

## Early verb constructions in French: adjacency on the left edge

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### ABSTRACT

Children acquiring French elaborate their early verb constructions by adding adjacent morphemes incrementally at the left edge of core verbs. This hypothesis was tested with 2657 verb uses from four children between 1;3 and 2;7. Consistent with the Adjacency Hypothesis, children added clitic subjects first only to present tense forms (as in *il saute* ‘he jumps’); modals to infinitives (as in *faut sauter* ‘has to jump’); and auxiliaries to past participles (as in *a sauté* ‘has jumped’). Only after this did the children add subjects to the left of a modal or auxiliary, as in *elle veut sauter* ‘she wants to jump’, or *elle a sauté* ‘she has jumped’. The order in which these elements were added, and the development in the frequencies of the constructions, all support the predictions of the Adjacency Hypothesis for left edge development in early verb constructions.

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## INTRODUCTION

In this study, we examine the early acquisition of verbs in French. The focus is on very early stages in the acquisition of verb constructions where, in the adult language, many elements in the verb complex, including clitic pronouns (subjects and preposed objects), auxiliaries, and modals, appear adjacent to the left edge of the core verb. These elements distinguish person, number, and tense, and differentiate the meanings of certain homophonous forms – forms that sound alike but differ in meaning and grammatical function. The initial acquisition of verb constructions in French, we argue, unfolds primarily by adding grammatical elements to the left edge of the verb, starting from the most adjacent element and then working outwards on the left. Although these elements are grammatical morphemes from the standpoint of the adult language, we do not claim that they necessarily have grammatical status for the children from the very beginning. In what follows we refer to these elements with their grammatical tags, but the road from initial phonological and positional similarities to understanding of their grammatical function is a long one.

As previous studies have shown, children typically start producing verbs in only one form per verb (e.g. Aksu-Koç, 1988, for Turkish; Armon-Lotem & Berman, 2003, for Hebrew; Christensen, 2010, for Swedish; Gathercole, Sebastián & Soto, 1999, for Spanish; Pizzuto & Caselli, 1994, for Italian; Tomasello, 1992, for English; Veneziano, Sinclair & Berthoud, 1990, Kilani-Schoch, 2000, for French). The specific verb form children produce first tends to be based on the dominant form of the verb used in child-directed speech and, in particular, the form that both adults and children use in conversational exchanges (Veneziano & Parrisé, 2010; see also Bloom, Lifter & Hafitz, 1980; Goodman, Dale & Li, 2008; Rojas-Nieto, 2011). Next, children begin to produce some verbs in two distinct forms (Veneziano, 1999; Veneziano & Sinclair, 2000) and may produce filler syllables, e.g. /e, ə, a/, with no readily assignable grammatical function, at the left edge of words (Peters & Menn, 1993; Veneziano & Sinclair, 2000). It is only at this point that they also begin to produce recognizable grammatical elements along with their verb forms. The focus of this study is on the way young children acquiring French add these elements to core verbs, and thereby start to build their early verb constructions. Before we turn to children's early verb constructions, we review some properties of verb classes in French.

*Verb classes in French*

French verbs are generally described as falling into three classes. Some recent accounts propose a division into two major groups (e.g. Carstairs-McCarthy, 1992; Le Goffic, 1997; Dressler, Kilani-Schoch,

Gargarina, Pestal & Pöchtrager, 2006). Here we follow the traditional classification. Class 1 – verbs with infinitives in *-er* (pronounced /e/ in spoken French) – is highly regular, and comprises 85–90% of French verbs (New, Pallier, Ferrand & Matos, 2001). Class-1 verbs form all tenses and derived forms from a single stem (Grevisse & Goosse, 2008). For example, class-1 *sauter* ‘to jump’ relies on just one stem, *saut-* /sot/, in all its forms. Note that /sot/ corresponds to several different orthographic forms, including present tense *je saute* ‘1Psg-Pres: I jump’, *tu sautes* ‘2Psg-Pres: you jump’, and *ils sautent* ‘3Ppl-Pres: they jump’.

Class 2 contains around 300 regular verbs with infinitives in *-ir*, e.g. *finir* ‘to finish’, and present participle in *-issant*. These verbs rely on two stems for various tenses and derived forms (e.g. *fin-* as in *je finis* ‘1Psg-Pres: I finish’ and *finiss-* as in *ils finissent* ‘3Ppl-Pres: they finish’).

Class 3, the repository of irregular verbs, contains around 400 verbs. Their infinitives mostly end in *-re* /ʁ/ (*mettre* /mɛtʁ/ ‘to put’) or *-oir* /wɑʁ/ (*vouloir* /vulwɑʁ/ ‘to want’), and the verb tenses may make use of three distinct stems. This class includes irregular *aller* ‘to go’ – the only irregular verb in *-er* – also used as a semi-auxiliary to indicate future (Leeman-Bouix, 2005) (as in English ‘I’m going to jump’), with three stems: *v-* (*vais* ‘1Psg-Pres: go’, *vont* ‘3Ppl-Pres: go’), *all-* (*allons* ‘1Ppl-Pres: go’, ‘*allé*’ past participle (PP): gone/went’), and *ir-* (*irai* ‘1Psg-Fut: will-go’). Class 3 is also home to several irregular verbs in *-ir*, characterized by the absence of a second stem for the present participle (e.g. *courir* ‘to run’ and *dormir* ‘to sleep’).

Class-1 verbs contain many homophonous forms. Although these are distinguished orthographically, they are not distinct in spoken French. For example, the infinitive (INF) and the past participle (PP) of all class-1 verbs sound alike, with the same homophony extending to the 2nd person plural (2Ppl) of the present indicative and subjunctive, and to the plural imperative (Veneziano & Parisse, 2010). When children produce forms in /-e/ in early utterances, as in /sote/ ‘to jump/jumped’, the addressee cannot tell whether the child means ‘to jump’ (INF) or ‘jumped’ (PP).<sup>1</sup> So even if children intend to differentiate the two meanings, adults do not hear the corresponding verb constructions for doing this. In conversation, adults provide information about this meaning distinction as they systematically interpret these homophonous verb forms on the basis of the context in which the child produces them (Clark & de Marneffe, 2012). In class-3 verbs the lexical forms for the infinitive and the past participle nearly always differ in spoken French: Compare *mettre* /mɛtʁ/ ‘INF: to put’ and *mis* /mi/ ‘PP: put’, *courir* /kuʁiʁ/ ‘INF: to run’ and *couru* /kuʁy/ ‘PP: ran’,

<sup>1</sup> All homophonous forms cited are given phonetically, as are child forms when they depart from adult pronunciation. Child utterances are translated to represent the nearest spoken equivalent in English.

or *asseoir* /aswaʁ/ 'INF: to sit' and *assis* /asi/ 'PP: seated/sat'. Homophonous forms do occur in a few class-3 verbs but the homophony concerns different modes, e.g. the past participle (*fait*), the singular present indicative (*fais*, *fait*) and the imperative singular (*fais*) of *faire* 'to do', are all pronounced /fe/.

### *On the edges*

According to Slobin (1973, 1985), children rely on general 'operating principles' in acquiring a first language. Data from typologically diverse languages show that they pay attention early on to variations on both the left and right edges of words. Children also appear to keep together as chunks units that frequently co-occur and store them as such in memory – for example, articles or demonstratives with nouns; pronouns, auxiliaries, and inflections with verbs.

To acquire contrasting verb meanings, French-speaking children must attend both to different forms within a verb, e.g. the Pres form /sot/ *saute* 'jump(s)' versus the INF/PP /sote/ 'to jump/jumped', and to the specific grammatical morphemes appearing in verb constructions, as in *il saute* 'he jumps', with a clitic subject pronoun preceding a Pres form, or *veut sauter* 'wants to jump', with a modal (mod) preceding an INF form. In the case of homophonous forms (e.g. /sote/for INF *sauter* and PP *sauté*), only the grammatical morphemes on the left edge disambiguate the two forms. Children's early use of fillers (short, unaccented front or nasal vowels) just before nouns and verbs shows that they already attend to the left edge of words (Veneziano & Sinclair, 2000; Veneziano, 2003). In French, children hear a variety of grammatical morphemes adjacent to the left edge of verbs: clitic pronouns (e.g. *je saute* 'I jump', *elle saute* ('she jumps')), modals (*peux sauter* 'can jump', *veux sauter* 'want to jump'), prepositions (*pour sauter* 'in order to jump'), and auxiliaries (*a sauté* 'has jumped'). In this paper we focus on how children build larger verb constructions as they add grammatical morphemes to the left edge of verbs (see Klein, 2012), and specify our predictions about early acquisition on the left edges of verbs in French on the basis of what we call the Adjacency Hypothesis.

The Adjacency Hypothesis takes into account the fact that there is extensive variation in the grammatical morphemes that can be added to the left edge of French verbs. These morphemes are the ones children hear most often in the forms addressed to them by adults (see, e.g. Veneziano & Parisse, 2010; Ågren & van de Weijer, 2013; see also de Villiers, 1985; Naigles & Hoff-Ginsberg, 1995, 1998; Ellis & Sagarra, 2011; Ashkenazi, 2015). At the same time, of course, children also attend to right edge variations in the forms of verbs. Indeed, it is only once they can produce two forms of a verb that differ on the right edge (e.g. *saute*

'jump(s)' vs. *sauté* 'jump-PP', or *vient* 'comes' vs. *venu* 'come-PP') that they start adding elements on the left as they elaborate their verb constructions (e.g. Veneziano & Sinclair, 2000).

### *The Adjacency Hypothesis: predictions*

The hypothesis here is that, in French, children build their initial verb constructions by adding grammatical morphemes to the left edge of core verb forms, starting with the most adjacent element. This hypothesis makes three specific predictions.

*Prediction 1.* Children add clitic subject pronouns to present tense verb forms before they produce subject pronouns in INF and PP constructions. This is because, for present tense forms, the subject clitics on the left edge of the verb, as in *il saute* 'he jumps', or *je cours* 'I run' are immediately adjacent to the left edge of *saute* and *cours*, respectively. Although the linguistic status of clitic pronouns as subjects is a matter of some debate (e.g. Miller & Monachesi, 2003; Culbertson & Legendre, 2008), notice that clitic pronouns cannot stand on their own, but act like bound morphemes with respect to the verb.

