



Pier Marco Bertinetto, Alessandro Lenci, Sabrina Noccetti, Maddalena Agonigi

## The indispensable complexity (When harder is easier).

Lexical and grammatical expansion in three Italian L1 learners.\*

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### 1. Introduction

COMPLEXITY has become a key notion in EMERGENTIST approaches to language and cognitive development (MacWhinney 1999), namely, the approaches adhering to a functionalist, anti-modular and anti-innatist paradigm. In this context, “complexity” must be clearly stripped of any *prima facie* negative connotation: being “complex” is not necessarily the same as being “complicated or difficult” (Merlini Barbaresi 2003). Rather, it should be interpreted within terms of dynamic systems theory, as a way to characterize the particular level of language organization and its specific dynamics. Indeed, an important hallmark of language as a complex system is the deep interplay between lexical and grammatical development, which gives rise to various types of non-linear dynamics in language ontogenesis. The role of complexity in language acquisition can also be clearly observed in the formation of the actionality-temporality-aspect-mood (ATAM)

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\* The authors of this paper constitute a run-in team, involved in a project on the acquisition of ATAM features by Italian children. MA has patiently re-elaborated the data-base collected by PMB and SN. Although this should be regarded as a collective work, PMB bears special responsibility for section 2, SN for sect. 3, AL for sect. 4. Sect. 5 was jointly written by PMB and AL.

In the course of this paper, the following abbreviations will be used: CP = Compound Past, IF = Infinitive, IMP = Imperative, IPF = Imperfect, PF = perfective past (CP + PT), PR = Present, PT = (perfect) Participle, PT-Adj = Adjectival Participle. The remaining abbreviations are self-explanatory.

system, where grammar and lexicon development, cognitive maturation and language acquisition appear to be deeply intertwined.

## **2. Overt and covert categories.**

Natural languages differ dramatically in the structure of their ATAM system. On a broad typological scale, it quickly becomes obvious that not a single ATAM feature needs to be overtly manifested. This is admittedly a general property of grammatical features at large, but the degree of variability to be found in the ATAM domain is so wide as to propose it as an extreme case in this respect. Yet, ATAM features, or at least the main ones among them, appear to be inherently necessary in order to assure efficient communication of the human's experience. How could we, e.g., dispense with the notion of temporality (past-, present-, future-reference) when narrating a story? How, therefore, can the speakers of tense-less languages achieve efficient communication amongst themselves?

The answer to these crucial questions appears to be the following: the fundamental grammatical categories should be considered latently active, even when they are not overtly expressed. In the example in question, one should therefore assume that the speakers integrate the lack of verbal morphology by means of alternative tools, like lexical surrogates (e.g., temporal adverbs) or contextual inferences. The latter tool, in particular, seems to be a frequently exploited mechanism, far beyond the ATAM system. The same applies, *mutatis mutandis*, to aspect: even speakers of aspect-less languages appear to understand the fundamental aspectual contrasts (Bertinetto 2008). Needless to say, this creates a complex interplay between the cognitive and the morphological system. One should assume that a selected set of primary cognitive notions, necessary for linguistic communication, are used by the speaker even in the absence of any explicit morphological manifestation.

From the point of view of acquisition, this poses an intriguing challenge, for apparently morphology does not appear to be a pre-requisite to achieve the cognitive system's maturation (in the relevant sub-domains). One might thus entertain the hypothesis that cognitive maturation not only precedes morphological maturation, but may even dispense with it. A more likely hypothesis, however, consists in assuming that

morphological maturation accompanies cognitive maturation and indeed accelerates it, effectively guiding the learner towards full grammatical competence. A convincing hint at this is offered by the results obtained by the international team led by W.U. Dressler, showing that a rich morphology accelerates the rate of acquisition, rather than slowing it down (Laaha & Gillis 2007).

From this, one may draw an important conclusion: the ATAM acquisition path should not be regarded as universally given, but rather as language-dependent. The ATAM subdomains that are most supported by the given language's morphological articulation are the ones that develop faster and presumably trigger the acquisition process. Initial proof of this is offered in a study three Italian children (Bertinetto et al. in press). Contrary to wide-spread assumption, the present authors were able to demonstrate that the acquisition of the Italian ATAM system does not presuppose the initial convergence of atelicity/imperfectivity/present-reference as opposed to telicity/perfectivity/past-reference. Indeed, activity verbs do not follow the expected pattern: perfective uses were remarkably present from the beginning, and with one child they even prevailed (following the identical pattern to be found in the mother).

This should be no wonder. Actional categories are highly opaque in Italian (as indeed they are in most languages). Most verbs receive their interpretation from the context and may be hard to classify even for expert judges (Zarcone & Lenci, to appear). Few verbs form recognizable actional pairs (e.g., *dormire* act. vs. *addormentarsi* ach.; *essere fermo* stat. vs. *fermarsi* ach.); an exceedingly high number of verbs, by contrast, are actionally ambiguous (e.g., *collegare*, *separare* stat./ach.; and see the endemic ambiguity act./acc. in *leggere / leggere un libro* etc.). It is thus unlikely that actionality may be an acquisition trigger for Italian children. However, Italian presents a number of overt features that might fulfill this role. Let us briefly review them, together with the negative side of this.

