

The Underspecification of Number and the Licensing of Root Infinitives

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1. Introduction

Root infinitives of the sort in (1) are a common feature of many child languages. In the languages which display this phenomenon, the non-finite forms appear to be in free variation with finite forms of the verb. The apparent optionality of root infinitives led Wexler (1994) to propose that children pass through an *optional infinitive stage*.

- (1) a. Papa schoenen wassen.
Daddy shoes wash-inf. (Dutch, Weverink 1989)
b. Eve sit floor. (English, CHILDES Brown, 1973)
c. Pas manger la poupée
not eat-inf. the doll
Michel dormir.
Michel sleep. (French, Pierce 1992)
d. Thorstn das haben.
Thorstn that have- inf. (German, Wexler 1994)

In earlier work (Hyams 1996; Hoekstra & Hyams 1995), we argued that the RI phenomenon is part of a more general property of early grammar, which is that children often fail to grammatically encode 'specificity.' A finite verb marks 'temporal specificity', that is, the morphological specification of finiteness through Tense and agreement features places the event at a time relative to speech time, either past or present. This is parallel to what we find in the nominal domain, where specificity is marked by a specification of definiteness and other functional categories within DP. Thus, a definite DP or pronouns denotes a specific individual or entity, while a specific, that is finite, verb picks out a specific interval of time.

Just as children can fail to encode temporal specificity, giving rise to RIs, so they can fail to mark nominal specificity, and this manifests itself in the omission of determiners, as in (2), and the omission of overt pronouns, as in (3); the null subjects in (3) are taken as instances of null D with zero noun phrase complementation.

- (2)
- | | | |
|----|--|-------------------------|
| a. | Wayne in garden. | |
| b. | Hayley draw boat. | (Radford 1990) |
| c. | Niekje ook boot maken.
Niekje also boat make.
'Niekje also makes the boat' | (Dutch, Schaeffer 1994) |
| d. | Nur eisenbahn moegen wir.
only train like we
'We like only the train' | (German, Becker 1995) |
- (3)
- | | | |
|----|--|---------------------------|
| a. | Want more apple. | (Bloom et al. 1975) |
| b. | Veux pas lolo.
want not water
'(I) don't want water' | (French, Pierce 1992) |
| c. | Kan niet slapen op een schaaap.
can not sleep on a sheep
(I) cannot sleep on a sheep.' | (de Haan & Tuijnman 1988) |
| d. | a Matratze schlafen.
mattress to sleep
'(he) sleeps on the mattress' | (German, Becker 1995) |

In order to account for the properties in (1) through (3) in a unified manner, Hoekstra & Hyams propose that in the early grammar the functional head Number, which is crucial to determining specificity, can be left unspecified in the morphosyntax; the underspecification of Number in the verbal domain gives rise to RIs, while its underspecification in the nominal domain gives rise to null subjects and bare Ns. We suggested further that children can leave Number unspecified because they can have a deictic option for establishing reference which is not available to adults under normal circumstances. Adults, we argued, are subject to a requirement that specificity be grammatically encoded where possible.

This paper takes the Hoekstra & Hyams analysis as a point of departure. Here we will provide evidence that the RI phenomenon is not only related to underspecification within DP in the sense that both show a failure to grammatically encode specificity, but that the occurrence of RIs is in fact contingent on properties of the DP. This contingency is based on spec-head agreement. Hence, we will argue that despite appearances, RIs are not in fact optional, but dependent on properties of the subject DP.

2.0 Finiteness and spec-head agreement in the early grammar

We begin by noting one of the most striking properties of this early stage, which is that despite the apparent optionality in the expression of certain functional elements, when these elements are realized, they are largely correct

in form. In particular, there is now considerable evidence that (non-finite forms apart) children respect the spec-head agreement requirement at a very early age; agreement errors, by which we mean mismatches in agreement features, are not a robust phenomenon in early language. For example, Hyams (1983) and Guasti (1994) found few agreement errors in the language of young Italian-speaking children. Pizzuto and Caselli (1992) report a 96% accuracy rate in subject-verb agreement. Clahsen and Penke (1992), Poeppel and Wexler (1993) and Rohrbacher and Vainikka (1995) find similar results in German-speaking children. Harris and Wexler (1995) show that English-speaking children do not produce agreement errors with first person subjects (eg. *I goes*). Torrens (1992) counted at most 3% agreement errors among his Catalan-speaking subjects. These results are summarized in Table 1. (1)

Table 1: Subject-verb agreement errors in early language.

