Partial Constraint Ordering in Child French Syntax

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ABSTRACT

Reanalyzing production data from three French children, we make two basic points. First, we show that tense and agreement inflection follow independent courses of acquisition (in child French). Tense production starts and ends at near-adult levels, but suffers a "dip" in production in the intermediate stage. Agreement develops linearly, going roughly from none to 100% over the same time. This profile suggests an analysis in which tense and agreement *compete* at the intermediate stage. Second, using a mechanism of grammatical development based on partial rankings of constraints (in terms of Optimality Theory (Prince and Smolensky 1993)), our analysis successfully models, over three stages, the frequency with which children use tensed, agreeing, and nonfinite verbs.

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1. Introduction

In this article we have three goals. First, we describe properties of the development of the syntax of tense and agreement, separately, in the acquisition of Child French. Second, we show that syntactic development occurs in systematic stages that have generally been overlooked in previous studies that collapsed the data over too large a developmental range. Third, we consider the implications of this data against the backdrop of an adult syntax, cast in terms of Optimality Theory (Prince and Smolensky (1993)). Briefly, we show here that tense and agreement develop independently in Child French, tense being acquired earlier, but by looking closely at the course of development in appropriately small increments, we also find an intermediate stage showing evidence of a temporary competition between tense and agreement (agreement marking becomes more robust during this stage, but at the expense of tense marking). We then present an Optimality-Theoretic syntactic analysis that accurately models the proportions of tensed and agreeing forms.

As our results in Section 3 show, there are systematic and independent progressions in the development of tense and of agreement in Child French, which we were able to identify by analyzing our data in stages. The stages we use are defined in terms of the PLU metric, outlined in Section 3.1.

Viewed from the perspective of Optimality Theory (OT), a grammar consists of structural "markedness" constraints pitted against conflicting "faithfulness" constraints. Adult grammars differ from one another not in the constraints involved (which form the core of UG), but in the relative rankings between them. Thus, the process of child acquisition of syntax must in large part involve learning the relative rankings of the constraints. In this paper, we adopt a particular view of the re-ranking of constraints in child language acquisition which can explain not only the *existence* of the observed child forms, but also model the *frequency* with which these forms appear—something which has not been substantially addressed in previous formal work on syntactic acquisition.

In a nutshell, our analysis pits constraints requiring the structural realization of tense features and of agreement features (faithfulness constraints) against constraints on the maximal complexity of the syntactic structure (markedness constraints). In the first stage examined here, the mandate to realize tense features is roughly on a par with the constraint limiting structure, both taking priority over realizing agreement features. The result is an alternation between tensed and nonfinite forms, none of which are agreeing. The second stage sees an increased priority for agreement features, but at the expense of the realization of tense; observationally, we see a drop in the production of tensed forms corresponding to the increase in the production of agreeing forms. In the third stage, the faithfulness constraints overcome the markedness constraints, resulting in constant production of both tense and agreement (in appropriately complex structures). Our particular implementation of the grammar of variation allows us to predict the observed proportions at each stage, as discussed in section 4.

In the next section we provide some brief general background to the crosslinguistic acquisition of grammatical phenomena under study: finite and non-finite verb forms in child language. We then turn to a description of our data from child French on finite and non-finite verbs (Section 3), followed by our analysis of these data (Section

4). Section 5 concludes the paper with some connections to other research reported in the literature to set the present proposals in a more general context.

2. The crosslinguistic development of finiteness
2.1 The order of acquisition of tense and agreement

Inflection on the finite verb is already acquired by around age 2, as production data from various languages have shown (see, e.g., Aksu-Koç and Slobin (1985) on Turkish, Berman (1985) on Hebrew, and Imedadze and Tuite (1992) on Georgian). Verbal inflection can generally be decomposed into tense marking and agreement marking, but most previous studies have not addressed these separately, making it difficult to discern whether they are acquired at different times. Below, we present data from child French that indicate that tense marking appears before person agreement marking. The literature contains a modest amount of evidence that this is also true of Swahili, English, and possibly German, which we review briefly below. Note that the independence of tense and agreement in development will figure into our analysis, but the question of whether tense universally appears prior to subject agreement is a separate issue beyond the scope of the analysis proposed here (although such a universal is unlikely; see Grinstead (1994), Davidson and Legendre (to appear) for evidence that subject agreement precedes tense marking in Catalan child production).

In support of the claim that tense appears before agreement in English, Ingham (1998) presents syntactic evidence to the effect that Tense Phrase (TP) is acquired before Agreement Phrase (AgrP). Taking the fact that subjects precede adverbs as evidence for a functional projection into which the subject moves, Ingham identifies that functional projection as TP and not AgrP based on the presence of modals and tense inflection coupled with a lack of Nominative case marking and agreement inflection. Earlier work on the acquisition of English morphology points toward the same conclusion: Brown (1973) and de Villiers and de Villiers (1973) found that past irregular forms reached a 90% level (in obligatory contexts) much earlier than the third person irregular forms (e.g. *has*). For regular inflection, Brown showed the regular past (*-ed*) reaching 90% (of obligatory contexts) slightly before the third person singular present suffix (*-s*), although de Villiers and de Villiers found them to be acquired at the same time. Research on the acquisition of German (Clahsen (1990), Clahsen et al. (1996); although cf. Meisel (1994)), and of Swahili (Deen and Hyams 2002) also indicates that tense morphology appears productively prior to subject agreement morphology.

Determining the status of a French verb with respect to tense and agreement is complicated by the fact that many agreeing forms of the regular verbal paradigm are homophonous (see section 3.3). Pierce (1992), assuming (as we do here) that the presence of a clitic subject in French unambiguously indicates subject-verb agreement, found that agreement in French is acquired very early; however, Pierce's analysis often collapses data spanning several months, making it impossible to discern the relative order of acquisition between tense and agreement. Ferdinand (1996), although breaking the same data set into smaller stages, also considers tense and agreement together. Our analysis of the French data (discussed in section 3) reveals clearly that tense is acquired before agreement.

2.2 Root infinitives and other NRFs

In addition to producing adult-like finite verbs with tense and agreement marking, young children often produce sentences with a non-finite verb form in a main clause, which are ungrammatical in the adult language. These "Root Infinitives" have posed a challenging problem for current research on the early acquisition of syntax. We will use the term Non-finite Root Forms (NRFs) to refer to non-finite verbs in root contexts because it explicitly encompasses both infinitives and other non-finite forms (such as bare participles) that are used as main verbs. Some examples of NRFs from child French are provided in (1), obtained from the CHILDES Database (MacWhinney and Snow (1985); cf. also Vainikka, Legendre and Todorova (1999)):[1]

(1)   a.   Cabinets   ouvrir.   (Grégoire 1;9.28)
           Restroom   open-INF
           '(I will) open the restroom (door)'
           Situation: G shows the Kleenex while starting for the restroom

    b.   Mont[e]   la main.   (Grégoire 1;10.20)
           go up-PART/INF the hand
           'gone/go up the hand'
           Situation: G and the two adults are speaking about a bird perched on a roof. Mother proposes to wave to the bird and G is asked: what is the hand doing? Sometimes the child answers correctly: *la main elle est montée* 'the hand (it) has gone up,' sometimes with an NRF as above. The form *mont[e]* could either be a participle or an infinitive.

    c.   cherch[e]   la pim   (Stéphane 2;2.16)
           look-for-INF   the flashlight
           '(I am) looking for the flashlight.'
           Situation: S enumerates small objects he is looking for, including a flashlight he claimed earlier was beneath something.

Robust occurrences of NRFs have been attested in many languages, including French (Ferdinand (1996), Pierce (1989, 1992)), German, Dutch, and the Scandinavian languages; for recent surveys, see Phillips (1995), Wexler (1998). On the other hand, in the Romance languages Italian, Spanish and Catalan, NRFs are reportedly rare (Grinstead (1994), Guasti (1994)), but see Davidson and Legendre (to appear)). A thorough overview of the properties of (infinitive) NRFs is provided by Phillips (1995), who concludes with the findings summarized in (2):

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[1] In the Stéphane examples, *cherch[e]* indicates a form which sounds like either *chercher* or *cherché*.

(2)   Summary of widely accepted findings on properties of (infinitive) NRFs:

    a.   The word order of utterances containing (infinitive) NRFs shows that they are unmoved verbs (cf., e.g., Poeppel and Wexler (1993) and Rohrbacher and Vainikka (1994)).

    b.   Auxiliary verbs do not occur as (infinitive) NRFs (de Haan and Tuijnman (1988), Wexler (1994)).

    c.   (Infinitive) NRFs are very likely to co-occur with a null subject (Krämer (1993)).

    d.   (Infinitive) NRFs decline gradually with age (Miller (1976)).

    e.   The richer the inflectional paradigm of the adult language, the less common (infinitive) NRFs are (Phillips (1995)).

The analyses proposed to account for the NRF phenomenon can be divided into two categories: (i) those assuming a null modal or auxiliary, and (ii) those involving missing or underspecified functional projections. The classic null modal/auxiliary analysis was proposed in Boser et al. (1992), based on German data, and pursued for early French by Ferdinand (1996). However, later analyses of Germanic data have failed to find support for such a null element in these NRFs (e.g., Wijnen 1995). The second type of analysis is exemplified by Radford (1990), Rizzi (1993/4), and Wexler (1994, 1998) who propose that NRFs have a reduced syntactic representation (e.g. a bare VP projection, or a structure lacking TP or AgrP), and by Pierce's (1992) and Hyams' (1996) proposals which involve underspecified (rather than missing) functional projections. Approaches of either type can account for the properties (2a–c) listed above, while neither approach accounts for properties (2d–e).

The analysis of child French developed in this paper follows this second general approach: Our proposal entails that NRFs lack certain functional projections. Unlike previous proposals, however, the analysis proposed here gives us a handle on property (2d) and in fact, further, allows us to make some predictions about how the gradual decline in NRFs interacts with the other aspects of syntactic development. The last property, (2e), does not follow directly from our approach, although it stands to reason that the primary linguistic data in languages with richer inflection provide the child with more abundant evidence for the rankings of the constraints concerned with tense and agreement, which in turn could accelerate the acquisition process in this domain. If this is true, we might expect to find NRFs in the child data for languages with rich inflectional paradigms, but only at an earlier point in development and for a shorter time period (making them more difficult to detect) (see also Crago and Allen (2001), Davidson and Legendre (to appear)).

3. The acquisition of tense and agreement in French
3.1 PLU stages in early syntax
To begin to analyze syntactic development, it is important to be able to measure a child's stage of development using a metric that is comparable across children and independent of particular syntactic constructions. Age and MLU (Mean Length of Utterance) are well-known to be unreliable (see, e.g., Klee and Fitzgerald (1985)), but the PLU (Predominant Length of Utterance) measure developed elsewhere (Vainikka, Legendre and Todorova (1999)) has been very effective in isolating qualitative shifts in development. The stages represented in our data are defined below. PLU stages are defined over two dimensions, the primary stage reflecting the number of words in the majority of a child's utterances, and the secondary stage reflecting the proportion of utterances containing a verb. These definitions were formulated through consideration of data from several languages, with the intent of creating a metric that will have crosslinguistic applicability.

(3)　　*PLU stages in our data*: [2,3]
　　　　Stage 3: *"Two word" stage*
　　　　　　• Over 40% of the utterances contain more than 1 word.
　　　　　　• Yet utterances still tend to be very short, with 1-word and 2-word utterances predominating over multi-word utterances.

　　　　Stage 4: *Predominantly multi-word stage*
　　　　　　• Multi-word utterances predominate over both 1-word and 2-word utterances.

(4)　　*Secondary PLU stages in our data*
　　　　Secondary stage b:　　11%–60% of all utterances contain a verb
　　　　Secondary stage c:　　more than 60% of all utterances contain a verb

　　　　Previous research on the PLU as a measure of syntactic development has shown that the proportion of verbs in the data is indicative of the child's developmental stage. Given the crucial status of verbs in adult syntax, this measure perhaps most reliably gets at the status of syntactic development in the child's mental grammar. The PLU metric has also has been used successfully to differentiate qualitatively different stages in several other languages as well, clearly a crucial component of analyzing the course of syntactic development.[4]

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[2] Stage 3 is intermediate between Stage 2, not discussed further here, and Stage 4. Stage 3 most closely corresponds with the traditional "two-word" stage. Stage 2 is not represented in the Child French data we had available.

[3] We use the term "multi-word utterances" to refer to utterances containing more than two words.