In the sub-domain of temporality, Italian presents explicit marking of past-, present- and future-reference. Actually, Past and Future tenses may occasionally be used with non-past and non-future reference, but this is unlikely to happen in Child Directed Speech (CDS). In the aspect sub-domain, there is explicit marking of perfective vs. imperfective in the past (Simple / Compound Past vs. Imperfect). On the negative side,

however, Italian presents a number of opaque features. The Present tense, in particular – namely the tense to which children are most exposed – may often be used with past- or (mainly immediate) future-reference. Besides, the Present is also highly ambiguous in terms of aspectual meaning. Although Italian presents a fully-fledged progressive periphrasis, this device is not massively employed, not even in present-referring contexts (this is also true of past-referring contexts, but there the Imperfect plays its role as an explicit imperfectivity marker). Thus, one has to admit that Italian children have very early experience with a relatively underdetermined ATAM system, where contextual inferences often turn out to be the decisive factor.

In order to check the actual acquisition path, the productions of the three Italian children studied (in Bertinetto et al. in press) were labelled according to a specifically designed strategy, whereby latent as well as explicit categories are separately marked (Bertinetto & Nocetti 2006). Needless to say, the more languages compared, the clearer the picture. Remarkable convergences have already emerged in the study of one Austrian German child (Freiberger 2008).

### **3. Steps in grammatical learning**

The acquisition of verbal morphology shows that, despite similarities, each child follows a different path of morphological categories acquisition. For this reason, and with the aim of identifying the moment when significant variations occur, the verbal morphology development will be separately described for each of our three learners. It will be here proposed that relevant changes in children's linguistic behaviour reflect a parallel development in their cognitive system. The variations occurring in child speech will thus be interpreted as marking different developmental periods. This in turn implies that each period is essential for the transition to, and the development of, the next phase.

The most relevant variations in the verbal system highlight the moment when children begin to productively use the various morphological suffixes, namely - in our case - when they begin to assign ATAM features to verbs. This especially occurs when: (1) verbs begin to be actively manipulated by the child, so that different forms of the same verb surface for example, in different person and number endings, or in tense and mood endings; (2) hypercorrection errors occur, showing overextension of specific

features. As for (1), it is useful to distinguish when: (i) overt temporal features, apart from the Present tense, appear (i.e. Past and Future tenses); (ii) overt aspectual features emerge (in the case of Italian, Compound Past and Perfect Participle vs. Imperfect).<sup>1</sup>

### 3.1. Camillo

Camillo's data present four main developmental periods with regard to ATAM categories. The first phase, which ends at 2;2, is characterized by the absence of overt ATAM categories. The verbs appear to be rote-learned, as shown by the absence of paradigms – either for person / number or tense – and by the lack of agreement with the extra-sentential arguments (e.g., *corre* 'runs' employed with both pl. *bisonti* 'buffaloes' and sg. *lepre* 'hare'). In addition, the verbs are bound to the context of utterance and rely on the adult's interpretation.

In the second period, from 2;2 to 2;5, perfective past-referring tenses (Participle and CP) and future-referring presents (i.e. non-current or intentional present) emerge. Despite the appearance of these forms and the emergence of the first tense and person contrasts with different verbs, the verb forms are often used in a deviant way with respect to adult speakers. The above variations can thus only be considered as precursors of fully-fledged ATAM categories. Namely, from 2;2 to 2;5, the child has not yet completely abandoned the deictic reference to the context that characterizes his early production. Nevertheless, together with the Present tense referring to current actions or expressing an attitude or routine, some verbs now describe non-current actions, either by referring to an imminent future (often expressing intention, e.g. *alzo* 'I (shall) rise') or, but only in a single case, by substituting a Compound Past (e.g. *casca* 'it falls' for *è cascato*). Modality is expressed by the bare Infinitive, which emerges at 2;3 although, not yet preceded by a modal verb. In the same month, the first person paradigm within a single verb appears (e.g. PR.1s *casco*, PR.3s *casca* 'fall'), showing that the child begins to distinguish the different performers of an action. In addition, the first CP (e.g. *sono scappati* '(they) have escaped') emerges, although this tense will only become productive at 2;5. Moreover, at 2;3, the adjectival Participle (i.e. *rotto* 'broken') co-occurs with the PR *rompo* 'I break'.

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<sup>1</sup> In the speech of Italian children, the Compound Past often appears in a reduced form, with auxiliary deletion. For some purposes, it is thus useful to jointly consider the Compound Past and the (perfect) Participle. To this end, we use the label PF, specifically meaning 'perfective Past'.

Although the two forms might not yet be related to one another for the child, they are contrasted in two ostensive contexts connecting two events. Therefore, they can be seen as precursors of further temporal and aspectual oppositions.