With infinitives, INF, and past participles, PP, though, it is not the subject but the modal (mod) or the auxiliary (aux) that is immediately adjacent to the left edge of the verb. Children will therefore add adjacent modals or auxiliaries first to INF and PP forms, respectively, and only later add clitic subjects adjacent to those morphemes. So clitic subjects like *je*, the first person singular (1Psg), will appear in Pres constructions before they appear in INF constructions like *je veux sauter* 'I want to jump', *je peux courir* 'I can run', or in PP constructions like *il a sauté* 'he jumped' or *il a couru* 'he ran'. We summarize this prediction in (1):

- 1a. Subj + Pres appears before Subj + mod + INF
- 1b. Subj + Pres appears before Subj + aux + PP

*Prediction 2* follows directly from Prediction 1. Children will produce mod + INF constructions (where the modal is immediately adjacent on the left) before they add a Subj in the form of a clitic pronoun or a lexical noun phrase, now in turn adjacent to the modal on the left (e.g. *veut sauter* 'wants to jump' before *il veut sauter* 'he wants to jump'); they will do the same with aux + PP constructions, producing these combinations before they add any subjects, again adjacent to the auxiliaries on the left (e.g. *a couru* 'has run / ran' before *il a couru* 'he ran'). This prediction is summarized in (2).

- 2a. mod + INF before Subj + mod + INF
- 2b. aux + PP before Subj + aux + PP

*Prediction 3.* This prediction concerns the addition of modal and auxiliary forms adjacent to the left edge of INF and PP forms: Children will first produce bare INF/PP forms (indeterminate in Class-1 verbs because of their homophony, but unambiguous in class-3 verbs because of their distinct forms), before they add the appropriate morphemes to the left edge of the verb: a modal or some other morpheme appropriate to INF uses (e.g. mod + INF, prep + INF), on the one hand, and an auxiliary verb or the negative particle *pas*, appropriate to PP uses, on the other.

For class-1 verbs, the homophonous INF/PP form precedes the differentiated INF and PP constructions (e.g. /sote/ 'to jump / jumped' before *veu(x,t) sauter* (INF) 'want(s) to jump', or /sote/ 'to jump / jumped' before *a sauté* 'PP: has jumped'). For class-3 verbs, the unambiguous bare INF and PP forms precede the constructions with an adjacent mod or prep added to INF, on the one hand (e.g. *courir* 'to run' before *peu(x,t) courir* 'can run'), and with an adjacent aux added to PP, on the other (e.g. *mis* 'PP: put' before *a mis* 'has put'). This is summarized in (3) below:

3. class 1 INF/PP or class 3 INF and PP before mod + INF and aux + PP

To test these predictions for each child, we trace both the first appearance of the relevant constructions for individual verb types, and their frequency of occurrence in each child's overall production. The initial analysis of individual VERB TYPES allows us to test whether children produce the constructions in the predicted order on the basis of their appearance with the same verb. This analysis offers a strong test of the predictions because it provides evidence for the developmental progression within each verb type. However, it only takes into account the first appearance of a construction, regardless of how many times it is produced, and so pays no attention to the relative productivity of the constructions. Moreover, the number of verb types for which children produce two or more relevant constructions with the same verb is limited because they do not produce those constructions with every verb. For example, to support Prediction 1, children need to produce the more elaborate Subj + mod + INF or Subj + aux + PP after producing Subj + Pres with the same verb, and to support Prediction 2, they must produce the more elaborate Subj + mod + INF or Subj + aux + PP after mod + INF or aux + PP, again with the same verbs. However, all these constructions may have appeared in the children's speech with only a subset of their verbs, or they may have appeared in the simpler and the more elaborate constructions with different verbs at different ages.

So, to establish further support for our predictions, we did a second analysis that took into account not only the first appearance but also the

FREQUENCY of the relevant constructions, for all the children's verbs. Although our predictions focus on the order of appearance of the relevant constructions, it is also important to assess how frequently each construction is produced over time. Indeed, appearance alone doesn't necessarily attest to mastery of a construction: Children may require some time before coming to use a new construction frequently or extending it to a variety of verbs. Tracking the frequencies of constructions, regardless of the verbs used, adds another piece of evidence in support of the order of acquisition. Here we assume that, for constructions that have been mastered, children will use them more frequently (and presumably with a variety of verbs) than constructions that are just beginning to emerge. By analyzing both THE APPEARANCE OF CONSTRUCTIONS WITHIN VERB TYPES and their FREQUENCY OVER TIME, we can also be more confident that complete absence or sporadic use of a construction throughout the studies indicates that the construction hasn't yet been acquired.

These two analyses together capture the actual acquisition profile of the constructions targeted here, and, at the same time, mitigate the sampling problems inherent to much longitudinal research (Tomasello & Stahl 2004; Rowland & Fletcher 2006), on the assumption that constructions mastered earlier will be more frequent and apply to more verbs than constructions that are mastered later.

Finally, to test the general hypothesis that children start with elements adjacent to the left edge of core verbs, and add more and more grammatical elements in an orderly fashion, we also looked at which single elements were added first on the left edge of verbs – are they elements that could occupy that position in the adult language? – and at the developmental progression in the NUMBER OF ELEMENTS added to the left edge of the verb – from zero up to three or more – as the children produce an increasing number and variety of verb constructions.

## METHOD

### *Participants*

Our data come from longitudinal video-recordings of four mother–child dyads, two boys (Arno and Gael) and two girls (Camille and Anaë). Three children, Arno, Camille, and Gael, lived in Geneva, Switzerland, and one, Anaë, near Paris, France. Gael was an only child, Arno and Camille were second-born, and Anaë was the youngest in a family of three. All four families were middle-class and spoke only French at home. The variety of French spoken did not differ in any way relevant to the predictions made. The age periods covered in this study were: for Camille 1;3 to 2;2; for

Gael 1;8 to 2;3; for Anaë 1;5 to 2;0, and for Arno 1;10 to 2;7. The starting ages were chosen to capture children's earliest uses of verbs.

### *Data collection and transcription*

Audio- and video-recordings were made for about one hour every two weeks for Arno, Camille, and Gael, and for one hour once a month for Anaë. All the recordings were made in the child's home during everyday interactions with the mother and occasionally the father, a sibling, or the observers. Filming was done with a shoulder-held camera to follow the child. Sessions included spontaneous free play (e.g. block construction, game routines, puzzles, manipulating objects, etc.), book reading, symbolic play, and, sometimes a snack.

For the Genevan children (Arno, Camille, and Gael), two observers (the first author and a collaborator) were present, taking turns at filming and taking notes. The note-taker sat out of the way of the activities, with a generally friendly, non-intrusive attitude, only responding when addressed by the child. The observers also made an audio-recording from the time they rang the doorbell until they left the house. For the Parisian child, there was just one observer present who did the filming while interacting at times with the child.

All the sessions were transcribed and then checked by at least two other transcribers. Disagreements were resolved during repeated joint listening and viewing of the tapes. For the Genevan children, transcribers sometimes drew on the audio-tapes and hand-written notes. All the data here were listened to and rechecked by the first author. The children's speech was transcribed in SAMPA (a computer-readable phonetic script using ASCII characters, developed in the ESPRIT 1541 Project in the late 1980s). Specific child utterances cited in this paper are given in IPA, or, for standard adult-like pronunciations, along with adult speech, in French orthography. The transcripts were formatted in CHAT and linked to the videos using CLAN tools (available in the CHILDES archive; MacWhinney, 2000). This linkage made it easier to inspect and check the original recordings together with the non-verbal context, during the coding of each child utterance.

### *Coding*

We coded all occurrences of child verb uses for tense and mood (e.g. present indicative, imperative, infinitive, past participle, imperfect, or future), with multiple coding for homophonous forms. For example, the child form /kaʃe/ produced as a bare form was coded as INF/PP, since it could be either an infinitive, *cache* 'to hide', or a past participle, *caché* 'hidden'. But if the child form was /akaʃe/ (*a/as caché* 'have/has hidden'), we coded



TABLE 1. *Total number of Verbs analyzed, by child and verb class*

	Arno 1;10-2;7		Camille 1;3-2;2		Gael 1;8-2;3		Anaë 1;5-2;0	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Class-1	107	815	41	324	40	150	44	175
Class-2*	3	10	1	1	0	0	1	7
Class-3	34	649	21	201	18	120	22	205
Total	144	1474	63	526	58	270	67	387

NOTE: \* Because the four children produced very few or no class-2 verbs, these verbs were omitted from our analyses.

it as aux + PP; similarly, /fokaʃe/ (*faut cacher* ‘need to hide’), was coded as mod + INF. We also coded any other elements produced adjacent to the left edge of the verb form – filler, clitic pronoun (subject or object), modal, auxiliary, preposition, negative particle, adverb, and any combinations of such elements. Finally, since children began by using only one form for each verb produced, we noted the session in which each child began to produce two contrasting forms for the same verb type (see Table 2). It was around or after this point that they began to add elements recognizable as grammatical morphemes to the left edge of core verb forms.

### Data

The four children produced a total of 2657 lexical verb tokens (332 types), of which 1464 tokens (232 types) were from class-1 verbs, 18 tokens (5 types) from class-2 verbs, and 1175 tokens (95 types) from class-3 verbs. *Avoir* ‘to have’ and *être* ‘to be’ were coded only for auxiliary status, and the modals *devoir* ‘must’, *falloir*, ‘to have to’, and *pouvoir* ‘to be able’ were coded only for modal status. Table 1 presents the total number of tokens and types analyzed for each child, by verb class.

## RESULTS

### *Overview: MLU-V, verb forms, and first verb constructions*

Could children’s increasingly complex verb constructions in French simply be the result of increasing utterance length? In order to relate changes in children’s emerging verb constructions to their capacity for combining words, for each child we computed the mean length of utterance in words (see Hickey, 1991; Parker & Brorson, 2005) on the first 50 utterances containing a verb (where available), in each session (MLU-V). Since production of two forms for the same verb type is crucial for testing our predictions, we noted the session in which each child first produced two contrasting forms for one or more verbs (e.g. both *Pres saute* ‘jump’ and

TABLE 2. Mean length of utterances (in words) for up to fifty utterances containing verbs, by age and child\* †

Age	Arno	Camille	Gaël	Anaë
1;3		(no verbs)		
1;4		1.2		
1;5		1.0		(only 3 verbs)
1;6		1.0		1.11
1;7		1.0		1.68 <sup>1</sup>
1;8		1.33	1.20	1.67
1;9		<b>2.02</b> <sup>1,3</sup>	1.13	<b>1.82</b> <sup>2,3</sup>
1;10	1.67 <sup>1</sup>	2.33	<b>1.28</b>	—
1;11	<b>1.54</b>	—	1.13 <sup>1,3</sup>	2.36
2;0	2.08	—	1.49	3.07
2;1	—	—	1.57	
2;2	2.69 <sup>2,3</sup>	2.01 <sup>2</sup>	—	
2;3	2.97		1.87 <sup>2</sup>	
2;4	2.99			
2;5	3.19			
2;7	3.38			

NOTES: \* Fillers were counted as half-words (van Dijk & van Geert, 2005; Belikova, Kupisch, Özçelik & Sadlier-Brown, 2009). † Bold-face numbers mark the session at which the child began to produce two forms for at least one verb type.

