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An Elicitation Study of Young English Children's Knowledge of Tense: Semantic and Syntactic Properties of Optional Infinitives

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1. Introduction

In this paper we report an experiment with English-speaking children (ages 2–4) that used elicited production to explore semantic and syntactic properties of main verbs used as Root or Optional Infinitives (OIs). Specifically, we examine the possible tense/aspect meanings with which children use these OIs, and the question of whether these OIs license null subjects to a greater extent than finite main verbs. These issues were pursued experimentally using two sets of scenarios: one designed to elicit a simple past description (e.g., *She took a nap*), the other designed to elicit a habitual description, where the simple present tense of eventive verbs is felicitous in English (e.g., *She takes a nap every day*). Two sets of findings converge on the conclusion that OIs involve omission / underspecification of Tense (Wexler 1992, 1994; Schütze 1997; i.a.): main verb OIs are used with both present and past tense meanings, and they occur with a greater proportion of null subjects than do finite main verbs. The latter finding is of particular interest because it differs from results based on naturalistic corpora.

2. Experimental Design

2.1 Participants

Monolingual English speaking children were recruited from daycare centers in the Cambridge, Massachusetts area. For analysis purposes only, the children are divided into three groups by age: 17 children ages 2;2–2;10 (identified as the "young" group in the tables), 14 children ages 3;0–3;5 ("mid"), and 7 children ages 3;6–3;11 ("old"). (Four additional children were run, but produced no codable responses.)

2.2 Materials & Procedure

Scenarios were acted out using a farm play set. Before starting the probe items, child and experimenter played a game with a Pooh Bear puppet in which Pooh misnames animals and objects and the child corrects him, to set up the fact that Pooh is confused and does not pay attention.

Examples of a range of elicitation scenarios are given in (1)–(3). The general structure of each scenario was as follows. The protagonist (in the examples, Mickey or Minnie) carried out some action while describing it in the first person singular (1sg) present tense, using the verb we expected the child might use in the target response. Because this was a 1sg use, the verb was never in an in-

flected *-s* form, and because the action was concurrent, it was never in the past tense. As a result, the target 3sg inflected form of the verb was never heard by the child. Then Pooh, who had not been paying attention, would ask the child a question designed to elicit either a habitual or a past tense description of the protagonist's activity. Because our original intent was also to elicit pronoun subjects, including non-nominative subjects, we never used a third person pronoun in the scenario—instead, the protagonist was always referred to by name. As we will see from the results, this strongly biased the children to respond with either a pronoun or a null subject. Each child was presented with 20 scenarios: 10 present habitual and 10 simple past, which were run in blocks, using 20 different eventive verbs. In the past condition, five verbs were regular and five irregular. Across children, two different stimulus sets were used. The final utterance before the child's response (spoken by Pooh) was either a question about the actions of a participant (e.g., *What did Mickey do?*), a *how/why* question (*Why is the blanket like that?*), a question about the event (*What happens?*), or an incorrect statement with a request for confirmation (*Mickey eats the crayon, right?*). (The experiment also included a third condition, targeted at 1sg subjects, whose data we do not report because too many children failed to continue playing the game long enough.)

(1) *Present habitual scenario with* wh-*question prompt*
Mickey: Can you find my car?
Child: There!
Mickey: Very good! I drive my car every day when I go to the store.
[Mickey does some driving]
Pooh: Uh oh. I didn't see. How does Mickey Mouse go to the store?
Child target: He drives.

(2) *Past tense scenario with confirmation prompt*
Minnie: My animals are so dirty. Which one should I wash first, my pig or my cow?
Child: The cow!
Minnie: OK, I'll wash the cow.
[Minnie engages in cow-washing]
Pooh: I wasn't watching. Minnie just sat on the cow, right?
Child target: No! She washed it.

(3) *Past tense scenario with* what happened *prompt*
Mickey: I love to travel around! Should I ride in the train or in the pickup truck?
Child: The truck!
Mickey: OK, here I go.
[truck-riding ensues]
Pooh: I didn't see what happened! Could you please tell me what just happened?
Child target: He rode (in the truck).