[4] In other research not reported here, we have found the PLU metric divides child transcripts quite reliably into qualitatively different stages. See Davidson and Legendre (to appear) for Catalan, Hagstrom et al. (to appear) for Mandarin. For each of the languages we investigated, the PLU stages do correlate with other measures of advancement in syntactic development. Generalizing across languages, we found that in languages that show NRFs (English, French, Swedish), NRFs are common in Stage 2–3, dropping significantly in Stage 4. We also found that development of the pronominal system (Russian), case-marking systems (Polish, English), and placement of subjects (French) correspond well to the PLU stages proposed

This PLU-based approach to identifying stages of syntactic development has its conceptual grounding in the traditional observation that children progress through one-word, two-word, and multi-word stages; the PLU measure reveals these stages directly. Another advantage is in its generality; the PLU measure can classify child data reliably into syntactic stages much more accurately than a simple MLU cutoff would allow. Although, roughly speaking, higher MLUs correlate with more advanced PLU stages, it is clear that a direct mapping from MLU to PLU stage is not possible. This point is demonstrated clearly in Figure 1, which shows three files each from Grégoire and Philippe, all at PLU Stage 4b. We have plotted the percentage of NRFs and each file's MLU measure. Notice that the percentage of NRFs is about the same for both children, indicating that we are looking at the same stage of syntactic development, but the MLU measures are quite far separated. We can conclude from this that it is not possible to simply compute the PLU stage from the MLU measure across children.
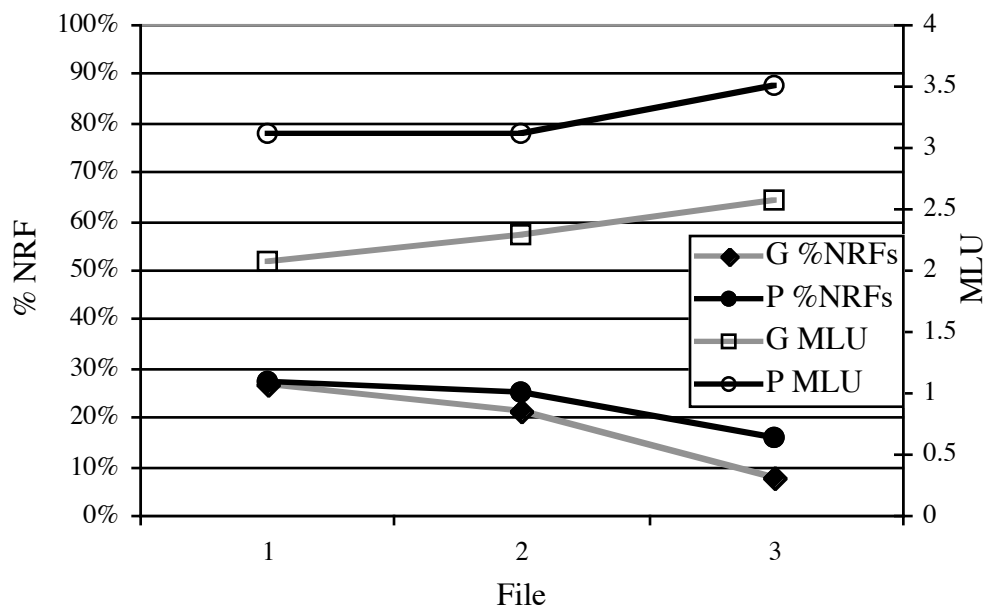

Figure 1. Grégoire and Philippe, MLUs and NRFs at PLU stage 4b

3.2 Subject profiles

We have examined the speech production data from three French children, Grégoire, Philippe, and Stéphane, whose early files are available on the CHILDES Database (MacWhinney and Snow 1985). All files were analyzed by hand and classified into PLU stages. The data obtained from Grégoire's and Stéphane's files had the greatest

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…continued…

above. Hagstrom et al. (to appear) show that the PLU measure is suitable for analyzing development of analytic languages like Mandarin Chinese, although for now, we must simply leave open the question of how to apply a PLU-like measure to polysynthetic languages in a way that does not classify *adults* as being at Stage 1c.

developmental spread, spanning PLU stages 3b, 4b, and 4c. Philippe's data were found to instantiate stages 4b and 4c. The profile for each child is given in Table 1.

Table 1. Children, files, and ages included in this study

a. <u>Grégoire (Champaud corpus)</u>

Files	Age	PLU stage	Total # of Utterances
1–4	1;9–1;10	3b	874
5–7	2;0–2;3	4b	732
8–10	2;5	4c	1038

b. <u>Stéphane (Rondal 1985)</u>

Files	Age	PLU stage	Total # of Utterances
1–3	2;2–2;3	3b	644
6a/6f/8a	2;6–2;8	4b	688
25b	3;3	4c	257

c. <u>Philippe (Suppes, Smith & Leveillé 1973)</u>

Files	Age	PLU stage	Total # of Utterances
1–3	2;1–2;2	4b	898
11	2;6	4c	387

The files we analyzed were chosen to ensure representation of each PLU stage, prior to any analysis of the tense and agreement morphology (the determination of PLU stage requires only counting verbs and utterance lengths).[5]

Once broken down into PLU stages, the files were further analyzed with respect to the development of finite inflection in the verbal system and the occurrences of NRFs. Before presenting our findings, we turn to a brief overview of the verbal inflectional paradigm of French to illustrate the specific challenges it presents to the researcher interested in the development of finiteness and to point out the methodological decisions we have made in the analysis of the data.

3.3 Coding tense and agreement in French
The overwhelming majority of French verbs (90%; Dietiker (1978)) belong to the regular conjugation whose infinitive ends in '*-er*'. For verbs of this conjugation, all present tense forms of the verb except the second person plural are homophonous; despite its misleading spelling conventions, French has a highly impoverished agreement paradigm in these regular '*-er*' verbs.[6] This means that except for the second person plural, and in

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[5] In addition to the files mentioned above, we determined that Philippe 10 and Stéphane 15a come out on the border between stages 4b and 4c; we did not undertake an analysis of these intermediate stages, but rather moved on to later files to obtain clearer cases of stage 4c. The selection of only a few files from Stéphane's corpus was for practical reasons; the Stéphane corpus is transcribed phonologically, and Stéphane exhibits certain phonological problems that make analysis difficult.

[6] We intentionally exclude the 1pl (*nous*) form, since in modern spoken French (the primary linguistic data for the children), *on* (which shows 3sg agreement) has completely replaced the more formal *nous*.

the absence of an overt subject, it cannot be determined whether a verb form produced by the child (e.g., *danse* 'dance') carries correct adult-like agreement. Since, this one identifiable form is also usually the last to appear in child production, it is not available for the purpose of studying the earliest stages of the development. Fortunately, agreement in French is not only realized in the verbal endings: Subject clitics can also be considered to be overt instantiations of agreement, as has been argued for by, among others, Auger (1994), Lambrecht (1981), Miller (1992), and Roberge (1990) (but cf. Kayne (1975, 1989), Rizzi (1986)). In the acquisition literature, studies have been nearly unanimous in interpreting both nominative and accusative clitics in French as agreement markers (e.g. Ferdinand (1996), Kaiser (1994), Jakubowicz and Rigaut (1997), Meisel (1990), Pierce (1989); but cf. Côté (2001)). Pierce (1992) reports that over 95% of the subject clitics produced by the four children she studied occurred with finite verbs, while this correlation does not hold for strong (non-clitic) subject pronouns or lexical NP subjects. In addition, several studies have reported that nominative clitics are typically acquired earlier than accusative clitics (e.g., Clark (1985), Ferdinand (1996), Hamann, Rizzi and Frauenfelder (1995), Pierce (1989)), paralleling the order of acquisition of subject vs. object agreement in languages that uncontroversially have both (such as Basque, see Meisel and Ezeizabarrena (1996)). Accordingly, we take subject clitics to be an overt realization of agreement, a reliable diagnostic for finiteness. This also implies that adult French sentences in which the only indication of the subject is a subject clitic should be analyzed as in fact having a null subject (the clitic being simply subject agreement); on this point, see also the discussion in section 5.2 below.[7]

Irregular verbs, including the auxiliaries *être* 'to be', *aller* 'to go', and *avoir* 'to have', display greater diversity in inflectional endings, and are used very frequently both as main verbs and in the periphrastic tenses. The agreement paradigms for these verbs contain four distinct forms (the second and the third person singular forms are homophonous with the first person plural *on* form), which can be easily identified.

Turning to tense inflection, French has two past and two future tenses. Of these, the *passé composé*, or perfect past, and the *future proche*, or near future, are formed with an auxiliary verb (*avoir/être* 'to have/to be' or *aller* 'to go', respectively) combined with a non-finite form of the verb (the past participle or the infinitive, respectively). Agreement in these tenses is carried on the auxiliary verb. The remaining finite tenses, the imperfective past and the simple future, are synthetic. Because the periphrastic tenses are more frequent in spoken French, and are the first to be used by the child acquiring the tense system of French, we focus only on the periphrastic tenses here.

It is worth pointing out that there is a difficulty in coding tense, which arises from the widespread tendency of young children to omit auxiliaries in their early production. A past participle without an auxiliary can have an adjectival use in adult French, and in the absence of an auxiliary in a child utterance it is nearly impossible to determine which use was intended by the child (adjective, main verb, or past tense). Similarly, some bare infinitives might be instances of the future tense lacking an auxiliary, or they might be true NRFs. Here, we have coded only forms of the verb consisting of both the auxiliary

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[7] In all of the (3000+) utterances we examined, we found only three cases that might arguably be nonfinite forms with clitic subjects. These three utterances were not included in our analysis.

and the participle/infinitive as instantiations of a future or past tense form. Participles and infinitives used without the auxiliary were coded as non-finite forms.

It is well known that the third person singular (3sg) and present tense forms are the first to appear in child productions and are often the only finite forms produced by the child for a time. Additionally, young children tend to overuse these third person singular and present tense forms in contexts where a different form of inflection would be appropriate (for some examples, see section 3.4 below). This suggests that these 3sg forms and present tense forms serve as "default" forms, causing a complication in coding 3sg verbs with 3sg subjects. Such cases are ambiguous; one cannot tell whether the 3sg verb is truly *agreeing* with the 3sg subject or whether it instead simply lacks agreement and is taking on an "anywhere" form (see also Ferdinand (1996) for discussion). There is no way to tell the difference empirically. Hence, we counted only non-3sg and non-present forms as unambiguously showing the presence of agreement and tense.[8]

We close this section with examples from Grégoire and Stéphane's earlier transcripts of each finite type.

(5)   **Marked for both tense and agreement (*passé composé*, 1sg)**
     a.   Et   moi j'ai roulé sur   moi la   belle   voiture.   (Grégoire 2;3.0)
             And I   I've run   over me   the beautiful car
             'I have run the beautiful car all over me.'
     b.   Papa j'ai   vu   là   (Stéphane 2;6.13)
             Daddy I have seen there
             'I saw Daddy there'
     c.   T'as   dit autre chose?   (Stéphane 2;7.30)
             You have said other thing
             'Did you say something else?'

(6)   **Tensed but not agreeing (future, but 3sg)**
     a.   Va   chercher maman.   (Grégoire 1;11.22)
             goes to.seek Mother
             'I am going to look for Mother.'
             (Grégoire leaves the kitchen to look for his mother)
     b.   Moi a   mis Titi là   (Stéphane 2;7.30)
             Me   has put Titi there
             'I put Titi there'

(7)   **Agreeing but not tensed (1sg, but present tense)**
     a.   Je mets   le   gant.   (Grégoire 2;0.5)
             I   put on the glove
             'I put on a glove'

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[8] One can also make the independent observation here that by focusing on non-3sg and non-present forms we are focusing on a point in the linguistic development at which the children have acquired the inflectional paradigm, according to Meisel's (1990) criterion under which a paradigm is only considered acquired at a point where two distinct forms from the paradigm are productively used.

b.	Moi je veux kik	(Stéphane 2;6.13)
Me I want chique
'I want some chique (kind of medicine)'

For completeness, it is worth mentioning that in the data we analyzed there were a very small number of examples that run counter to the analysis given above. There were three examples like *vais partir* 'go(1sg) to leave' (Grégoire 2;3.0), unambiguously showing 1sg agreement yet lacking the expected subject clitic. Similarly, there were also rare (9 instances of 649 agreeing verbs in Grégoire's stage 4b data) examples like *je va jusqu'ici* 'I goes until here' (Grégoire 2;5.1) where a 1sg subject clitic is paired with a verb which shows 3sg agreement. Both of these types of utterances were counted as "agreeing," although their effect on the total number of agreeing verbs is small (these examples constitute less than 2% of the agreeing verbs). We coded any other form of 3sg as potentially showing default agreement.[9]

3.4 Development of tense and agreement
Tables 2 and 3 below summarize our findings relating to the use of tense and agreement, respectively, by each child.[10] There are several measures we make use of in our analysis. Verbs that are "marked for tense," are verbs that are marked for any tense at all, including present tense. This number will include some verbs which are displaying "default" present tense (as discussed above), but will not include NRFs. Similarly, verbs which are "marked for agreement" exclude NRFs but will include some verbs marked with "default" 3sg agreement instead of "true" agreement. Table 2 shows how many of the verbs showing tense marking definitely showed *true* tense marking—that is, non-present (unambiguously non-default) marking. Table 3 shows how many verbs showing agreement definitely showed *true* (i.e. non-3sg*)* agreement marking.[11]

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[9] At stage 3b we found no instances of *ce* (*c'*) or *ça*, and we counted the few instances of *elle* (3sg feminine) as potential 3sg defaults, the same as *il* (3sg masculine). It is possible that only 3sg masculine *il* is really a potential default, in which case we might have been able to count 3sg feminine *elle* as truly agreeing, in the same way we took 1sg subject agreement to be truly agreeing. However, because we compared the non-3sg child numbers to the non-3sg adult targets, and because the number of instances of *elle* subjects was relatively small (Grégoire used *elle* 14/874 times in stage 3b, 15/732 in stage 4b, and 49/1038 times in stage 4c; Philippe used *elle* 29/898 in stage 4b, and 23/387 in stage 4c), we are confident that we have not introduced any serious error by viewing the 3sg default as we did. Thanks to Cécile de Cat (p.c.) for reminding us to clarify these points.

