

On the Relation between Input Frequency and Acquisition Patterns from a Cross-Linguistic Perspective

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1. Introduction

Parameter setting approaches may be criticized for a number of reasons. One of them concerns the apparent optionality in acquisition stages. It has been observed for many grammatical domains, e.g. subject pronouns, finite inflection, copula verbs, and determiners, that children pass through variation stages. For instance, in one and the same recording session a child may produce bare and determined nouns under similar syntactic, semantic, and pragmatic conditions.

- (1) Adult: oh / c'est quoi ça?
 "oh / what's that?"
Child: girafe /
 "giraffe"
Adult: hein? / c'est quoi ça? /
 "what? / that's what?"
Child : une girafe /
 "a giraffe"

(Alexandre 2;2,27)

Some scholars have attempted to uncover rules underlying this variation. For instance, root-infinitives were argued to coincide with a modal interpretation. True or not, this is unexpected under the assumption that children's linguistic behaviour is guided by one syntactic parameter-setting. Roeper (1999) elegantly solves this issue by suggesting *universal bilingualism*. Accordingly, every speaker of a language has a set of mini-grammars for a particular grammatical domain. Variation is now explained by children's simultaneous access to more than one grammar.

Secondly, it is questionable how parameters can be set in a linguistic environment that is heterogeneous for most grammatical domains. For example, we occasionally find subject-drop in English, though it is not a *pro*-drop language.

- (2) Care for more coffee? (waiter at *Denny's*, speaker of AE)

Given the child converges on one grammar, how does he/she know what the target is? The multiple grammar-solution can account for this on the assumption that

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grammars continue to coexist even in the adult system. In other words, the child does not need to converge on one parameter-setting, because the adult system displays more than one option.

Thirdly, classical parameter-setting approaches do not account for the gradualness of the acquisition process. In this respect, frequency sensitive models should be favoured, but they raise other questions. In fact, not all frequent phenomena are acquired early, and rare occurrence does not guarantee late acquisition. The root-infinitive phenomenon is often mentioned as a case in point because root infinitives are (arguably) absent in the adult language.

The present contribution is couched in terms of a variational approach to language acquisition (Yang 2002), which combines an experience based learning model with the assumption of an innate grammar. The study is concerned with the acquisition of determiners in bilingual children acquiring German simultaneously with French or Italian. It will be demonstrated that the rate of learning coincides with the relative frequency of overtly realized determiners in the target language. The paper is structured as follows. Section 2 will give an introduction to the Variational Model, section 3 is concerned with NPs and DPs as possible options in UG, sections 4 and 5 provide the empirical part of this work, relating determiner omission in the adult and child grammars. A short conclusion is given in section 6.

2. A variational approach to language acquisition

The Variational Model (Yang (2002)) is based on the idea of coexisting grammars that compete during the acquisition process and get reinforced or punished depending on whether they can parse incoming sentences. Yang draws inspiration from biological evolution. In the Lamarckian tradition, evolution was thought to be transformational: it takes place because each individual organism undergoes the same change. Darwinism, by contrast, holds that evolution is variational. Individuals within a population differ in some properties. Some types, with a particular combination of properties, persist, while others gradually disappear. Language acquisition, too, may be seen from a variational perspective: acquisition would be the gradual change in the distribution of I-language grammars.

The Variational Model presupposes the learner's simultaneous access to several grammars with respect to particular syntactic domains. The number of possible human grammars is supposed to be finite. The model is in line with the strong continuity assumption: the learner has access to UG-defined grammars from the outset of the acquisition process. Each grammar is paired with a weight p , corresponding to the measure of prominence of a grammar in the learner's language faculty. The weight p changes during the learning process until reaching its ultimate value, which equals the distribution of the particular grammars in the target language. The approach is one of grammar competition. Grammars that succeed in analysing a sentence are rewarded and grammars that fail are punished. To parse an incoming sentence, one of the grammars is chosen randomly, but grammars with a higher weight are more likely to be chosen. Not all input sentences are relevant to the acquisition of particular grammatical phenomena and consequently not analysable with present grammars. Input sentences that can be analysed and that lead to changes in p are called signatures.

