

Evidence for syntactic competition in the acquisition
of tense and agreement in child French

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1 The proposal

In many languages, children around the age of 2 make certain systematic errors in their verbal forms. They produce both non-finite root forms (NRFs) and finite forms in contexts where finite forms are required in the adult language. This is often referred to as the “optional infinitive (OI) stage” (Wexler 1994, 1998). For example, young children acquiring French as their native language produce sentences like (1a,b) where the verbal forms are non-finite and non-adult-like (e.g. infinitival *ouvrir* ‘to open’, and the past participle form *assis* ‘sat down’ instead of the adult forms *j’ouvre* ‘I (will) open’ and the compound past tense *est assis* ‘has sat down’ respectively.^{1,2}

- (1) a. Cabinets ouvrir. (Grégoire 1;9.28)
restroom open-INF
‘(I will) open the restroom (door)’
b. Assis Grégoire (Grégoire 1;10.20)
sit.down-Part Grégoire
‘Grégoire (has) sat down’

In this paper we present evidence that the OI stage is not a monolithic stage of development but rather consists of a sequence of substages with a systematic and evolving pattern in the child’s realization of tense and agreement features. In other words, the use of NRFs is not an *optional* choice on the child’s part about whether to project certain functional structure, contra the characterization in Wexler (1994, 1998).

In particular, we show that the observed frequencies of finite and non-finite forms are expected under an Optimality-Theoretic view of grammar (Prince and Smolensky 1993) and a model of the developing syntax whereby conflicting constraints determine the grammatical structures of a language. From a developmental perspective this means that the child must, in particular, balance constraints prohibiting (functional) structure against constraints requiring faithfulness to what the child intends to say. Faithfulness constraints require parsing of the functional features (tense, agreement). They ensure that what is expressed (the output of the grammar) differs minimally from what is intended (the input to the grammar, which by assumption contains features for tense and agreement).

- (2) *Faithfulness Constraints:*
 PARSET: Parse Tense
 PARSEA: Parse Agreement

Assuming that the presence of inflectional categories is indicative of phrase structure above that instantiating lexical categories (Pollock 1989), the constraints penalizing structure can be stated as *F and *F².

- (3) *Markedness Constraints:*
 *F: No functional heads.
 *F²: No pairs of functional heads.

The key to our proposal is the ability of the faithfulness constraints to “float” over a certain range of the constraint hierarchy determined by markedness constraints penalizing structure. Formally, a partial ordering determines a set of rankings which predicts not only that we see variation in outputs of the developing grammar but also with what frequency we will see each (see also Reynolds 1994, Anttila 1997, Boersma 1997).

Consider how a partial ranking can give us proportions.

- (4) a. Partial ranking:
 Fixed *F² >> *F
 Floating: PARSET _____
 b. Set of rankings:
 i. *F² >> *F >> PARSET winning candidate: untensed verb
 ii. *F² >> PARSET >> *F winning candidate: tensed verb

PARSET covers a *range* of the ranking space. Prior to each evaluation, it is fixed in a random place in that range. So each evaluation could *either* be using (strict) ranking (4bi) *or* (4bii). Assuming it is random (i.e. that for any given evaluation, PARSET may be fixed in any position in its range with equal probability) we expect to see 50% tensed verbs and 50% untensed verbs.

2 The evidence

Evidence for a competition-based analysis comes from the observation that (a) tense and agreement show different courses of development and (b) the frequency of NRFs is not constant over the course of the so-called OI stage. This is the case in child French for all three children from the CHILDES database (MacWhinney and Snow 1985): Grégoire (1;9–2;5), Stéphane (2;2–3;3), and Philippe (2;1–2;6). This section elaborates on claims (a) and (b) after a brief discussion of two important methodological considerations.