<i>Child</i>	<i>Language</i>	<i>Age</i>	<i>n</i>	<i>%</i>
Simone (Clahsen & Penke 1992)	German	1;7-2;8	1732	1%
Martina*	Italian	1;8-2;7	478	1.6%
Diana*	Italian	1;10-2;6	610	1.5%
Guglielmo* (Guasti 1994)	Italian	2;2-2;7	201	3.3%
CHILDES* (Harris & Wexler 1995)	English	1;6-4;1	1352	.02%
Claudia	Italian	1;4-2;4	1410	3%
Francesco	Italian	1;5-2;10	1264	2%
Marco (Pizzuto & Caselli 1992)	Italian	1;5-3;0	415	4%
Marti*	Cat/Span	1;9-2;5	178	.56%
Josep*	Cat/Span	1;9-2;6	136	3%
Guillem*	Catalan	1;9-2;6	129	2.3%
Gisela* (Torrens 1992)	Catalan	1;10-2;6	81	1.2%

(*data available on CHILDES, MacWhinney & Snow 1985: Martin, Guglielmo, Diana corpora, Cipriani et al 1991; Marti, Josep, Guillem, Gisela corpora: Serra & Sole 1992)

These results, as well as others related to verb placement, clearly show that finiteness is a feature of the early grammar and that the distribution of finite forms is not random, but rather is determined by adult-like grammatical processes, including spec-head agreement.

2.1 Formulating the predictions

Although in many languages Number is a property of both the nominal and verbal domain, verbal Number is rather different from nominal Number. In the nominal domain Number is inherently determined by the referent of the nominal phrase, while in the verbal system, Number is derivative; it encodes a property of a dependent, the subject, rather than of the verb itself. We saw earlier (cf. table 1) that children respect spec-head agreement requirements from a very early age. Thus, just as we find agreement when features (eg. person) are specified, we expect correspondences when features are left unspecified, an idea also put forth by Clahsen et al. (1996). Specifically, we expect root infinitives to occur with subjects that are likewise unspecified for Number, and conversely, we expect finite verbs to have subjects that are specified for Number. With respect to underspecified subjects we need to distinguish two cases: first, radically empty DPs, which would have the status of null subjects, and second, DPs with overt nouns but without any functional specification, that is, bare singular Ns.

A number of previous studies have shown that there is a rough correlation between null subjects and RIs on the one hand, and between lexical subjects and finite verbs on the other. The results of these studies are summarized in table 2.

Table 2: Finiteness and subject type

	finite			non-finite		
	<i>overt</i>	<i>null</i>	<i>total n</i>	<i>overt</i>	<i>null</i>	<i>total n</i>
<i>Dutch:</i>						
Hein 2;3-3;1* (Haegeman 1994)	68%	32%	3768	15%	85%	721
<i>Flemish:</i>						
Maarten 1;11* (Kramer 1993)	75%	25%	92	11%	89%	100
<i>German:</i>						
Simone 1;8-4;1 (Behrens 1993)	80%	20%	3636	11%	89%	2477
Andreas* (Krämer 1993)	92%	8%	220	32%	68%	68
<i>French:2</i>						
Nathalie 1;9-2;3 (Krämer 1993)	70%	30%	299	27%	73%	180
Philippe* 2;1-2;674 (Krämer 1993)	70%	26%	705	7%	93%	164

(Data from CHILDES; MacWhinney & Snow 1985; Philippe corpus: Suppes, Smith & Leveille 1973; Hein, Maarten corpora: Elbers & Wijnen 1992; Simone corpus: Miller 1976; Nathalie corpus: Lightbown 1977)

In Table 2 we see that in a range of child languages (the non-pro-drop languages) lexical subjects occur disproportionately more often in finite clauses than in RIs. Averaging across languages and children we find about 76% overt subjects in finite clauses and 17% overt subject in RIs. RIs typically occur with null subjects (roughly 83%). But the correlations between finiteness and subject type are not perfect in either direction. First, we still find some percentage of finite verbs occurring with null subjects (roughly 24%) and some RIs have overt subjects (about 17%).