The third period, from 2;5 to 2;7, is characterized by the expansion of Present and Past forms with different verbs. In addition, there are other person / number (e.g., PR.3s *è* / PR.3p *sono* ‘be’) and gender paradigms (e.g., PT *lasciat-o* / *lasciat-a* ‘left-ms / -fs). Some verbs also show tense (i.e., CP vs. PR) as well as aspectual (imperfective vs. perfective, i.e. PR vs. CP / PT) paradigmatic oppositions. At 2;5 both past- and future-referring adverbs appear in the corpus (*prima* ‘first’, *poi* ‘then’). Although they are not yet used deictically, they work nevertheless as textual anchors, highlighting the sequencing of events. The fact that they emerge simultaneously with the earliest tense oppositions, can be regarded as an overt sign of the cognitive development of temporality. In this period, the child overgeneralizes the suffix *-i* as a marker for the second person singular of the verb, establishing an equation from IMP.2s *vien-i* ‘come’, PR.2s *dorm-i* ‘you sleep’, PR.2s *mang-i* ‘you eat’) to the erroneous Imperative form \**guard-i* (cf. PR.2s *guard-i* ‘look’ vs. IMP.2s *guard-a* ‘look’).

The next period, from 2;6 to 2;7, is characterized by increasing productivity of two- and three-member paradigms. Besides person and number contrasts (e.g., PR.3s *fa* / PR.3p *fanno* ‘do’), one finds tenses oppositions between Present and Past (e.g., PR.1s *prendo* / PT.ms *preso* ‘take’, PR.3s *fa* / CP.2s.ms *hai fatto* ‘do’) or Past and Infinitive, the latter carrying a modal value (e.g., CP.1s.fs *ho tagliata* / IF *tagliare* ‘cut’).

The last period goes from 2;8 until the end of the recordings (and beyond) and is marked by the emergence of the Imperfect, which overtly marks imperfectivity (as opposed to perfectivity) in the past. Although the first Imperfect appears at 2;8 (3s *picchiava* ‘beat’) and the first two-member paradigm occurs at 2;10 (PR.3s *c’è* / IPF.3p *c’erano* ‘there is/were’), it is only at 3;2 that it becomes fully productive when it is used with 5 different verbs. In this period, the large number of two- and three-member paradigms shows a great deal of productivity in the use of verb morphology. (e.g., IMP.2s-obj.clit.ms *di-llo*, CP.3s.ms *ha detto*, PR.2s *dici* ‘say’, PR.1s *prendo*, IF *prendere* / CP.1s.ms *ho preso* ‘take’).

### 3.2. Raffaello

Similarly to Camillo, Raffaello's first period, from 1;7 to 1;9, shows context-bound verbs appearing in just one form. They are mainly in the Present and Imperative, the only forms available to the child at 1;7, or in the Infinitive and (perfect) Participle in its adjectival function, appearing at 1;9.

From 1;10 onwards, Raffaello's data show a gradual but constant development. In the time lag from 1;10 to 1;11, the child begins to employ different forms of the same verb in his first two-member paradigms, namely the oppositions between 1s and 2s (PR *sbuccio / sbucci* 'peel') and between the Imperative and the adjectival Participle verb (IMP.2s *chiudi* / PT-Adj.fs *chiusa* 'shut down'). It is difficult to ascertain whether, at this point in time, the child has already assigned a real grammatical value to suffixes and, consequently, whether the forms are paradigmatically connected or rather independently used in different contexts. Nonetheless, they may be good precursors of the next period's fully-fledged paradigms. The emergence of the adjectival Participle (fs) *chiusa* occurs simultaneously with the imminent-future Present, which appears to be the initial step towards deictic future-reference. In addition, the past-referring Present appears concurrently with the first Compound Past. Temporal reference thus begins to clearly emerge, either implicitly, with the Present used to express non-current (i.e. intentions and imminent actions) as well as past events, or explicitly, by means of the Compound Past and the adjectival Participle.

The third period begins at 2;0 and in the course of this time span Raffaello further develops person and number paradigms (e.g., PR.3s *sono* / PR.3p *è* 'be', PR.2s *mangi* / PR.2p *mangiate* 'eat'). As the Compound Past is extended to other verbs, overgeneralization errors appear (e.g. PT.fs *\*scrivota* for *scritta* 'written', PT.fs *\*rompata* for *rotta* 'broken'). This demonstrates the degree of productivity of the regular Participle-forming-rule, as well as the growing independence from the input. Most importantly, this new phase is marked by the appearance of the first Imperfect, and of two- and three-member paradigms opposing Compound Past and Present (CP.1s.fs *ho fatta* / PR.3s *fa* 'do', CP.1s.ms *ho schiacciato* / PR.1s *schiaccio* 'smash'), Present and Imperfect (PR.3s *è* / IPF.3s *era* 'be') and Present, Participle, and Imperfect (PR.1s *scappo* / PT.ms *scappato* / IPF.3s *scappava* 'escape'). The latter paradigm is particularly important in the child's development, as it contrasts the aspectual values of perfectivity