The model makes straightforward predictions with respect to the rate of learning. Each grammar has a penalty probability, which corresponds with its proportional distribution in the target-system. A grammar that is hardly or not at all represented in the target-system, as are bare nouns in French, has a high penalty probability and can be eliminated very fast. To give an example, let us assume that nominals have two possible representations in UG (cf. section 3): they may project to the NP-layer, or to the DP-layer. Let us call these possible representations G_{NP} and G_{DP} . G_{NP} and G_{DP} are competing grammars. G_{NP} is the only target-grammar. That is, nominals are used at target-level when the weight p of G_{DP} is 0 and p of G_{NP} is 1. S is a sentence. While all incoming sentences are of the form S_{NP} , the child's output should reflect that the grammar which is prevalent in the environment slowly rises to dominance and should roughly look as follows:

Early in acquisition:

$S_{NP}, S_{NP}, S_{DP}, S_{DP}, S_{DP}, S_{NP} \dots$

Intermediate in acquisition:

$S_{NP}, S_{NP}, S_{DP}, S_{NP}, S_{NP}, S_{DP} \dots$

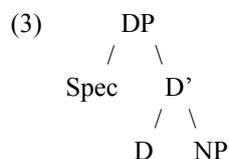
Completion of acquisition:

$S_{NP}, S_{NP}, S_{NP}, S_{NP}, S_{NP}, S_{NP} \dots$

An immediately evident problem is that in reality children do not start off with the more complex DP-structure, especially in languages lacking articles, while the opposite has often been observed. The issue may be solved, however, by assuming that the child proceeds from the default option, which would be G_{NP} . At the outset of acquisition the weight of G_{NP} would be 1 and that of G_{DP} would be 0.

3. Preliminaries for the DP-domain

The present study is concerned with the acquisition of nominal syntax. Therefore, some clarification about the structure of nominals is appropriate. Since Sziabolcsi's (1983) and Abney's (1987) pioneering works, nominal utterances such as *the cat* are thought to have the syntactic structure in (3).¹



Researchers in the generative field largely agree that determiners cannot be located in specifier positions but must head their own projections, as do other functional

¹ More elaborate structures have been proposed for nominals (see e.g. Giorgi & Longobardi (1991)) and what I am proposing is consistent with it, but for the present purpose only the NP and whether there is a DP above is relevant.

categories. However, there is no consensus about the structure of bare nominals, as e.g. in *I like cats*, nor about the question of whether nominals universally project to be DPs regardless of the presence of a determiner. This contribution is in line with the work of Chierchia (1998), Roeper & De Villiers (1995), Pérez-Leroux & Roeper (1999), proceeding from the assumption that NP and DP represent possible options in UG. In what follows, I will give some arguments in favour of this claim.

According to the *Correspondence Law* (Vergnaud & Zubizarreta 1992:612), the N-layer should be associated with *types* or *kinds* and the D-layer with *tokens* or *reference to specific individuals*. The authors were concerned with inalienable possessives in French, such as (4).

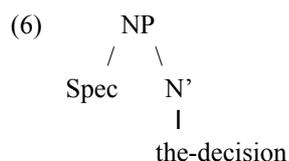
- (4) Les hommes ont levé la main.
 the men have raised the hand
 “The men raised their hands.” (Vergnaud & Zubizarreta 1992)

In the example, *la main*, a noun with a singular definite article, does not refer to any specific hand but has a type-reading, denoting the concept of hands in general. Although the Correspondence Law links the NP-DP distinction to the difference between specific and non-specific readings, Vergnaud & Zubizarreta do not consider a change in the phrase structure of the DP but assume that the definite article in cases like (4) is an expletive one that does not bear any denotational index. De Villiers & Roeper (1995) take a different position. They are also concerned with type-readings, but they argue that such nominals represent NPs rather than DPs.

Recall that the functional category DP constitutes a binding domain. De Villiers & Roeper show determiner-noun sequences for which this generalization does not hold, suggesting that their exceptional status is due to the missing DP-layer. The sentences in (5) contain a light-verb construction in which *the decision* has a type-reading. Under co-reference with *the boy*, the use of the pronoun *him* (which must be free in its binding domain according to Binding Principle B) is ungrammatical. By contrast, the use of the reflexive *himself* (which must be bound in its Binding Domain according to Binding Principle A) turns out to be fine, suggesting that *the boy* can bind *himself* despite of the intervening determiner-noun sequence.

