes fully productive in the syntax.

To summarize the production data: Searching through Adam's, Nina's and Sarah's data we found seven examples of clear, unambiguous purpose clauses, including two examples of Nina's from the age of 2 years and 10 months. In addition, we found five examples containing a gap after a preposition, where the gap is interpreted as an NP in the matrix clause; such constructions would also have to involve an abstract operator. The remainder of the examples discussed (and those listed in Appendix A) presumably also involve an abstract operator, whether in an infinitival relative or in a purpose clause. Except for Nina's early sentence fragments given in (20) above, all the potential operator examples were produced after the CP had become fully productive in the syntax (cf. Table 1); in fact, several of them were found in the files shortly following the emergence of the CP. Thus, the production data support our hypothesis that an abstract operator can be posited once the CP projection is available in the syntax.

One might, however, suppose that — instead of an abstract operator being involved — it is the acquisition of the complementizer *to* which is responsible for the acquisition of the purpose clause construction; we shall see in Nina's data that this does not seem to be the case.

2.2.3. *Nina's acquisition of* to. We searched for the infinitival *to* in Nina's early data, and found that it appears soon after the IP projection is productively used (according to Vainikka 1993) and well before the emergence of the CP projection.

In the first 9 files, before the emergence of the IP, there were no examples of infinitival to (although *to* occurred as a preposition). According to Vainikka's criteria (usage of nominative subjects and Infl-elements), Nina acquires an IP around file 10 (at the age of 2;1); this is also the point at which Deprez and Pierce (1993) propose that Nina begins to raise her subjects from Spec of VP to the Spec of IP, based on the placement of negation.

The following are the first examples of Nina's *to*-infinitives (for all verbs), none of which involve an object gap:

(26)	a.	*I going to take a Maggie's house.*	[file 11; age 2;1.22]
	b.	*You try to draw triangle.*	[file 13; age 2;2.6]
	c.	*You going to put her in the doll house?*	[file 13; age 2;2.6]
	d.	*You have to sit down.*	[file 14; age 2;2.12]

From file 15 on (age 2;2) — still before the emergence of the CP — Nina begins to use the infinival complement construction more productively. The following are some of her examples of *to*-infinitivals found in files 15 and 16:

(27)	a.	*Please go to sleep.*	[file 15; age 2;2.28]
	b.	*I want to go to sleep.*	[file 15]
	c.	*You need your blanket to sleep.*	[file 15]
	d.	*I going to show you.*	[file 15]
	e.	*I want to get up.*	[file 15]
	f.	*Going to put [noun] on.*	[file 15]
	g.	*I want to make a zoo now.*	[file 16; age 2;3.5]
	f.	*I want to put him there.*	[file 16]
	g.	*We have to go.*	[file 16]
	h.	*I want to play that.*	[file 16]
	i.	*I like to sit on your lap.*	[file 16]

In addition to (27a–i), Nina produced a number of examples with *to sleep* in these files. Note that although the *to* infinitival occurs, there are no examples requiring an operator yet. Example (27c) is a rationale clause with no gap in the embedded clause, and therefore it presumably has no operator. As we saw above, the operator examples come in quite a bit later.

Nina's data is clearly consistent with the notion that *to* occurs in the IP (cf. Chomsky 1986), rather than being a complementizer in Comp. It shows up well before (other) complementizers, and before productive *wh*-movement. Furthermore, it is acquired about three months before the first instances of purpose clauses are produced; therefore, the acquisition of purpose clauses cannot be explained based on the acquisition of *to*.

We conclude that children have the capacity to project operators at a very

young age.[19] Since the child does not need to learn a new lexical item in order to use an abstract operator (assuming that the infinitival marker *to* has been independently acquired), it is natural that operators should be projected based on UG as soon as CP is available in the syntax (by about the age of 3). As far as we can tell, purpose clauses with operators do not occur before this point. In the next section we will present experimental results which show that children treat operators as blocking extraction.

3. Abstract operators block extraction in child English

3.1. *Comprehension versus production*

We turn now to a comprehension experiment. The comprehension dimension serves as an independent source of evidence for the existence of an operator in a child's grammar. However, we need to address the fact that comprehension and production are notoriously distinct for reasons that have never been explained and may not have a unified explanation. It is often suggested that "processing" factors delay production. However, the question remains concerning individual words: Why is our passive vocabulary substantially greater than our active vocabulary? Why do we not use a word as soon as we understand it?

It is possible, in like fashion, that children's comprehension of operator constructions precedes their use of it. One possibility is that the constraints on use require that there be no indeterminacies in the grammar. Comprehension, however, may move forward even if certain decisions are not yet made, such as parameter settings of headedness or the mutual order of functional projections.[20] If the child were aware that an operator occurs in the CP but not sure what the position of CP is relative to other functional projections, he/she might make a provisional decision in order to understand the sentence heard, but the construction would not be used until the structure is fixed. In this way one can imagine UG competence factors as playing a role in the comprehension/production distinction.

19. See the discussion in Wexler (1991) on children's early constructions where the hypothesis is advanced that an abstract operator may not be present.
20. For instance, a TP (= Topic Phrase) has been proposed both for English and German, but in English the CP may be embedded under the TP while in German the reverse might hold. It is not clear whether UG requires fixed order relations of functional projections in all languages; cf. Weissenborn and Roeper (1993).