(PT) and imperfectivity (IPF) in the past. The Imperfect emerges already at 2;0, but is initially employed with only one or two verbs in each recording. It begins to be used with a wider range of verbs in the fourth period, starting at 2;5. Here Raffaello, alone among our three children, occasionally uses the Present Progressive, thus marking imperfectivity with overt morphological devices also in the present. By contrast, even considering the not infrequent use of the non-current Present, this child never employs explicit morphology for future-reference; interestingly, however, he employs a future-referring adverb at 2;1 (i.e., *domani* ‘tomorrow’, presumably not to be read in its literal meaning).

Sound evidence of development in the aspectual domain is the productivity shown at 2;7 by the paradigmatic oppositions of Compound Past and Imperfect (CP.3s *è stato* / IPF.3s *era* ‘be’; CP.1s *ho fatto* / IPF.3s *faceva* ‘do’; CP.3s.ms *è andato* / IPF.3s *andava*, ‘go’; CP.1s.ms *ho messo* / IPF.3s *metteva* ‘put’), offering explicit perfectivity / imperfectivity contrasts. At this point in time, Raffaello also uses future-referring adverbs to deictically speak of future events (*dopo* ‘after’).

### 3.3. Rosa

Rosa’s data present some differences with regard to both order and time of appearance of the various verbal features. Despite the precocious appearance of morphological markers, she seems to delay their productive use, thereby ending up less accurate than the other children. This obviously poses a problem in deciding how to distinguish the different acquisitional periods. Therefore, the divisions here proposed are only tentative.

From 1;7 to 1;9 Rosa uses rote-learned verb forms in the Present and in the Imperative. At 1;7, her data show a past-referring use of the Present, antedating by three months the appearance of the Past tenses, a larger time span than that of the other children. Future-reference is absent however, for one does not find either the Future or future-referring adverbs. Explicit morphology for past-reference appears as early as 1;10 with the first Compound Past. At the same time, some Present forms express a non-current reading (intentional interpretation), showing that the child begins to disengage her speech from the *hic et nunc* of the situational context. Moreover, at 1;10 she begins to make use of different persons of one and the same verb (PR.1s *casco* / PR.3s *casca* ‘fall’), and a month later the first two-member paradigms emerge, opposing Present and



Participle (PR.3s *vede* / PT.ms *visto* ‘see’; PR.1s *cascol* / PT.ms *cascato* ‘fall’), Infinitive and Imperative (IF *levare* / IMP.2s *levi* ‘remove’), as well as different forms of the Present (1s *metto* / 2s *metti* / 3s *mette* ‘put’). In the same recording, Rosa also makes two errors of overgeneralization with two Imperative.2s forms, i.e. *\*levi* for *leva* ‘remove’ and *\*meta* for *metti* ‘put’. At 2;2, apparently, a new period begins, with the emergence of the first Imperfect (3s *era* ‘was’), which overtly marks imperfectivity in the past. From 2;2 to 2;11, concomitant with a modest lexical expansion, two- and three-member paradigms of tense and person flourish, and PR, Participle and CP forms are employed with a great many different verbs, showing that the distinction between present- and past-reference is now productive. At 2;2, deictic future-referring adverbs (*dopo* ‘after’, *poi* ‘then’) emerge. Past-referring adverbs emerge some months later however, at 2;10. The first contrast between Imperfect and Participle emerges in the very last period, at 3;0 (IPF.1s *trovavo* / PT.ms *trovato* ‘find’), exhibiting the overt aspectual opposition perfectivity / imperfectivity.

### 3.4. Comparison

Our three L1 Italian learners exhibit significant similarities, as well as some difference.

As for temporality, a reasonable expectation would be that cognitive maturation precedes grammatical maturation. A good reason for this claim would be the observation that temporal adverbs on the one hand, and non-present referring uses of the Present on the other hand, emerge earlier than the first occurrences of Past or Future tenses. This, however, is not to be found in our data. In all three children the first Past perfective tenses (CP and PT) emerge simultaneously with the first occurrences of the non-current and past-referring Present, and in general antedate the appearance of future-referring adverbs. Interestingly, in all children the latter adverbs emerge simultaneously with or a little after the time when the individual child begins to distinguish between past- and present-reference by means of explicit tense morphology. Considering that the Future is never used by the children within our observation window, one might surmise that they need the support of lexical devices (i.e., future-referring adverbs) to complete the pattern of

present-, past- and future-reference.<sup>2</sup> Conversely, the overt expression of past-reference by means of the Compound Past and the (perfect) Participle supposedly explains why past-referring adverbs appear so late in Camillo and Rosa and are never used by Raffaello.