[10] The data in Tables 2–4 excludes imperative verbs from consideration.

[11] An anonymous reviewer reminds us that the observed drop in the proportion of non-present forms at stage 4b might instead be attributable to an (otherwise irrelevant) increased preoccupation with the "here and now" in (the transcripts from) that stage. Certainly impressionistically this is not the case; the early, late, and intermediate files don't seem to show any real change in the focus on the present. Similarly, although it might be possible instead to attribute the low rate of non-3sg subject clitics to a delay in the acquisition of deixis, there are numerous cases, for example in Grégoire's files, where it is clear in context that he is referring to himself (often indicating what he is about to do) yet without the appropriate subject agreement. (e.g., *descendre*, *va voir maman*). Moreover, we find cases of alternation within the same transcript; Stéphane (stage 3b, age 2;2.23) says *va chercher bas* '(I) goes/is going to look for socks' and shortly thereafter says *vais chercher camion là* '(I)'m going to look for that truck'. It does not seem that the children have trouble referring to themselves, rather it seems they have trouble with the clitics.

Table 2. Verbs with non-present tense inflection (out of verbs marked for tense)

Child	Stage 3b	Stage 4b	Stage 4c
Grégoire	34% (66/194)	21% (44/212)	32% (205/646)
Stéphane	37% (19/52)	10% (17/179)	25% (34/135)
Philippe		13% (44/334)	30% (74/246)
Weighted average	35% (85/246)	15% (105/725)	31% (313/1027)

Table 3: Verbs with non-3sg agreement inflection (out of verbs marked for agreement)

Child	Stage 3b	Stage 4b	Stage 4c
Grégoire	3% (5/156)	19% (33/172)	34% (221/649)
Stéphane	5% (2/43)	12% (13/109)	38% (51/133)
Philippe		15% (44/303)	40% (98/246)
Weighted average	4% (7/199)	15% (90/584)	36% (370/1028)

Of course, in adult speech (that is, in the target language), most of the verbs are in the present tense or show 3sg agreement, so these measures of the child data in Tables 2–3 do not hold much meaning until they are compared with the rate of adult non-3sg and non-present tense usage. To ascertain this, we ran a similar count on the adult utterances in three of the CHILDES files (Philippe 11, Grégoire 9, and Stéphane 25b) in order to get at least a reasonable estimate of what adult use of non-3sg and non-present forms is. The results are given in Table 4. The combined results from Tables 2–4 are graphed in Figure 2, to illustrate the development of tense and agreement across the attested PLU stages.[12]

Table 4: Adult usage of non-3sg and non-present tense

Adults from file	non-present	non-3sg
Grégoire 9	28% (184/661)	35% (231/659)
Stéphane 25b	31% (61/197)	32% (63/197)
Philippe 11	34% (173/507)	41% (206/506)
Average	31% (418/1365)	37% (500/1362)

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[12] We did the adult computation on Grégoire 9 rather than on Grégoire 10 (which is the last file) because we felt that Grégoire 10 would be skewed. The subject matter of the conversation in Grégoire 10, which occurred after a summer break, was in large part about what had happened over the previous summer and thus contained a disproportionately high amount of non-present (past) tense, both in Grégoire's utterances and in the adult utterances. The actual figures from this file were 45% non-present (210/465) for the adults, and 48% non-present (151/315) for Grégoire. As expected for stage 4c, Grégoire's rate of non-present usage matched the adults' rate, but both were higher than in other samples. The same holds for non-3sg usage, as this interchange consisted mostly of 2sg questions to Grégoire about his vacation, and 1sg responses to those questions. In this file, the adults' usage of non-3sg was 46% (214/465) and Grégoire's was 50% (159/315).
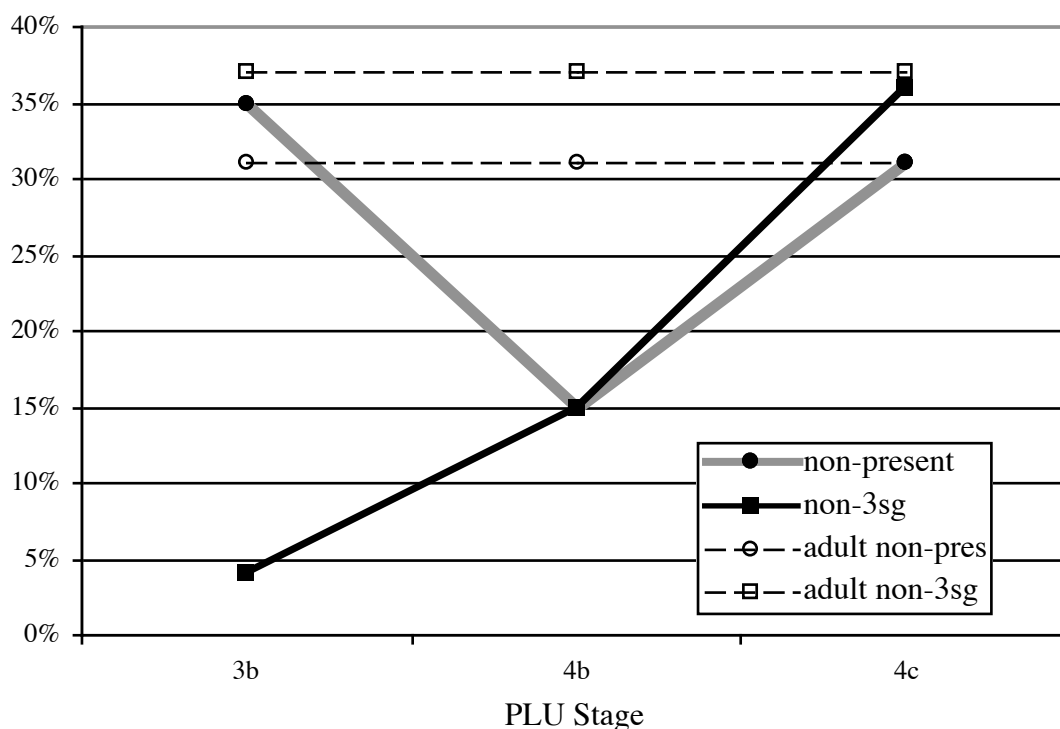
Figure 2. Tense and Agreement

Assuming that adults *always* produce finite verbs and observing that they produce non-present tense verbs roughly 31% of the time, we can reasonably take the children's 35% production of non-present tense (of tensed verbs) at stage 3b to be an adult-like level of production. On the other hand, we can also reasonably suppose that the children's 4% production of non-3sg (of agreeing verbs) at stage 3b indicates that the children are not realizing agreement and are using a default (3sg) form.

As can be seen from Tables 2–3 and Figure 2, tense and agreement show distinct patterns of development. At stage 3b, the proportion of (truly) agreeing forms in the children's speech is negligible—it is clear that they are not yet using agreement. At the same time, the proportion of tensed forms is sufficiently high to allow us to conclude that tense is already in regular use. At the subsequent stage, 4b, agreement emerges at a substantial, though not yet adult-like, level.

Notice that at stage 4b, tense suffers a dip in production compared to stage 3b. This interesting relationship between increased use of agreeing forms and decreased use of tensed forms suggests a temporary *competition* between the two before they both stabilize at the subsequent stage, 4c. We expand on this idea further in our analysis of the tense and agreement data in section 4.

The dissociation between tense and agreement is especially striking in the child production of periphrastic tenses; throughout stage 3b, Grégoire and Stéphane produce numerous instances of the past and future tenses; however, the auxiliary (whether *être*, *avoir*, or *aller*) that appears in these utterances is always 3rd person singular.

(8) a.   Est tombé puzzle.   (Grégoire 1;9.18)
            is   fallen puzzle
            'The puzzle has fallen down.'

    b.   Papa   et   Maman est parti.   (Grégoire 2;0.5)
            Father and Mother is gone
            'Mother and Father left.'

    c.   Va   chercher balle.   (Stéphane 2;2.16)
            goes look for   ball
            'I will look for the ball.'

    d.   Moi a   mis Titi là   (Stéphane 2;7.30)
            Me   has put Titi there
            'I put Titi there.'

    e.   a   vu?   (Grégoire 1;10.20)
            has seen
            'Did you see?'[13]

Broadly speaking, our results are consistent with previously reported data from child French. However, we cannot directly compare our findings with those in the existing literature for two reasons. First, we see a fine-grained course of development through stages delimited by the PLU measure, with systematic differences between stages; yet, previous research with which we could otherwise have compared our results has generally analyzed data collapsed over two or more PLU stages, or even over the entire corpus (e.g., Ferdinand (1996), Pierce (1992)). Thus, when Pierce (1992) claims that her subjects demonstrate a productive knowledge of finiteness at a very young age, we cannot tell whether the data from the later files in her study are masking out an earlier stage where such productive knowledge still appears to be absent.

Second, previous work on the acquisition of French has used "finiteness" as a cover term encompassing both tense and agreement inflection, precluding any systematic study of the course of these developments individually. However, we have seen above that tense and agreement do follow different courses of development: agreement develops in a monotonic fashion, not acquired at stage 3b but controlled by stage 4c, while tense develops in a U-shaped curve, controlled at stages 3b and 4c, but yet often omitted at stage 4b. Our findings from French thus strongly indicate that these two grammatical categories are independent. This conclusion is bolstered by the results from the acquisition of Catalan reported by Davidson and Legendre (to appear), where tense and agreement also can be seen to develop independently (but in the reverse order, with agreement becoming productive before tense, cf. also Grinstead (1994)).

3.5 Non-finite root forms
Turning now to NRFs, we found that children produce steadily fewer as their age/PLU stage increases. Our findings are illustrated in Table 5 and Figure 3. In Table 5, we are

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[13] The adult response to this example was *eh j'ai vu oui* 'yes, I saw', indicating that it was interpreted as a 2sg form by those present. Note that 3sg *a* is homophonous with 2sg *as*, making this example ambiguous; however, if taken to be 2sg *as*, this would be the only second person pronoun in all of Stage 3; it is not until file #6 (stage 4b) that this child uses a clear 2nd person form.

looking at the proportion of NRFs out of all verbs. Some of these verbs were not clearly determinable as either NRFs or tensed/agreeing forms (e.g., the verbal form *fait* [fe] is homophonous in the present tense in any person as well as in the participle form). Such verbs were excluded from the count of NRFs, although not from the count of all verbs. This means that the proportions in Table 5 are conservative, and might be underestimates.

Table 5: Proportion of non-finite root forms (NRFs) of all verbs

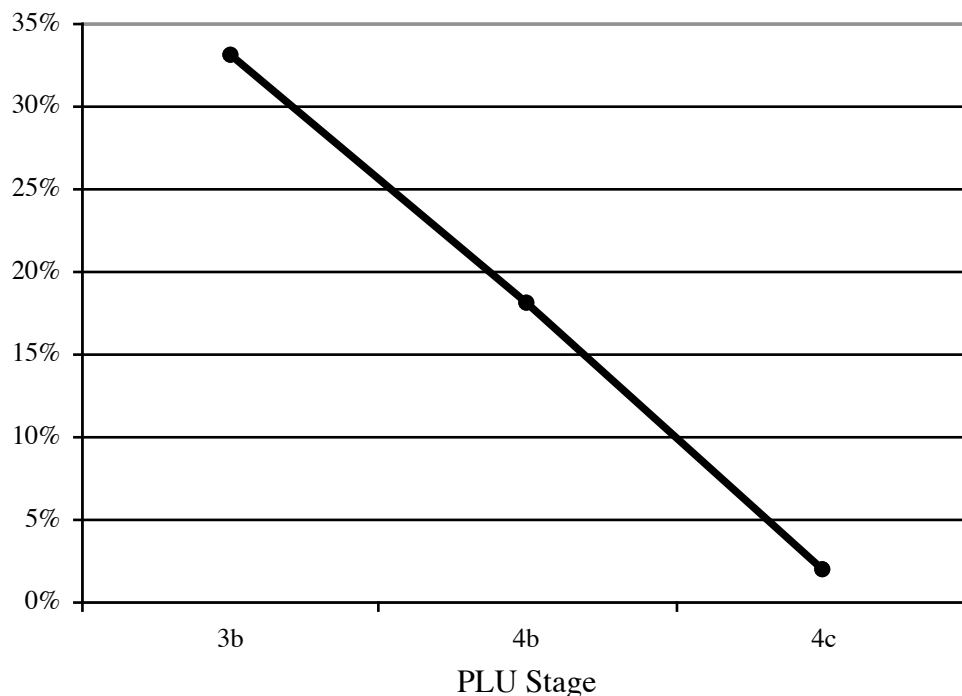| Child	Stage 3b	Stage 4b	Stage 4c
Grégoire	28% (82/297)	16% (46/287)	1% (6/711)
Stéphane	48% (51/106)	12% (25/205)	2% (3/152)
Philippe		21% (102/476)	4% (11/260)
Weighted average	33% (133/403)	18% (173/968)	2% (20/1123)

Figure 3. Proportion of non-finite root forms of all verbs

Comparing Figure 3 to the agreement data shown in Figure 2, we can see that the reduction in the use of NRFs over time appears to be inversely related to the development of agreement: in a sense, the NRF pattern is the mirror image of the pattern we have found for agreement (recall Table 3). By contrast, the decrease in NRFs does not appear to correlate with the development of tense; compare Figure 3 to the tense data shown in Figure 2. Put another way, if there is a connection between the occurrence of NRFs and the development of either tense or agreement, the connection is between NRFs and agreement, not tense.