How might we explain the lack of a perfect correlation? With respect to the null subjects in finite sentences, it is arguably the case that the null element is not in an A-positions, but rather results from topic-drop, as first proposed by de Haan & Tuijnman (1988), and more recently in Hyams and Wexler (1991) and elsewhere. There is support for this idea from numerous quarters, most notably the observation that null subjects of finite clauses occur only in first position in root clauses (Valian 1991; Roeper & Rohrbacher 1994; Poeppel & Wexler 1993; Haegemann 1994; Rizzi 1994a and others.)

Turning to the lexical subjects, it has been proposed that lexical subjects

should not occur in RI sentences (perhaps for case-theoretic reasons) (Kramer 1993; Sano & Hyams 1994; Roeper & Rohrbacher 1994). However, this expectation is based on an assumption that all lexical subjects are equal. According to our hypothesis, however, this is not the case; we make a distinction between *finite* lexical subject and *non-finite* lexical subjects. PRO, that is, a radically empty DP, is one instance of a non-finite DP, but an overt subject with a missing determiner likewise instantiates a non-finite DP. Neither of these non-finite DP-types is specified for the features relevant to agreement of the verb. On the other hand, lexical subjects with a determiner, as well as plural DPs, are finite DPs. With these considerations in mind, and assuming that there is agreement between the feature specification of the DP subject and that of V, we formulate the predictions in (4),:

- (4) a. The subject of a root infinitive will be either;
 (i) a zero pronoun, or
 (ii) a bare noun phrase, i.e. no determiner,
 no number marking (eg. *dog*).
 b. Finite verbs will occur with finite DP subjects, i.e. DPs with
 a determiner (eg. *the boy*).
 c. Plural subjects will occur with finite verbs.

2.2. Testing the predictions: English-speaking children.

We tested these predictions in English and German child language. For English we relied on the corpora of Adam and Nina (in the CHILDES data-base, MacWhinney and Snow 1985). The German data were collected by Misha Becker. The number of files examined and the age of each child is given in (5).

(5)	<u>Child</u>	<u># of files</u>	<u>Age</u>	<u>Language</u>
	Adam	11	2;3-3;7	English
	Nina	7	2;4-2;10	English
	Philip	1	2;9	German
	Sophie	1	2;5	German
	Wolfgang	2	2;5	German
	Johanna	1	2;5	German

Turning now to the predicted relationships between subject type and finiteness of the verb, as just noted, previous studies have shown a rough correlation between null subjects and RIs on the one hand, and finite verbs and lexical subjects on the other (cf. table 2.) We looked to see if this was the case for Adam and Nina. Tables 3 and 4 provide the relevant figures. Note that in these tables the category *overt subject* includes all singular lexical subjects and that we have collapsed main verbs and BE. Although BE does not occur in

infinitival form (except in rare cases), we take non-occurrence of BE in obligatory contexts, that is null BE, as in (6), as the BE form of the root infinitive. This is based on the idea that BE is in fact a carrier of inflectional structure, which is hence non-overt when the inflectional structure is unspecified (Jaeggli and Hyams 1987).

- (6) a. Little tricycle going round.
b. Cowboy funny.

Table 3: Finiteness and Subject: Adam

	<i>Non-finite</i>	<i>Finite</i>
Null subject	50	19
Overt subject	245	263

Table 4: Finiteness and Subject: Nina

	<i>Non-finite</i>	<i>Finite</i>
Null subject	15	17
Overt subject	87	294

If we look at the columns marked *finite* in tables 3 and 4, we see that the overwhelming majority of subjects for both Adam and Nina are overt; 93% in Adam's case and 95% in Nina's. And, as before, we can put assume that the null subjects with finite verbs represent cases of topic or diary-drop. If we now look at the column marked *non-finite*, we see a rather large number of lexical subjects. In fact, lexical subjects far exceed null subjects. According to the predictions in (4), the lexical subjects occurring with non-finite verbs must be non-finite themselves (bare nouns), while the lexical subjects occurring with finite verbs will be finite (ie., DPs with determiners).

To test the distribution of finite and non-finite lexical subjects, we looked only at subject with common nouns. We excluded pronouns and proper names from our analyses because according to our assumptions about the internal structure of DPs, they can occur with both finite and non-finite verbs. (cf. Hoekstra and Hyams 1995 for discussion). Table 5 gives the relevant figures for Adam. As in the previous analysis, the category *finite verbs* includes finite lexical verbs and finite forms of the verb BE, and the category of *non-finite verbs* includes root infinitives and cases in which BE is missing, as in (6).