- (5) a. *The boy_i made *the decision* to shave him_i.
 b. The boy_i made *the decision* to shave himself_i.

Provided that *the decision* represents an NP, the question about the position of the article arises. As specifier positions usually host maximal projections, the article is unlikely to occupy SpecNP. De Villiers & Roeper propose cliticization to the NP. Put differently, non-specific NPs may appear as NPs with cliticized articles, as in (6), while specific NPs require a DP.



Similar to light verb constructions, the existence of different possessive pronouns for bound and unbound readings in languages such as Swedish speaks in favour of the “NP-hypothesis”. The Swedish possessive pronouns *hans/ hennes* “his/ her” cannot normally have a bound reading, as illustrated by the example (8). For a bound reading, the use of a reflexive possessive, such as *sin/ sitt* “his/ her”, is required, as exemplified by (7).² It may be deduced that *hans* represents a DP and hence a barrier prohibiting a binding relation, while *sin* has the status of an NP and constitutes no barrier (see also De Villiers & Roeper (1995)).

(7) Lisa_i klappar sin katt_i. (bound)
 “Lisa caresses her (own) cat.”

(8) Lisa_i klappar hennes katt_j. (unbound)
 “Lisa caresses her (=someone else’s) cat.”

The NP-hypothesis receives further confirmation from the *Inherent Binding Construction* (IBC) (Pérez-Leroux & Roeper (1999)). The IBC contains a bare nominal and is characterised by having an inherently bound interpretation for the possessor. For instance, the bare noun *home* in (9a) can only have a narrow scope reading: each fireman went to his own house. This distinguishes the IBC from a parallel construction containing an indefinite, as in (9b).

(9) a. Every fireman went home.
 b. Every fireman went to a house. (Pérez-Leroux & Roeper (1999:2))

In contrast to full DPs, the modification possibilities of IBCs are restricted. Given that relative clauses and modifiers are attached at the DP-level, the reason why IBCs cannot take them must be the absence of the DP-layer (cf. (10-11a) vs. (10-11b)).

(10) a. Ellen visits a certain home.
 b. *Ellen visits certain home.

(11) a. Ellen visits a home that sits near the lake.
 b. *Ellen visits home that sits near the lake.
 (Pérez-Leroux & Roeper (1999:6))

Abstract nouns display another argument against a universal DP. They cannot usually be combined with a possessive. As the position for an overt possessive is SpecDP (Valois 1991), the absence of DP would again provide an explanation. Note also that a definite or indefinite article is not allowed in these constructions.

(12) a. Maria hat Recht.
 lit. “Mary has right.”

² Note, however, that the use of *hans/deras* “his/their” to mean *sin/sina* has become very common in Spoken Swedish, especially among younger speakers.

- b. *Maria hat ihr Recht.
lit. "Mary has her right."
- (13)
- a. Maria hat Hunger.
lit. "Mary has hunger."
 - b. *Maria hat ihren Hunger.
lit. "Mary has her hunger."
- (14)
- a. Maria hat gute Laune.
lit. "Mary has good mood."
 - b. *Maria hat ihre gute Laune.
lit. "Mary has her good mood."

In short, there is abundant evidence justifying that nominals do not always project to the DP-level. One may now further hypothesize that children initially follow principles of economy assuming that NP is the maximal projection for a noun. Roeper (1999) defines constraints on child language in terms of *Economy of Representation* (Chomsky (1995)). Accordingly, less structure and short movement are preferred over more structure and long movement if there is an option.

"Whatever is a universal requirement of all languages cannot be omitted. Therefore each claim of minimalism must be defended. For instance, if Determiner Phrases are universally present above Noun Phrases, then they should not be omitted, but if languages allow NP to occur by itself [... this ...] should be the first hypothesis." (Roeper 1999: 177).

This hypothesis is not inconsistent with the Variation Model, if we assume that the weights of G_{NP} and G_{DP} are initially set to a default value ($p_{NP} = 1, p_{DP} = 0$).