Again, because previous reports in the acquisition literature have generally collapsed over multiple stages or collapsed over tense and agreement, it is difficult to directly compare prior results with ours. While Pierce (1992) notes the presence of non-finite forms in her subjects' speech and even proposes a syntactic representation for these utterances, she does not provide any numbers to illustrate the extent to which NRFs are used by children or any developmental trends there may be. Ferdinand (1996) reports the proportions of finite and non-finite forms out of the combined files for her three subjects. She found that roughly between one quarter to one third of each child's utterances contained a non-finite main verb. Again, it is impossible to determine whether these were distributed evenly, or clustered in the very early files from among those that she analyzed.

4. An Optimality-Theoretic analysis of the development of finiteness

In the second major part of this article, we argue that an optimality-theoretic analysis which exploits three formal properties of Optimality Theory (OT)—(i) competition (for a single projection), (ii) constraint re-ranking, and (iii) partial ordering of constraints at any stage of the developing grammar—straightforwardly accounts for the developmental course outlined above as well as the observed percentages summarized in section 3.4. We briefly introduce the general principles of OT (Prince and Smolensky (1993), followed by an analysis of the development of finiteness.

4.1 Fundamentals of Optimality Theory

OT is a formal theory of constraint interaction in UG (see Legendre (2001) for an introduction to its application in syntax). The main hypotheses of OT that we are using here are: (i) UG provides a system that optimizes linguistic forms with respect to universal well-formedness constraints; (ii) alternative structural realizations of an input compete, and only the most harmonic ("optimal") candidate (the one minimally violating the highest ranked constraints) is grammatical; (iii) every competition yields some optimal output; (iv) well-formedness constraints are simple and general, and thus routinely come into conflict, resulting in constraint violations even in the surface forms; (v) constraint conflicts are resolved through language-particular rankings of the constraints; (vi) candidate output forms are evaluated against a strictly ranked set of constraints.

OT is an architecture for mapping an input to an output. The *input* to an optimization in syntax may be assumed to consist of predicate-argument structure, functional features, and lexical items (an "underlying form"). For a given input, the grammar generates and evaluates a set of output candidates—*the candidate set*—consisting of alternative structural realizations of that input. In syntax, we assume that the component of the grammar (*Gen*) responsible for generating the candidate set corresponding to a particular input generates only candidate structures which respect basic X′ theory principles. The constraint ranking constitutes the language-particular component of the grammar, that is, it is the only component that admits variation, while the set of constraints itself is claimed to be universal.

A subset of the constraints in an OT grammar is the family of "Faithfulness" constraints, which limit differences between the input and the output. They require the output to express all and only the properties of the input, and often stand in conflict with

"Markedness" constraints that make demands on the structure of the output. Notice that the faithfulness constraints are crucial to the OT conception, since without them any input structure would be mapped to the same, least marked, output.

As stated above, candidate structures are evaluated against a strictly ranked set of constraints, meaning that between any two constraints, one has priority over the other. Crucially, however, we interpret this as a requirement on each *evaluation* rather than on each *grammar*. By allowing a single grammar to encode several possible rankings (i.e. by allowing *partial rankings* in the grammar, which are fixed in some possibly different strict order before each evaluation), we gain a means to explain the phenomenon of variation, e.g., across sociolects, over the course of diachronic evolution of a language, or—as is relevant here—through the course of language acquisition. Others have pursued this idea in studies of variation in phonology and morphology as well as of learnability (Anttila (1997), Boersma (1997), Boersma and Hayes (2001), Boersma and Levelt (1999), Kiparsky (1993), Nagy and Reynolds (1997), Reynolds (1994)). Behind this approach is the recognition that (grammar-level) partial constraint rankings determine sets of strict rankings (consistent with assumption (vi)), each of which can yield a potentially different optimal output. This particular interpretation of constraint rankings is exploited in the proposed analysis below. We will show that the developing grammar at any stage is specified by a partial ordering of constraints.

Turning the picture around and considering the set of possible output forms given by these several rankings, we can observe what proportion of the rankings result in each output form being optimal. Under a model of grammatical variation in which all of these rankings is equally available to evaluate input forms, we can predict the probability of that output occurring. Concretely, our model allows us to predict how often, for example, the verb is realized without tense in child speech at a given stage of development. Traditional syntactic analyses do not lend themselves to even a description of the actual proportions attested (let alone to an explanation), whereas the partial ordering analysis presented here provides an account of (what gives rise to) them.[14]

4.2 Development of finiteness: General analysis

Informally, the main idea is the following: At Stage 3b, constraints requiring realization of finiteness compete with constraints on economy of structure, sometimes resulting in finite verbs and sometimes resulting in NRFs. At Stage 4b, tense and agreement compete for a single structural position: a functional projection that can realize the features either of tense or of agreement (but usually not both).[15] At Stage 4c, two positions become available, allowing both tense and agreement features to be realized without competition. Formally, the constraints that require realization of the functional features (tense, agreement) rise in the ranking relative to a fixed hierarchy of constraints penalizing structure (*STRUCTURE, Prince and Smolensky (1993)). Variation in the optimal outcome

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[14] This is of course not to say that one could not graft a system to model proportions onto a traditional analysis; yet, it would be an independent module. Under our analysis, the proportional predictions follow naturally from the syntactic system, from elements that are needed independently to predict the existence of the forms in the first place.

[15] We also assume that these features can only be realized on a functional head.

arises from a constraint's ranking being specified by a range (Nagy and Reynolds (1997), Reynolds (1994)).

The constraints requiring realization of functional features are Faithfulness constraints. They ensure that what is expressed (the output of the grammar) differs minimally from what is intended (the input to the grammar, the underlying form, which we assume does contain the functional features like tense and agreement). Constraints prohibiting structure, on the other hand, are economy constraints belonging to the superfamily of Markedness constraints. The present study supports the general picture emerging from studies of acquisition of phonology (e.g., Demuth (1995), Gnanadesikan (1995), Levelt (1994), Pater and Paradis (1996)). Empirically speaking, it appears that in adult grammars, Faithfulness constraints often dominate Markedness constraints, whereas in early child grammars, the reverse often holds, with Markedness constraints dominating Faithfulness constraints (resulting in "simplified" (less marked) structures). In fact, Smolensky (1996) shows formally that, assuming children's underlying representations (or "inputs" to the optimality evaluation system) are the same as adults', for unmarked structures to be learnable, the Markedness constraints must outrank the Faithfulness constraints in the initial state of the grammar. From this perspective, the process of acquisition consists in reranking the constraints such that some Faithfulness constraints outrank Markedness constraints (see Tesar and Smolensky (1998, 2000) for discussion of learning procedures in strict domination hierarchies by demoting Markedness constraints; see Boersma (1997), Boersma and Hayes (2001) for discussions of learning partial rankings statistically).[16] The present study contributes evidence that this proceeds via constraints "floating" over a certain range (i.e., yielding a partial constraint ordering), rather than through abrupt and absolute constraint re-ranking.

Our analysis makes use of the following Economy of Structure constraints (*STRUCTURE family, Prince and Smolensky (1993)).

(9)   *Economy of Structure constraints*

        *F: No functional heads

        $*F^2$:   No pairs of functional heads

The *F constraint is violated by any candidate structure which has a functional projection, be it Tense or Agreement. *F is only satisfied by non-finite verbs, which, by assumption, have no functional projections realizing tense or agreement features. The $*F^2$ constraint is violated by any structure which has two functional projections, i.e. by

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[16] While inventories of entirely unmarked structures would presumably be easiest to process in production and comprehension, they do not allow for the range of distinctions that adult language expresses. Therefore, learning a target grammar rich enough to express such distinctions requires interleaving Faithfulness constraints among structural Markedness constraints. On this view, reranking is driven by the cognitive and functional role of grammars, i.e., the need to express distinctions.

structures in which both tense and agreement features are realized. We will return to some further comments on this constraint at the end of this section.[17]

The Faithfulness constraints relevant to our analysis are given in (10).

(10) *Faithfulness constraints* (PARSE family (Prince and Smolensky (1993))

      PARSET: Parse Tense

      PARSEA: Parse Agreement

PARSET and PARSEA require realization of tense and agreement, respectively. PARSET is violated by any untensed form while PARSEA is violated by any non-agreeing form.

There are four candidate structures relevant to this analysis (we assume that the input to every evaluation has tense and agreement features subject to Faithfulness constraints). They are given below in (11) along with examples and the constraints each satisfies and violates.

(11) *Candidates for input containing past tense and 1st singular agreement features*:

a.   VP   example: *danser*   (NRF)
                                            violates: PARSEA, PARSET
                                            satisfies: $*F$, $*F^2$

b.   TP   example: *a dansé*   (3sg, past)
  T[PAST]   VP   violates: PARSEA, $*F$
                                            satisfies: PARSET, $*F^2$

c.   AgrP   example: *je danse*   (1sg, present)
  Agr[1SG]   VP   violates: PARSET, $*F$
                                            satisfies: PARSEA, $*F^2$

d.   AgrP   example: *j'ai dansé* (1sg, past)
  Agr[1SG]   TP   violates: $*F$ (twice), $*F^2$
                                        satisfies: PARSEA, PARSET
   T[PAST]   VP

The key to our proposal is the ability of the Faithfulness constraints to "float" over a certain range in the ranking (unlike the *STRUCTURE constraints discussed above, which remain fixed in their relative ranking) during the course of development. This is illustrated in (12), where PARSET ranges from below $*F$ to above $*F$. A partial ordering like (12a) translates into the set of two rankings in (12b).

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[17] As an anonymous reviewer reminds us, $*F$ here is intended to be taken as a constraint against functional structure in the extended projection of V (Grimshaw 1991). We do not wish to suggest that the same $*F$ constraint regulates the appearance of, for example, DP projections. In fact, there is evidence in the literature (e.g., Hoekstra and Hyams (1998)) that D-related functional projections do *not* compete with V-related functional projections, but rather tend to co-occur.

(12) a. Partial ordering:

    Fixed $*F^2$ $\gg$ $*F$

    Floating: PARSET   ——————————

  $\Rightarrow$

  b. Set of rankings:
    i. $*F^2 \gg *F \gg$ PARSET   winning candidate: untensed verb   (11a)
    ii. $*F^2 \gg$ PARSET $\gg *F$ winning candidate: tensed verb   (11b)

We see that a different candidate structure wins under each of the rankings in (12b); under ranking (12bi), a candidate with a nonfinite verb wins, while under ranking (12bii) a candidate with a tensed verb (that is, with a functional projection to realize tense features). For any given evaluation, a grammar with the partial ordering in (12a) will use one of the rankings, either (12bi) or (12bii), to determine the optimal candidate. Thus, in any given evaluation, either a tensed verb or an untensed verb will win the competition. We make the further assumption that either of the two rankings has an equal (i.e. random) chance of being called upon during an evaluation. This means that there is a 50% chance that ranking (12bi) will be used, yielding an untensed verb as the optimal candidate. To put it another way, we expect to see the untensed candidate 50% of the time (and to see the tensed candidate the other 50% of the time). Under this hypothesis, the model allows us to predict not only *that* we see variation between A and B in the developing grammar, but also *with what frequency* we will see each.

  This example illustrates well the nature of the conflict underlying the development of finiteness. Functional features can only be parsed (satisfying the Faithfulness constraints PARSET and/or PARSEA) if the Economy of Structure constraints ($*F$ and possibly $*F^2$) are violated. The conflict is resolved by the ranking. If Economy of Structure dominates Faithfulness, then functional features cannot be realized and the optimal candidate will be a nonfinite form acting as a main verb (an NRF). If Faithfulness dominates Economy of Structure, then functional features will be parsed into a functional head, yielding a finite form as the optimal candidate (recall that *either* tensed *or* agreeing forms count as "finite" under our terminology). The actual course of development of finiteness we propose here is an expanded version of this basic re-ranking schema. We will see that the PARSE constraints advance separately, at one point (Stage 3) with PARSET invariably outranking PARSEA, with the result that the observed finite forms will be tensed, but non-agreeing. In the following section, we will work through our analysis of the development of finiteness stage-by stage.