Table 5: Determiners and finiteness in main verbs and BE: Adam

	<i>Finite Verbs</i>	<i>Non-finite Verbs</i>
Overt determiner	53	2
Null determiner	4	39

What we see in Table 5 is that overt determiners occur

overwhelmingly with finite verbs, while nonfinite verbs occur with bare Ns, as predicted by our hypothesis. When Number is unspecified in DP, resulting in a bare N, the verb must also be unspecified with respect to Number and hence non-finite.

Table 6 reports the figures for Nina

Table 6: Total determiners and finiteness: Nina

	<i>Finite Verbs</i>	<i>Non-finite Verbs</i>
Overt Determiner	34	12
Null determiner	3	9

We see in Nina's data that finite verbs behave as predicted, occurring roughly 92% of the time with overt determiners. Non-finite verbs, however, do not behave as expected. More than 50% of the subjects have overt determiners, that is, the DPs are finite in our terms. Our suggestion at this point is that the finite DPs that occur with non-finite verbs are not in subject position, but are rather dislocated constituents.³ Time limitations prevent us from providing a full justification for this proposal. We note, however, the observations in (7), which are consistent with a dislocation analysis:

- (7)
- i. Overt subjects of RIs occur on the left (or right, as in French, cf. (1c)) periphery of the clause (cf. Haegeman 1994).
 - ii. Subject clitics do not occur with RIs, as they cannot be dislocated. (cf. Pierce 1992).
 - iii. Non-nominative subject pronouns occur only with RIs, eg. *him go*, **him goes* (Schutze 1995).

Additionally, if finite DPs in RIs are dislocated, we make the additional prediction in (8).

- (8) There can be no finite subjects of RIs in V2 languages, as left dislocation in these languages requires V2, and hence a finite verb (eg. **Dat boek de man lezen* 'that book the man read-inf.').

So let us now turn to a V2 language.

2.3 Testing the predictions: German speaking children

Our predictions with respect to finiteness were also tested in the four German children listed in (5). However, the data examined are rather limited, consisting of only 1 or 2 files per child so that conclusions here should be regarded as tentative. We first looked at the distribution of overt vs. null

determiners in obligatory position. The figures are presented in table 7.

Table 7: Finiteness and subject determiners in early German

	<i>Finite Verbs</i>	<i>Non-finite Verbs</i>
Overt Determiner	9	2
Null Determiner	1 (9)	11

For the German children, as for the English-speaking children, we find the predicted pattern; non-finite verbs occur 85% (11/13) of the time with null determiners and finite verbs 90% (9/10) of the time with full DPs. Moreover, the fact that there are only 2 cases of overt determiners with RIs also bears out the prediction in (8), supporting the dislocation analysis of finite subjects in RIs.

The number (9) in parentheses refers to a number of apparent counterexamples in the German data, cases of finite verbs with null determiners. However, if we examine these 9 cases individually, we see that all but 1 are problematic in one way or another. We have given an exhaustive list of the counterexamples in (9) on the handout.

- (9)
- a. *Eisenbahn* geht das nicht
'Train goes that not'
 - b. So *Feuerwehr* macht
'So firefighter does'
 - c. So *Anlage* so macht
'So device so does'
 - d. *Katze* macht
'cat does'
 - e. *Wau-wau* noch kommt rein
'Dog also comes in'
 - f. *Katze* reicht das
'Cat reaches that' or '(to the) cat is-sufficient that'
 - g. *Anre Pferdebuch* heisst
'Other horsebook is-called'
 - h. *Turnstunde* ist so da lang
'Gym class is so there long'
 - i. Hier ist *Stopper*
'Here is ?'

In (a), it is not clear whether the italicized noun is in fact the subject, or even what the structure of the sentence is. The pronoun *das* might be the subject. Examples (b, c, e, g) don't have the V-second order which is normal for finite clauses. The verb form *macht* in (b,c,d) might be a participle, missing the *ge-* prefix. The subjects in (d,e,f) might be proper names. In (g,i) the italicized noun might be a nominal predicate rather than the subject. The meaning, and hence

also the grammatical analysis of (f,i) is unclear. Hence, we are unwilling to draw many conclusions on the basis of these examples. If we put these examples to the side, we find the predicted correlation between finiteness of the verb and determiners, or more to the point, between the specification of Number in the nominal and verbal domains.