1 = first production of Subj + Pres.

2 = first production of mod + INF.

3 = first production of aux + PP.

INF/PP /sote/ *sauter/sauté* ‘to jump / jumped’), shown with a bold-face MLU value, and we used superscript 1, 2, and 3, to note the constructions with first clitic subjects, first modals, and first auxiliary verbs, respectively. These data are shown in Table 2.

The emergence of word combinations is marked by an MLU value greater than 1. If we consider the values in Table 2, we see that before the children began to add their first grammatical elements (clitic subject pronouns, mod and aux) to their verb forms (superscripted sessions), at least three of the four children already produced multiword utterances combining two, and sometimes two words with an additional filler, or three words:

- (1) Camille 1;8
  - a. /afã o’be/ *enfant(s) tombé(s)* ‘child(ren) fallen down’ [indicating the children at the end of a slide in a picture-book]
  - b. /ədaɪ vy/ [filler ə]doigt(s) *vu* ‘seen [filler ə]finger(s)’ [showing the finger introduced into a little box]
- (2) Gael 1;10
  - a. /sa agvy/ *ça* [filler a]grue? ‘this (is) [filler a]crane?’ [pointing at the picture of a crane in a picture-book]
  - b. /sapɔ̃ gæl/ *ça prend Gael* ‘this Gael takes’

- (3) Anaë 1;6  
 a. /kobebe/ *encore bébé* 'more baby'  
 b. /metamā/ *mets ta main* 'put your hand'

In short, the elements children add to build their verb constructions, both within and across constituents, cannot be accounted for solely in terms of their growing ability to produce longer utterances during the period studied. As we will show, children's addition of grammatical elements to verbs goes beyond the ability to combine elements within a single prosodic unit. Rather, it represents a development specific to the acquisition of verb constructions and of the first grammatical morphemes found there.

*Adjacency on the left edge 1: order of appearance of constructions with individual verb types*

To test our predictions about the developmental sequence in which children's verb constructions appear in production, we first looked at each verb type that children used in at least two different sessions. For those verbs, we looked at whether they occurred in two (or more) different constructions relevant to the predictions, and whether the order of appearance of the constructions complied with or violated the order predicted. This naturally limited the number of verb types we could consider for this analysis.

To count as support for a specific prediction, a child had to have produced, for a given verb type, each of the constructions relevant for that prediction, in the predicted temporal order (e.g. Subj + Pres earlier than Subj + mod + INF). The appearance of the relevant forms in reverse order counted against the prediction, and appearance of both forms in the same session neither supported nor disconfirmed a prediction. Given these criteria, for Arno we could draw on 45 verb types; for Camille, 7 types; for Anaë, 13 types; and for Gaël, 4 types. We evaluated the adjacency predictions against all the supporting and disconfirming cases.

Coding for the individual verb-type uses was done independently by the two authors, with any cases of disagreement resolved by discussion. Overall agreement between the coders for Arno's data was 97%. For Prediction 1, coder agreement was 96% (Cohen's  $\kappa = .91$ ); for Prediction 2, coder agreement was 100% (Cohen's  $\kappa = 1.0$ ), and for Prediction 3, coder agreement was 92% (Cohen's  $\kappa = .80$ ). For the other three children, the two coders were in agreement 100% of the time.

*Sequence of development within individual verbs: Arno*

The evidence for (and against) each prediction for Arno is presented in Table 3. Since we are testing directional predictions, we report one-tailed *p*-values.

TABLE 3. *Predictions 1, 2, and 3 tested for Arno's verb type uses*

Prediction	Supporting	Against	<i>p</i>
P1a: Subj + PRES before Subj + mod + INF	<b>11</b>	<b>1</b>	< <b>.01</b>
P1b: Subj + PRES before Subj + aux + PP	<b>7</b>	<b>0</b>	< <b>.01</b>
P2a: mod + INF before Subj + mod + INF	<b>10</b>	<b>4</b>	= <b>.09</b>
P2b: aux + PP before Subj + aux + PP	<b>5</b>	<b>3</b>	= <b>.113</b>
P3a: INF/PP (INF) before mod + INF	<b>17</b>	<b>6</b>	< <b>.001</b>
P3b: INF/PP (PP) before aux + PP	<b>17</b>	<b>1</b>	< <b>.001</b>

*Prediction 1.* The data relevant to Prediction 1 are shown in the top panel of Table 3. For the verb types that satisfied the criteria here, 18 cases out of 19 supported the prediction that Subj + Pres appeared before Subj + mod + INF, or before Subj + aux + PP, or both. Only 1 case went against this prediction. The difference between supporting and disconfirming cases was tested against the null hypothesis of no difference in developmental ordering ( $p < .001$ , Sign Test, one-tailed). If we consider the two constructions separately, 12 cases tested the prediction of Subj + Pres before Subj + aux + PP, with 11 supporting it and 1 against ( $p = .003$ , Sign Test, one-tailed); and 7 cases tested it for Subj + Pres before Subj + aux + PP, with all 7 supporting the prediction ( $p = .008$ , Sign Test, one-tailed). These findings offer strong support for Prediction 1.

*Prediction 2.* The data relevant to Prediction 2 are shown in the middle panel of Table 3. For the verb types that satisfied the criteria, 15 cases supported the prediction that, for a given verb type, mod + INF appears before Subj + mod + INF, aux + PP appears before Subj + aux + PP, or both, with 7 cases against ( $p = .067$ , Sign Test, one-tailed, n.s.). (All four children generally produced clitic pronouns as subjects; only rarely did they produce lexical noun phrase subjects.) When the two constructions are considered separately, 10 cases supported the prediction that mod + INF appears before Subj + mod + INF, and 4 cases were against ( $p = .09$ , Sign Test, one-tailed, n.s.), while for aux + PP before Subj + aux + PP, 8 cases supported the order predicted, and 3 did not ( $p = .113$ , Sign Test, one-tailed, n.s.). At the same time, it is worth noting that this prediction would have received much stronger support if we took into account several additional verb types where the constructions predicted to appear earlier were attested throughout the recording sessions, but the constructions predicted to appear later did not occur at all in the sessions analyzed for the present study. The number of supporting cases would then have been 26 for, and 7 against ( $p = .0007$ , Sign Test, one-tailed).

*Prediction 3.* The data relevant to Prediction 3 are shown in the bottom panel of Table 3. To test this prediction, we examined whether Arno produced undifferentiated INF/PP forms of class-1 verbs or INF and PP

forms of class-3 verbs before constructions with INF and PP preceded by the appropriate grammatical morphemes, for instance modals or prepositions with INF (mod + INF or prep + INF), and auxiliaries with PP (aux + PP). Note that with class-1 verbs, addition of these grammatical morphemes transforms undifferentiated INF/PP forms into distinct INF and PP forms. As Table 3 shows, of the verbs satisfying the criteria, 34 cases supported the prediction, with 7 against ( $p = .0001$ , Sign Test, one-tailed). If we consider the development of INF and PP separately, there were 17 cases supporting the order of undifferentiated class-1 INF/PP forms or class-3 INF forms before mod + INF or prep + INF, with 6 cases against ( $p = .017$ , Sign Test, one-tailed), and 17 cases supporting the order of class-1 INF/PP or class-3 PP before aux + PP, and only 1 case against ( $p = .0001$ , Sign Test, one-tailed). These results offer strong support for Prediction 3.

*Sequence of development within verb types: Camille, Anaë, and Gael*

For the other three children, the number of verb types that satisfied the criteria for testing the predictions yielded only small numbers, mainly because the children were developmentally younger than Arno. Prediction 1 could be tested on only 4 cases, with 3 supporting the appearance of Subj + Pres before Subj + mod + INF or Subj + aux + PP, or both, and 1 case against (top panel, Table 4). Again, if we take into account all the cases where Subj + Pres constructions were attested consistently, session after session, throughout the recordings, and the constructions predicted to occur later that didn't appear at all in the study, there would have been 7 supporting cases and 1 against ( $p = .035$ , Sign Test, one-tailed).

For Prediction 2, only two verb types met the criteria, and both supported the hypothesis (middle panel, Table 4). If we were to take into account those cases where mod + INF or aux + PP constructions were attested, but their more complex counterparts with an added Subj were absent throughout the study, there were 8 additional verb types in support, for a total of 10 in support and none against ( $p = .001$ , Sign Test, one-tailed).

For Prediction 3, for the verb types that met the criteria, 20 cases supported the prediction that INF/PP or bare INF and PP forms appear before mod + INF or aux + PP (bottom panel, Table 4), with only 2 cases against ( $p \ll .001$ , Sign Test, one-tailed). Both Camille (7 for, 0 against) and Anaë (10 for, 1 against) provided significant individual support for this prediction ( $p_s = .008$  and  $.006$ , respectively, Sign Tests, one-tailed). Although the number of cases from each child was sometimes too small for statistical analysis, the general pattern was consistent with the findings from Arno shown in Table 3.

In summary, the results from Arno offer robust support for the predictions of the Adjacency Hypothesis. This was particularly the case for Prediction 1

TABLE 4. *Predictions 1, 2, and 3 tested for Camille, Gael, and Anaë's verb type uses*

Prediction	Supporting	Against
P1: Subj + Pres before Subj + mod + INF and/or Subj + aux + PP		
Camille	2	0
Gael	0	0
Anaë	1	1
P2: mod + INF/aux + PP before Subj + mod + INF and/or Subj + aux + PP		
Camille	0	0
Gael	1	0
Anaë	1	0
P3: INF/PP before mod + INF and/or aux + PP		
Camille	7	0
Gael	3	1
Anaë	10	1

(clitic Subjects, the dominant subject-type the children produced, initially appear only in constructions with Pres verb forms) and Prediction 3 (undifferentiated (homophonous) class-1 INF/PP and class-3 INF and PP forms appear before children add modals in mod + INF constructions or auxiliaries in aux + PP constructions). For Prediction 2, the results go in the right direction in that the simpler constructions (mod + INF, aux + PP) appear before the more complex ones (Subj + mod + INF, Subj + aux + PP).

The data from Camille, Gael, and Anaë were consistent with these findings. Together, the four children provide 21 cases in support of Prediction 1 (with 2 against); 17 cases in support of Prediction 2 (with 7 against), and 54 cases in support of Prediction 3 (with 9 against). However, for the shorter studies of these three children, for Prediction 2, the more complex structure could be observed only for a few verbs. Indeed, for several verbs, they produced only the simpler constructions, and never produced the more complex ones during the study. This suggests that the more complex constructions must be a later acquisition.