3.2. *Overt operators as blocks for extraction*

Our techniques are drawn from the University of Massachusetts *wh*-project, in which barrier effects in six languages have been systematically examined, involving a variety of structures. The experiments varied verbs, *wh*-words, complements (infinitival, finite, small clause) and barrier types: *wh*-complement, relative clause, quotation, etc. (cf. Plunkett and Maxfield 1991 for a full summary). For our purposes, the crucial result of these experiments is that *wh*-phrases give rise to a barrier in the children's grammar, for every language examined.

The technique used in these experiments involves setting up a context in the form of a story and pictures. The context provides two possible answers to two different questions, such as those exemplified in (28); each possible answer corresponds to either the short distance or the (logically possible) long distance interpretation of the questions:

(28) a. *How did the mother learn what to bake?*
b. *How did the mother learn to bake?*

In the adult grammar, only the short distance answer is possible to the question in (28a), while both answers are grammatical answers of (28b). If the child is asked a question without a medial *wh*-phrase (for example 28b), he/she gives a long distance answer (corresponding to the manner of mother's baking) about half the time. But if a question containing a *wh*-phrase in the embedded Spec of CP such as (28a) is asked, the child almost never gives a long distance answer (less than 5% of the time). Thus, although the long distance option is clearly available when there is no barrier, the presence of an overt operator virtually always blocks *wh*-extraction.[21]

To test whether abstract operators result in barriers for children in a similar way, we conducted an experiment with 21 children between ages 3 and 6. We found that children failed to extract from purpose clauses with an operator, while extraction occurred readily when there was no operator.[22]

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21. One might argue that just because the child gives a short distance answer does not mean that the long distance answer is not available, as well. In our first experiment using this technique (cf. de Villiers, Roeper and Vainikka 1990) we provided a pragmatic context in which the long distance reading was the appropriate answer — and yet the children gave short distance answers whenever the long distance reading would have crossed a barrier. In later experiments, the results have been comparable witout using a special pragmatic context (cf. Plunkett and Maxfield 1991). In the present experiment, as well, it is striking how children provide a different answer based on the exact same scenario, depending on the type of question.

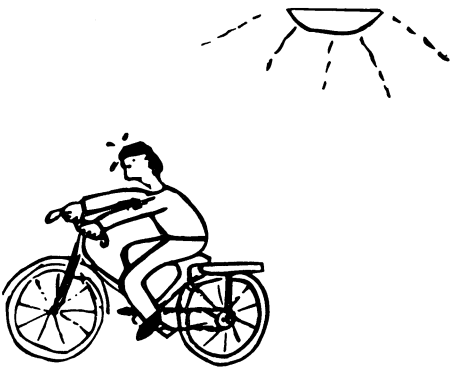
22. In important work on the interpretation of purpose clauses, Goodluck and Behne (1990) have shown that children in general prefer "short distance" object control of the PRO subject in a purpose clause. However, extraction of adjuncts is in principle an independent process that cannot be explained based on control of the subject PRO; if pragmatically salient, extraction of

3.3. *The experiment*

3.3.1. *The set-up.* We tested three 3-year-olds, seven 4-year-olds, ten 5-year-olds and one 6-year-old. The testing was done at three day-care centers in western Massachusetts.[23] For the duration of the experiment, the child was taken to a separate room or to a corner of the main room; the experiment lasted for about 10 minutes. We taped the experiments either on videotape or on audiotape. The children's answers were also written down on answer sheets during the experiment. One of us conducted all of the experiments, while a second person filled in the answer sheets.[24]

The experiment consisted of 9 scenarios. These were presented to the child in random order. In each scenario, a story was told to the child with the help of pictures. Consider the following sample story, with the pictures shown to the children (we encourage the reader to do the experiment on him/herself as it is presented here):

(29) "The boy was riding his bike, and he got really hot and thirsty.

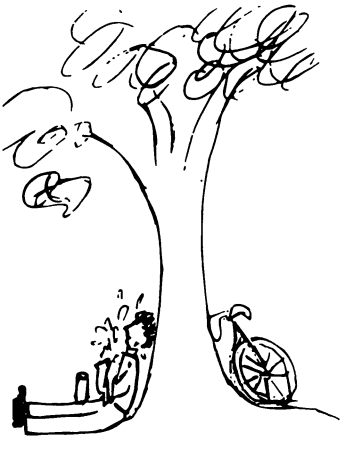


adjuncts should be allowed regardless of the what is controlling the PRO. Thus, the results we will report on extraction of adjuncts out of purpose clauses call for an explanation beyond the preference for object control. On the other hand, our results do not indicate that purpose clauses are "easy" for children (although present), and some explanation is needed for why children resist them in the environments Goodluck and Behne discuss. In these environments, we believe, there is a possibility of using an object as a subject, and this could be the root of the difficulty. We are not aware of a child laughing when they hear *I want a book to read* and saying *That's silly, a book can't read.* If such responses were frequent, they would be in the folklore of acquisition (along with accusative subjects *Me want* or overgeneralized causatives *He falled me down*).