Another intuitive point in favour of the NP-option concerns the *Configurational Hypothesis* (Giorgi & Longobardi 1991:2). In stating that the structure of nominals parallels clause structure this idea played an important role when the DP-hypothesis was advanced. As for clauses, the left periphery is argued to have a complex structure, containing FinP and ForceP (Rizzi 1997). However, this complex structure may also be absent in some complement clauses, such as small clauses. If the parallel between clauses and nominals holds, the latter should not necessarily project the DP-layer.

In sum, there are a lot of arguments against a universal DP that is always projected. I will therefore depart from the assumption that NP and DP constitute possible representations for nominals in UG.

4. Determiner placement in the target-systems

This section deals with determiner omission in child-directed speech by adult speakers of French, Italian, and German. Simplifying, one may assume that each nominal syntagma that contains overtly realized material above NP leads to an increase of p_{DP} . It remains open whether the child can distinguish between nouns with a specific reading (projecting DP) and nouns with non-specific reading (not

projecting DP). For the moment, suppose that the child considers all nouns to be specific by default, with or without an article.³ The portion of bare nouns is illustrated in Figure 1, which summarizes an investigation based on corpora of child directed speech containing between 2500 and 2700 nominal expressions per language. Proper names, compound nouns, and the expressions *faire mal*, *faire male* “hurt” are not included among the group of bare nouns. The penalty probabilities of the grammar competing with G_{DP} differ significantly ($p < 0.001$) between each language pair (French/ Italian: $\chi^2 = 56.83$, $df = 1$, $N = 5051$; Italian/ German: $\chi^2 = 36.22$, $df = 1$, $N = 5186$).

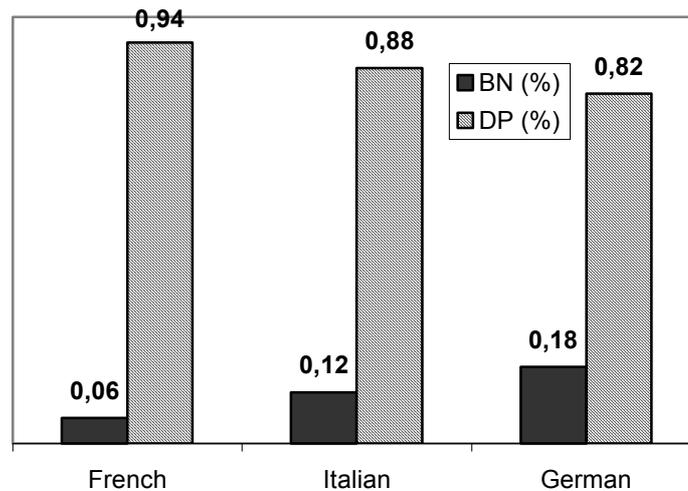


Figure 1: Distribution of bare nouns in child-directed adult speech

Given these penalty probabilities, the Variational Model makes clear and testable predictions for the rate of learning across languages. Since G_{NP} has the highest penalty probability in French, French children should converge to the target before Italian and German children. Italian children use determiners at target-level before German children. In section 5 we will show that this is borne out.

5. Determiner omission in acquisition

A number of studies have focussed on determiner acquisition in monolingual German, French, and Italian (see e.g. Eisenbeiss (2000) for German, Granfeldt (2003) for French, Bottari et al. (1993/94), Pizzuto & Caselli (1992), and Antelmi (1997) for Italian)). Comparing across studies, it seems that determiners appear earlier in the speech of children acquiring a Romance language than in children

³ This is a plausible assumption, since before age 2;6 children predominantly use Det+N sequences in referring to specific individuals, present and mostly visible in the extra-linguistic context. It is not clear whether the first determiners already encode specificity or whether they are only used to mark gender or agreement. Children may not be able to make the specific/ non-specific distinction, as it hinges on complex semantic and pragmatic knowledge. Possibly, the system is bootstrapped merely by surface structure.

acquiring a Germanic language, but different counting and evaluation procedures call for caution in drawing ultimate conclusions. Evidence is, however, also provided by cross-linguistic studies, in particular by Chierchia et al. (1999), Lleó & Demuth (1999), Guasti & Gavarró (2003). Clearly, children cease to omit earlier in the Romance languages than in the Germanic ones, while it is less clear whether the same asymmetry applies to the moment when determiners are ultimately used at target-levels (cf. Kupisch 2003).