*Adjacency on the left edge 2: development in the frequency of verb constructions*

To cast further light on the developmental sequence predicted for children's verb constructions, we next analyzed all the tokens of verb constructions relevant to the three adjacency predictions. This analysis took into account not only first appearances but also the relative frequencies of the constructions, for all the verbs the children produced. As we noted earlier, first appearance alone is not sufficient evidence that the construction has been acquired. Changes in the frequency of use provide this evidence on

the grounds that constructions appearing frequently earlier in development are better established than constructions appearing later or only sporadically.

*Prediction 1.* The overall data relevant to Prediction 1 (that Subj + Pres will appear before Subj + mod + INF and/or Subj + aux + PP) are shown in Table 5 for Arno, and then in Tables 6a, 6b, and 6c for Camille, Gael, and Anaë, respectively.

Arno produced his first Subj + Pres at 1;10, but it was not until 2;0 that the construction was used more widely (11 instances) (see examples in (4) below). In the following session, at 2;2, he produced his first Subj + mod + INF and his first Subj + aux + PP constructions (see examples in (5) below). In the session that followed, he considerably increased his use of Subj + Pres constructions; these remained at about that level of frequency for the rest of the study. Only two months later he began to produce Subj + mod + INF and Subj + aux + PP constructions more frequently (see Table 5).

- (4) Subj + Pres from Arno
- a. *jé bois* 'I drink' [before pretending to drink water from an empty toy cup]
  - b. *on tourne là* 'we turn there' [just before turning the page of a picture-book with his mother]
  - c. *il joue le bébé* 'he plays the baby' [indicating a baby pictured in a picture-book]
- (5) Subj + mod + INF and Subj + aux + PP from Arno
- a. *tu peux mettre ça là* 'you can put that there' [handing a toy spoon to his mother]
  - b. *j'ai fait ça moi* 'I did that me' [showing a finished puzzle to the observer]

In summary, analysis of Arno's frequencies of use for the relevant constructions supports the developmental sequence predicted. Compared to the appearance of each construction within individual verb types (cf. Table 3), it reveals two additional facts about development: (i) Arno produced Pres, INF, and PP forms for some months before his elaborated constructions appeared, and (ii) the two more complex constructions appeared AFTER the simpler one (Subj + Pres) had become more frequent and then, with the appearance of the more complex constructions, the simpler one became even more widely used and seemed to be fully consolidated in Arno's repertoire.

The data for Camille are given in Table 6a. Her first Subj + Pres appeared at 1;9, with an increase in frequency from 1;10 on, the age at which she also produced her first Subj + mod + INF and Subj + aux + PP constructions.

Gael's data, in Table 6b, show that his first Subj + Pres constructions appeared at 1;11.15. In the following session, when his uses of Subj + Pres

TABLE 5. *Arno – verb forms and verb constructions (all tokens) relevant to Prediction 1: Subj + Pres before Subj + mod + INF and/or Subj + aux + PP, by age*

V-form	1;10*	1;11*	2;0*	2;2*	2;3*	2;4	2;5*	2;7	Total
PRES TOTAL	10	51	19	20	137	78	117	153	585
<b>Subj + PRES</b>	<b>2</b>	<b>3</b>	<b>11</b>	<b>8</b>	<b>57</b>	<b>29</b>	<b>73</b>	<b>80</b>	<b>263</b>
INF TOTAL	0	0	0	27	104	38	73	101	343
<b>Subj + mod + INF</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>6</b>	<b>3</b>	<b>17</b>	<b>38</b>	<b>70</b>
PP TOTAL	1	2	0	13	23	15	39	31	124
<b>Subj + aux + PP</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>11</b>	<b>8</b>	<b>26</b>

NOTE: \* Starred columns present the mean tokens of two sessions within the same month.

became more frequent, he produced his first Subj + aux + PP constructions. By the time his recordings ended at 2;3, he had not produced any additional Subj + aux + PP constructions (Subj + mod + INF hadn't appeared at all throughout the study), and his Subj + Pres constructions presented little further increase after 2;0.

Finally, as shown in Table 6c, Anaë produced her first Subj + Pres at 1;7, and her first Subj + mod + INF and Subj + aux + PP constructions between two and four months later. For Anaë, the latter constructions appeared while her Subj + Pres constructions were still few in number, but when she began using this construction with greatly increased frequency (60 occurrences at age 2;0, accounting for 64% of her present tense verb forms), she also began to produce Subj + mod + INF and Subj + aux + PP more often.

In summary, for all four children, analyses of the frequencies of use for the three constructions relevant to Prediction 1 support the findings on the appearance of constructions within individual verb types (Tables 3 and 4). The analysis of all uses of these constructions confirms that the Subj + Pres construction was produced before both Subj + mod + INF and Subj + aux + PP (Gael produced no instances of Subj + mod + INF, and just two instances of Subj + aux + PP, up through the last session of the study; see Table 6b). Moreover, analysis of the frequencies of use of these constructions showed that (i) the earliest construction the children produced (Subj + Pres) first appeared only several months after they had produced bare verbs in the present tense, and (ii) there was a consistent ordering between first appearance and increases in use of the simpler construction (Subj + Pres) and the appearance and subsequent uses of the more complex constructions (Subj + mod + INF and Subj + aux + PP).

*Prediction 2.* The frequencies of occurrence for the constructions relevant to Prediction 2, that mod + INF and aux + PP constructions would appear before Subj + mod + INF or Subj + aux + PP, are shown in Tables 7 and 8.



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TABLE 6. *Camille (a), Gael (b), Anaë (c) – verb forms and verb constructions (all tokens) relevant to Prediction 1: Subj + Pres before Subj + mod + INF and/or Subj + aux + PP, by age*

6a. Camille\*

V-form	1;4	1;5	1;5	1;7	1;8	1;9	1;10	2;2	Total
PRES TOTAL	0	22	14	25	5	54	68	31	219
<b>Subj + PRES</b>	0	0	0	0	0	7	20	23	50
INF TOTAL	0	0	0	0	2	8	8	22	40
<b>Subj + mod + INF</b>	0	0	0	0	0	0	1	4	5
PP TOTAL	0	0	0	0	6	7	6	9	28
<b>Subj + aux + PP</b>	0	0	0	0	0	0	2	3	5

NOTE: \* Camille produced no verbs at 1;3 so this session is omitted.

6b. Gael

V-form	1;8	1;9	1;10	1;11	1;11-15	2;0	2;1	2;3	Total
PRES TOTAL*	5	2	4	19	11	30	17	11	99
<b>Subj + PRES</b>	0	0	0	0	3	7	3	10	23
INF TOTAL	0	0	0	7	5	3	8	2	25
<b>Subj + mod + INF</b>	0	0	0	0	0	0	0	0	0
PP TOTAL	0	3	0	2	1	5	4	2	17
<b>Subj + aux + PP</b>	0	0	0	0	0	2	0	0	2

NOTE: \* At 2;3, Gael produced one clitic Subj with an Imperfect verb form, counted with Pres.

6c. Anaë

V-form	1;5	1;6	1;7	1;8	1;9	1;11	2;0	Total
PRES TOTAL	0	1	16	10	17	20	94	158
<b>Subj + PRES</b>	0	0	3	0	2	4	60	69
INF TOTAL	0	0	1	5	18	14	38	76
<b>Subj + mod + INF</b>	0	0	0	0	2	3	11	16
PP TOTAL	0	0	1	3	19	3	31	57
<b>Subj + aux + PP</b>	0	0	0	0	0	2	14	16

The results for Arno in Table 7 show that his mod + INF and Subj + mod + INF constructions on the one hand, and his aux + PP and Subj + aux + PP on the other, all appeared in the same session, at 2;2. Developmental changes in the frequencies of these constructions, however, showed that while mod + INF and aux + PP constructions became more frequent in the following session at 2;3 (when they represented 37% and 52% of the relevant verb forms, respectively), and remained at that level of frequency through the end of the study, Arno's uses of Subj + mod + INF and Subj + aux + PP

TABLE 7. *Arno – verb forms and verb constructions (all tokens) relevant to Prediction 2: mod + INF before Subj + mod + INF and aux + PP before Subj + aux + PP, by age*

V-form	1;10*	1;11*	2;0*	2;2*	2;3*	2;4	2;5*	2;7	Total
INF TOTAL	0	0	0	27	104	38	73	101	343
<b>mod + INF</b>	0	0	0	<b>8</b>	<b>36</b>	<b>10</b>	<b>32</b>	<b>33</b>	<b>119</b>
<b>Subj + mod + INF</b>	0	0	0	<b>6</b>	<b>6</b>	<b>6</b>	<b>17</b>	<b>38</b>	<b>70</b>
PP TOTAL	3	0	0	13	23	15	39	31	124
<b>aux + PP</b>	0	0	0	<b>3</b>	<b>12</b>	<b>4</b>	<b>14</b>	<b>15</b>	<b>48</b>
<b>Subj + aux + PP</b>	0	0	0	<b>3</b>	<b>2</b>	<b>2</b>	<b>11</b>	<b>8</b>	<b>26</b>

NOTE: \* Starred columns present the mean tokens of two sessions within that same month.

increased in frequency only two months later, when they accounted for nearly 25% of both his INF and PP verb forms. Notice that although the absolute numbers suggest that Subj + mod + INF constructions are more numerous than Subj + aux + PP ones, their occurrence relative to the INF and PP forms he produced accounts for approximately the same overall percentage (20% and 21%, respectively). So although the simpler constructions and their more complex relatives appeared at the same time in Arno’s production, and so may appear to offer weaker support for this prediction, the developmental progression and the interplay between the first appearance and the sequence in the relative increases in frequency of these constructions still offers good support for Prediction 2.

The data for the other three children are given in Tables 8a, 8b, and 8c. Camille’s uses relevant to Prediction 2 were not very numerous. Her aux + PP constructions were the first to appear at 1;9, with some Subj + aux + PP constructions at 1;10. The occurrence of both structures remained at the same level of use through the end of the study at 2;2. Although Subj + mod + INF appeared before mod + INF at 1;10 (at the same session where Subj + aux + PP appeared), she only produced one instance of this construction. In the following session, at 2;2, Camille produced a large number of mod + INF constructions, but her Subj + mod + INF constructions remained relatively infrequent (18% of her INF verb forms).

Gael’s data are shown in Table 8b. Like Camille, Gael also produced only a few instances of the constructions relevant for this prediction: aux + PP was the first construction to appear, at 1;11-15. He produced one instance of mod + INF in his last session, and never produced any Subj + mod + INF constructions.