23. We wish to thank the children, parents, and teachers at Sunnyside, Sand Hill and Woodside for their help and co-operation.
24. Thanks to Merce Gonzalez and Ana Teresa Perez for helping Anne Vainikka in running the experiment.

He decided to get some cold lemonade that he could splash on his face.

He wanted to cool himself down under a shady tree.



The lemonade was really cold and refreshing."

3.3.2. *The questions without an operator.* At the end of the above story, about half of the children were asked:

(30) *Where did the boy plan to splash it on his face?*[25]

As expected, given the saliency of the lemonade-splashing over the boy's decision to get lemonade, almost all of the children gave a long distance answer (*Under the tree*) to this question.[26] The questions of this type — without an

25. We chose *it* as the form of the object for one out of three examples, while the other two had full NP-objects (the object was repeated immediately before the question in order to facilitate pronominal reference). Given the potential ambiguity between purpose clauses with an object gap and infinitival relatives (cf. section 1 and section 2), we wanted to make sure that at least some of our examples were unambiguously purpose clauses.

26. 8 out of 10 children gave a long distance answer; 1 child answered a *why*-question and 1 child answered a *what*-question (that is, not the one they heard). No one gave a short distance answer.

operator — acted as a control set to make sure that the children tested would give long distance readings.

Each child heard three scenarios with a non-operator question. The 21 children were randomly divided into two groups: Group A (10 children) were presented with the questions in (31a), and Group B (11 children) were given the questions in (31b); cf. Appendix B for the full scenarios:

(31) a. *Where did the boy plan to splash it on his face?*
Where did the girl plan to wear her socks as mittens?
Where did the girl get to color the coloring book with her new crayons?
b. *Where did the girl plan to eat the hamburger with a spoon?*
Where did the boy plan to take it along with him?
Where did the boy get to paint the Easter eggs with bright colors?

3.3.3. *The questions with an abstract operator.* The exact same scenarios and pictures were used to test for the operator questions. The children in Group B heard the scenario given above, but instead of (30) they were asked the following question:

(32) *Where did the boy buy it to splash on his face?*

Since the lemonade-splashing is as salient here as it was for Group A, we might expect children to violate the barrier constraint and give a long distance answer. Instead, all 11 children gave a short distance answer (*At the store* etc.).
For the operator questions, Group A heard the questions in (33a), and Group B the questions in (33b):

(33) a. *Where did the girl buy the hamburger to eat with the spoon?*
Where did the boy look for it to take along with him?
Where did the boy get the Easter eggs to paint with bright colors?
b. *Where did the boy buy it to splash on his face?*
Where did the girl look for her socks to wear as mittens?
Where did the girl get the coloring book to color with her new crayons?

Thus, each child heard three questions without an operator and three questions with an operator.

3.3.4. *Results.* The overall results for the 21 children were as follows: 83% of the time the children gave a long distance answer to a non-operator question,[27] while 98% of the time they gave a short distance answer to the operator ques-

27. The total number of responses for each set of questions was 63 (3x21 children). For the non-operator questions, 9 responses were either unclear, there was no response, or the children answered a question different from the one asked; of the remaining 54 responses, 45 (or 83%) were long distance answers and 9 (or 17%) were short distance answers.

tions.[28] Let us now consider the results by age group, where the younger group consists of the ten 3-to-4 year-olds tested, and the older group consists of the eleven 5-to-6 year-olds.The children in the younger group gave a long distance answer to a non-operator question 76% of the time, while the corresponding figure for the older children was 90% of the time; that is, both groups readily gave long distance responses when there was no intervening abstract operator. For the questions containing an abstract operator, the younger children never gave a long distance response,[29] while the older group produced one long distance response to a purpose clause question (3% of the clear responses).

Recall that one third of the test sentences involved a pronominal object, designed to prevent the possibility of an infinitival relative reading. For the two scenarios containing a pronominal (*it*) object (scenarios 2 and 3; cf. [29] and Appendix B) children gave a long distance response to the question with no operator (as in [30]) 11 out of 12 times. For the purpose clause question containing an operator (as in [32]), they never chose the long distance reading.[30] That is, whether the object NP was pronominal or not, children basically never extracted over the abstract operator.

Clearly children allow (and prefer) the long-distance reading for the questions which did not contain a blocking operator, while extracting from the purpose clause across an operator seems to be basically impossible for both the younger and the older test group, including the unambiguous purpose clause cases.

3.3.5. *The "heaviness" of the matrix clause.* As a further test condition (in addition to and independent of the test sentences discussed so far), we wished to control for the heaviness of the matrix clause versus the embedded clause. In the non-operator cases, one might argue, the matrix clause is "light", consisting only of the subject and a verb, and this might give rise to a strong preference for the embedded clause. In the operator examples, the matrix clause also contains an object NP, making the matrix clause "heavier". In order to make sure that children were not giving short distance answers to the operator questions because the matrix clause was "heavy", we included a set of three scenarios/questions which do not have an operator but the matrix clause is "heavy". All 21 children were asked the following three questions (cf. Appendix B for the scenarios):

(34) *Where did the boy ask his mother to come?*
Where did the girl promise her mother to wear her kneepads?
Where did the girl get her friend to draw a picture of a horse?