3. Results

3.1 Tense

Table 1 shows, for all of the children in each age group, the distribution of verb forms produced in the two scenario types. In this and all subsequent tables, we do not distinguish whether the child's choice of main verb was the one expected on the basis of the wording of the scenario—only the choice of inflection is at issue. As we can clearly see in the first two rows, even the youngest children are sensitive to the tense/aspect manipulation and know which verbal inflection is appropriate to each context: when they use an inflected form (simple present or simple past), they use it in the correct context virtually without exception.[1] This indicates that even children in their twos analyze English main verb inflections as markers of Tense, and understand the difference between present and past. It is important to recall that inflected forms could not have been produced by imitation, since they did not occur in the scenario. (The prompt utterance did of course contain some verb form in the appropriate tense, as is generally true of felicitous question–answer sequences.)

The third row of Table 1 shows that in both present and past contexts the children produced a large number of OI main verbs. Given the success of the Tense manipulation, we can be confident that when the children produced OIs, they intended these to have the meaning appropriate to the context.[2] We take this finding as support for the claim that OIs in English involve omission / underspecification of Tense, and not, for example, a null modal, since neither scenario type involved a modal meaning.[3]

Table 1
All children: Tense/aspect sensitivity & distribution of OIs

	Context					
	Young (N=17)		Mid (N=14)		Old (N=7)	
Verb form	*Present*	*Past*	*Present*	*Past*	*Present*	*Past*
present	41	0	19	1	30	0
past	4	35	0	35	3	39
OI	48	46	63	29	35	28
other[4]	2	0	0	0	2	0

We can make these conclusions stronger by looking just at the children who produced at least one instance of each finite inflection (*-s* and *-ed*[5]). Table 2 shows that these children with productive tense contrasts still produce OIs in both past and present habitual contexts, so the OI uses cannot simply be attributed to gaps in their knowledge of the inflectional paradigm. In the first two rows of data, percentages are given for rate of correct use of the inflection, which is uniformly extremely high. In the third row of data, the OI rate in each context

is given, showing that the chances of an OI being selected as opposed to a finite form are substantial in both conditions for all age groups.

Table 2
Data restricted to children who produced both tense inflections

	Context					
	Young (N=9)		Mid (N=6)		Old (N=6)	
Verb form	*Present*	*Past*	*Present*	*Past*	*Present*	*Past*
present	21 (100%)	0	15 (100%)	0	30 (100%)	0
past	3	31 (91%)	0	27 (100%)	3	35 (92%)
OI	30 (56%)	36 (54%)	21 (58%)	13 (33%)	25 (43%)	22 (39%)

It may be of interest to note that the children excluded from Table 2 do not all exhibit the same gap in their production: some produced *-s* but no *-ed*, others the reverse, and a couple produced neither inflection. Given the small number of items in each condition, we suspect that many of these "gaps" are simply sampling artefacts.

Furthermore, we would like to establish that *individual* children are willing to use OIs in both present and past contexts. So, we identify the children who produced at least one OI in each context (which was the majority of the children from Table 2, in each age group), and see whether the pattern continues to hold for them. (That is, we seek to rule out the possibility that some children treat OIs as exclusively present and others treat them as exclusively past.) Table 3 shows that the strongest hypothesis holds: OIs are still thoroughly available in both contexts. (Note that this refinement is unnecessarily conservative as far as assessing the distribution of the *finite* forms is concerned; for that purpose, Table 2 is entirely appropriate.)

Table 3
Data further restricted to children who produced OIs in both tense conditions

	Context					
	Young (N=7 of 9)		Mid (N=4 of 6)		Old (N=5 of 6)	
Verb form	*Present*	*Past*	*Present*	*Past*	*Present*	*Past*
present	15 (100%)	0	8 (100%)	0	22 (100%)	0
past	3	23 (88%)	0	18 (100%)	3	28 (90%)
OI	27 (60%)	36 (61%)	21 (72%)	11 (38%)	25 (50%)	20 (42%)

3.2 Null subjects

Let us now compare the rates of subject omission for OIs versus inflected main verbs, the latter including both *-s* and *-ed* forms. Since very few of the overt subjects were full DPs, as opposed to pronouns, we pool all overt subject types in one category. As Table 4 shows, for each group of children, null subjects were much more frequent with OIs than with inflected verbs.