Finally, Anaë’s verb uses are shown in Table 8c. She produced both mod + INF and Subj + mod + INF constructions, starting at 1;9. At 2;0, her production of mod + INF constructions increased in frequency, as did her

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TABLE 8. *Camille (a), Gael (b), Anaë (c) – verb forms and verb constructions (all tokens) relevant to Prediction 2: mod + INF before Subj + mod + INF and aux + PP before Subj + aux + PP, by age*

8a. Camille\*

V-form	1;4	1;5	1;5	1;7	1;8	1;9	1;10	2;2	Total
INF TOTAL	0	0	0	0	5	5	8	22	40
<b>mod + INF</b>	0	0	0	0	0	0	0	<b>13</b>	<b>13</b>
<b>Subj + mod + INF</b>	0	0	0	0	0	0	<b>1</b>	<b>4</b>	<b>5</b>
PP TOTAL	0	0	0	0	6	7	6	9	28
<b>aux + PP</b>	0	0	0	0	0	<b>3</b>	<b>2</b>	<b>4</b>	<b>9</b>
<b>Subj + aux + PP</b>	0	0	0	0	0	0	<b>2</b>	<b>3</b>	<b>5</b>

NOTE: \* Camille produced no verbs at 1;3 so this session is omitted.

8b. Gael

V-form	1;8	1;9	1;10	1;11	1;11-15	2;0	2;1	2;3	Total
INF TOTAL	0	0	0	7	5	3	8	2	25
<b>mod + INF</b>	0	0	0	0	0	0	0	<b>1</b>	<b>1</b>
<b>Subj + mod + INF</b>	0	0	0	0	0	0	0	0	0
PP TOTAL	0	3	0	2	1	5	4	2	17
<b>aux + PP</b>	0	0	0	0	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>4</b>
<b>Subj + aux + PP</b>	0	0	0	0	0	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

8c. Anaë

V-form	1;5	1;6	1;7	1;8	1;9	1;11	2;0	Total
INF TOTAL	0	0	1	5	18	14	38	76
<b>mod + INF</b>	0	0	0	0	<b>5</b>	<b>7</b>	<b>18</b>	<b>30</b>
<b>Subj + mod + INF</b>	0	0	0	0	<b>2</b>	<b>3</b>	<b>9</b>	<b>14</b>
PP TOTAL	0	0	1	3	19	3	31	57
<b>aux + PP</b>	0	0	0	0	<b>16</b>	<b>0</b>	<b>4</b>	<b>20</b>
<b>Subj + aux + PP</b>	0	0	0	0	0	<b>2</b>	<b>14</b>	<b>16</b>

Subj + mod + INF constructions, but the latter remained less frequent than mod + INF. At 1;9 she also produced her first aux + PP constructions, and only two months later, at 1;11, did she produce her first Subj + aux + PP constructions. At 2;0, her Subj + aux + PP constructions increased in frequency and outnumbered aux + PP forms.

In summary, although in a few cases the simpler and more complex constructions appeared at the same time in the children's speech (and, in one case, in reverse order), the overall order of appearance and, in particular, the pattern of relative increases in frequency of these constructions, support the developmental sequence predicted here, with

TABLE 9. *Arno – verb forms and verb constructions (all tokens) relevant to Prediction 3: INF/PP (class 1) and INF or PP (class 3) before mod + INF and aux + PP*

V-form	1;10*	1;11*	2;0*	2;2*	2;3*	2;4	2;5*	2;7	Total
Under-determined INF/PP and bare INF and PP	35	25	1	42	120	60	77	39	399
<b>X + INF †</b>	0	0	0	<b>16</b>	<b>49</b>	<b>18</b>	<b>58</b>	<b>87</b>	<b>228</b>
<b>Y + PP ††</b>	0	0	0	<b>7</b>	<b>6</b>	<b>7</b>	<b>35</b>	<b>30</b>	<b>94</b>

NOTES: \* Starred columns present the mean tokens of two sessions within the same month. † X = Mod, Subj + Mod, or filler + Mod; or a Preposition. †† Y = Aux, Subj + Aux, or filler + Aux.

the simpler constructions appearing earlier and more frequently than the more complex constructions.

*Prediction 3.* The overall verb data relevant for Prediction 3 – that children will produce under-determined class-1 INF/PP forms or bare class-3 INF and PP forms before adding grammatical elements appropriate to the left edge of INF and PP forms, respectively, are shown in Tables 9 and 10.

As shown in Table 9, Arno produced class-1 INF/PP forms, and class-3 bare INF and PP forms from his first session in this study (at 1;10) (see examples in (6) below). He sometimes produced the negative particle *pas*, as in /patõbe/ *pas tomber/tombé* ‘not to fall / not fallen’, but the negative particle does not distinguish INF from PP in adult speech (cf. adult *il faut pas tomber* ‘he mustn’t fall’, and *il est pas tombé* ‘he hasn’t fallen’). Only at 2;2 did Arno produce his first constructions combining the appropriate morphemes with INF or PP forms – mainly mod before INF and aux before PP – or in more complex constructions (mod + neg + INF, Subj + mod + INF, Subj + aux + PP) (see examples in (7) below). From 2;5 on, his more elaborate constructions containing INF and PP outnumbered his uses of undifferentiated class-1 INF/PP and bare class-3 INF and PP verb forms.

- (6) bare class-1 INF/PP and class-3 INF and PP forms from Arno
  - a. /kafɛ/ *cacher/caché* ‘to hide/hidden’
  - b. /ako pase/ *encore passer/passé* ‘more/again to pass / passed’
  - c. /dõvmiʒ/ *dormir* ‘to sleep’
  - d. /vy/ *vu* ‘seen’
- (7) mod + INF and aux + PP and more elaborate constructions from Arno
  - a. /vɛzue/ *veux jouer* ‘want to play’
  - b. /ɛtõbe/ *est tombé* ‘has fallen’
  - c. /kɛlkõ amiʒa/ *quelqu’un a mis ça* ‘someone has put this’
  - d. /ipɛtõmiʒla/ *il peut dormir là* ‘he can sleep there’

TABLE 10. *Camille (a), Gael (b), Anaë (c) – verb forms and verb constructions (all tokens) relevant to Prediction 3: INF/PP (class 1) and INF or PP (class 3) before mod + INF and aux + PP*

**10a.** Camille\*

V-form	1;4	1;5	1;6	1;7	1;8	1;9	1;10	2;2	Total
Under-determined INF/PP and bare INF and PP		4	25	23	21	37	43	9	162
<b>X + INF †</b>		0	0	0	0	4	1	20	25
<b>Y + PP ††</b>		0	0	0	0	3	4	7	14

**10b.** Gael

V-form	1;8	1;9	1;10	1;11	1;11-15	2;0	2;1	2;3	Total
Under-determined INF/PP and bare INF and PP	4	13	14	26	23	16	27	11	134
<b>X + INF †</b>	0	0	0	3	3	2	1	2	11
<b>Y + PP ††</b>	0	0	0	0	1	2	2	1	6

**10c.** Anaë

V-form	1;5	1;6	1;7	1;8	1;9	1;11	2;0	Total
Under-determined INF/PP and bare INF and PP	0	2	4	12	32	8	17	75
<b>X + INF †</b>	0	0	1	5	8	12	35	61
<b>Y + PP ††</b>	0	0	1	0	19	2	27	49

NOTES: \* Camille produced no verbs at 1;3 so this session is omitted. † X = Mod, Subj + Mod, or filler + Mod; or a Preposition. †† Y = Aux, Subj + Aux, or filler + Aux.

The comparable data for Camille are shown in [Table 10a](#). She produced under-determined class-1 INF/PP and bare class-3 INF and PP from 1;5 on, with increasing frequency, until 1;10. Her first INF and PP constructions appeared at 1;9, but it was not until 2;2 (her last session) that they became more frequent, in particular her constructions with INF. In this session, her constructions with INF and PP outnumbered her bare verb forms.

Much the same pattern of use appears for both Gael ([Table 10b](#)) and Anaë ([Table 10c](#)) as they moved from producing under-determined class-1 INF/PP and bare class-3 INF and PP forms to clear instances of INF and PP constructions. Like Arno, Gael produced under-determined INF/PP and bare INF and PP forms from his first session on. He began to produce grammatical elements appropriate to INF at 1;11, and two weeks later also did so for PP (at 1;11.15). But he produced only a few INF and PP constructions, so their frequency was low overall, and neither construction ever outnumbered his under-determined forms up through his last session at age 2;3 ([Table 10b](#)).

As shown in [Table 10c](#), Anaë produced under-determined class-1 INF/PP and bare class-3 INF and PP forms from 1;6 on. She began to use constructions appropriate to INF and PP at 1;7. These more elaborate constructions became more numerous by 1;9, with a further increase in frequency in her last session, at 2;0, when her elaborated constructions outnumbered her under-determined INF/PP and bare INF and PP forms (see [Table 10c](#)).

In summary, all four children offer further supporting evidence for Prediction 3: all the children produced under-determined class-1 INF/PP and bare class-3 INF and PP forms before they added appropriate grammatical morphemes to the left edge of INF and PP, respectively. These constructions, for three of the children, showed an increase in use until they outnumbered bare class-1 INF/PP or class-3 INF and PP forms, that the children were still producing with some frequency, up until the final recording sessions.

#### *Adjacency on the left edge 3: status of first adjacent elements on the left edge*

To provide further support for the Adjacency Hypothesis that children start by adding elements that, in adult language, appear adjacent to the left edge of core verbs, we looked at whether the first elements children add could actually occur in that position in the adult language.

[Table 11](#) presents these data for Arno, for the three forms under particular scrutiny here: Pres, INF, and PP, as well as for all other verbs with a single element adjacent on the left. Of these elements, 88% overall correspond to, or can be traced to, grammatical morphemes that can occur adjacent to the left

TABLE 11. *Number (in parenthesis) and percentages of single elements that either can or can't occur adjacent to the left edge of verbs in adult language, for Arno, for all verb tokens and for Pres, INF, and PP forms separately*

Added elements that	Total N	Verb form		
		Pres	INF	PP
can occur	88 (525)	89 (260)	95 (149)	100 (59)
can't occur	12 (71)	11 (32)	5 (8)	0 (0)

edge of verbs in the adult language. This held for 89% of the single elements added to Pres forms, 95% of those added to INF, and 100% of those added to PP. Comparing the actual distribution to one based on equal probability between admissible and non-admissible additions ( $p = q = .5$ ), the probability of finding 88% vs. 12% (525 vs. 71), for all verbs, is significantly less than  $p \ll 001$  (for the normal approximation to the binomial distribution,  $z = 18.64$ ). The corresponding value for Pres (260 vs. 32) is  $z = 13.4$ ,  $p \ll 001$ , for INF (149 vs. 8), is  $z = 11.33$ ,  $p \ll 001$ , and for PP (59 vs. 0), is  $z = 7.81$ ,  $p \ll 001$ . In short, the first elements Arno placed immediately next to verbs, on the left edge, correspond to elements that can be traced to grammatical morphemes likely to occur in that position in the adult language.