As for aspect, one might expect (in a parallel fashion) this category to be cognitively activated, at the covert level, under the contextually-bound uses of the Present in its imperfective vs. perfective readings. However, the lack of explicit evidence makes this claim completely unwarranted. What one can soundly assert, however, is that the first overtly marked aspect expressions consist in the appearance of Past perfective tenses (CP and PT). The Imperfect, by contrast, emerges definitely later, except for one sporadic early occurrence in Raffaello.

Thus, in one case (temporality) we have good reason to claim that grammatical maturation accompanies cognitive maturation, rather than presupposing it. In the other case (aspect), the only discriminating evidence is provided by the emergence of overt morphological markers, for highly ambiguous morphological devices (such as the Present) could not possibly be regarded as valid triggers for L1 learners. Taken together, these findings suggest that the child's grammatical development needs the support of explicit morphological structure.

#### **4. Lexical vs. grammatical expansion**

A number of recent works on early language conducted within a cognitive and functionalist approach have claimed that there exist strong interdependencies between lexical and grammatical development, thereby supporting an integrated approach to language acquisition. For instance, Marchman and Bates (1994) reported a non-linear relation between lexical expansion and the acquisition of Past tense morphology. In particular, they found that the number of verbs marked for Past tense accelerated around the age of 24 months. They attributed this fact to the attainment of a “critical mass” of verb types. This hypothesis has found independent confirmation in a number of different

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<sup>2</sup> The Future is also quite rare in the input. For instance, Camillo's input contains 52 Futures (mostly Simple) against 801 fully-fledged Past tenses (CP + IPF; ratio 0,065). The most extreme situation is that of Rosa: 9 Futures against 1044 Past tenses (ratio 0,008). No wonder, then, that the Future appears so late in the children's speech.

languages. In a longitudinal study on the acquisition of periphrastic constructions in two French children and two Austrian children, Bassano *et al.* (2004) found a phase of “verb lexical spurt” (between 1;9 and 2;3), closely followed by a phase of rapid, non-linear acceleration of morphology expansion. Individual differences notwithstanding, this developmental pattern was found in all four children, suggesting itself as a pervasive feature. The correlation between lexical expansion and grammatical development has important consequences for our models of early language. Firstly, it supports the continuity hypothesis between these two domains, against “dual-route” models that tend to radically contrast grammar acquisition and lexical development in terms of different cognitive processes and resources (cf. Pinker and Ulman 2002). Secondly, the particular shape of this development, i.e. the fact that morphological expansion occurs after a lexical spurt, supports the idea of the centrality of non-linear dynamics in early language acquisition. That is to say, the lexicon must reach a certain threshold of complexity – in terms of quantity – before grammar acquisition in general, and ATAM morphology acquisition in particular, can significantly start.

The purpose of this section is to investigate the above question in our three children. We shall focus on two issues: i) the shape of verb lexical acquisition, to evaluate whether a non-linear acceleration similarly to the lexical spurt reported by Bassano *et al.* (2004) occurs; and ii) the relation between the verb lexicon expansion and the acquisition of ATAM morphology. The first issue is related to the well-known phenomenon of *vocabulary* (or *word*) *spurt*, i.e. the rapid acceleration in the expansion rate of the child’s vocabulary, usually claimed to occur approximately after the first 50 words. The importance of this phase of non-linear vocabulary growth is obvious, for it is often regarded as the proof of a significant step in cognitive development. Its wide popularity notwithstanding, the vocabulary spurt as a general and universal feature of language acquisition is not uncontroversial. For instance, Bloom (2000: 35) claims that “there is no sudden acceleration in word learning. *The word spurt is a myth*” [our emphasis]. Similarly, Ganger & Brent (2004) report that only 5 children, out of a group of 38, showed evidence of a phase of non-linear expansion in vocabulary growth. They even claim that the very ascertainment of a vocabulary spurt is not an obvious task, for it strongly depends on the particular method used to estimate the vocabulary growth, and to

identify the possible phases of non-linearity. Therefore, although, on the one hand, the existence of a general phase of vocabulary explosion would have important consequences in the understanding of the actual child learning patterns and of its underlying dynamics, one should be aware that it might be hard to identify a clear phase of discontinuity in lexical development.

With these methodological *caveats* in mind, we investigate the presence of a non-linear acceleration phase in the verb lexicon growth by analyzing the variation in time of the child *verb expansion rate* (V-rate), i.e. by measuring the incremental rate of verb quantity growth with respect to noun quantity growth in our children's recordings. The formula of V-rate we used is as follows:

$$\frac{V_{t_{i+1}} - V_{t_i}}{N_{t_{i+1}} - N_{t_i}}$$

Given a series of longitudinal recordings,  $V_{t_i}$  and  $N_{t_i}$  are, respectively, the cumulative number of verbs and nouns types produced by the child in all the recordings (from  $t_1$  up to  $t_i$ ).  $V_{t_{i+1}} - V_{t_i}$  and  $N_{t_{i+1}} - N_{t_i}$  represent instead the number of new verbs and noun types produced by the child in recording  $t_{i+1}$ . By plotting the V-rate in time, we can inspect the resulting curve to identify different growth phases of the verb lexicon. In particular, a curve with a positive slope will correspond to a faster growth rate of the verb lexicon with respect to the noun lexicon growth rate, whereby the child produces more new verbs than new nouns. Conversely, a curve with a negative slope will correspond to a slower growth rate of the verb lexicon with respect to the noun lexicon, whereby the number of nouns expands faster than the number of verbs. Finally a flat curve will correspond to a phase in which the expansion rate remains more or less constant for both verb and noun lexicons. The advantage of the V-rate is that it allows us to avoid problems due to the different size of the various recordings, which hinder the reliability of other common indexes of lexical richness, such as Type / Token Ratio. Moreover, considering that we are specifically interested in the verbal lexicon growth, the V-rate allows us to contrast the rate of appearance of new verbs vs. new nouns.

In Fig. 1, we report the V-rate development in our three children. The x-axis indicates the child age as measured in months. Besides a fairly high degree of individual variation (parallel to the one mentioned in section 3), we can find a common pattern. Both Rosa and Camillo show a first phase in which verbs increase at a much slower rate than nouns. Subsequently, there is a sharp inversion of this trend, at approximately 2;0 for Rosa and 2;2 for Camillo. After this, the V-rate begins to increase, revealing a phase of fast verb expansion. Raffaello differs from the other two children in that he lacks the negative-slope first phase: for him there is a steep increase in V-rate, i.e. a fast verb growth rate, from 1;7 to 2;0. This disconfirms Tomasello’s (2003: 46) claim, according to which “Italian children show almost as strong a noun advantage as American children”. Rather than be taken as strictly language-dependent (as in the case of Korean, often claimed to exhibit verb-advantage), this tendency should be regarded as child-dependent, with differing individual inclinations.

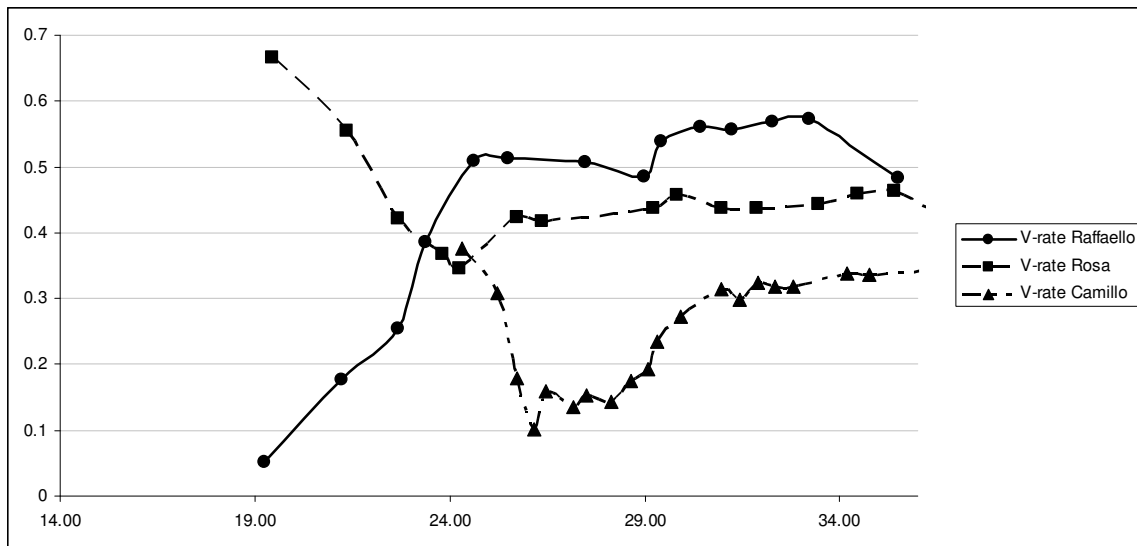


Figure 1 – Development of V-rate

These differences aside, there are three features shared by all children. First, the V-rate development has a clear non-linear character, with points of discontinuity marking different phases in the growth of the verbal vocabulary. Second, all the children show a phase in which verbs grow at a much higher rate than nouns: we take this as evidence that

they all show a phase of verb spurt, like the one reported by Bassano *et al.* (2004). Third, the verb spurt phase leads to a well-distinguished phase of an almost flat slope, meaning that the rate of verb / noun growth ratio becomes more or less constant (at least in the relevant period). However, children differ on a number of factors: SPURT TIME (Raffaello: 1;7 - 2;0; Rosa: 2;0 - 2;2; Camillo: 2;2 - 2;7); SPURT DURATION AND INTENSITY (Rosa's spurt period is much shorter and weaker than those of Raffaello and Camillo); PRESENCE VS. ABSENCE OF A NEGATIVE EXPANSION PHASE of verbs with respect to nouns.