One important methodological issue in acquisition studies concerns the notion of stage of development and its definition. We have developed an independent, cross-linguistically valid, measure of syntactic development (PLU or

Predominant Length of Utterance) which refines the traditional observation that children go through stages in which they produce one-word, then two-word, and then multi-word utterances (Vainikka, Legendre, and Todorova 1999). This allows us to divide the transcripts into stages without relying on age (a notoriously poor predictor of syntactic development) or the MLU (Brown 1973), neither of which correlate consistently with a particular level of syntactic development (e.g., percentage of verbs realized as NRFs) across the three French-speaking children. See the Appendix for definitions of PLU stages.

Note that there are three contiguous stages of development of inflectional categories represented in the French data available from the CHILDES database; we label these stages 3b, 4b, and 4c. 4c represents the adult stage of development with respect to inflectional categories.

The second methodological issue is specific to French. Interpreting the data requires interpreting subject agreement. In French, the overwhelming majority of verbs used by young children belong to the first conjugation class (-*er* verbs) which displays considerable homophony across persons (e.g. *danse, danses, dansent* ‘dance’ have the same phonological form [dãs] despite the fact that they encode 1sg/3sg, 2sg, and 3pl, respectively).³

Following many linguists including Auger (1994, 1995), Ferdinand (1996), Lambrecht (1981), Legendre (1999), Miller and Sag (1997), Pierce (1992), Roberge (1990), and Suñer (1988), we assume that subject clitics (*je, tu, il, ...*) are overt realizations of agreement (in particular, they are *not* overt subjects) in French. Thus, we analyze a sentence like *je danse* ‘(I) dance’ as a sentence with a null subject and overt 1sg agreement.

We now turn to the evidence for a competition-based analysis. Firstly, *tense and agreement show different courses of development*, based on two separate observations. One is grounded in a well-known cross-linguistic pattern: The first tense morphology to appear in child’s speech is present tense (Piaget 1927), and the first agreement morphology to appear is third person singular (see, e.g., Smoczyńska 1985, for Polish). For a time children overgeneralize third person singular and present tense but the two are dissociated. For example, past tense can occur together with overgeneralized third person singular, as shown in (5).

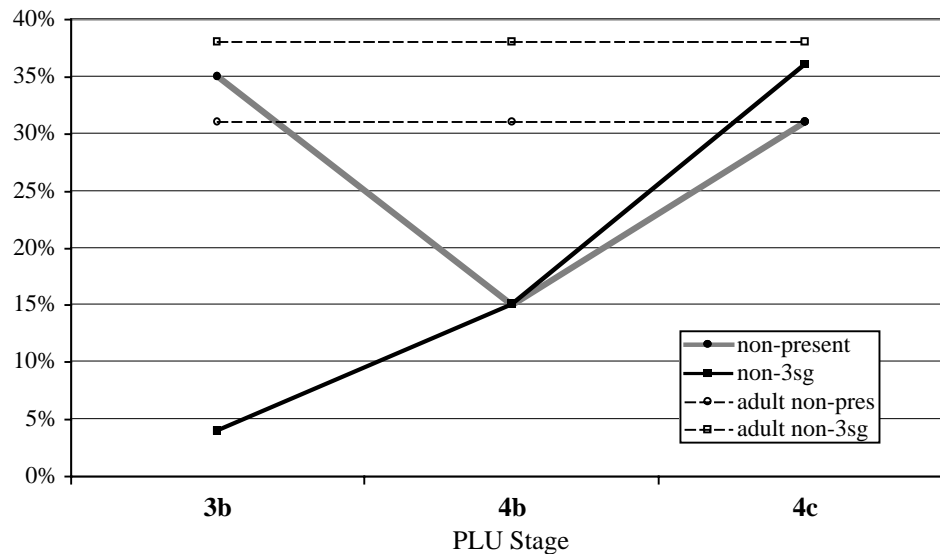
- (5) Papa et maman est parti (Grégoire 2;0.5; Stage 3b)
father and mother is-sg gone
‘Mother and Father have gone’

We interpret the overgeneralization of third person singular and present tense as the realization of default morphology, making third person singular agreement and present tense marking unreliable indicators of true tense or agreement. Essentially adopting Meisel’s (1990) definition of ‘acquisition of an inflectional paradigm’ as the point at which two distinct affixes are productively

used by the child, we count only non-third person singular and non-present forms as unambiguously showing agreement.