5.1 Determiner omission in bilingual German/French and German/Italian

The following data have been collected in a research project on early bilingualism, comparing German-Italian and German-French bilinguals. The project is directed by Natascha Müller and it is associated with the acquisition group at the *Research Center on Multilingualism* in Hamburg, Germany. The children come from binational families in Hamburg. All have German-speaking fathers; their mothers are either French or Italian. Video-recordings have usually been conducted bimonthly from the age of between 1;6 and 2;2 until the age of 5. Two of the children are still in the process of being recorded. The investigation covers the period between the earliest recordings available until age 3, when determiner omission has normally stopped. The sessions took place at the children's homes. They were conducted by native speakers and contain between 30 and 45 minutes of spontaneous interaction in each language.

As the study deals with bilingual data, an important point to be addressed relates to language balance. Given the paper makes a statement about cross-linguistic variation, it is important to ensure that the behaviour of bilinguals mirrors that of monolinguals. As Meisel (1990:17) points out, "bilingual first language development does not differ in substantial ways from monolingual development". Many researchers share this opinion, but it is taken to imply *simultaneous* and *balanced* bilingualism. *Unbalanced* bilingualism, by contrast, is still a matter of debate. In particular, opinions vary regarding the question of whether the "weaker language" is merely quantitatively different from monolingual acquisition and retarded with respect to age, as argued by Müller & Kupisch (to appear), or whether it is qualitatively different and has traits of second language acquisition, as proposed by Schlyter and colleagues (e.g. Schlyter 1994). To circumvent the issue, I excluded the language developing more slowly with an average MLU difference of more than 0.3 in the investigated time span.⁴ An overview of the corpora finally chosen is provided in Table 1 (a star indicates that only one language was analysed).

The investigation aimed at a comparison of determiner omission in the bilingual children across languages. Though there may be inter-individual differences, a comparison with respect to age was favoured over an MLU-based one because the languages differ in terms of what they realize as free morphemes. To give an

⁴ It is often argued, and I agree on this point, that MLU is a necessary but insufficient criterion to measure language proficiency. In fact, other criteria, such as the number of utterances and the longest utterance per session, the increase of verb types and language mixing have been analysed as well and led to similar findings (cf. Kupisch & Müller (2002), Müller & Kupisch (to appear)).

example, the question *where does he go?* consists of two words in Italian (15a), three in German (15b), and six in French (15c).

- (15) a. Dove va?
 b. Wohin geht er?
 c. Où est-ce qu'il va?

Therefore, at a comparable point of their linguistic development children acquiring French may have higher MLU-values than children acquiring Italian.

Italian (+German)	French (+German)	German (+Italian)
Lukas (1;8-3;0)		Lukas (1;8-3;0)
Carlotta (1;8-3;0)		Carlotta (1;8-3;0)
Marta* (1;6-3;0)	Alexandre* (2;2-3;0)	Jan* (2;0-3;0)
Aurelio* (1;9-3;0)	Amélie* (1;6-2;6)	

Table 1: Overview of investigated corpora

Omission rates have been established based on the absolute number of determined nouns as opposed to illicit determiner omissions. Bare nouns that are licensed in the target language, as e.g. post-verbal mass and plural objects with nonspecific reference (or with unclear reference) have not been considered in German and Italian. The same holds for imitations, both with or without determiner, and uncertain cases, such as *der geht in krankhaus* “he goes to (the) hospital”, where the preposition *in* could possibly be a contraction of the preposition *in* and the article *den*, encoding a target-deviant case. The percentages were calculated for a two-month-span. The results are shown in Figure 2.