To address the issue of the correlation between the verb expansion dynamics and the emergence of the ATAM morphology, we plotted the individual child's V-rate against the cumulative number of Past verb forms produced with a perfective marker (PF in the figures, including both CP and PT; cf. fn. 1) as opposed to the imperfective marker (IPF). Raffaello (Fig. 3) and Camillo (Fig. 5) show a similar pattern, where the production of perfective forms is characterized by a steep increase, occurring shortly after the verb spurt phase. By contrast, Rosa's pattern (Fig. 4) is more complex, with a more linear developmental trend of PF morphology. There is some acceleration in the production of PF forms, but this occurs much later than the verb spurt. However, it is worth remarking that even Rosa's verb spurt is much shorter and weaker than that of Camillo and Raffaello. Thus, Rosa differs from the other two children with respect to both lexical and grammatical development, and this can be taken as further evidence of the strict interdependency of these dimensions. As for the imperfective morphology, one can observe that these (supposedly marked) forms expand in a much more linear fashion. The corresponding weak acceleration spots appear much later than the verb spurt, at approximately 3;2 for Camillo, 3;0 for Rosa and possibly 2;5 for Raffaello. The lack of clear non-linear phases with the Imperfect may be due to the fact that the Past imperfective morphology appears later than the perfective one, with the latter possibly acting as a sort of "pathfinder" for the whole ATAM system (recall that the Present is both temporally and aspectually ambiguous).

To sum up, our Italian data substantially confirm the situation reported by Bassano *et al.* (2004) for French and German. The comparison of verbs and nouns growth rate allows us to conclude that, individual differences notwithstanding, our three children showed a phase of rapid, non-linear acceleration in their verb vocabulary expansion rate,

although this is not equally sharp in each case (compare Camillo to Raffaello and Rosa). Significantly, this verb spurt phase is followed by a phase of fast acceleration in the production of verb forms marked with perfective morphology. These facts together support the hypothesis of a strict continuity of lexical and grammatical development, both characterized by complex, non-linear dynamics. Moreover, the data also confirm the importance of a critical threshold of internal complexity in the lexical system as a precondition to acceleration of grammar development.