The second and novel observation is that *agreement follows a linear course of development while tense follows a U-shaped curve* in French. That is, production of tense suffers a *dip* at the intermediate stage (4b), as graphically represented in Figure 1.

Figure 1. (Non-default) tense and agreement in child French



To understand the extent to which the children's production of non-default tense and agreement is non-adult-like it is important to measure it against adult production. Table 1 summarizes the result of a count on adult utterances in two of the CHILDES files (Philippe 11 and Grégoire 9).

Table 1. Adult usage of non-3sg and non-present tense

Adults from file	non-present	non-3sg
Grégoire 9	28% (184/661)	35% (231/659)
Philippe 11	34% (173/507)	41% (206/506)
Average	31% (357/1168)	38% (437/1165)

Assuming that adults always produce finite verbs (when they are supposed to) the fact that they produce non-present tense verbs roughly 31% of the time means that we can take a percentage-wise equivalent production by children to be adult-like. That is, if a child uses non-present tense about 31% of the time, she is representing tense at 100%. Similarly, if a child uses non-3singular about 38% of the time, she is representing agreement at 100%.

Tables 2 and 3 give the details of our findings relating to the use of tense and agreement, respectively, by each child.

*Table 2. Verbs with non-present tense inflection
(out of unambiguously tensed verbs)*

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)
Average	35% (85/246)	15% (105/725)	31% (313/1027)

*Table 3. Verbs with non-3sg agreement inflection
(out of unambiguously agreeing verbs)*

Child	Stage 3b	Stage 4b	Stage 4c
Grégoire	3% (5/156)	19% (33/172)	34% (221/650)
Stéphane	5% (2/43)	12% (13/109)	38% (51/133)
Philippe		15% (44/303)	40% (98/246)
Average	4% (7/199)	15% (90/584)	36% (370/1029)

It is clear that at stage 3b (the earliest stage of French production available in the CHILDES database) the children show adult-like production of tense (35%) while they have not yet acquired agreement (4%). At stage 4c, all children show adult-like production of both tense and agreement, respectively 31% and 36%, compared with adult 31% and 38%. What happens at the intermediate stage (4b) is particularly interesting: Production of tense dips to 15% while production of agreement increases to the same level, 15%. The pattern to be explained is therefore the following:

- (6) Tense starts out being used at adult-like levels (Stage 3b).
 Tense use drops dramatically (Stage 4b).
 Tense returns to adult-like levels (Stage 4c).
 Agreement starts out essentially unused (Stage 3b).
 Agreement increases (Stage 4b).
 Agreement reaches adult-like levels (Stage 4c).

Our proposal is that the correlation between increased use of agreeing forms and decreased use of tense forms at stage 4b results from a temporary *competition* between the two at stage 4b before they stabilize at the subsequent stage 4c.

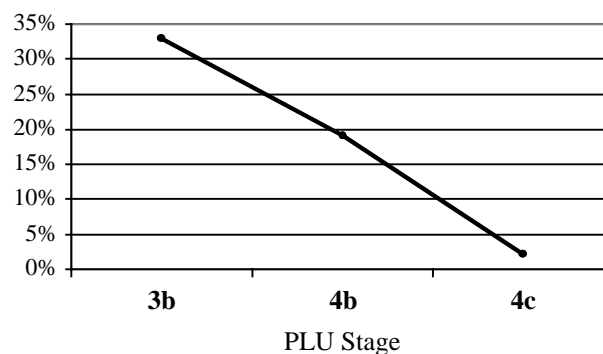
Our analysis receives further support from the observation that *the frequency of NRFs is not constant over the course of development*. Children

produce steadily fewer NRFs as their PLU increases. Production of NRFs follows a linear course of development, as shown in Table 4 and Figure 2.