Table 4
All children: Rates of subject omission as a function of inflection

	Subject					
	Young (N=16)		Mid (N=14)		Old (N=7)	
Verb form	*Overt*	*Null*	*Overt*	*Null*	*Overt*	*Null*
Inflected	55	12 (18%)	30	20 (40%)	67	6 (8%)
OI	48	42 (47%)	20	76 (79%)	14	47 (77%)

It should be noted that in certain question–answer contexts in adult English, elliptical responses lacking a subject are felicitous, and these take uninflected verbs (cf. 4b, 4e)—16 of our 40 items overall had this property.

(4) a. Q: What did she do yesterday?
b. A: Ride/?*Rode a train.
c. A: She rode/*ride a train.

d. Q: What does she do every morning?
e. A: Ride/?*Rides a train.
f. A: She rides/*ride a train.

In particular, questions like *What does Mickey do?* would allow answers like *Ride the train*, alongside *He ride(s) the train*, but questions like *What happens?* or *Why is the blanket like that?* or *Mickey eats the crayon, right?* would not. If the children's null subject responses to the former type of question have the same structure as adults use in that context, then one might question whether the contrasts in Table 4 bear on the properties of OIs in general. However, we can show that the effect demonstrated in Table 4 is not simply attributable to the environments where adult English allows an elliptical response to a question. When we subdivide the responses from Table 4 into items which do versus do not allow such ellipsis for adults (Tables 4A and 4B, respectively), we find that the effect of finiteness holds solidly in both subsets of items.

Table 4A
All children: Rates of subject omission as a function of inflection, ellipsis-licensing contexts

	Subject					
	Young		Mid		Old	
Verb form	*Overt*	*Null*	*Overt*	*Null*	*Overt*	*Null*
Inflected	25	3 (11%)	12	8 (40%)	30	2 (6%)
OI	17	17 (50%)	5	42 (89%)	8	22 (73%)

Table 4B
All children: Rates of subject omission as a function of inflection, non-ellipsis contexts

	Subject					
	Young		Mid		Old	
Verb form	*Overt*	*Null*	*Overt*	*Null*	*Overt*	*Null*
Inflected	36	7 (16%)	15	11 (42%)	36	3 (8%)
OI	30	22 (42%)	12	32 (73%)	6	23 (79%)

We would also like to ensure that the above patterns are not an artefact of pooling together children at different stages of development, i.e. that we do not find this difference in null subject rates just because the younger children tend to use more OIs and more null subjects, with no grammatical contingency between them. Our criteria for asking this question meaningfully were the following: a child must produce at least one overt and one null subject, and at least one inflected and one uninflected verb; i.e., she must be in the OI, optional-subject stage. This excludes only a minority of the children in the two younger age groups. Then we can ask for the remaining 25 whether each child individually showed the predicted trend, i.e., whether the proportion of null subjects with finite verbs is less than the proportion of null subjects with OIs. As we can see in

Table 5, the effect of finiteness is still very clear in the pooled data for the relevant children. Furthermore, 23 children individually show the predicted pattern; only two show the opposite.

Table 5
Data restricted to children who produced
null/overt and inflected/uninflected alternations

	Subject					
	Young (N=9)		Mid (N=9)		Old (N=7)	
Verb form	*Overt*	*Null*	*Overt*	*Null*	*Overt*	*Null*
Inflected	39	8 (17%)	29	17 (37%)	67	6 (8%)
OI	39	40 (51%)	19	43 (69%)	14	47 (77%)
# children who conformed to prediction		8/9		8/9		7/7

As we discuss further below, the fact that OIs allow null subjects to a greater extent than inflected verbs do supports the claim that OIs are indeed syntactically nonfinite; the fact that they still allow plenty of *overt* subjects is also consistent with this claim.