  We will finish this section with some comments about the $*F^2$ constraint and about our assumptions about the interpretation of these floating constraints.

  It is important to note that $*F^2$ is not a basic constraint, but is rather the local conjunction of two instances of $*F$ ($*F^2 \equiv *F\&*F$) (see Smolensky (1995) for an early discussion of local conjunction). That is, $*F^2$ is a constraint formed from two (identical) more basic constraints. $*F^2$ is necessarily ranked above $*F$, because they are part of a Power Hierarchy (Smolensky (1995)); a local conjunction invariably outranks the individual conjoined constraints. This formalizes the intuition we wish to capture, that having two functional heads is more costly than having one (and not simply by virtue of having two violations of $*F$, but qualitatively worse for having two *simultaneous* violations of $*F$ in the same domain). Local conjunction is familiar both from the

phonological OT literature and from the syntactic literature (see, e.g., Legendre et al. (1998)); here we find that it has an application in child syntax as well.

It is also important to observe that constraints against structure (like *F and $*F^2$) have been argued to play a role in the adult language as well (see, e.g., Grimshaw (1997)), as we would expect, given the claim of OT that the inventory of constraints is universal. For a similar idea, not couched in OT terms, see Speas' (1994) Economy of Projection in adult grammars and an application to early Child English in Roeper and Rohrbacher (1994) (see also section 5.1 below for a comparison between $*F^2$ and Wexler's (1998) Unique Checking Constraint in child language). However, it is also not surprising that one rarely needs to refer to *F and $*F^2$ in the description of adult languages (with the possible exception of languages that show little evidence of elaborate functional structure, for example Chinese and Vietnamese, or of marked constructions in otherwise functionally articulated languages such as in newspaper-style headlines), since having faithfulness constraints that outrank markedness constraints is crucial to the expression of underlying contrasts.

With respect to our interpretation of "floating" constraints as defining a set of equiprobable grammars (the approach also pursued by Reynolds (1994) and Anttila (1997) for phonological variation), some further comments are in order. An alternative way to interpret "floating" constraints of this sort would be to suppose that, while various rankings are possible given the range over which the constraints float, some are more likely than others. For example, it might be that a constraint is more likely to appear at the center of its range than near the edges of its range (a version of such an approach is explored by Boersma (1997) and subsequent related work). While we have not explored this alternative in full detail, it is certainly not clear to us that such an interpretation can lay claim to being the obvious "null hypothesis." We interpret constraint rankings as simply *orderings*, without any further mathematical structure, an assumption that we would only want to depart from in the face of convincing evidence that further complication is required.[18] Viewed as an ordering, there is no meaningful way to say that constraint A is ranked "more above than below" another constraint B; constraint A either overlaps constraint B or it doesn't. This significantly narrows the range of possible predictions our system can make, which is clearly desirable. As we will see, our assumptions allow a tight match between predicted and observed percentages.

4.3 Development of finiteness: A stage-by-stage analysis
We begin with stage 3b, where the rankings are as in (13), yielding the 3 rankings given in (14).

(13)   *Stage 3*
      Fixed $*F^2$ >>   *F
      Floating: PARSET   ————————
                    PARSEA   —

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[18] Although, for a possible instance of such evidence that further structure is necessary, see Davidson and Legendre (to appear).

(14) *Stage 3*:
      a.   PARSET >> *F^2 >> *F >> PARSEA   yields: tensed
      b.   *F^2 >> PARSET >> *F >> PARSEA   yields: tensed
      c.   *F^2 >> *F >> PARSET >> PARSEA   yields: NRF

At stage 3b, PARSET spans a range allowing it to sometimes outrank *F^2, and sometimes be outranked by *F. PARSEA is always outranked by both PARSET and *F.[19]

Of the three rankings in (14), only (14c) results in an NRF; under this ranking, it is better not to have a functional projection (satisfying *F) than to realize tense (which would satisfy PARSET) or agreement (which would satisfy PARSEA). This means that given this model of Stage 3b, we expect NRFs to comprise one-third of a child's utterances at Stage 3b.

The other two rankings yield a tensed form, but without agreement. Under these two rankings, PARSET outranks *F, making it more important to realize tense in a functional projection than to avoid functional projections. Neither ranking yields a form that also agrees because this would require two functional projections, and PARSEA is outranked by *F^2 under both rankings. Thus, we expect tensed forms (without agreement) to comprise the other two-thirds of a child's utterances at stage 3b.

What we actually observed (recall Table 5) was 33% NRFs and 67% finite forms, exactly the prediction made by modeling the stages this way. Of the finite forms, we counted only non-present forms, and found 35% such forms (Table 2). Recall that when this is compared to the adult production of 31% non-present forms (Table 4), it appears that all finite utterances the children produce at Stage 3 are tensed. Looking at agreement (Table 3), we found very few (4%) non-3sg forms, compared to an adult rate of 37%. So, idealizing a little, we find that all finite child utterances at Stage 3 are tensed but non-agreeing, as predicted by this model of Stage 3.

In Stage 4b, illustrated in (15), PARSEA advances to a position equal to PARSET; both now sometimes outrank *F^2, and can sometimes be outranked by *F. Moreover, in some rankings PARSET outranks PARSEA, while in others PARSEA outranks PARSET. These ranges yield the 12 rankings in (16).[20]

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[19] PARSET outranks PARSEA in French, as we will see. Which Faithfulness constraint advances first in a given language is not something our analysis says anything about one way or another. Empirically, as mentioned earlier in this paper, languages appear to differ here (English, French, and German showing evidence of PARSET advancing first, Catalan showing evidence of PARSEA advancing first). The difference is presumably a function of the morphological structure of the adult language, and more specifically, a function of the primary linguistic data the child receives.

[20] To avoid confusion, a word about the "psychological validity" of this system may be in order. Although a higher degree of constraint overlap results in a larger number of possible rankings for each evaluation, this does not in any way mean that the child must "exert more effort to choose" when there is a large number of possible rankings than when there is a small number of possible rankings. We could use the metaphor of choosing a random number for each constraint, to determine at which point in its range it will be for the purposes of the ranking. Under this metaphor, the child's task is to choose a random position for each constraint before each evaluation, a task that doesn't change no matter how much or how little constraints overlap with one another. Knowing the constraint ranges, we can predict which rankings could result and compute what the individual likelihood is of each, but the number of possibilities we determine this way has no effect on the procedure required to fix a ranking; for 4 constraints, there are always 4 random positions to choose, whether this could result in 2, 3, or 12 different possible rankings.

(15)　*Stage 4b*:
　　　Fixed　　　　　　　　　　　　　　　　$*F^2$　>>　$*F$
　　　Floating:　　PARSET　　　　　　──────────────
　　　　　　　　　PARSEA　　　　　　──────────────

(16)　*Stage 4b*:
　　　a.　　PARSET >> PARSEA >> $*F^2$ >> $*F$　　yields: tensed and agreeing
　　　b.　　PARSEA >> PARSET >> $*F^2$ >> $*F$　　yields: tensed and agreeing
　　　c.　　$*F^2$ >> $*F$ >> PARSET >> PARSEA　　yields: NRF
　　　d.　　$*F^2$ >> $*F$ >> PARSEA >> PARSET　　yields: NRF
　　　e.　　$*F^2$ >> PARSET >> PARSEA >> $*F$　　yields: tensed
　　　f.　　$*F^2$ >> PARSEA >> PARSET >> $*F$　　yields: agreeing
　　　g.　　PARSET >> $*F^2$ >> PARSEA >> $*F$　　yields: tensed
　　　h.　　PARSEA >> $*F^2$ >> PARSET >> $*F$　　yields: agreeing
　　　i.　　PARSET >> $*F^2$ >> $*F$ >> PARSEA　　yields: tensed
　　　j.　　PARSEA >> $*F^2$ >> $*F$ >> PARSET　　yields: agreeing
　　　k.　　$*F^2$ >> PARSET >> $*F$ >> PARSEA　　yields: tensed
　　　l.　　$*F^2$ >> PARSEA >> $*F$ >> PARSET　　yields: agreeing

First, notice that two of these rankings, (16a–b), yield verb forms which are both tensed and agreeing (that is, essentially adult forms), since under those rankings it is more important to realize both tense and agreement than it is to avoid having two functional projections. Another two rankings, (16c–d), yield NRFs, since under these rankings it is more important not to have any functional projections than it is to realize either tense or agreement. The rest of the rankings (16e–l) yield finite forms that are either tensed (when PARSET outranks PARSEA) or agreeing (when PARSEA outranks PARSET), but not both.

　　　This model predicts, then, that only 17% (2 out of 12) of the verb forms uttered at Stage 4b should be NRFs. We observed (Table 5) 19% NRFs, very close to the prediction. Of the remaining verbs, all finite, 20% are predicted to be adult-like (with both tense and agreement), the remaining forms having only one or the other (40% of them with only tense, 40% of them with only agreement). To compute the predictions we make for the child data, we must scale the percentages by the "expected" proportion of non-present forms and non-3sg forms, based on what we found in the observed adult speech (Table 4). Concretely, 60% of finite forms are predicted to be tensed by our analysis (there are 10 finite rankings, 4 of which result in tense alone, and 2 of which result both tense and agreement), and adults produce 31% non-present forms, so we expect to find 60%×31% = 19% of (finite) child utterances to be in a non-present form. Similarly, since adults produce 37% non-3sg forms, we expect to find 60%×37% = 22% non-3sg forms in the children's (finite) utterances. Again, the predictions line up well with the observations. Of the finite verbs we predict 19% non-present forms and observe 15% (Tables 2 and 4), and predict 22% non-3sg forms and observe 15% (Tables 3 and 4).

　　　Before moving on, let us step back and take stock of the nature of the predictions discussed above. While the specific partial rankings we proposed make specific predictions about the percentages we should find in the data, the partial rankings were of course tailored to the data we observed. While it is encouraging that we found such a

good fit, nothing in what we proposed predicts *that* we would find the particular partial rankings given above; to make such a prediction would require in addition a complete learning theory as well as a thorough representation of the data the child receives. This does not mean, however, that our framework for acquisition of syntax in OT is free of these more global predictions altogether. The initial constraint rankings for a child have Markedness constraints outranking Faithfulness constraints, and acquisition proceeds by spreading Faithfulness constraints—monotonically—upward through the hierarchy. The system cannot backtrack, so our proposed ranking for Stage 3b could not *follow* that proposed for Stage 4b, since this would entail retracting PARSEA to a lower position in the hierarchy. Nor could Stage 3b be followed by a stage in which we find a third of the child utterances to be NRFs, a third to be agreeing but not tensed, and a third to be tensed but not agreeing (which would arise from a partial ranking in which $*F^2$ outranks both PARSE constraints, but PARSEA and PARSET can each sometimes outrank, and sometimes be outranked by, $*F$). This too could only arise by retracting PARSET from its position in Stage 3b. It is in this developmental prediction that our proposed ranking in Stage 3b differs from a similar ranking in which PARSET floats only over $*F$. Under this latter ranking, we would expect half NRFs and half tensed (but not agreeing) verbs (already not in line with the observed data), and there would be no reason not to expect that such a stage could be followed by the stage described above in which no verbs show both tense and agreement simultaneously, but are split evenly between the other three options. What we found in fact does correspond to a monotonic increase in the ranking of Faithfulness constraints, and the prediction of the system we propose here is that it could never be otherwise.

Returning now to the specific rankings we proposed above, let us compare stage 4b to stage 3b with respect to the realization of tense. Notice that, while at stage 3b, 100% of the finite utterances were tensed, at stage 4b only 60% (6 out of 10) of the finite forms are tensed. In other words, we predict (and in fact observe) a "dip" in the child's production of tensed forms. If children were simply "learning tense" (speaking vaguely), we would not have expected them to get *worse* at any point during the course of development.[21] The proposed analysis provides an explanation for this otherwise puzzling fact. Back in stage 3b, PARSEA was ranked so low as to ensure that tense features were realized in the single functional projection allowed. What has happened at stage 4b is that the tense features and agreement features now *compete* for realization in the single functional projection available. Since tense sometimes (in fact, half the time) loses to agreement, we predict the observed dip in the proportion of tensed forms, which coincides with an increase in the proportion of agreeing forms.

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[21] Note that this does not appear to be a traditional "U-shaped curve" attributed to the use of memorized forms early on, followed by a learned but overgeneralized rule, and finally followed by a reduction of the domain of application for the rule. In Grégoire's transcripts, for example, he uses several verb stems in both present and past forms (including *tourner* 'turn', *monter* 'go up' *passer* 'drive by', *manger* 'eat', and *voir* 'see'), and most verbs appear in both finite and nonfinite (often the past participle) variants. The existence of these verbs in the transcripts suggests that the observed dip in tense production is not simply due to early memorization.