Table 4. Proportion of non-finite root forms (NRFs) of all verbs

Child	Stage 3b	Stage 4b	Stage 4c
Grégoire	28% (83/297)	18% (51/287)	1% (7/711)
Stéphane	48% (51/106)	13% (27/205)	2% (3/152)
Philippe		22% (105/476)	6% (14/250)
Average	33% (134/403)	19% (183/968)	2% (24/1113)

Figure 2. Proportion of non-finite root forms of all verbs (Table 4)



Comparing Figure 2 to Figure 1, we can see that the reduction in the use of NRFs over time is inversely correlated with the development of agreement. The NRF pattern is essentially the mirror image of the pattern found for agreement.

Note that under existing alternative approaches (e.g., Wexler 1998), there is no principled reason why the proportion of NRFs, or of tense and agreement realization among finite forms, should undergo the observed systematic course of development. Yet, these systematic changes are a predicted consequence of a constraint-reranking approach. On alternative approaches such changes are outside the scope of the framework; there is no reason to expect anything but random (chance) behavior through the OI stage with respect to the proportion of NRFs, tensed forms, and agreeing forms. In the next section, we will turn to how these changes are predicted by our analysis.

3 A stage-by-stage analysis of development

A competition-based model captures two basic, intuitive ideas. The first idea is that there are conflicting constraints at play in the child: On the one hand, “sentences should show tense” (PARSET) and “sentences should show agreement” (PARSEA) but on the other, “sentences should not be so complicated as to realize inflection” (*F) and “sentences should not be so complicated as to realize both tense and agreement” (*F²). The second idea is that a particular stage of


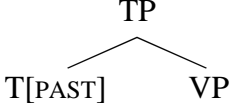
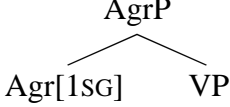
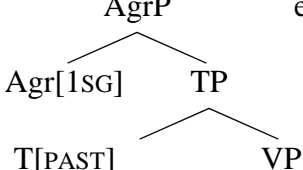
(incomplete) development does not represent a unique grammar. Grammars coexist and change through the course of acquisition.

It is straightforward to formalize these ideas in Optimality Theory, based on the principles of the theory outlined in Prince and Smolensky (1993) (see also Legendre, in press, for an introduction to OT in syntax).

- (7) Optimality Theory (Prince and Smolensky 1993)
- i. UG is an optimizing system of universal well-formedness constraints on linguistic forms.
 - ii. Well-formedness constraints are simple and general. They routinely come into conflict and are surface-violated.
 - iii. Conflicts are resolved through hierarchical rankings of constraints, which are language-particular.
 - iv. Alternative structural realizations of an input (“candidates”) compete. The candidate which best satisfies, or minimally violates, the full set of ranked constraints in a given language is the optimal one. Only the optimal structure is grammatical. Every competition yields an optimal output.
 - v. Candidates are evaluated against a *strictly ranked* set of constraints; for every two constraints C_1 and C_2 , either C_1 outranks C_2 or C_2 outranks C_1 .

In formal OT terms, the pattern of development of inflected verbs in French overall results from the economy of structure constraints taking priority over the faithfulness constraints initially. Then the faithfulness constraints become more dominant as the child’s development progresses.

At every stage of development, there are four possible structures or *candidates* to be evaluated. For example, given an input containing the features [1sg] and [past tense], the candidates are as follows: 1) a simple VP structure (8a) which precludes parsing any inflectional features,⁴ yielding an NRF as output; 2) and 3) a single functional projection above VP which allows to parse only one feature, either tense or agreement, as shown in (8b) and (8c), yielding verbal forms that are either tensed or agreeing but not both; and 4) an adult-like sentential structure that includes two functional projections above VP, making it possible to parse both tense and agreement and yielding adult-like verbal forms.