4. Comparison with spontaneous transcript findings

Before pursuing further consequences of these findings, let us compare the null subject data from our experiment to those that have recently been reported from corpus-based studies on CHILDES (MacWhinney & Snow, 1990). As shown below in Tables 6–10, several counts by different researchers have failed to find any consistent effect of finiteness of main verbs in child English on null subject rates, unlike in other languages. (Note that these studies vary as to whether just pronouns, as opposed to all overt subjects, constitute the denominator. Valsecchi's figures are reported in Rizzi 1998, where raw numbers are not given.) This is in sharp contrast to corpus studies of other child languages, where OIs take more null subjects than finite clauses do, a point that we return to below.

• *Eve (Brown 1973)*

Table 6
Finiteness and null subjects with main verbs
Eve files 01–20 (Phillips 1995)

	Main verb form	
Subject	*Finite*	*Nonfinite*
overt	78	138
null	8	17
Percent null	9%	11%

Table 7
Finiteness and null subjects with main verbs
Eve files 01–20 (Boster 1997)

	Main verb form	
Subject	*Finite*	*Nonfinite*
overt	30	268
null	3	29
Percent null	9%	10%

Valsecchi (1997): 13.6% vs. 11.3%

• *Adam (Brown 1973)*

Table 8
Finiteness and null subjects with main verbs
Adam files 01–20 (Phillips 1995)

	Main verb form	
Subject	*Finite*	*Nonfinite*
overt	79	195
null	34	47
Percent null	30%	19%

Table 9
Finiteness and null subjects with main verbs
Adam odd-numbered files 01–25 (Boster 1997)

	Main verb form	
Subject	*Finite*	*Nonfinite*
overt	29	402
null	8	125
Percent null	22%	24%

• *Peter (Bloom 1970)*

Table 10
Finiteness and null subjects with main verbs
Peter files 01–20 (Boster 1997)

	Main verb form	
Subject	*Finite*	*Nonfinite*
overt	117	172
null	78	142
Percent null	40%	45%

• *Sarah (Brown 1973)*

Valsecchi (1997): 19.3% vs. 25.4%

We suggest two avenues to explore in explaining this discrepancy between our elicitation experiment and corpus counts, and since these accounts are not mutually exclusive, both may be applicable. First, it is possible that counts based on a corpus where situations are unconstrained and contextual information is limited lead to counting procedures that systematically mask a contrast that is in fact present in the children's speech. For example, it has often been noted that an OI with a null subject is generally indistinguishable from an imperative based on form alone, and as a result, many such utterances are typically excluded from these corpus counts on the grounds that they *could* be imperatives. But what if some of them are not? Then excluding them reduces precisely the cell of the contingency table that would otherwise yield a higher proportion of null subjects with OIs; that cell can then be interpreted only as a lower bound on the true null subject rate. A second kind of exclusion used by many of the cited researchers has been not to count null subject utterances that would be acceptable for adults in the same context (cf. (4)), but again, if some of these child utterances are licensed as OIs rather than ellipses, this would disproportionately remove OI–null subject utterances from the counts.

Let us now consider a second potential explanation for the fact that our experiment found an effect of main verb finiteness on null subject rate where corpus studies did not. (This was suggested by Nina Hyams.) It involves the question of how null subjects arise in *finite* clauses for English children. It has often been suggested that some sort of topic drop is at work (cf. Rizzi 1994; Haegeman 1995). Suppose that topic drop in child English, as in some adult Germanic languages such as German, Dutch and Swedish, is syntactically restricted to finite clauses, because topic drop requires movement to the topic position, a fronting process that is itself restricted to finite clauses. If so, this would entail that subject omission in finite clauses and subject omission in OIs arise from separate, nonoverlapping processes: topic drop is not possible in nonfinite clauses, and the kind of null subject licensed in nonfinite clauses (PRO, by hypothesis) is not possible in finite clauses.