In the last stage covered in our data, stage 4c, PARSET and PARSEA together move to a position high enough in the hierarchy to invariably outrank $*F^2$.[22] This yields 2 rankings, but both produce the same optimal candidate, a finite form that realizes both Tense and Agreement. At this stage, we predict no NRFs, and we observed only 2% NRFs in child speech (Table 5). We also expect the children's production of non-present forms and non-3sg forms to match the proportion in adult speech, which it does quite well; we observed (Tables 2–4) 31% non-present tense forms compared with 31% for adults, and 36% non-3sg forms compared with 37% for adults.
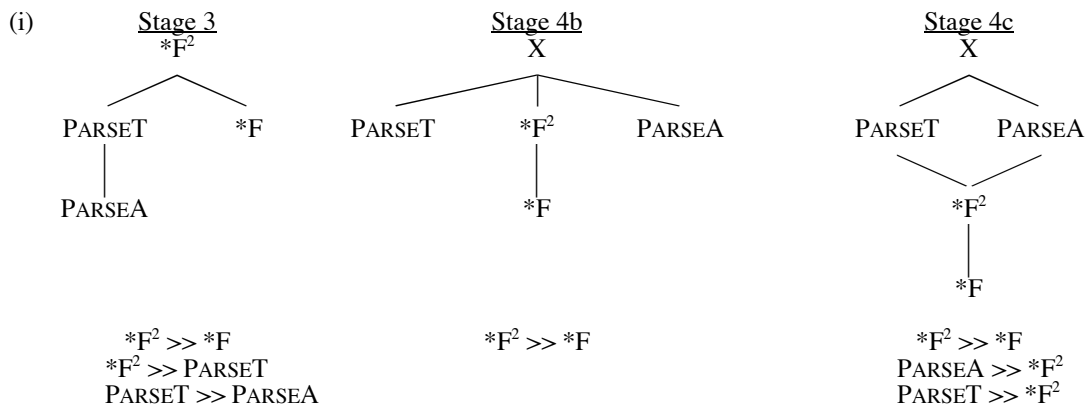
(17) *Stage 4c*:
    Fixed $*F^2$ >> $*F$
    Floating: PARSET   ——
                  PARSEA   ——

(18) *Stage 4c*:
    a.   PARSET >> PARSEA >> $*F^2$ >> $*F$ yields: tensed and agreeing
    b.   PARSEA >> PARSET >> $*F^2$ >> $*F$ yields: tensed and agreeing

We have now illustrated our analysis of the development of finiteness in child language acquisition, the predictions of which match the observed figures quite closely.[23]

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[22] There are discontinuous jumps in the rankings between stages 3b and 4b and between stages 4b and 4c. Given that, we might expect to find intermediate stages as well; for example between 3b and 4b we might expect a stage 3b′ in which PARSEA has advanced partway, but is still always ranked below $*F^2$, and between 4b and 4c we might expect a stage 4b′ in which PARSEA and PARSET are no longer ever outranked by $*F$. While we do not have much data on this issue, we looked at one file (Philippe #10) between stage 4b and stage 4c that shows roughly the proportions we would expect for a stage with "4b′" rankings. It has been harder to find a convincing case of stage 3b′ in the data we have examined. More thorough investigation of these intermediate stages must await future research.

[23] Although we have cast our analysis in terms of Reynolds' (1994) floating constraints model, it may be that independently Anttila's (1997) model of partial rankings is to be preferred. It is fairly easy to recast our system in terms of Anttila-style partial rankings as well (thanks to an anonymous reviewer for providing the basics of this analysis). We could represent this as something like the following:

(i)   Stage 3   Stage 4b   Stage 4c

           $*F^2$ X   X

PARSET $*F$ PARSET $*F^2$ PARSEA   PARSET   PARSEA

PARSEA $*F$ $*F^2$

                                                           $*F$

     $*F^2$ >> $*F$ $*F^2$ >> $*F$ $*F^2$ >> $*F$
     $*F^2$ >> PARSET   PARSEA >> $*F^2$
     PARSET >> PARSEA   PARSET >> $*F^2$

The predictions made under this notation do not change, however; Stage 3 still yields 3 rankings (2 tensed, 1 NRF), stage 4b yields 12 rankings (2 NRF, 2 tensed and agreeing, 4 agreeing, and 4 tensed), and stage 4c

                                                                         …continues…

Before finishing this discussion, there is another point worth making. If we assume that negation introduces a functional projection that violates *F, as seems reasonable, our analysis predicts that negation should compete with tense and agreement, or, more concretely, predicts that we should see more default forms and NRFs in negative utterances than in non-negative utterances. This prediction clearly runs counter to Rizzi's (1993/4) prediction that negation should entail tense. Existing studies on the interaction of negation and NRFs (e.g., Levow (1995)) have not differentiated default from non-default tense and agreement. Reviewing the transcripts we analyzed, we found no cases of negation co-occurring with unambiguously tensed and agreeing verbs out of about 70 opportunities at stages 3b and 4b, whereas at 4c negation often occurred with agreement/tense marking. A larger-scale study would needed to determine if negation really competes on a par with tense and agreement, but this preliminary observation suggests that it may.

4.4 Summary of the predictions and results

In the previous subsections, we reviewed the basic tenets of OT, outlined the framework of partial rankings and floating constraints, and then gave a specific analysis for each stage in terms of the rankings of the two Faithfulness constraints PARSET and PARSEA and the two Markedness constraints *F and *F^2. We close this section of the paper by showing the close match between the predictions of the system and the observed rates of tense and agreement marking over the course of acquisition.

In Figures 4–6, we show graphically the comparison between the observed and predicted results for non-present tense, non-3sg agreement, and NRFs for each stage.

We wish again to highlight the fact that these predictions made here are not made (either correctly or incorrectly) by existing analyses of the acquisition of tense and agreement. Given our results from section 3, showing that the course of acquisition is systematic and grammatical in nature (as shown by the differential rates of tense and agreement use), it is clear that these facts require explanation. While previous analyses in the literature have concentrated on predicting the *existence* of different forms at different points during acquisition, this analysis takes it a step further and predicts *how often* the forms will occur.

…continued…

yields 2 rankings (both tensed and agreeing). It is possible that looking at it in this way will be revealing in terms of how faithfulness constraints advance in the ranking over time, although we will not pursue this further here.
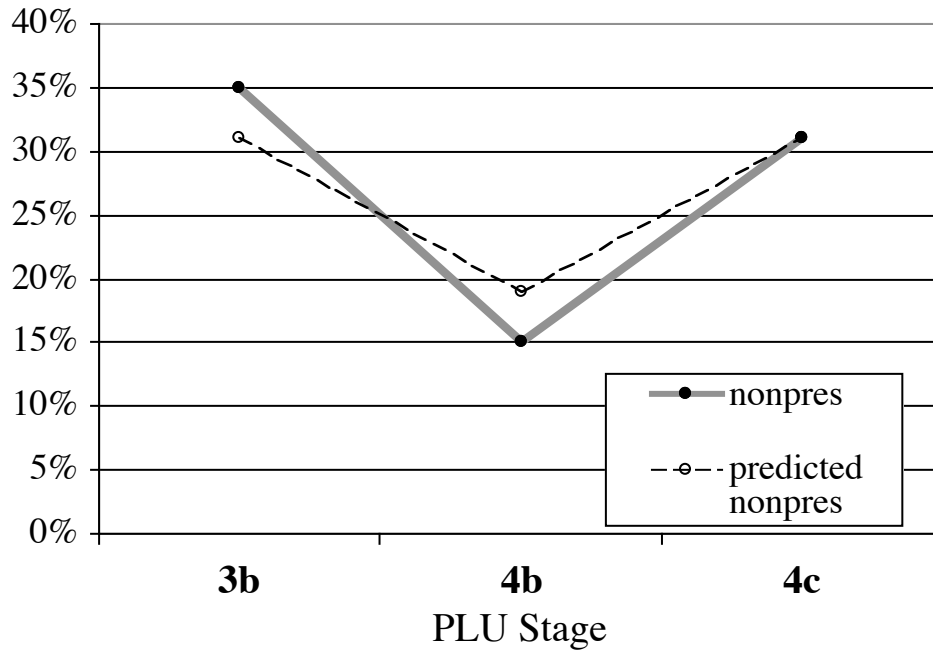
Figure 4. Predictions of the partial ranking analysis vs. observed data: Tense
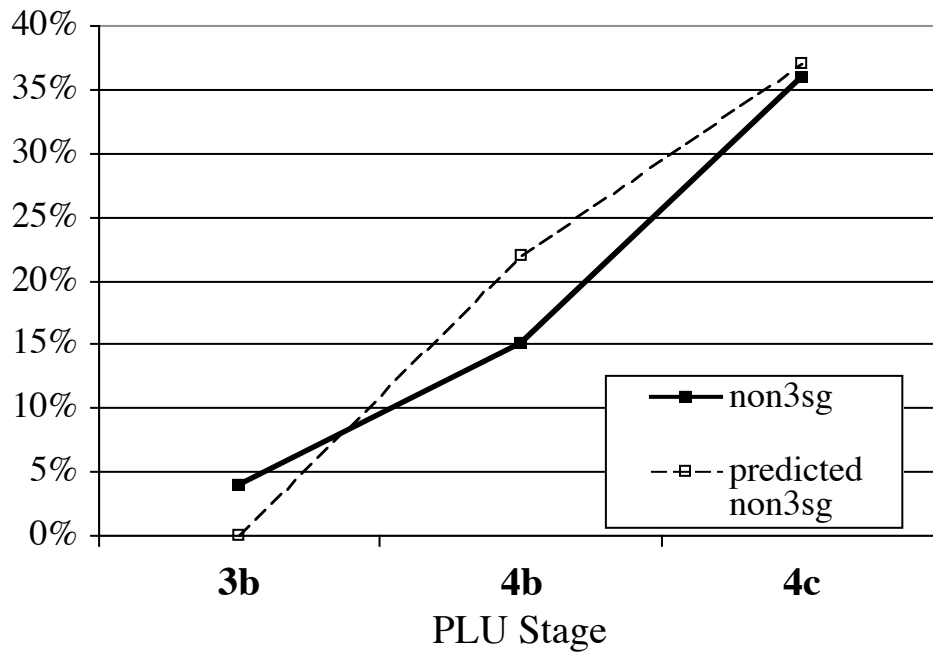

Figure 5. Predictions of the partial ranking analysis vs. observed data: Agreement
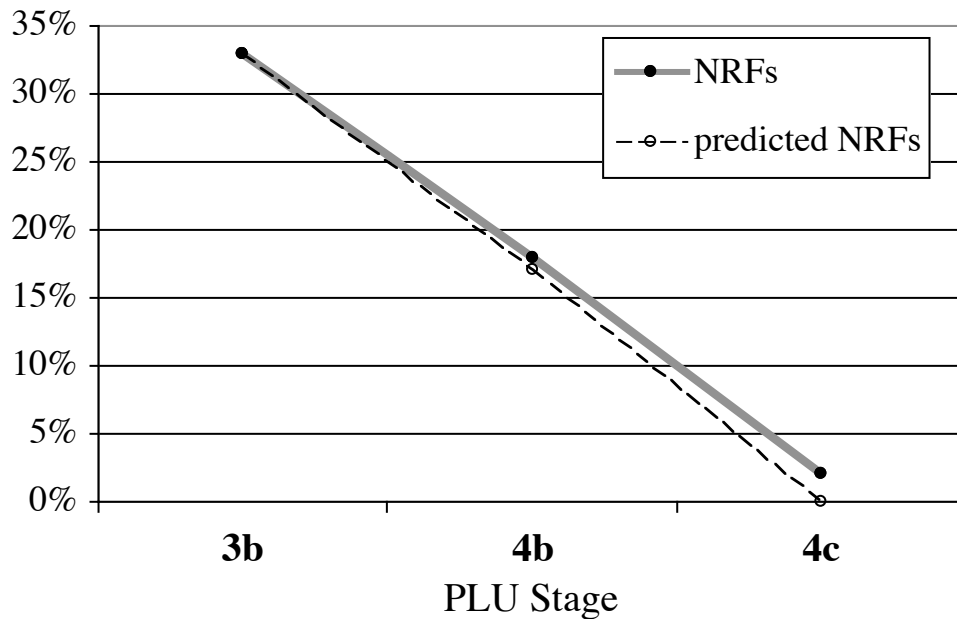
Figure 6. Predictions of the partial ranking analysis vs. observed data: NRFs

5. Some connections
5.1 Comparison to Wexler's (1998) Unique Checking Constraint
Wexler (1998) provides a model of NRFs that is generally compatible with the basic results we report here, in which children around age 2 will leave either TP or AgrP out of their syntactic representations in order to avoid violating a constraint (the *Unique Checking Constraint*) against having both. At this level, Wexler's UCC performs the same function as $*F^2$ under our analysis. Under Wexler's system, the child faces constraint conflict (basically between PARSEA, PARSET, and the UCC) and must choose one to violate. No further proposal is made with respect to how this choice is made. The OT account proposed here essentially focuses in on this aspect of syntactic development, providing a principled account of the observed systematicity in the choice of constraint violations.