28. For the operator questions, five out of 63 were unclear/missing/wrong answer; of the remaining 58, one (or 2%) was a long distance answer and 57 (98%) were short distance answers.
29. Excluding the two instances where the response was either unclear or missing, all 28 responses to the purpose clause questions produced by the younger group were short distance responses.
30. 11 out of 12 gave a short distance response; one response was unclear.

As before, the scenarios included both a short distance and a long distance answer. The results were as follows: the children gave a long distance response 54% of the time.[31] Breaking up by age group, the younger children produced long distance readings 50% of the time, while the older children did so 57% of the time.

These results suggest that "heaviness" of the matrix clause seems to make a difference for both age groups; fewer long distance answers were given to the questions in (34) than to those in (31) above. However, we would expect children to have access to both readings as long as there is no operator. Thus, the fact that both the short distance and the long distance readings constituted about half of the total responses is not surprising. In the case of the non-operator questions discusses above, the unexpectedly high number of long distance readings may be due to the "lightness" of the matrix clause.

Crucially, then, the operator questions are the only type which seem to disallow the long distance reading, for children as well as adults.

4. Discussion

4.1. *Alternative accounts*

We have proposed that the first instances of purpose clauses found in the production data involve an abstract operator;[32] the experimental results confirm the analysis, since the abstract operator blocks extraction.

A natural alternative to the operator analysis would be to propose the presence of a small *pro* (in the object position), without an operator. There are two arguments against this proposal. First, the adult language does not allow a small *pro* after a preposition but we find a number of them in the naturalistic data, just when a purpose clause is involved (cf. section 2). For instance, one can leave out the object after the verb in (35a), but not the object of the preposition in (35b):

(35) a. *I'm looking for a bathroom and you look too.*
b. **I'm looking for a bathroom and you look for too.*

However, one might suppose that a child will allow a small *pro* even with a preposition. If there were a small pro, but no operator, then we would predict that sentences of the following kind would appear in the naturalistic data:

(36) **We got a new chair and I want to sit in.*

31. Of the 63 expected responses, 11 were unclear/missing/wrong question; of the remaining 52 responses, 28 (54%) were long distance answers and 24 (or 46%) were short distance answers.
32. Cf. also Lebeaux (1988) who argues that a default operator is available to children.

No clear examples of the type in (36) have been found in the data; in general, there is no acquisition evidence that suggests a general capacity for empty objects with prepositions.[33] On the other hand, sentences of the following form were found (cf. section 2 for actual examples):

(37) *We got a new chair to sit in.*

Our experimental results provide the second argument against the no-null-operator analysis. If just a small *pro* were present, long distance extraction should be possible. Our results indicate that this is precisely not the case. Therefore our results argue clearly against the notion that a simple small *pro*, without an operator, is involved in children's purpose clause constructions.

As a further alternative analysis, one might ask if the effects we have obtained simply demonstrate the child's awareness of the CED (Huang 1982), namely, that it is impossible to extract from adjunct clauses. Such a result would itself be of interest, as the recognition of adjuncts requires a fairly sharp definition of the semantics of verbs. Thus there is a contrast between the status of the *during* PP in (38):

(38) a. *What*$_i$ *did you leave during* t_i*?*
b. **What*$_i$ *did you eat lunch during* t_i*?*

Simply learning that *during* is a preposition heading an adjunct is not sufficient for obtaining the contrast in (38). The child must be able to notice that certain PPs are quasi-arguments for some verbs, as in (38a), but pure adjuncts for other verbs, as in (38b).

We have already alluded to the problems with an analysis based on the CED. Apart from the fact that extraction out of adjuncts is sometimes possible (cf. for example the examples in [6] and [19]), the CED does not account for the impossibility of extracting out of argument-like purpose clauses, as was discussed in section 1.3. Furthermore, it does not account for the apparent correlation between the development of the CP projection and the emergence of operator constructions (cf. section 2) in the children's production data.

An abstract-operator analysis of the sort we have proposed accounts both for the barrier effects attested in our experimental results, as well as for the production data; the abstract operator becomes productive at about the same time as the CP projection fully available in the syntax. Under the standard analysis of abstract operators occupying the Spec of CP position, such a connection is to be expected.

33. No such general phenomenon has been reported; see Kato (1994) and Perez (1993) for some pertinent discussion on resumptive pronouns in acquisition.

4.2. *Ramifications for acquisition theory*

Our results are relevant for at least three general processes in the acquisition of syntax: long distance *wh*-movement, functional projections, and empty categories with their associated chains. Let us consider each of these in turn.

Regarding the research on *wh*-movement in child syntax, our purpose was to take the logical next step in the study of barriers. If children obey explicit *wh*-barriers, will they also obey invisible barriers? We therefore extended our methodology to examine purpose clauses which are described in adult grammars as involving an abstract operator barrier. We found that children exhibited purpose clauses readily in naturalistic data. These purpose clauses occurred with pronouns and prepositions, indicating that they cannot be described as relative clauses or intransitive verbs. The results of our comprehension experiment show that children did not allow extraction from purpose clauses, suggesting that abstract operators act as barriers in child grammars in the same way that overt operators do.