We then expect the degree to which topic drop is available in a discourse situation to strongly affect the rate of null subjects in finite clauses. This could explain the relatively higher rate of those null subjects in corpora, as compared to our experiment. Since each sentence elicitation involved a separate mini-narrative in our experiment, it is not implausible that topic drop would be less available than in a naturalistic setting where a single episode of discourse could last over many more utterances. We do not claim that topic drop was impossible in our scenarios—the fact that children (and adults) would most felicitously use a pronoun subject in the target utterance implies that its referent is a discourse topic at that point. Rather, we suggest that one would be less inclined to choose to drop a topic in our scenarios than in naturalistic conversations, because the longer something is under discussion (and hence the more familiar it is), the greater the tendency to drop it, and/or because topic drop is facilitated if the topic was explicitly mentioned in the preceding utterance—in many of our prompts it was not. Thus, if finite clauses and OIs each allow subject omission in only one way, there can be circumstances in which the finite mechanism (topic drop) is used as often as the nonfinite mechanism (PRO), yielding the corpus findings of no difference, or even slightly more null subjects with finites in the case of Phillips's counts for Adam.

The general claim that two different mechanisms underlie child English null subjects gains support from observations in the literature that the null subject rate with main verbs in (nonsubject) *WH*-questions is dramatically lower than in declaratives (Table 11), because (by hypothesis) topicalization, and hence topic drop, is blocked by a fronted *WH*-phrase. Furthermore, in this environment we expect to find a difference in null subject rate as a function of finiteness even in corpus analysis, because topic drop is completely unavailable. This is what Roeper and Rohrbacher (1994) found (Table 12), although it must be noted that their counts include auxiliaries as well as main verbs; the finding was replicated for Eve by Bromberg and Wexler (1995).

Table 11
Null subjects with finite main verbs
Adam files 01–20 (Sano & Hyams 1994 + Guasti & Rizzi 1999)

	Sentence context	
Subject	*All*	*Post-WH*
overt	56	41
null	29	2
Percent null	34%	4.6%

Table 12
Finiteness and null subjects for all verbs in post-*WH* contexts
Adam files 01–18 (Roeper & Rohrbacher 1994)

	Verb form	
Subject	*Finite*	*Nonfinite*
overt	107	106
null	6	98
Percent null	5%	49%

Under either of the approaches suggested above, there remains the question of why corpus counts for main verbs in other OI languages do find higher null subject rates for OIs than for finite clauses (e.g., Phillips 1995). Under the first explanation, based on overly conservative counting procedures, we note that other OI languages are less susceptible to the ambiguities that lead to the excluded cases for child English, because their (singular) imperatives are generally not homophonous with infinitives. Under the second explanation, we might appeal to the fact that in several OI languages, overt subjects are virtually nonexistent with OIs, unlike in child English. This suggests that a property of the (adult) grammars of these languages makes overt subjects of infinitives less readily available than in English (cf. (11) below). If so, the finding of a contrast in null subject rate with OIs versus finite verbs in corpus counts of those other child languages reflects their lesser ability to license overt subjects in OIs, as compared to child English. It remains to be seen whether this could also cover the facts for child languages where OIs do allow substantially non-zero amounts of overt subjects.

Another apparently puzzling observation vis-à-vis the claim that OIs license null subjects in a distinct way (i.e., PRO) because they are nonfinite is Hamann and Plunkett's (1998) finding that in child Danish, the rate of null subjects in *finite* clauses declines with the same temporal profile as the rate of OIs. Wexler (in preparation) suggests that this can be explained with reference to a specific

proposal about the underspecification of morphosyntactic features of the verbal affixes in Danish.

5. Conclusions

Our main findings for child English are as follows:

• Eventive main verb OIs allow (at least) present habitual and simple past interpretations.

• Main verb OIs license null subjects to a greater degree than, and possibly in a different way from, finite main verbs (cf. Guilfoyle 1984, Guilfoyle & Noonan 1992).

Taken together, these findings on temporal interpretations of OIs and their licensing of null subjects strongly support an analysis of OIs as involving omission / underspecification of Tense.