The UCC and $*F^2$ do make some slightly different predictions, however. First, if the UCC is the only constraint on structure, there is no reason to expect children to omit *both* TP and AgrP (since omitting either one or the other satisfies the UCC and Wexler's MINIMIZE VIOLATIONS principle), which they nevertheless appear to do. Schütze & Wexler (1996) propose that this is the structure attributable to utterances with genitive subjects in Child English, and in our analysis above, this is the structure we assign to the NRFs in Child French. Yet the child would be under no pressure to omit both TP and AgrP without a constraint like *F, which favors omission of both. Thus, empirically, some constraint like *F is required.

Another point where the UCC and $*F^2$ differ is with respect to what they are sensitive to. The $*F^2$ constraint is simply sensitive to the presence of functional projections in the structure. Wexler proposes that the UCC is a constraint specifically on checking of D features in a minimalist syntax framework, which can indirectly force omission of (one) functional projection where that projection requires checking a D

feature. From this, he is able to further derive a correlation between null subject languages and child NRFs under a particular analysis of null subjects. This is something that $*F^2$ does not provide as it stands, but given the discussion in the next section, this may not be a disadvantage.

The last point we would like to make with respect to this comparison is that the system we have outlined in this paper provides an explanation of the eventual loss of NRFs in terms of constraint re-ranking of the kind that must be involved in all other aspects of syntactic acquisition in the OT view. Faithfulness constraints start ranked below markedness constraints and work their way up the constraint hierarchy, in a basically continuous fashion. The UCC, on the other hand, is posited as a maturationally imposed child-specific constraint that children "grow out of" at a certain point. While there may or may not be a maturation-based trigger for the advancement of these Faithfulness constraints, the analysis we have outlined here better places this kind of development in the context of the grammar as a whole.

5.2 French as a null subject language with NRFs

Throughout this paper, we have been taking French to be a null subject language. Specifically, sentences with only a clitic subject are analyzed as being sentences with a null subject, the clitic being a realization of agreement.

In connection with this, there are at least two questions that need to be addressed, with respect to the (standard French) adult pattern in (19): Why isn't *il* obligatory in the canonical subject-verb structure (19a)? Why is (19b) ungrammatical?

(19)　　a.　　　Jean est parti.
　　　　b.　　* Est parti.
　　　　c.　　　Jean il est parti.
　　　　　　　　'John left.'

On the analysis of subject clitics we adopt here, taking them to be subject agreement, the pattern in (19a–b) is highly reminiscent of the well known agreement pattern in Irish discussed in McCloskey and Hale (1984), where subject agreement in person and number appears on the verb if and only if the subject DP is not overtly present. That is, when there is a null subject, agreement (in the form of a subject clitic) is required, and when there is an overt subject, no agreement appears—unless the overt subject has been moved out of canonical subject position (i.e. dislocated to a topic position, as in (19c)).

Building on Rizzi (1986) we might say that a clitic appears only when the agreement is not "locally identified" by a subject (say in the specifier of AgrSP). By contrast, in LD constructions the subject has moved out of SpecAgrSP to a higher functional projection due to its informational status (LD is characteristic of a change in topic, i.e. a reintroduction of a recent topic in the discourse). As a last resort, the head AgrS is spelled out to avoid a violation of the local identification constraint.

If we continue to assume that French is indeed a null subject language, this has implications for the claim made in previous literature (see, e.g., Wexler 1998) that NRFs

do not appear in languages which license null subjects. It is clear that NRFs appear in French, which will make French a counterexample to this generalization as stated.[24]

To the extent that there is a valid generalization to be made here, it cannot be simply a matter of being a null-subject language; rather, it must be that the appearance of NRFs correlates with something else, something that usually goes along with being a null subject language. A likely place to start would be in aspects of the morphology, given that richer morphology tends to go both with null subject languages and with a lack of NRFs. Trying to state this properly will, however, need to be left future research.

5.3 Weak and Strong Continuity

Within Principles & Parameters approaches to acquisition, there are two prevalent but incompatible views on the development of phrase structure. Briefly, one posits fully articulated structures in child grammars (Strong Continuity or the Full Competence Hypothesis), and the other claims that child grammars represent less than adult grammars do (Weak Continuity or Minimal Trees).

According to the Strong Continuity (or Full Competence) approach to phrase structure development, adult-like phrase structure is available to the child from the beginning of syntactic acquisition (see Boser, Lust, Santelmann and Whitman (1992), Hyams (1992), Poeppel and Wexler (1993), and Wexler (1998), among others). The main advantage of such an approach is its simplicity in terms of learnability: since the child at all relevant points of development has the adult grammar, nothing special needs to be said about how the adult grammar is acquired. Apparent non-adult properties of child language are then attributed to interfering factors, e.g. memory limitations, or specific non-adult restrictions on the syntactic structures. The partial ordering proposal put forth here shares several of the advantages of Strong Continuity:

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[24] Our observations of the appearance of clitic pronouns in child speech also seem to show that child French behaves more like child Italian (a null-subject language) than child English (a non-null subject language). Valian (1991) reports that Italian children in this age range use null subjects about 70% of the time, and the French children we analyzed went from about 55% to about 65% usage of null subjects (including utterances with subject clitics, which we take to be agreement). For (US) English-speaking children, Valian reports about 85% use of subject pronouns (where the subject is overt), compared to an increase we found in our observations from about 20% to about 60% use of subject clitics (where the subject is overt) in French. Although this requires more systematic investigation, these results are consistent with our view of French as a null subject language where the subject clitics represent agreement.

(20)   *Strong Continuity advantages shared by the partial ordering analysis*:

a.   The input to the syntactic component is adult-like (all of the features corresponding to functional categories are present in the grammar from the beginning of syntactic acquisition).

b.   The syntactic constraints are adult-like (there are no special constraints specific to child language nor does the child learn any new constraints over the course of development).

c.   Variation between stages of a child's grammar is adult-like (the mechanism of constraint reranking that is needed to account for different child grammars is the same as the mechanism needed to account for historical or sociolinguistic variation in adult grammars).

There are also several differences, many of which are common to both our partial ordering proposal and the "Weak Continuity" approach (also referred to as the Minimal Trees approach; see, e.g., Guilfoyle and Noonan (1992), Vainikka (1993/4), Wijnen (1995), Vainikka and Young-Scholten (1994), Radford (1996)). According to Weak Continuity, phrase structure develops gradually, "from the bottom up," resulting in representations during intermediate stages of development that often differ from those available to the adult grammar. The following characteristics are shared by the Weak Continuity approach and the partial ordering analysis:

(21)   *Weak Continuity advantages shared by the partial ordering analysis*:

a.   Each stage of development corresponds to a different grammar (the differing grammars arise from constraint reranking during development).

b.   A minimal amount of phrase structure is posited (this economy of structure arises from constraint interaction between markedness constraints and faithfulness constraints).

c.   There exist non-adult-like grammars at early stages of development (such non-adult grammars arise from a general tendency of input-output faithfulness constraints to have an initial low ranking, as has been observed in the acquisition of phonology; see, e.g., Levelt (1994), Demuth (1995), Gnanadesikan (1995), Pater and Paradis (1996)).

The partial ordering analysis presented here shares important characteristics of both the Strong and Weak Continuity approaches, while capturing the most important advantages of each. As with Strong Continuity, the acquisition problem is considerably reduced; under the partial ordering approach, the problem consists of explaining why faithfulness constraints have an initially low ranking and how their status changes during development (cf. (21c)). As with Weak Continuity, early syntactic structures receive a

simplified syntactic analysis. Unlike Weak Continuity, however, the partial ordering analysis is grounded in a theory of transitions from the initial state to the adult state.

Note that the partial ordering analysis synthesizes the Strong and Weak Continuity approaches as a *natural* consequence of the mechanisms of OT, arising from the separation of syntactic constraints from their ranking. Under Principles & Parameters approaches, by contrast, the two approaches are explicitly incompatible.

(22)   *Properties unique to the partial ordering analysis*:

a.   A natural synthesis of (otherwise explicitly incompatible) Strong and Weak Continuity.

b.   A description and explanation of proportions of "optional" syntactic phenomena is possible.

5.4. Concluding remarks

Using a new analysis of the production data of three French children (Grégoire, Philippe, and Stéphane, from CHILDES), we have uncovered previously overlooked characteristics of the acquisition of tense and agreement in French. This was made possible in large part through the use of the PLU measure (described above in section 3.1) to separate the corpus into qualitative stages of development, revealing the systematic progression from stage to stage. The first finding is that tense and agreement follow independent courses of acquisition. While the use of tense starts and ends strong (at Stages 3b and 4c all finite verbs are tensed), it suffers a "dip" between these stages (at Stage 4b only about half of the finite verbs are tensed). Meanwhile, agreement develops in a more linear way; at Stage 3b none of the finite verbs were agreeing, at Stage 4b about half were, and at stage 4c all of the finite verbs agreeing. At the same time, the proportion of NRFs is dropping; while a full third of the verbs are NRFs at Stage 3b, only a fifth are NRFs at Stage 4b, and almost none are NRFs by Stage 4c.

The distinctive profile of tense production over the three stages naturally leads to an analysis in which, at Stage 4b, tense and agreement are *competing* for realization. In particular, an Optimality-Theoretic analysis making use of "floating constraints" (defining partial ranking orders) that allow us to predict not only the *occurrence* of the observed types of utterances, but to model their *frequencies* as well. In previous analyses, there has been no clear way even to *describe* the frequency facts, whereas under our proposal the frequency predictions are a consequence of the re-ranking mechanism. The fundamental principle of OT, that grammars share the same constraints but rank them differently with respect to one another, requires that the acquisition process be one of re-ranking constraints. We have proposed that this re-ranking occurs by spreading constraints across ranges in the rankings, narrowing in on the correct adult ranking. These "floating" or partially ranked constraints allow our model to make frequency predictions. As we saw in Section 4, a very simple model can produce predictions which match the observed proportions quite closely.

References

Aksu-Koç, A. and D. Slobin (1985) "The Acquisition of Turkish," in D. Slobin, ed., *The Crosslinguistic Study of Language Acquisition*, vol. 1. Lawrence Erlbaum Associates, Hillsdale, NJ, 839–878.

Anttila, A. (1997) *Variation in Finnish Phonology and Morphology*, Doctoral dissertation, Stanford University.

Auger, J. (1994) *Pronominal Clitics in Québec Colloquial French: A Morphological Analysis*, Doctoral dissertation, University of Pennsylvania.

Berman, R. (1985) "The Acquisition of Hebrew," in D. Slobin, ed., *The Crosslinguistic Study of Language Acquisition*, vol. 1, Lawrence Erlbaum Associates, Hillsdale, NJ, 255–371.

Boersma, P. (1997) "How We Learn Variation, Optionality, and Probability," *Proceedings of the Institute of Phonetic Sciences of the University of Amsterdam* 21, 43–58.

Boersma, P. and B. Hayes (2001) "Empirical Tests of the Gradual Learning Algorithm," *Linguistic Inquiry* 32(1), 45–86.

Boersma, P. and C. Levelt (1999) "Gradual Constraint-Ranking Learning Algorithm Predicts Acquisition Order," in *Proceedings of 30th Child Language Research Forum*, Stanford University, 229–237.

Boser, K., B. Lust, L. Santelmann and J. Whitman (1992) "The Syntax of CP and V–2 in Early Child German: The Strong Continuity Hypothesis," in K. Broderick, ed., *Proceedings of NELS 23,* GLSA, Amherst, MA, 51–65.

Brown, R. (1973) *A First Language: The Early Stages*, Harvard University Press, Cambridge, MA.

Clahsen, H. (1990) "Constraints on Parameter Setting. A Grammatical Analysis of Some Acquisition Stages in German Child Language," *Language Acquisition* 1, 361–391.

Clahsen, H., S. Eisenbeiss and M. Penke (1996) "Lexical Learning in Early Syntactic Development," in H. Clahsen, ed., *Generative Perspectives on Language Acquisition*, John Benjamins, Amsterdam, 129–159.

Clark, E. (1985) "The Acquisition of Romance, with Special Reference to French," in D.I. Slobin, ed., *The Crosslinguistic Study of Language Acquisition, Vol. 1: The Data*, Lawrence Erlbaum Associates, Hillsdale, NJ, 687–782.

Côté, M.-H. (2001) "On the Status of Subject Clitics in Child French," in M. Almgren et al., eds., *Research on Child Language Acquisition: Proceedings of the 8th Conference of the International Association for the Study of Child Language*, Cascadilla Press, Somerville, MA, 1314–1330.

Crago, M.B. and S.E.M. Allen (2001) "Early Finiteness in Inuktitut: The Role of Language Structure and Input," *Language Acquisition* 9(1), 59–111.