- (8) Possible structures (candidates) evaluated for “optimality”
- a.  example: *danser* (NRF)
violates: PARSEA, PARSET
satisfies: *F, *F²
> **NEITHER TENSED NOR AGREEING**
- b.  example: *a dansé* (3sg, past)
violates: PARSEA, *F
satisfies: PARSET, *F²
> **TENSED, NOT AGREEING**
- c.  example: *je danse* (1sg, present)
violates: PARSET, *F
satisfies: PARSEA, *F²
> **AGREEING, NOT TENSED**
- d.  example: *j'ai dansé* (1sg, past)
violates: *F (twice), *F²
satisfies: PARSEA, PARSET
> **TENSED AND AGREEING**

Note that if we supposed that a child has a single (strict) constraint ranking at each stage of development, this would necessarily entail a single type of output, and not the appearance of optionality with respect to NRFs. Instead, we take the apparent optionality to indicate *co-existence* of grammars at a given stage of development. Formally, grammars co-exist because some constraints are *partially ranked* with respect to others (Reynolds 1994, Anttila 1997, Boersma 1997, Nagy & Reynolds 1997). Here we take a partial ranking to delimit a set of strict rankings; that is, on any given evaluation performed by the system, a *single* strict ranking is chosen for the evaluation (resulting in a single output), taken from the set of strict rankings defined by the partial ranking.

A partial ranking straightforwardly allows us to express the fundamental observation that proportions of alternative verbal forms (e.g., finite, NRF) change in particular, systematic ways through the course of development.

We now turn to the details of the formal evaluation of candidates. Overall, the stage-by-stage analysis relies on the changing distribution of PARSEA and PARSET with respect to *F² and *F.⁵

In Stage 3, PARSET has a higher range than PARSEA. At this stage, PARSEA is ranked so low as to be irrelevant.

- (9) *Stage 3b:*
 Fixed
 Floating: PARSET $*F^2 \gg *F$
 PARSEA _____ —

The partial ranking in (9) encodes three strict orderings (or three grammars): PARSEA is (strictly) ranked below *F but PARSET is partially ranked with respect to *F² and *F. In some evaluations, PARSET is ranked above *F², and in others, below. Concretely, this means that the child uses any of the three rankings given below in (10). Two of these rankings yield a tensed verb, one yields an NRF.

- (10) *Stage 3b:*
 a. PARSET >> *F² >> *F >> PARSEA yields: tensed
 b. *F² >> PARSET >> *F >> PARSEA yields: tensed
 c. *F² >> *F >> PARSET >> PARSEA yields: NRF

Note that the three rankings in (10) provide an expected proportion of each type of output as well: twice as many rankings yield tensed verbs as yield NRFs, so we expect to see twice as many tensed verbs as NRFs. In other words, the partial ranking in (9) predicts that 33% of verbs at Stage 3b will be NRFs while 67% of verbs will be tensed (which is 100% of finite verbs). No verbs at Stage 3b will be agreeing (so of course no verbs at Stage 3b will be both agreeing and tensed). And that's precisely what we saw in the child data (see Table 4): 33% of verbs are NRFs at Stage 3b; all of the finite verbs are tensed and non-agreeing.

In Stage 4b, PARSEA advances to cover the same ground as PARSET; PARSEA, and PARSET are completely symmetrical at this stage. The partial ranking in (11) defines the twelve orderings given in (12).

- (11) *Stage 4b:*
 Fixed
 Floating: PARSET $*F^2 \gg *F$
 PARSEA _____

- (12) *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 |

The rankings in (12) yield the following proportions for verbal forms: 2 of the 12 rankings (a, b) yield forms that are both tensed and agreeing (17%). 2 of the 12 rankings (c, d) yield NRFs (17%). 4 of the 12 rankings (e, g, i, k) yield tensed (non-agreeing) forms (33%). Finally, the remaining 4 of 12 rankings (f, h, j, l) yield agreeing (non-tensed) forms (33%).

Of finite verbs, this predicts that 60% (6 out of 10) will be tensed (this of course includes two, a and b, that show both tense and agreement) and 60% (6 out of 10) will be agreeing.