#### *Adjacency on the left edge 4: filling slots on the left*

The Adjacency Hypothesis, applied to the left edge, predicts that children will produce more complex verb constructions by adding grammatical elements, starting at the left edge of core verbs and building progressively outwards in an ordered way. In the preceding analysis, we saw that when Arno added one element to bare verb forms, this was most likely traceable to a grammatical morpheme that could occur on the left edge of core verbs in the adult language.

We therefore next examined the developmental progression in the NUMBER OF ELEMENTS the children added to the left edge of verbs, as they produced their first verb constructions. Figures 1 to 4 show, for each child, the percentage of verbs produced with 0, 1, 2, or 3 or more elements added to the left, with increasing age. As the Figures show, there is a steady change for all four children, from no element at all for most or all verb uses in the first sessions, to 1 element, and then to 2 or more elements.

Single elements added to the left edge included filler syllables (mainly with schwa vowels) and a variety of identifiable morphemes such as clitic subjects like *il* 'he' or *je* 'I', in Subj + Pres constructions, demonstrative *ça* 'this/that', modals like *faut* 'must' or *veux* 'want' in mod + INF constructions, and

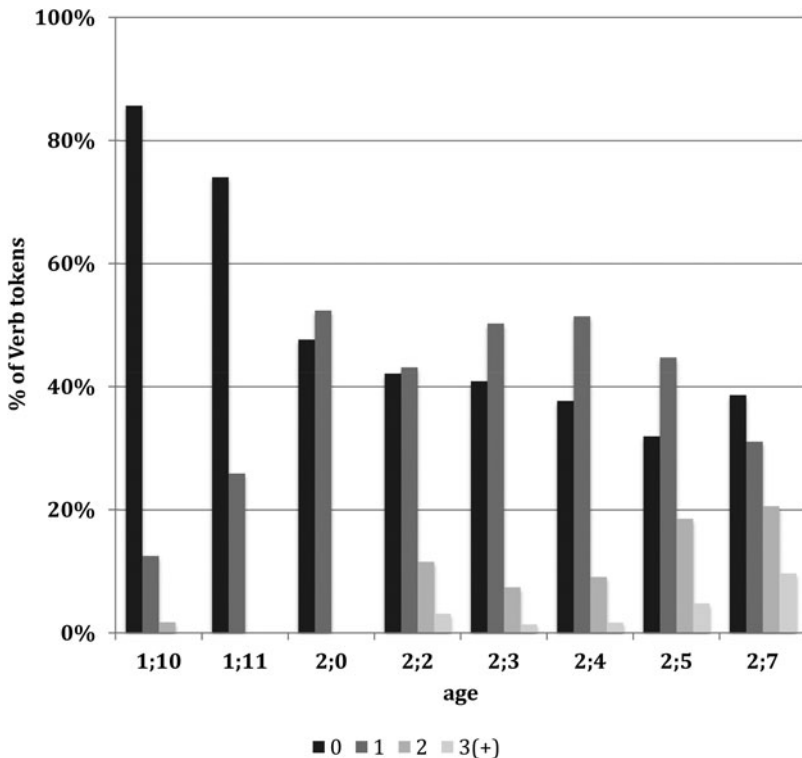


Fig. 1. Arno (1;10–2;7) – percentage of all verb tokens produced with 0, 1, 2, 3(+) elements on the left edge, by age.

auxiliaries in aux + PP constructions, as well as fillers, adverbs, prepositions, negative particles like *pas* ‘not’, and prepositions like *à* ‘to’ or *pour* ‘for’ (see the corresponding examples in (8) below):

(8) 1-element additions

- a. *il saute* ‘he/it jumps’ [Camille 1;9]
- b. *ça tourne* ‘that goes round’ [Gael 1;11-25]
- c. *pas /tobe/ pas tomber/tombé* ‘not fall/fallen’ [Arno 2;0]
- d. *à boire* ‘for drinking / (want) to drink’ [Camille 1;9]

Once the children started adding two elements to the left edge of the verb, they produced such combinations as mod + neg + INF, Subj + mod + INF, aux + neg + PP, Subj + aux + PP, prep + Obj + INF, DisjuncPron + Subj + Pres, and Subj + Obj + Pres (see the corresponding examples in (9) below):



EARLY VERB CONSTRUCTIONS IN FRENCH

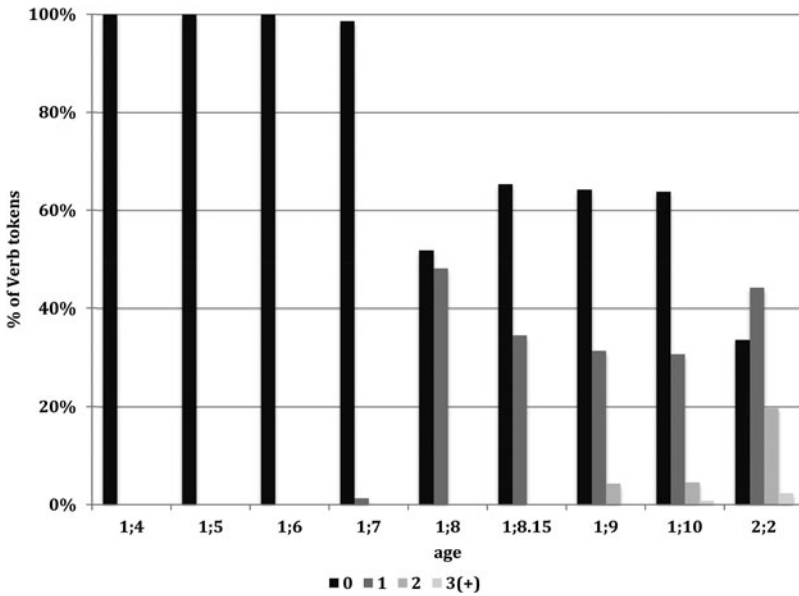


Fig. 2. Camille (1;4–2;2) – percentage of all verb tokens produced with 0, 1, 2, 3(+) elements on the left edge, by age.

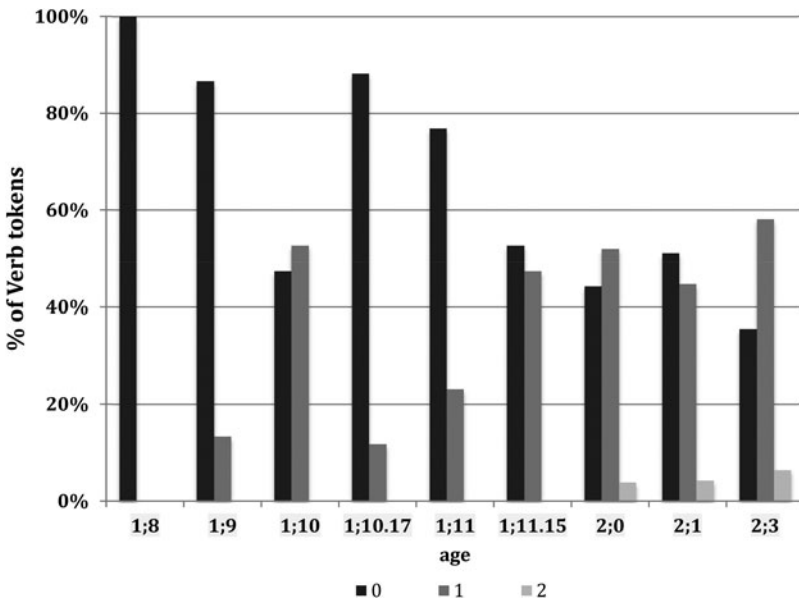


Fig. 3. Gael (1;8–2;3) – percentage of all verb tokens produced with 0, 1, 2, 3(+) elements on the left edge, by age.

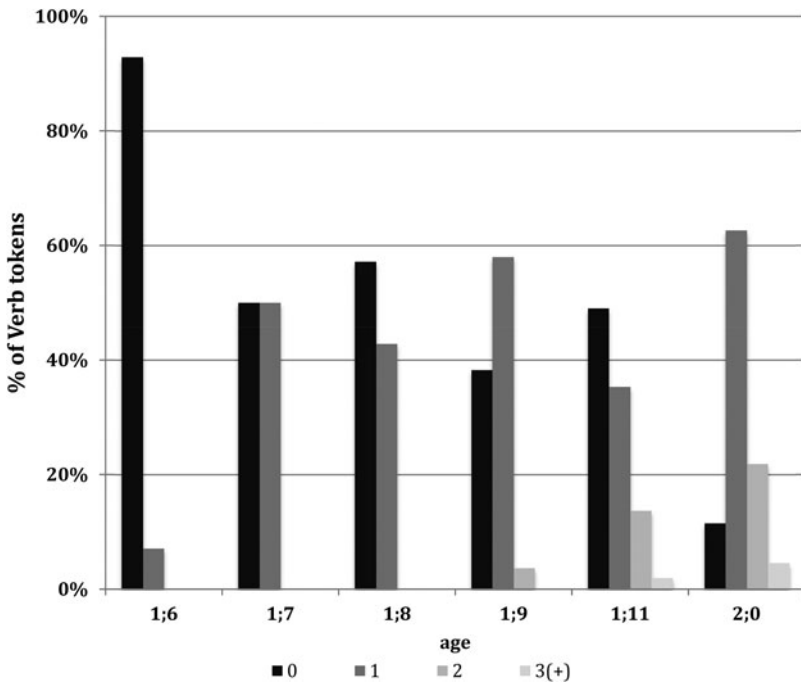


Fig. 4. Anaë (1;6–2;0) – percentage of all verb tokens produced with 0, 1, 2, 3(+) elements on the left edge, by age.

(9) 2-element additions

- a. *peut pas tomber* ‘can not fall’ [Arno 2;4]
- b. *tu peux mettre ça maman* ‘you can put this, mommy’ [Arno, 2;4]
- c. *est pas attaché* ‘is not fastened’ [Camille 2;2]
- d. *j’ai ramené ça* ‘I have brought this’ [Arno 2;4]
- e. *pour le mettre* ‘in order to put it’ [Arno 2;7]
- f. *moi j’enfile* ‘me, I thread [it on]’ [Camille 2;2]
- g. *on la met* ‘we put it [on]’ [Camille 2;2]

With three or more elements added on the left edge, the constructional possibilities become both more varied and more elaborate, with combinations such as *fil + mod + neg + Obj + INF*, *Subj + modfut + Obj + INF*, *Subj + mod + neg + Obj + INF*, or even *Subj + semimod + neg + prep + Obj + INF* and *demon + cop + NP + Relativizer + aux + PP* (see the corresponding examples in (10) below):

(10) 3- and more-element additions

- a. */e/faut pas le prendre* ‘[filler e] should not take it’ [Arno 2;7]
- b. *je vais le défaire* ‘I’m going to undo it’ [Arno 2;5]

- c. *on peut pas l'enlever ça* 'we can not take it [off] this' [Camille 2;2]  
 d. *j'arrive pas à la mettre* 'I don't manage to put it = I can't put it'  
 [Arno 2;7]  
 e. *c'est un petit bateau qui est cassé* 'it's a little boat that is broken'  
 [Arno 2;7]

As shown in [Figure 1](#), in the first two sessions (at 1;10 and 1;11), most of Arno's verbs were produced as bare forms, and only 13% to 26% of them were preceded by one element. At 2;0 he produced more verbs preceded by one element than he did bare forms, but he produced no verbs preceded by two or more elements. Although he continued to produce both bare forms and verbs preceded by one element until the end of this study, at 2;2 Arno also started to produce some verbs with two preceding elements (13% of his verbs) and a few with three or more elements as well (3%). These multiple-element constructions increased in number in the last two sessions (at 2;5 and 2;7), with their proportions rising to 24% and 31% of his verb uses, respectively.