It now follows that children are likely to possess the same kind of CP structure for invisible operators as they exhibit for overt *wh*-expressions. In addition, we found that the appearance of purpose clauses coincides with the appearance of other (overt) CP material. This suggests that the appearance of a syntactic CP is triggered in several domains at once, and supports an approach according to which functional projections are not fully available in the syntax from the start. Nevertheless, it is important to emphasize that the overt appearance of CP at S-structure is logically distinct from its role at LF.

What causes the young child to posit an abstract analysis involving an empty operator and an invisible chain connecting the operator to an empty position? One possibility is that the overt realizations of operators, such as *what,* trigger the operator–variable structure in the grammar. In addition to the operator structures we have discussed (involving co-indexation by a c-commanding NP), operators have also been proposed for a wide variety of relationships such as tense, negation, and possibly generics and plurals. Consider now the following possibilities:

(i) Lexical items such as *wh*-phrases, tense marking and negation trigger operator chains.
(ii) No lexical information is needed to trigger operator chains.

Under option (i), we would predict that purpose clauses arise later than, say, negative polarity items, since negation would naturally trigger an operator chain responsible for negative polarity items, while the abstract operator in purpose clauses would have no lexical item as a trigger. Under option (ii), however, we predict the opposite: if learning a lexical item (such as negation) delays the

direct projection of properties of Universal Grammar, then operator chains which do not require a lexical trigger should arise first.

Recent work by Crain indicates that children do not initially utilize negative polarity items. In this instance, one could argue that the operator chain is lexically triggered. However, our results show that purpose clauses are available at a very early stage, supporting option (ii) above — that operator chains are available without a lexical trigger. Furthermore, there is direct acquisition data which supports the notion that operator chains are available before the relevant lexical items are used: it has been reported that embedded questions initially appear without a *wh*-word in German (Rothweiler 1990), and examples exist in English as well.

In sum, since (a) there is no lexical item or morphology which corresponds to an operator of a purpose clause and (b) such operators arise early in acquisition in comparison to other forms of complex syntax, we are led to the hypothesis that the [Op...x] relationship (where x is either a null constant or a variable) is available in the syntax whenever a discontinuous relationship is recognized by the child. Therefore, like the notion of Move α, which creates [Op...x] chains, the more general notion of an operator chain is an analytic option available to the child from UG without lexical or parametric prerequisites.

Thus, in purpose clauses the perception that the same NP is linked to two verbs leads to a discontinuous structure (for example '*John bought bananas to sell*'), since the NP (*bananas*) cannot simultaneously occupy the object position of both verbs (*bought* and *sell*).

We leave open the question of whether lexical triggers (such as complementizers) are required to trigger the head of a CP-projection in the syntax. A separate question is whether the Spec of CP projection requires its own trigger, or whether a specifier position is automatically projected once the head is posited. However, once the Spec of CP position is available, and as long as no parametric variation is involved, we make the evidently correct prediction that UG provides the operator-chain analysis for a purpose clause with no further lexical trigger.

Appendix A: Search results for Adam and Nina

— searched for all examples of *to*-infinitivals with an object gap
— embedded verbs searched for: *drink, eat, get, make, play, read, ride, watch, wear, use*

ADAM (all files searched; none in files 1–21)

File 22, age 3;1:
URS: *Did you find some tiny ones?*
ADA: *Those are not peas to eat.*
URS: *No, because they weren't cooked.*
ADA: *No. They not to eat. Why they not to cook?*
MOT: *They are to cook, but they are not cooked yet.*

File 24, age 3;2:
ADA: *Let's have something to read.*

File 27, age 3;3:
ADA: *Those are for me to eat.*

File 28, age 3;4:
ADA: *And I throwed it back to the chicken. And the chicken gave it to Bozo to eat.*

File 29, age 3;4:
MOT: *You did.*
ADA: *I took them all the way down. I want some toys to play with.*

File 31, age 3;5:
ADA: *I want something to play with.*

File 32, age 3;6:
ADA: *We looking for some food to eat.*
ADA: *I want some toys to play with.*

File 33, age 3;6:
ADA: *I want some more to play with.*
ADA: *I want something more to play with.*

File 35, age 3;8:
URS: *Adam, what are you peeking at already?*
ADA: *I looking for something to eat.*

MOT: *You don't need to pull this all the way down.*
ADA: *What do you call this? A temperature to eat all up? To cut your finger?*

File 36, age 3;8:
ADA: *Is it food to eat? Jelly.*

File 37, age 3;9:
ADA: *I need something to play with.* [x2]

File 40, age 3;11:
MOT: *Is that an oboe they're playing?*
ADA: *I never seen that to play.*
MOT: *I don't know what that is.*

File 41, age 3;11:
ADA: *I want something else to play with.* [x2]

File 42, age 4;0:
ADA: *I want something to play with.* [x4]
ADA: *We have to have something to eat.*

File 43, age 4;1:
ADA: *I gon to get another toy to play with.*
ADA: *Let's go on the train <to> — to play with.*

File 44, age 4;2:
ADA: *D(o) you have something more to play with?*

File 46, age 4;4:
ADA: *Can I have something to play with?*
ADA: *I don't have enough to drink.*
ADA: *...so I have enough to drink with.*