Recall that only non-present tense unambiguously indicates presence of tense, and that only non-3sg agreement unambiguously indicates presence of agreement. Based on the observed adult proportions of non-present tense (31%) and non-3sg agreement (38%), we therefore predict that we will see 19% (60% × 31%) of finite verbs in the child data showing non-present tense, and 23% (60% × 38%) of finite verbs in the child data showing non-3sg agreement.

The attested proportions closely match the predictions: 19% are NRFs at Stage 4b (vs. predicted 17%); 15% of finite verbs show non-present tense morphology (vs. predicted 19%); and 15% of finite verbs showed non-3sg inflection (vs. predicted 23%).

Finally, at Stage 4c, PARSET and PARSEA, together, come to outrank *F², at which point tense and agreement are always both realized.

- (13) *Stage 4c:*
- | | | |
|-----------|--------|-----------------------|
| Fixed | | *F ² >> *F |
| Floating: | PARSET | _____ |
| | PARSEA | _____ |

- (14) *Stage 4c:*
- | | |
|----------------------------------------------|-----------------------------|
| a. PARSET >> PARSEA >> *F ² >> *F | yields: tensed and agreeing |
| b. PARSEA >> PARSET >> *F ² >> *F | yields: tensed and agreeing |

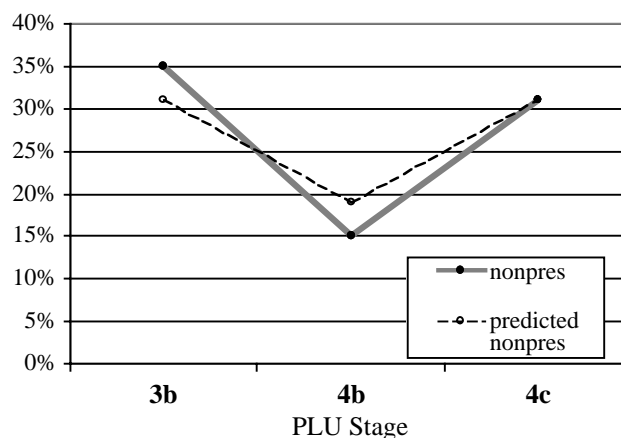
Both rankings in (14) yield tensed and agreeing forms. The corresponding partial ranking in (13) hence predicts 31% non-present (100% tensed \times 31% observed adult non-present) and 38% non-3sg (100% agreeing \times 38% observed adult non-3sg) as well as 0% NRFs. Once again the predictions closely match the proportions of attested forms: 31% non-present, 36% non-3sg, and 2% NRFs.⁶

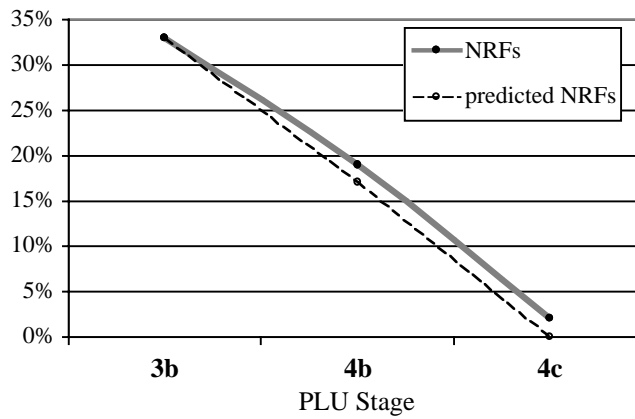
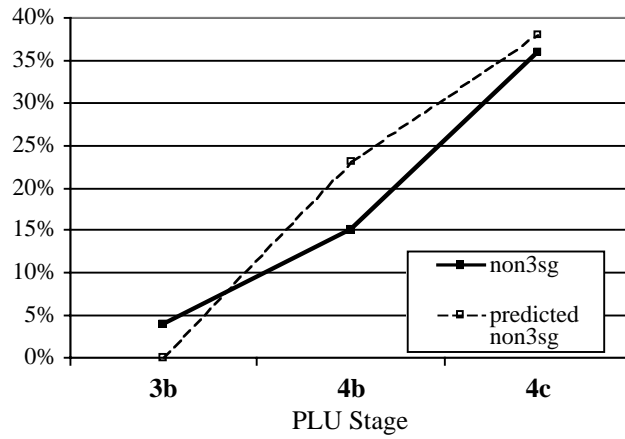
4 Conclusion