Davidson, L. and G. Legendre (to appear) "Defaults and Competition in the Acquisition of Functional Categories in Catalan and French," in R. Nuñez-Cedeño, L. López and R. Cameron, eds*., Selected Papers from the 2001 Linguistic Symposium on Romance Languages (LSRL XXVI)*, John Benjamins, Amsterdam. Available from Géraldine Legendre's web page at http://hebb.cog.jhu.edu.

Deen, Ud K. and N. Hyams (2002). "The Form and Interpretation of Finite and Non-Finite Verbs in Swahili," in B. Skarabela, S. Fish and A. Do (eds.), *BUCLD 26: Proceedings of the 26th Annual Boston University Conference on Language Development*, Cascadilla Press, Somerville, MA, 130–141.

De Haan, G.R. and K. Tuijnman (1988) "Missing Subjects and Objects in Child Grammar," in P. Jordens and J. Lalleman, eds., *Language Development*, Foris, Dordrecht, 101–121.

Demuth, K. (1995) "Markedness and the Development of Prosodic Structure," in *Proceedings of NELS 25*, GLSA, Amherst, MA, 13–25.

De Villiers, J and P. de Villiers (1973) "A Cross-sectional Study of the Acquisition of Grammatical Morphemes in Child Speech," *Journal of Psycholinguistic Research* 2, 267–78.

Dietiker, S. (1978) *En Bonne Forme: Révision de Grammaire Française*, D.C. Heath and Company, Lexington.

Ferdinand, A. (1996) *The Development of Functional Categories, The Acquisition of the Subject in French*, Holland Institute of Generative Linguistics.

Gnanadesikan, A. (1995) "Markedness and Faithfulness Constraints in Child Phonology," ms., University of Massachusetts, Amherst.

Grimshaw, J. (1991) "Extended Projections", ms., Brandeis University.

Grimshaw, J. (1997) "Projection, Heads, and Optimality," *Linguistic Inquiry* 28(3), 373–422.

Grinstead, J. (1994) *Tense, Agreement, and Nominative Case in Child Catalan and Spanish*, Masters Thesis, University of California, Los Angeles.

Guasti, M. (1994) "Verb Syntax in Italian Child Grammar: Finite and Nonfinite Verbs," *Language Acquisition* 3, 1–40.

Guilfoyle, E. and M. Noonan (1992) "Functional Categories in Language Acquisition," *Canadian Journal of Linguistics* 37, 241–272.

Hagstrom, P., J. Chen-Main, Legendre, G., and L. Tao (to appear) "Default *ne* in Child Mandarin Chinese," *Journal of Cognitive Science*, Seoul, Korea.

Hamann, C., L. Rizzi, and U. Frauenfelder (1995) "On the Acquisition of the Pronominal System in French," *Recherches Linguistiques* 24, 83–101.

Hoekstra, T. and N. Hyams (1998), "Aspects of Root Infinitives," *Lingua* 106, 81–112.

Hyams, N. (1992) "The Genesis of Clausal Structure," in J. Meisel, ed., *The Acquisition of Verb Placement*, Kluwer, Dordrecht, 371–400.

Hyams, N. (1996) "The Underspecification of Functional Categories in Early Grammar," in H. Clahsen and R. Hawkins, eds., *Generative Approaches to First and Second Language Acquisition*, John Benjamins. 91–127.

Imedadze, N. and K. Tuite (1992) "The Acquisition of Georgian," in D. Slobin, ed., *The Crosslinguistic Study of Language Acquisition*, vol. 3, Lawrence Erlbaum Associates, Hillsdale, NJ, 39–109.

Ingham, R. (1998) "Tense Without Agreement in Early Clause Structure," *Language Acquisition* 7, 51–81.

Jakubowicz, C. and C. Rigaut (1997) "L'acquisition des clitiques nominatifs en français," in A. Zribi-Hertz, ed., *Les pronoms: syntaxe, morphologie et typologie*. Presses Universitaires de Vincennes, Vincennes, 57–99.

Kaiser, G. (1994) "More about INFL-ection and Agreement: The Acquisition of Clitic Pronouns in French," in J. Meisel, ed., *Bilingual First Language Acquisition: French and German Grammatical Development,* John Benjamins, Amsterdam. 131–160.

Kayne, R. (1975) *French Syntax: The Transformational Cycle*, MIT Press, Cambridge. MA.

Kayne, R. (1989) "Null Subjects and Clitic Climbing," in O. Jaeggli and K. Safir, eds., *The Null Subject Parameter*. Kluwer, Dordrecht, 239–261.

Kiparsky, P. (1993) "Variable Rules," handout distributed at the *Rutgers Optimality Workshop* (ROW1).

Klee, T. and M.D. Fitzgerald (1985) "The relation between grammatical development and mean length of utterances in morphemes," *Journal of Child Language* 12, 251–269.

Krämer, I. (1993) "The Licensing of Subjects in Early Child Language," in C. Phillips, ed., *Papers on Case and Agreement II, MITWPL 19*, MIT Working Papers in Linguistics, Cambridge, MA, 197–212.

Lambrecht, K. (1981) *Topic, Antitopic and Verb Agreement in Nonstandard French*, John Benjamins, Amsterdam.

Legendre, G. (2001) "An introduction to Optimality Theory in Syntax," in G. Legendre, J. Grimshaw and S. Vikner, eds., *Optimality-Theoretic Syntax*, MIT Press, Cambridge, MA, 1–27.

Legendre, G., P. Smolensky, and C. Wilson (1998) "When is Less More? Faithfulness and Minimal Links in Wh-Chains," in P. Barbosa, D. Fox, P. Hagstrom, M. McGinnis, and D. Pesetsky, eds., *Is the Best Good Enough? Optimality and Competition in Syntax*, MIT Press, Cambridge, MA, 249–289.

Levelt, C. (1994) *On the Acquisition of Place*, Holland Institute of Generative Linguistics.

Levow, G.-A. (1995) "Tense and Subject Position in Interrogatives and Negatives in Child French: Evidence For and Against Truncated Structure," in C. Schütze, J. Ganger, and K. Broihier (eds.), *Papers on Language Acquisition and Processing, MITWPL 26*, MIT Working Papers in Linguistics, Cambridge, MA, 281–304.

McCloskey, J. and K. Hale (1984) "On the Syntax of Person-Number Inflection in Modern Irish," *Natural Language and Linguistic Theory* 1, 487–533.

MacWhinney, B. and C. Snow (1985) "The Child Language Data Exchange System," *Journal of Child Language* 12, 271–96.

Meisel, J. (1990) "INFL-ection: Subjects and Subject-Verb Agreement," in J. Meisel, ed., *Two first Languages: Early grammatical development in bilingual children*, Foris, Dordrecht, 237–298.

Meisel, J. (1994) "Getting FAT: Finiteness, Agreement and Tense in Early Grammars," in A. Meisel, ed., *Bilingual First Language Acquisition: French and German grammatical development,* 89–129.

Meisel, J., and M. Ezeizabarrena (1996) "Subject-Verb and Object-Verb Agreement in Early Basque," in H. Clahsen, ed., *Language Acquisition: Empirical Findings, Theoretical Considerations, Cross-linguistic Comparisons*, John Benjamins, Amsterdam, 201–239.

Miller, M. (1976) *Zur Logik der fruehkindlichen Sprachentwicklung*, Klett, Stuttgart.

Miller, P. (1992) *Clitics and Constituents in Phrase Structure Grammar*, Garland, New York.

Nagy, N. and B. Reynolds (1997) "Optimality Theory and Variable Word-final Deletion in Fætar," *Language Variation and Change* 9, 37–55.

Pater, J. and J. Paradis (1996) "Truncation without Templates in Child Phonology," in A. Stringfellow, D. Cahana-Amitay, E. Hughes and A. Zukowski, eds., *BUCLD 20: Proceedings of the 20th Boston University Conference on Language Development*, Cascadilla Press, Somerville, MA, 540–552.

Phillips, C. (1995) "Syntax at Age Two: Cross-Linguistic Differences," in C. Schütze, J. Ganger, and K. Broihier, eds., *Papers on Language Processing and Acquisition, MITWPL 26*, MIT Working Papers in Linguistics, Cambridge, MA, 37–93.

Pierce, A. (1989) *On the Emergence of Syntax: A Crosslinguistic Study*, Doctoral dissertation, Massachusetts Institute of Technology.

Pierce, A. (1992) *Language Acquisition and Syntactic Theory: A Comparative Analysis of French and English Child Grammars*, Kluwer, Dordrecht.

Poeppel, D., and K. Wexler (1993) "The Full Competence Hypothesis of Clause Structure in Early German," *Language* 69, 1–33.

Prince, A. and P. Smolensky (1993) *Optimality Theory: Constraint Interaction in Generative Grammar*, Technical Report TR–2, Rutgers Center for Cognitive Science, Rutgers University, New Brunswick, NJ, and Technical Report CU–CS–696–93, Department of Computer Science, University of Colorado at Boulder.

Radford, A. (1990) *Syntactic Theory and the Acquisition of English Syntax*, Basil Blackwell, Oxford.

Radford, A. (1996) "Towards a Structure-Building Model of Acquisition," in H. Clahsen, ed., *Generative Perspectives on Language Acquisition*, John Benjamins, Amsterdam, 43–90.

Reynolds, B. (1994) *Variation and Phonological Theory*, Doctoral dissertation, University of Pennsylvania.

Rizzi, L. (1986) "Null Objects in Italian and the Theory of pro," *Linguistic Inquiry* 17, 501–557.

Rizzi, L. (1993/94) "Some Notes in Linguistic Theory and Language Development: The Case of Root Infinitives," *Language Acquisition* 3, 371–393.

Roberge, Y. (1990) *The Syntactic Recoverability of Null Arguments*, McGill Queen's University Press, Montréal.

Roeper, T. and B. Rohrbacher (1994) "Null Subjects in Early Child English and the Theory of Economy of Projection," ms., University of Massachusetts, Amherst, and University of Pennsylvania.

Rohrbacher, B. and A. Vainikka (1994) "On German Verb Syntax Under Age 2," IRCS Technical Report 94–24, University of Pennsylvania.

Rondal, J.A. (1985) *Adult-child interaction and the process of language understanding*, Praeger, New York.

Schütze, C. and K. Wexler (1996) "Subject Case Licensing and English Root Infinitives," in A. Stringfellow, D. Cahana-Amitay, E. Hughes and A. Zukowski, eds., *BUCLD 20: Proceedings of the 20th Boston University Conference on Language Development*, Cascadilla Press, Somerville, MA, 670–681.

Smolensky, P. (1995) "On the Internal Structure of the Constraint Component *Con* of UG," paper presented at University of California, Los Angeles.

Smolensky, P. (1996) "The Initial State and 'Richness of the Base' in Optimality Theory," ms., Johns Hopkins University.

Speas, M. (1994) "Null Arguments in a Theory of Economy of Projections," in E. Benedicto and J. Runner (eds.), *University of Massachusetts Occasional Papers in Linguistics 17: Functional Projections*, GLSA, Amherst, MA, 179–208.

Sportiche, D. (1996) "Clitic Constructions," in J. Rooryck and L. Zaring, eds., *Phrase Structure and the Lexicon*, Kluwer, Dordrecht, 213–276.

Suppes, P., R. Smith, and M. Leveillé (1973) "The French Syntax of a Child's Noun Phrases," *Archives de Psychologie* 42, 207–269.

Tesar, B. and P. Smolensky (1998) "Learning Optimality-Theoretic Grammars," *Lingua* 106, 161–196.

Tesar, B. and P. Smolensky (2000) *Learnability in Optimality Theory*, MIT Press, Cambridge, MA.

Vainikka, A. (1993/4) "Case in the Development of English Syntax," *Language Acquisition* 3, 257–324.

Vainikka, A., G. Legendre and M. Todorova (1999) "PLU Stages: An Independent Measure of Early Syntactic Development," Technical Report JHU–CogSci–99–10, Johns Hopkins University. Available from Géraldine Legendre's web page at http://hebb.cog.jhu.edu.

Vainikka A. and M. Young-Scholten (1994) "Direct Access to X′-Theory: Evidence from Korean and Turkish Adults Learning German," in T. Hoekstra and B. Schwartz, eds., *Language Acquisition Studies in Generative Grammar*, John Benjamins, Amsterdam. 265–316.

Valian, V. (1991) "Syntactic subjects in the early speech of American and Italian children," *Cognition* 40, 21–28.

Wexler, K. (1994) "Optional Infinitives, Head Movement, and Economy of Derivation," in N. Hornstein and D. Lightfoot, eds., *Verb Movement*, Cambridge University Press, Cambridge, 305–350.

Wexler, K. (1998) "Very Early Parameter Setting and the Unique Checking Constraint: A New Explanation of the Optional Infinitive Stage," *Lingua* 106, 23–79.

Wijnen, F. (1995) "Incremental Acquisition of Phrase Structure: A Longitudinal Analysis of Verb Placement in Dutch Child Language," in Beckman, J., ed., *Proceedings of NELS 25*, GLSA, University of Massachusetts, Amherst.