File 47, age 4;4:
ADA: *That's what I like to play with.*

File 49, age 4;7:
ADA: *Mommy, can I have something else to eat?*

File 52, age 5:2:
ADA: *This carrot has cherries on it. It's not for people to eat.*

File 55, age 4;11:
ADA: *Hey, you want some grain to eat.*
ADA: *Paul, you want grain? I got grain to eat.*
ADA: *We had something to eat.*
ADA: *He* (?) *has harder skin to get off.*

NINA: (all files searched; none in files 1–28)

File 29, age 2;5.26:
MOT: *What is that?*
NIN: *A bone. For the dogs to eat. For those dogs to eat.*
NIN: *The rice for the dogs. And the spaghetti for the the dogs to eat.*

File 31, age 2;5.28:
NIN: *Mashed potatoes. Eat the food. Good food* [....] *to eat.*

File 33, age 2;9.21 (unclear example):
MOT: *I see. What else are we going to put in the house? I see all kinds of furniture over there.*
NIN: *The chair to eat with the table on there. In that kitchen.*

File 34, age 2;9.26:
NIN: *Hi, Franky, is there something for me to play with?*
NIN: *He sayed he has something to play with for me.*

File 35, age 2;10.6:
NIN: *This is for the dog to eat.*
MOT: *They must be pretty hungry. You sure are giving them a lot of food.*
NIN: *For to eat.*
NIN: *I'm gonna put it in there for you now. For you to eat tomorrow.*
MOT: *What else would you like to cook for me?*
NIN: *A* <noun>. *A* <noun> *to eat.*
MOT: *A what?*
NIN: *A pickle and a* <noun> *to eat.*
MOT: *What are you cooking for Gumpy?*
NIN: *Nothing. He doesn't like nothing to eat.*

File 36, age 2;10.13:
NIN: *We don't have any more blocks to make.*
NIN: *We will pretend there's play dough for something to eat. Here's a play dough animal to eat, OK? Pretend something to* [...] *you gave them some play dough to eat.*
NIN: *I gave 'em play dough to eat.*
NIN: *I'm gonna give them some* [...] *food to eat. I give them some play dough to eat, Mommy.* [x2]

File 37, age 2;10.21:
NIN: *Mommy. He takes some hair to eat, Mommy.* [puts a piece of fuzz in front of the deer]
NIN: *I don't know. Let's leave 'em out here for us to play with.*

File 38, age 2;10.28:
(related construction:)
NIN: *I'm cracking it for you to — for you to eat it.*
NIN: *Here's some eggs for you to eat.*
NIN: *Here's some milk to drink.* [x2]
NIN: *The tea and sugar is in there for her to drink.*

File 39, age 2;11.6:
MOT: *What will he give me to drink?*
NIN: *He will give you* [...] *milk to drink.*
NIN: *Here's a blanket. Here's another blanket for this dolly* [...]
MOT: *Uhhuh.*
NIN: [...] *to wear on tonight. You can wear this blanket on tonight.*

File 40, age 2;11.12:
NIN: *Yup. And they had something to drink there and...*

File 41, age 2;11.16:
MOT: *What are you looking for?*
NIN: *My mask.*
MOT: *For what?*
NIN: *For to wear on my face.*

File 44, age 3;0.16:
NIN: *I want something to drink.*
NIN: *What you have to drink?*

File 45, age 3;0.24:
NIN: *We could play — play with these and make a little horsie to ride on.*
MOT: *What are you building?*
NIN: *A thing for those people to watch on.*

File 46, age 3;1.4:
NIN: *I want something to eat.*

File 49, age 3;1.7:
NIN: *I want some people like that. I want some woman to eat.*
MOT: *Is that the snake talking? He says he wants women to eat?*
NIN: *Yeah.*

File 50, age 3;2.4:
NIN: *You're not going to have anything else to eat for supper.*

[context: pant clamps for biking]
NIN: *Is it for me to ride on? For me to ride on my bicycle?*

File 51, age 3;2.12:
MIN: *I want some — some apple juice to drink.*

File 54, age 3;3.1:
MOT: *What are you gonna put in the plate?*
MIN: *Something to eat.*
MOT: *What are you going to use the oranges for?*
MIN: *To eat.*
MIN: *...and give her something to drink.*

File 55, age 3;3.8:
MIN: *And I need something to eat too.*
MIN: *And there's something to drink.*
MIN: *...so that they could have water to drink.* [x2]
MIN: *This is their something to drink for them tomorrow.*

Appendix B: Scenarios for purpose clause experiment

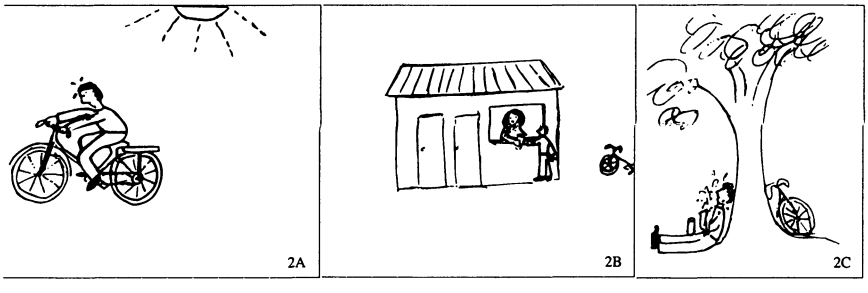
Note: In an effort to neutralize the role of intonation, the experimenter attempted to stress the capitalized words in the questions below.