To recap, we have presented new results from child French which show that the realization of tense and agreement proceeds independently. Specifically, at the stage represented by our earliest data files, tense realization is already at an adult-like level, but then dips (in response to competition from agreement), and finally regains adult-like levels. Agreement starts essentially completely unrepresented and increases roughly linearly across the three stages. NRFs start out at high levels (roughly 1/3) and decrease roughly linearly to zero.

This course of development can be modeled elegantly in terms of a partial ranking of constraints in an Optimality-Theoretic framework that predicts the relative frequencies of the different sentence types (tensed and agreeing, tensed only, agreeing only, NRF). As Figures 6–8 visually demonstrate, the proportions of attested forms in the French data very closely match the predictions of the analysis. We would also emphasize that to fully explain syntactic development, it is important to address the observed systematicity in inflectional development, which does not behave as if “optional.” Any alternative approach to syntactic acquisition would be responsible for explaining these facts, something which no proposed analysis that we are aware of captures.

Figures 6–8. Predictions of the partial ranking analysis vs. observed data





Appendix: Details on the data collection

Table 5. Children, files, and ages included in this study

a. Grégoire (Champaud corpus)

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. Stéphane (Rondal 1985)

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. Philippe (Suppes, Smith & Leveillé 1973)

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

The CHILDES files were analyzed by hand and classified into PLU (Predominant Length of Utterance) stages (Vainikka, Legendre, and Todorova, 1999). This independent measure refines the traditional observation that children progress through one-word, two-word, and multi-word stages. Earlier stages have been identified in other languages.

(15) PLU stages in our data:

Stage 3: *“Two-word” stage*

The one-word sentence type no longer clearly predominates (i.e. fewer than 60% of all utterances are one-word utterances). Of the three sentence types, the multi-word sentence type is not the most common one

Stage 4: *Predominantly multi-word stage*

Of the three sentence types, the multi-word sentence type is the most common one

(16) *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

Acknowledgments

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Notes

¹ While one might be tempted to analyze bare forms like *assis* as adjectives with a missing copula, it is worth noting that, in contrast to verbs, the copula and predicate adjectives and nouns are properly used at the earliest documented stage. Unambiguous adjectives are almost never used without the copula at this stage.

² (1) also shows two further predominant non-adult like patterns in child French: null subjects and postverbal overt subjects, both in the absence of a subject clitic. See Legendre et al. (1999) for discussion.

³ Second and third conjugation class also display considerable homophony, in particular in singular forms, e.g. second conjugation class [fini] ‘finish (1st, 2nd, 3rd singular)’ and third conjugation class [uvr] ‘open (1st, 2nd, 3rd singular, and 3rd plural)’.

⁴ Recall that following Pollock (1989) we are assuming that tense and agreement reside in functional projections erected above the lexical projection headed by V.

⁵ The economy of structure constraints $*F^2$ and $*F$ are part of a power hierarchy. F^2 is a *local conjunction* of two instances of $*F$ (Smolensky 1995, Legendre et al. 1998). Hence F^2 and F have the invariable ranking of power hierarchies: $F^2 \gg F$ (in every possible grammar).

⁶ It might be worth observing that there are discontinuous jumps in the rankings between stages 3b and 4b and between stages 4b and 4c. Given that, we might expect to see 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 a lot of data on this issue, we did find 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’, primarily because the proportions for stage 3b’ are predicted to be about halfway between those of stage 3b and those of stage 4b. However, we hope to address those intermediate stages further in future study.

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