The data for Camille are given in [Figure 2](#). In the first three sessions, from 1;4 to 1;6, Camille produced all her verbs as bare forms, then at 1;7, she added one element on the left edge of just one verb. At 1;8, the number of verbs she produced with single elements on the left rose to 13 (48% of her verb uses) and continued at about that level until the end of the study. One month later, at 1;9, she produced her first verbs preceded by two elements (4%), and at 1;10 her first constructions with three added elements. Finally, at 2;2, the percentage of multi-elements constructions, still mainly consisting of two added elements, increased to 22%.

[Figure 3](#) shows that, at 1;8 (his first session), Gael produced all his verbs as bare forms. Constructions with one left edge element appeared at 1;9, and their number as well as their percentage fluctuated until 1;11.15 when their number increased from a mean of 4.4 in earlier sessions to 18 occurrences here ( $\chi^2 = 8.25$ ,  $p < .004$ ). From then on, Gael continued to produce these constructions at the same level, and by 2;3 (his final session in this study), they far outnumbered his bare forms. At 2;0, when one-element additions had become fairly frequent (27 occurrences in that session), he began to produce his first constructions with two elements (4%). These showed little change through the end of the study at 2;3. Throughout this whole period, Gael produced no constructions with three or more elements.

Finally, the data for Anaë are shown in [Figure 4](#). In her first session, at 1;6, she produced almost all of her verbs (93%) as bare forms, along with just one verb with one element added on the left. Only in the next session, at 1;7, did she start to produce one-element constructions more frequently (now 50% of her verb uses). At 1;9, when her constructions with one element increased

and outnumbered her bare forms (47 occurrences, 56% of her verb uses), she also produced her first verb constructions with two elements on the left (3 occurrences, 4%). In the next session (at 1;11), she produced her first construction with three elements. At this last session, her production of one-element constructions increased considerably (109 occurrences, 63% of her verb uses); and so did her production of constructions with two and with three or more elements (38 and 11 instances, respectively). By this time, her bare verb uses accounted for only 11% of all her verb forms.

In summary, the findings on all four children's incremental production of elements on the left edge of their verbs provides further support for our proposal that, in their first verb constructions, children acquiring French begin by progressively adding elements adjacent to the left edge of core verbs. Just as in the earlier analyses of the overall development in verb constructions, for the number of elements added on the left, there is an interplay between first appearance and frequency of occurrence: it is only when simpler constructions have become more frequent, and so seem to have been mastered, that children add an additional element to the simpler constructions, and so advance from one, to two, then to three (and sometimes more) elements added to the left of the core verb.

## DISCUSSION

### *Adjacency on the left*

The pattern of development in verb constructions for the four children studied here strongly supports the predictions of the Adjacency Hypothesis, namely that children initially build verb constructions in French by adding adjacent grammatical morphemes incrementally to the left edge of core verbs. The order of acquisition for left-edge elements holds both for the appearance of different constructions within verb types (Tables 3 and 4), and for the subtler picture provided by taking into account the interplay between first appearance and frequency of occurrence of all verb constructions (Tables 5 to 10). That is, the order of appearance for constructions with individual verb types, and the frequency of occurrence for all relevant constructions for all verbs go hand-in-hand, with simpler forms appearing earlier and increasing in number as more complex constructions appear.

Our longitudinal data show that (i) when children add subjects to verbs (that is, elements that are subjects for the adult), they do so at first only with Pres forms; (ii) with INF and PP forms, children add modals or prepositions to build early INF constructions, and auxiliaries to build PP constructions, before they add subjects to the left of these constructions (again, elements that are modals, auxiliaries, and subjects for the adult). The analysis of the appearance of a construction within individual verb

types could not establish this trend for the children observed over a shorter time, and, even for Arno, the overt evidence was weaker. This was because there were only a few verbs for which the children used all the relevant constructions. However, indirect evidence for this trend was provided by the observation that while the children used the simpler constructions for several verb types, for many of these verbs the more complex constructions didn't occur at all, up to and including the last recorded session. In particular, this developmental trend was established by the interplay between appearance and frequency of occurrence in the developmental analysis of the different constructions across all verbs: The more complex constructions appeared later, and were used more frequently later on, than was the case for the simpler constructions. And, if they appeared at the same time, as in Arno's case, the more complex constructions increased in frequency only after the simpler constructions had done so; (iii) after a period of undifferentiated use of the homophonous INF/PP class-1 forms and of the distinct bare INF and PP class-3 forms, children begin to produce the appropriate grammatical morphemes that are adjacent to these forms in the adult language – mainly modals and prepositions before INF, and auxiliaries before PP. It is interesting to note that the distinct lexical forms of class-3 INF and PP, just like the undifferentiated class-1 INF/PP forms, require a certain amount of time before children add the appropriate elements on their left edge.

The general pattern of adding adjacent elements to the left edge of verbs in verb constructions is also supported by the highly significant results of our analysis of all the single elements added to bare verbs by Arno, elements traceable to grammatical morphemes that can occur in that position in the adult language. This pattern also shows up in the results of a still more general analysis of all the elements the children added to the left of their verbs over time (Figures 1 to 4). The pattern of development shows that once children produce verb constructions with one element, they move on to adding two-element constructions, and when these in turn become established, they begin on three-element constructions.

Overall, all these analyses support the Adjacency Hypothesis for left-edge additions. This pattern of development can be thought of as a series of orderly steps taken as children exhibit growing mastery over the production of the grammatical elements specific to each verb construction. In doing this, they start with one element (e.g. identifiable as Subj + Pres, mod + INF, aux + PP). Once children produce several constructions with one element, they start producing constructions with two elements on the left (e.g. identifiable as Subj + mod + INF, Subj + aux + PP). When these constructions with two elements become established, children begin to produce constructions with three and, later on, with a greater number of

elements. Interestingly, even in more complex constructions, children do not seem to make order errors. Rather, they seem to track the patterns of occurrence for each type of element – Subj and Obj clitics, negative, modal, and auxiliary – with respect to the left edge of the core verb, whether this is a Pres, INF, or PP form. Such attention to surface order is consistent not only with the Adjacency Hypothesis, but also with Slobin's (1985) cross-linguistic observations: children rarely make order errors in their production of sequences of grammatical morphemes.

*Utterance length, constituency, and verb constructions*

When children start to produce verb constructions, these constructions don't simply result from children's ability to combine words in their utterances (see Table 2).

For the three children for whom we have relevant data (Camille, Gael, and Anaë), we see that Camille's first Subj + Pres and aux + PP constructions appeared after she had begun to produce her first 2-word utterances, with mod + INF constructions appearing still later. The same pattern held for Gael, who started producing his first Subj + Pres and aux + PP constructions three months after his first word combinations; his mod + INF constructions appeared another four months later (when his MLU-V reached 1.87). Finally, Anaë produced her first Subj + Pres constructions some two months after she began to combine words; and another two months later (when her MLU-V reached 1.82), she began to produce mod + INF and aux + PP constructions. Increasing utterance length, then, precedes the appearance of these verb constructions. Arno's first Subj + Pres constructions occur at 1;10, the first session analyzed here. Inspection of the previous session (at 1;9) shows a few 2- and 3-word combinations like /mwa dəlo/ *moi dans l'eau* 'me in (the) water'; /ʃypɾɛtla/ *suis prête là* 'am ready there'; /paʃɛla/ = *pas ceux-là* 'not those'. Only five months later did he start producing aux + PP and mod + INF constructions (when his MLU-V had increased to 2.7).

As children elaborate their verb constructions, they are not guided by constituent boundaries either. Indeed, if the subject noun phrase as a constituent played a role, then the children should have added clitic subjects or lexical NP as subjects as soon as they started to elaborate their verb constructions. But this was not the case: in their first constructions, the children produced clitic subjects (the favored subject type) only with present tense verbs, not with any other verb forms. That is, children build up verb constructions in French by starting on the left edge of the verb, regardless of the constituent status of the element(s) normally found there in adult speech. The Adjacency Hypothesis, then, explains both the presence of clitic subjects with present tense verbs and their absence with

non-present INF and PP forms. It also predicts that children will add modal and auxiliary verbs adjacent on the left of core verbs before they add clitic subjects to the left of these modals and auxiliaries.

When children elaborate their verb constructions by adding an adjacent morpheme, they either add a constituent, to produce an utterance with two constituents, as when they add clitic subjects (in adult language) to Pres (e.g. NP<sub>subj</sub> + VP), or they expand a constituent to produce, for example, mod + INF or aux + PP, both elaborations of VP (see also Bowerman, 1973). In short, in this early period of acquisition, development seems to favor adding morphemes rather than constituents.

### *Continuity in development*

A variety of studies have shown that children set up some representation of grammatical morphemes – necessary for comprehension – before they can produce them (e.g. Shipley, Smith & Gleitman, 1969; Hirsh-Pasek & Golinkoff, 1999; Shady & Gerken, 1999; Höhle & Weissenborn, 2003; Soderstrom, White, Conwell & Morgan, 2007). In early production, one-year-olds typically omit all grammatical morphemes, then produce some filler-syllables before nouns and verbs (e.g. Peters & Menn, 1993; Veneziano & Sinclair, 2000; Demuth & Tremblay, 2008). Some time after this, their fillers appear to be used as proto-versions of such grammatical morphemes as articles (before nouns) and clitic subjects, modals, or auxiliaries (before verbs), and so provide evidence for continuity in their later production of grammatical morphemes.

Further evidence for continuity comes from Dye's (2011) cross-sectional study of two-year-olds acquiring French. She showed that what appeared to be bare verb forms in their speech were in fact not entirely bare. While the modals or auxiliaries these children produced were often barely audible, revealed only with instrumental analysis of the sound files, they showed that children already had some representation and were attempting to produce the modal and auxiliary elements that appear there in adult speech. Dye, however, did not collect any earlier data from these children, and so made no claims about their development from bare verb forms to early verb constructions.