Scenario 1

The girl was playing outside. [1A]
Suddenly she got hungry, and she decided to get some food and go eat it at the beach. [1B] She asked for a spoon, because she always likes to eat her hamburger with a spoon.
Then she went to the beach. [1C]

Group A: *Where did the girl BUY the HAMBURGER to eat with a SPOON?*
Group B: *Where did the girl PLAN to eat the HAMBURGER with a SPOON?*

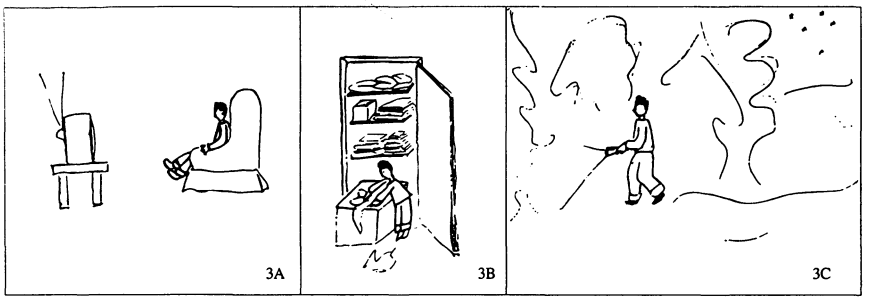
Scenario 2



The boy was riding his bike, and he got really hot and thirsty. [2A]
He decided to get some cold lemonade [2B] that he could splash on his face.
He wanted to cool himself down under a shady tree. [2C] The lemonade was really cold and refreshing.

Group A: *Where did the boy PLAN to SPLASH it on his FACE?*
Group B: *Where did the boy BUY it to SPLASH on his FACE?*

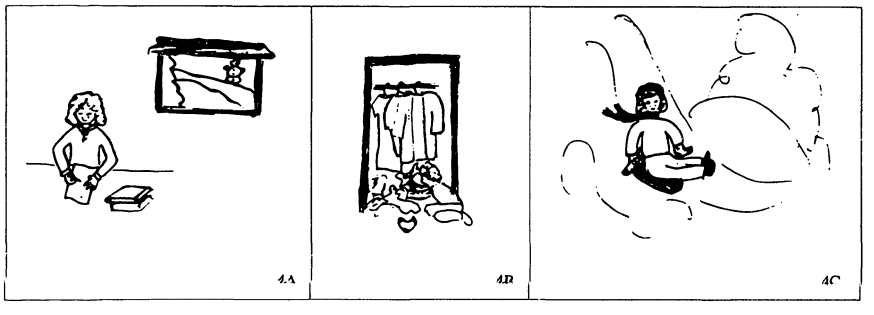
Scenario 3



The boy was watching TV at home. [3A]
Suddenly he felt like going for a walk in the forest. He needed to find a flashlight, [3B]
because it was dark outside. [3C] The flashlight was very useful.

Group A: *Where did the boy LOOK for it to TAKE along WITH him?*
Group B: *Where did the boy PLAN to TAKE it along WITH him?*

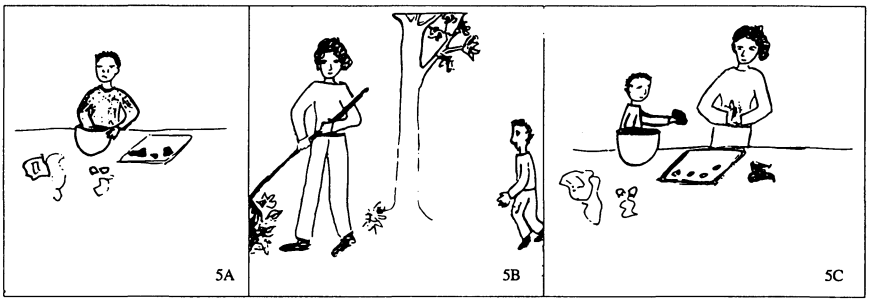
Scenario 4



The girl was finishing up her homework assignment. [4A] After homework, she wanted to go out to play in the snow — but she didn't have any mittens to wear.
She decided to wear her thick wool socks instead, if she could only find them. [4B]
Then she went outside and had a good time. [4C]

Group A: *Where did the girl PLAN to wear her SOCKS as MITTENS?*
Group B: *Where did the girl LOOK for her SOCKS to wear as MITTENS?*

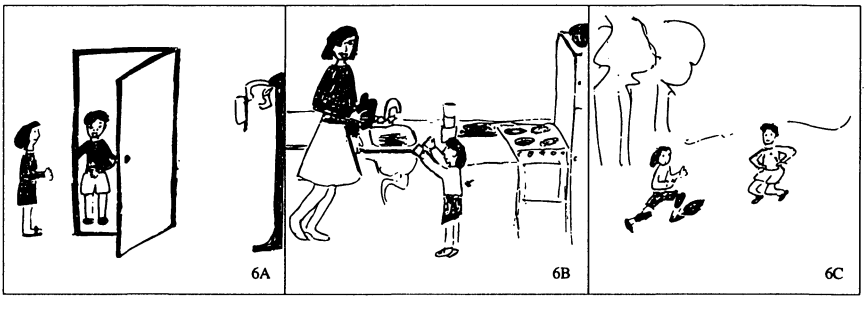
Scenario 5



The boy was trying to bake cookies in the kitchen, [5A] but it wasn't going well. He needed help.
He went to ask his mother, [5B] and she came to the kitchen. [5C]

Group A/B: Where did the boy ASK his MOTHER to COME?