Both of these properties are explained on a Full Competence view of child grammar, by virtue of the fact that many nonfinite clauses in adult English show these same two properties (Schütze 1997 and sources cited there). Specifically,

• Nonfinite clauses allow a range of possible temporal interpretations, including past and present, as illustrated in (5)–(9), and crucially their time reference can be independent of the matrix clause when there is one; even *to*-infinitivals are not restricted to irrealis meanings (10).

(5) *Adjunct small clauses*
   a. With John out of town last week, we'll have a lot to catch up on next week.
   b. With John out of town this week, we have a lot to do today.
   c. With John out of town next week, we had a lot to prepare last week.

(6) *Mad Magazine sentences*
   a. John drunk at 3:30 last night??!!
   b. John in the hospital now??!!
   c. Clinton (still) the president next year??!!

(7) *"Wistful" infinitives*
   a. Oh, to know her name yesterday and forget it today!
   b. Oh, to see her face right now!
   c. Oh, to be with her tomorrow!

(8) *Complement small clauses*
   a. I can envision [John happy in his youth/in 1965].
   b. I can envision [John upset right now].
   c. I can envision [John content in his old age/twenty years from now].

(9) *Adjunct gerunds*
   a. (What with) John eating the pizza yesterday, there's nothing left in the fridge now.
   b. (What with) John eating the pizza as we speak, we'll have to order Chinese tonight.
   c. (What with) Mom making pizza tomorrow, we warned our friends to bring their Zantac.

(10) *Realis uses of* to*-infinitives*
   a. He was the last man [to arrive].
   b. She eventually found a flashlight, only [for the power to come back on].
   c. [To finally meet his grandfather] had pleased John very much.
   d. After all that's happened, [to have in the end been left by her]!

• Many nonfinite clauses can license both PRO and overt subjects, as shown in (11) for gerunds and adjunct small clauses, just as children allow both null and overt subjects in OIs.

(11) *Alternation of PRO and overt subjects*
   a. [Everyone/PRO leaving early] would be rude.
   b. My sadness over [Mary/PRO leaving] brought me to tears.
   c. Mary avoided [John/PRO being informed].
   d. PRO/Him not having picked up the kids on time, John had really upset Mary.
   e. {PRO/His girlfriend} under surveillance, John didn't know which way to turn.

Finally, we note that our conclusion here is compatible with claims we have made elsewhere (Schütze & Wexler 1996; Wexler, Schütze & Rice 1998) that Tense is not the *only* feature of INFL that can be underspecified in the OI stage. In particular, the Agr/Tense Omission Model (ATOM) embodies the claim that agreement is also optional, but that does not affect either of the predictions tested in the present study. What optionality of agreement predicts, on this model, is the possibility of non-nominative subject pronouns. Interestingly, there was only one of these across all the utterances of all the children in our experiment. This adds some support to the speculation in Schütze (1997) that Agreement generally becomes obligatory before Tense does, and sharpens the need to try to understand the relationship between these two kinds of optionality in the INFL system of child grammars (cf. Wexler 1998).

Endnotes

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1. Note that the rare use of *-ed* in the present habitual condition is not necessarily inaccurate as a description of the scenario once it had been completed.
2. One could in principle suggest instead that the choice between an OI structure and a finite structure depends on whether the child is certain which tense is appropriate: if not, she uses an OI as a strategy to avoid possibly using the wrong tensed form. We find this unlikely, given the near-perfect distribution of the tense morphemes when they are used (cf. Table 2), and the uniformity of the elicitation scenarios: it is unclear what the source of uncertainty would be, and how the children could manage to be so accurate in knowing when they should be uncertain.
3. Rice, Wexler & Cleave (1995) report the same two findings (correct use of inflection, OIs in both tense contexts) for an experiment with children slightly older than our young group, mean age 3;0, range 2;6 to 3;4.
4. The four "other" responses were as follows: in the present habitual condition for the young group, *him sitting* and *she jumping*; in the present habitual condition for the old group, *does play* and *is sitting*. These are consistent with the tense manipulation. Since they involve auxiliaries and are so few in number, for simplicity we omit them from subsequent analyses.
5. Throughout, *-ed* is shorthand for any past tense form, regular or irregular.

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