The German data provide us with a further test of our hypothesis that is not available in English, the prediction (4c), that plural subjects will occur only with finite verbs. This prediction cannot be tested in English because there is no difference in either form or position between a plural finite verb form and an infinitive; they are both *The boys go*. In German, on the other hand, even though by and large the form of the plural inflected verb is identical to the form of the infinitive, eg. *machen* 'make', there is a positional difference: a plural inflected verb occurs in second position, while an infinitive occurs in clause-final position. Table 8 gives the relative distributions of plural and non-plural subjects across finite and non-finite verbs.

Table 8: Finiteness and plural subjects in early German.

	<i>Finite (V2)</i>	<i>Non-finite (verb final)</i>
Plural subjects	22	1
Non-plural subjects	46	43

These data provide very strong confirmation of the prediction in (4c): with only a single counterexample, plural subjects occur with finite verbs, while non-plural subjects show an even distribution across finite and non-finite constructions. 4

Further study of German is required. However, additional support for our hypothesis comes from Clahsen et al. (1996), who also investigated the relationship between underspecification in DP and IP under somewhat different assumptions. Their data is given in table 9. The 4 children in their study failed to produce a single finite DP in RIs. 5

Table 9: Different subject types in RIs in German

(adapted from Clahsen, Eisenbeiss and Penke 1996)

<i>Child</i>	<i>full DP</i>	<i>bare N</i>	<i>null</i>
Simone	0	28%	72%
Mathias	0	58%	42%
Annelie	0	0	100%
Hannah	0	10%	90%

3. Discussion

The empirical results for English and German support the hypothesis

that the root infinitive phenomenon in child language is not really an optional matter, but is rather determined by properties of the agreement system. In Hoekstra & Hyams (1995) we showed that the cross-linguistic differences observed in the occurrence of RIs (cf. Sano & Hyams 1994) could be accounted for by the hypothesis that Number (and only Number) can remain unspecified in the early grammar. Hence, languages with a specification for Person (eg. Italian, Spanish and Catalan) do not show a RI effect, nor do languages with a specification for Tense (eg. Japanese). In this paper we show that within systems that allow the use of non-finite forms, such as English and German, the choice is not free, but rather dependent on properties of the subject. The RI-phenomenon arises when the Number specification in the verbal inflection cannot be checked by a specification in its specifier. Hence, specifier-head agreement governs the choice of finite vs. infinitival form.

These results have implications for certain alternative analyses of the root infinitives. First, the fact that the omission of functional elements is governed by spec-head agreement requirements shows that the phenomenon is a matter of grammar and not performance (contra Bloom 1990). In addition, theories that account for RIs in terms of truncation (Rizzi 1994b), for example, modal drop (Boser et al. 1992), or a failure to spell out abstractly specified features (Phillips 1995) are not easily able to explain the correlations that we find. On a modal drop or defective spell-out analysis, RIs are finite and hence indistinguishable in relevant respects from finite verbs. Truncation analyses fall short in a similar way; if null subjects are licensed in the spec of the root -- either IP or VP -- the same options should be possible for bare nouns, that is, they should be possible in finite and non-finite clauses alike, contrary to fact.

Endnotes

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1. Ferdinand (1996) reports that agreement errors range from about 9% to 20% in the four French-speaking children she studied. Most of the errors involve a third person singular verb form, with subjects with an unclear status, for instance a null subject, understood as first person (as in (i)), or a non-nominative subject (as in (ii)). No errors of the sort in (iii) are reported. (@ indicates that a form is unattested.)

- (i) Va assis.
- (I) go-3rd per. sit

- (ii) Moi est pas villain.
 'Me is not naughty'
- (iii) @J'est pas villain.
 'I is not naughty.'
2. For French only preverbal subjects were counted.
3. Ferdinand (1996) and Labelle and Valois (1995) provide compelling evidence (grammatical as well as spectrographic) that post-verbal subjects in early French are dislocated. Most subjects of RIs in early French are post-verbal (cf. Friedemann 1994, Pierce 1992).
4. The reason the figures in table 8 are higher than in table 7 because we included all DPs, including pronouns and proper names, were included in this count.
5. Clahsen et al's *bare N* category includes bare Ns, pronouns and proper names.

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