Moreover, children's production of bare forms combined with a subject, sometimes proposed as evidence for the so-called 'optional infinitive' stage in early verb acquisition, was rare or entirely absent in Dye's data, just as in ours. One reason for this is probably that while children hear clitic pronouns adjacent to present tense forms, they hear no evidence of such adjacency to the left edge of INF and PP forms. Another reason might be that young children rely on contrast, and assume that a difference in form marks a difference in meaning from the earliest stages in acquisition

(Clark, 1990, 1993). Indeed, contrast in meaning here would preclude any optionality in production (see also Dye, 2011).

*Possible sources for verb constructions*

How do children learn verb constructions and their meanings? When adults talk to children, they expose them to linguistic constructions in the ambient language; they also expose them to the meanings of these structures. In French, both right and left edges are important for contrasts in form: once children have acquired some contrasts on the basis of right-edge variations (e.g. Pres vs. INF/PP, or Pres vs. INF vs. PP), they also begin to attend to the left edge where adult speakers produce different grammatical elements, and to look for meaningful distinctions correlated with specific variations in verb constructions (e.g. Clark & de Marneffe, 2012). That is, children's attention to adult speech in context should help them identify specific left- and right-edge elements: adult usage offers young children consistent and detailed information about the functions of specific linguistic forms (Clark, 1987, 1990, 1993; Diesendruck & Markson, 2001).

Another source of information about the meanings of grammatical elements appears in adult reformulations. Adults frequently reformulate child erroneous utterances, and children show that they attend to such repairs by repeating the repaired word or phrase in a third turn (Veneziano, 1988, 2005; Chouinard & Clark, 2003; Clark & Bernicot, 2008; Clark & de Marneffe, 2012). At just the right time, attention to adult reformulations might also make specific left- and right-edge elements more salient, and so help children identify the different meanings of homophonous forms as well as the meanings of grammatical elements present at the left or right edges of verbs.

In identifying the meanings at stake, children must attend to the relation between the timing of an event, and those elements, for instance, that distinguish present from non-present, or anticipated from completed events. Clark and de Marneffe (2012) found that when children used an indeterminate class-1 INF/PP verb form PRIOR to the action referred to, adults typically reformulated such uses with *aller* 'to be going to', or modals like *pouvoir* 'to be able' or *vouloir* 'to want', in construction with INF. But when children used an indeterminate INF/PP AFTER the action referred to had already occurred, adults reformulated with *aux* + PP constructions. And children appear sensitive to the meaning differences conveyed by these verb constructions. This shows up early in comprehension in the general association of modal constructions with future actions and past tense constructions with completed actions (see, e.g. Harner, 1980; Valian, 2006; see also Jordens, 2002).



Yet another source of information may be found in features of the French verb system. In French, class-3 verbs may help children distinguish the meanings of homophonous class-1 INF/PP forms. Class-3 INF and PP have distinct forms (with the exception of *aller*), such that children hear one form for INF (e.g. *mettre* 'to put') and another for PP (e.g. *mis* 'PP: put'). The two forms, with distinct meanings, occurring in different verb constructions, offer a bridge that could help children differentiate the INF and PP meanings carried by a single form in class-1 verbs. Under this view, class-3 verbs may have a pivotal role in establishing two distinct meanings for one form in class-1 verbs, by leading children to attend to the different constructions where class-1 homophonous forms appear. This is an issue we plan to explore further.

### *Adjacency and typology*

How general is the Adjacency Hypothesis? In the present study, we focused on the left edge as the site for a variety of early emerging constructions in French. The left edge is also primary in prefixing languages, where grammatical modulations of verb meaning are marked by ordered prefixes added to the core verb, as in Mohawk or Quiché Mayan (Mithun, 1989; Pye, 1983). But few languages rely exclusively on prefixes: in Mohawk, a polysynthetic language, both edges are in use. In languages like these, children must work on the information added both by prefixes on the left and suffixes on the right edge of the verb.

In contrast, in languages where suffixation dominates, children must, and do, attend to the right edge. In Turkish, for example, they must attend to the right edge almost exclusively as they learn which suffixes are used to mark past, progressive, negation, person, and any combination of these elements (Küntay & Slobin, 2002). When young children learning Turkish begin to produce verb forms, they produce the suffixes in the right order, but do they add adjacent elements in succession on the right edge? Maybe not exactly: they may start with some unanalyzed chunks, early verb forms like *koy* (IMPERATIVE 'put') or *koyma* (put + NEG 'don't put'), and then, for example, add *-d-* for PAST to the right edge with both, for *koy-d-um* ('put + PAST + 1Psg = 'I put') or *koy-ma-d-im* ('put + NEG + PAST + 1Psg = I didn't put'). Notice that past tense *-d-* immediately follows the core verb *koy-* in *koy-d-um*, but follows the negative element *-ma-* in *koy-ma-d-im*. So Turkish children add adjacent elements on the right edge, but they must also attend to the relative ordering of particular morphemes. Establishing just how soon they do this will require analysis, verb by verb, of fine-grained longitudinal data.

Children acquiring a language like French, we have proposed, attend to adjacency on the left edge as they build early verb constructions. As we

have seen, they first add adjacent elements incrementally to the left of the core verb. But our hypothesis about development holds essentially for early verb constructions in French. At a certain point, children must also learn about the structure-dependent ordering of morphemes. For example, once they produce both clitic subjects and clitic objects, they must attend to the fact that, with present tense forms, one says *il jette* (Subj + Pres, 'he throws') but *il le jette* (Subj + Obj + Pres 'he it throws = he throws it'), with the clitic object between the clitic subject and the verb. The same applies in past tense forms, with *il l'a jeté* (Subj + Obj + aux + PP 'he it has thrown = he has thrown / threw it'), but in INF constructions the clitic object has to go between the modal and the INF, as in *il veut le jeter* (Subj + mod + Obj + INF 'he wants it to throw = he wants to throw it'). The addition of a negative morpheme doesn't require reordering with present tense verb forms (e.g. *il (ne) jette pas*, *il (ne) le jette pas* ('he throws not, he it throws not = he doesn't throw, he doesn't throw it'), but it does with past tense forms, where the negative particle *pas* has to go between the auxiliary and the PP, as in *il (n')a pas jeté* (Subj + aux + neg + PP 'he hasn't thrown'). When also a clitic object is added, as in *il (ne) l'a pas jeté* (Subj + Obj + aux + neg + PP 'he it has not thrown = he hasn't thrown it'), the aux + neg + PP part of the construction remains unchanged. This contrasts with mod + INF constructions, where the negative particle *pas* follows the modal, but the clitic object follows *pas* and precedes INF, as in *je (ne) veux pas le faire* (Subj + mod + neg + Obj + INF 'I want not it to do = I don't want to do it'). Note that in colloquial French, speakers frequently omit *ne* and rely mainly on *pas*. But children also hear *ne...pas* from adults, and eventually learn how to order the morpheme *ne* as well (after clitic subjects, but before clitic objects, before modal or auxiliary verbs, and so on).

Constructions like these were just beginning to emerge in Arno's data. As in Turkish, to produce these still more complex constructions, children need to attend to the structure-dependent relative ordering of such morphemes.

At the same time, children acquiring French also attend to the right edge of verbs, and do so even before they start on the left edge. In class-1 verbs, right-edge distinction differentiates the Pres from the INF/PP forms: /sot/ *saute* 'jump(s)' vs. /sote/ *sauter/sauté* 'to jump / jumped'; in class-3 verbs, it distinguishes, for example, the Pres from the INF and the PP: /me/ *met(s)* 'put(s)' vs. *mettre* /metʁ/ 'to put' vs. *mis* /mi/ 'put'. Later still, French children will acquire the imperfect, future, and conditional tenses, all marked with right-edge inflections.

The extent to which children attend early on to the left edge and add adjacent morphemes on the left depends on the typology of the language, and, to some degree, on how dominant certain forms and constructions are in adult speech. Languages also vary in the extent to which modulations

of verb meaning depend on free morphemes or on affixes. Most rely more on suffixes, hence right-edge elements, than on prefixes (see, e.g. Cutler, Hawkins & Gilligan, 1985; Hupp, Sloutsky & Culicover, 2009). Some languages rely on both prefixes and suffixes, and, as we noted, a few favor prefixes. Spoken French exhibits some variation on the right edge of the verb for some number and tense distinctions, but has only a small number of contrasting inflectional endings compared to the greater variation on the left edge, where grammatical morphemes commonly mark person and number with clitic subject pronouns, as well as modality, tense, negation, and direct and indirect clitic objects.

The current account leaves several questions outstanding. First, to what extent might children's first uses of an element on the left edge of a verb reflect uptake of an unanalyzed chunk or formulaic utterance? When are early clitic subjects, modals, and auxiliaries identified by children as independent grammatical elements? To assess this requires, among other things, detailed analyses of variations in the constructions used in conversational exchanges between adult and child. To what extent does the frequency of adult uses of specific verb forms and constructions affect the order of acquisition observed in children's speech? Here we need to know more about both absolute and relative frequencies in adult usage (dominant verb uses and verb constructions in adult speech). Does the frequency of topicalization and dislocation in adult speech affect which grammatical morphemes children add first in early verb constructions (see, e.g. Richards & Robinson, 1993; Estigarribia, 2010)? The answer here may be important in considering the development of subjects in children's speech – whether clitic pronouns (which ones?), strong or disjunctive pronouns (*moi je*, *lui il*, etc.), uses of demonstrative *ça* (often used for non-focused elements introduced into the conversation), or lexical noun phrases (e.g. Salazar Orvig, Marcos, Morgenstern, Hassan, Leber-Marín & Parès, 2010). Indeed, patterns of adult verb construction uses in conversation with children may account better for children's first uses than simple frequency of verbs in adult speech (Veneziano & Parisse, 2010). The overall nature of adult–child conversational exchanges merits further exploration as we aim for a more complete account of children's acquisition of verb constructions.

#### CONCLUSION

In summary, this detailed longitudinal study of early verb constructions produced by four children acquiring French has shown that, early on, children attend to elements on the left edge of verbs. Around the time that they start producing two forms for certain verb types, they also start adding elements to the left edge of core verbs. These elements include

clitic subject pronouns, and modal and auxiliary verbs. But addition of these elements is highly selective, and follows an ordered incremental adjacency principle, namely: work outwards from the left edge of the core verb. So, in elaborating their earliest verb constructions, children first add those grammatical elements that, in adult language, appear appropriately on the left edge of present tenses, infinitives, and past participles. The elements they add play a central role in their growing understanding of the meanings and grammatical functions these verb constructions generally carry in French, and in their grasp of the structure-dependent nature of morphemes in specific verb constructions.

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