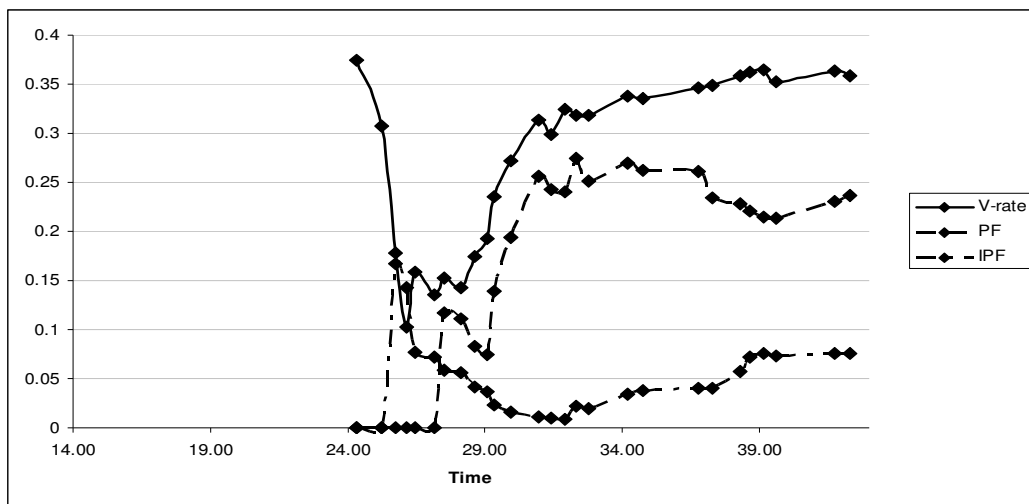


Figure 2 – V-rate and TAM morphology expansion in Camillo

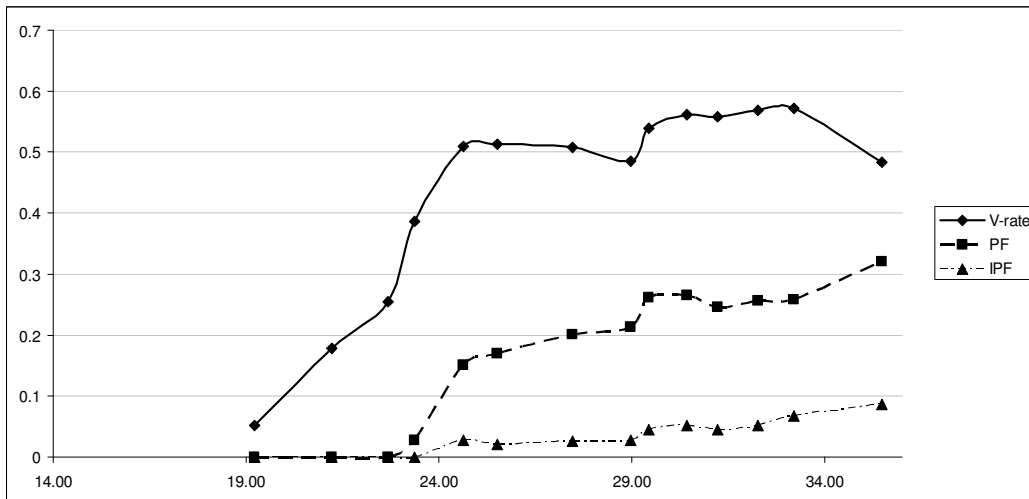


Figure 3 – V-rate and TAM morphology expansion in Raffaello

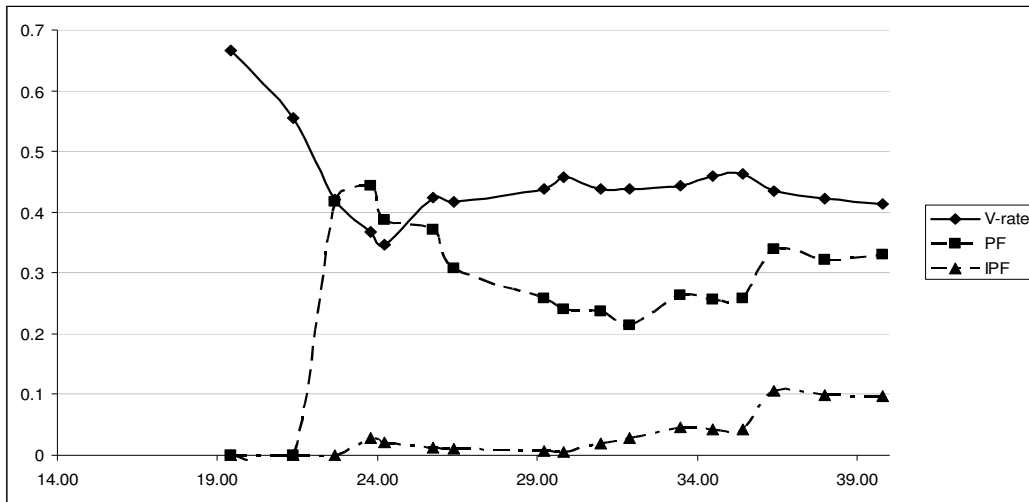


Figure 4 – V-rate and TAM morphology expansion in Rosa

### 5. On lexical and grammatical complexity

The dynamics of ATAM features acquisition, as studied in our three children, allows for some interesting concluding remarks.

Sect. 3 presented evidence that, over and above the individual discrepancies, Italian children show significant similarities in their developmental paths. Firstly, although the first clear evidence of cognitive maturation in the temporality domain appears to be differently timed from child to child (earlier in Raffaello and Rosa than in Camillo), all children agree in one important detail: namely, cognitive and grammatical maturation seem to go hand in hand; neither temporal adverbs, nor the non-present-referring uses of the Present precede the first occurrences of Past tenses. Secondly, the first overtly (i.e., morphologically) marked expression of aspect consists in the appearance of Past perfective tenses (CP and PT), whereas the Imperfect emerges significantly later. Needless to say, aspect could be implicitly active, cognitively speaking, in the contextually-bound uses of the Present (as either imperfective- or perfective-oriented), but there is no way to ascertain this. It therefore seems safer to generalize the preceding observation regarding the respective timing of cognitive vs. grammatical maturation. In other words, the former is assumed not to antedate the latter; rather, the emergence of morphologically overt markers seems to exert not only a robust triggering effect, but also a significantly more substantive effect than the lexical support provided by temporal adverbs.



In sect. 4, the dynamics of lexical vs. morphological maturation were compared. Here again, two points emerge as especially relevant. Firstly, all three children show, to varying degrees, a distinctive phase of verb spurt, where new verbs are learned at a faster rate than nouns. Secondly, the attainment of a substantial lexical density's "critical mass" is conducive to the emergence of grammatical competence. Apparently, the analytic competence, as shown by the child's ability to generalize (and possibly over-generalize) the relevant morphological commutations, awakens only when the learner has sufficient lexical material to operate upon. This confirms the findings by Laaha & Gillis (2007), according to which a relatively high level of complexity needs to be attained, in order for grammatical maturation to acquire momentum, namely for the learner to find the key to the system organization. Indeed, the more complex the target language, the faster the learning rate. This is all the more remarkable, as one considers how dramatically morphological complexity can hinder the acquisition capacity of L2 learners.

Rather than being an obstacle for language learning, therefore, lexical and morphological complexity act as catalysts for the acquisition process. Note that system complexity is also a function of the degree of its redundancies and inner structuring. Complex natural and social systems like language are obviously endowed with a high degree of internal organization, counterbalancing the high-dimensionality of the possible system states. One might justifiably consider the learning child as a sort of genetically programmed "complexity detector", able to exploit the recurrent patterns in the complex input distribution, finding out the key to its organizational principles, i.e. the key to its grammar.

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