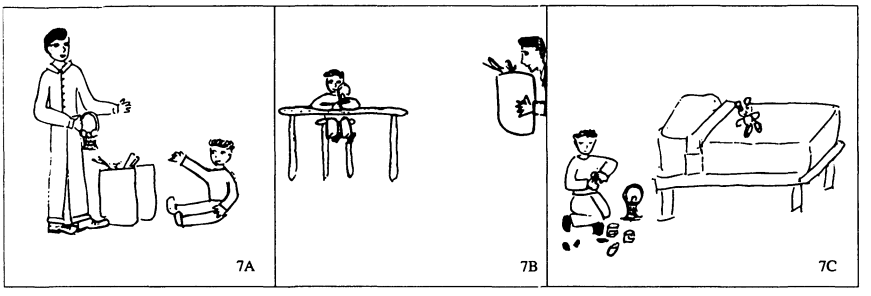
Scenario 6



The girl's friend came to ask her [6A] if she could come out to play football in the park.
Mom said she could go if she wore her kneepads; otherwise her knees could get all scratched and bruised. The girl promised she would wear them. [6B]
Then she went out with her friend. [6C]

Group A/B: *Where did the girl promise her MOTHER to WEAR her KNEEPADS?*

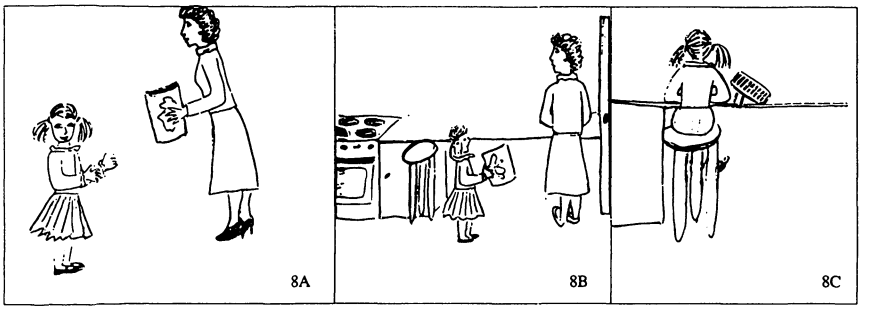
Scenario 7



The father bought some Easter eggs from the store. He brought them home for the boy, [7A] so the boy could paint them with bright colors.
The boy asked his dad: "Can I paint the eggs here in the living room?" [7B] Dad answered: "It's better if you do it in your room, because we need that table."
So the boy went to his room. [7C]

Group A: *Where did the boy get the EASTER eggs to PAINT with bright COLORS?*
Group B: *Where did the boy get to PAINT the EASTER eggs with bright COLORS?*

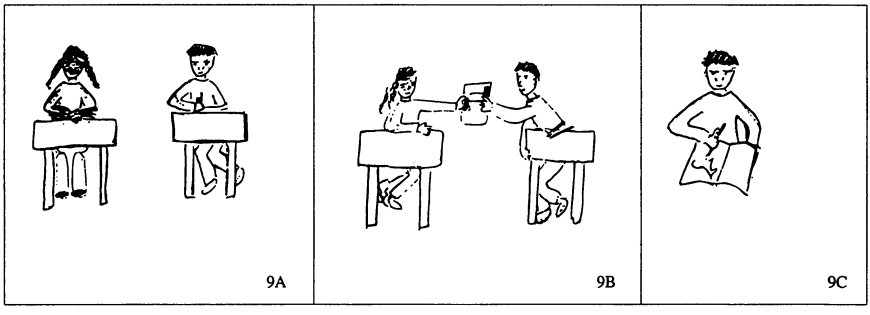
Scenario 8



The mother bought a new coloring book at the store. She wanted to give it to the girl, [8A] so the girl could try out her new crayons.
The girl was very happy with the coloring book, and she said: "Can I color my new coloring book here at the kitchen counter?" [8B]
Mom answered: "As long as you do it at THAT END [pointing] of the counter, [8C] it's fine — but I need the rest of the counter for baking."

Group A: *Where did the girl get to COLOR the COLORING book with her new CRAYONS?*
Group B: *Where did the girl get the COLORING book to COLOR with her new CRAYONS?*

Scenario 9



The girl and her friend were at school. [9A] The friend could draw a horse really well.
The girl gave her notebook to the friend, [9B] and asked him to draw a horse in it. [9C]

Group A/B: *Where did the girl get her FRIEND to DRAW a picture of a HORSE?*

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(Vainikka)
University of Pennsylvania
Institute for Research in Cognitive Science

(Roeper)
University of Massachusetts at Amherst
Department of Linguistics

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