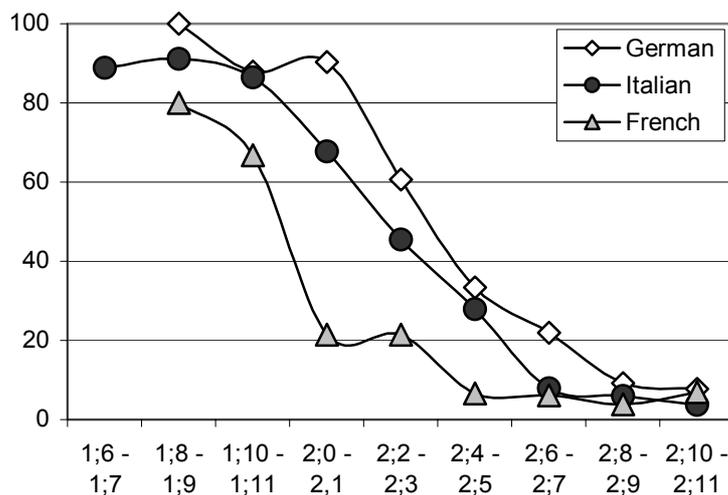


Figure 2: Determiner omission across languages

The order of convergence to the target is first French, then Italian, and finally German, as predicted by the Variational Model. Language differences were controlled by means of a χ^2 -test with respect to three phases: age 1;8 to 2;2, age 2;3 to 2;7, and age 2;8 to 3;0 (see Table 2 below). The results were highly significant ($p < 0.001$) for each individual difference in Phase 1 (French/ Italian: $\chi^2 = 188.03$, $df = 1$, $N = 1248$; Italian/ German: $\chi^2 = 51.97$, $df = 1$, $N = 1414$) and in Phase 2 (French/ Italian: $\chi^2 = 57.28$, $df = 1$, $N = 2914$; Italian/ German: $\chi^2 = 33.47$, $df = 1$, $N = 2629$). In Phase 3 only the contrast between Italian and German reached a significant ($p < 0.01$) value (French/ Italian: $\chi^2 = 0.12$, $df = 1$, $N = 2345$; Italian/ German: $\chi^2 = 7.70$, $df = 1$, $N = 2975$; German/ French: $\chi^2 = 2.43$, $df = 1$, $N = 1652$). I take this to suggest that the children have already converged to the target in Phase 3. Cross-linguistic differences are greater between French and Italian than between Italian and German (the divergence is obviously greatest between German and French). The contrast is more clearly pronounced in the two earlier stages and tends to disappear in Phase 3. An overview is provided in Table 2.

age	Phase 1 1;8 - 2;2	Phase 2 2;3 - 2;7	Phase 3 2;8 - 3;0
German	91.8%	30.2%	7.4%
Italian	75%	20.3%	4.9%
French	29.1%	10%	5.3%

Table 2: Determiner omission across languages

6. Conclusion

In this article I have given evidence for cross-linguistic differences in the acquisition of determiners between “Romance” on the one hand and “Germanic” on the other hand, but also among the Romance languages. The variational approach to language acquisition predicts these differences. The investigation was based on the token-frequency of determined as opposed to bare nouns. As for the Romance-Germanic contrast, the results are in keeping with previous research, but unlike other studies (e.g. Chierchia et al. (1999)), the present study also uncovered a difference among the Romance languages. Furthermore, differences mainly concerned the earlier phases.

Nevertheless, two questions have remained open. Firstly, there are alternative possibilities to explain the results. Lleó & Demuth (1999) predict the Germanic-Romance asymmetry based on a prosodic model. It is not clear however, whether the model makes the correct predictions for French. French is similar to Spanish and Italian in that articles are proclitic to the noun, but the stress pattern on nouns should not promote an early acquisition, compared e.g. to Italian. Another possible explanation for cross-linguistic differences is that determiner acquisition is bootstrapped by gender properties. This is not unlikely because children acquiring French and Italian start to encode gender at a very early age. One would however expect that Italian children are faster than French children, because the Italian gender system is more transparent than the French one (cf. Kupisch et al. 2002). Both possibilities have to be explored in more detail in future research.

Secondly, I cannot exclude the possibility that the acquisition process illustrated here involved language influence. While nowadays most researchers working on bilingual acquisition agree that bilingual children are capable of separating the two grammatical target-systems, more recent investigations have shown that there may be language influence despite of language separation (e.g. Gawlitzek-Maiwald & Tracy 1996, Hulk & Müller 2000). In particular, if two languages overlap with respect to the properties of a grammatical domain, language A may influence language B positively or negatively and accelerate or slow down the acquisition of that grammatical property (Müller et al. 2002). While language influence is unlikely to appear in the four more unbalanced children, as the direction would be from weaker to stronger language, it could have played a role in the acquisition process of Lukas, and especially Carlotta. In fact, evidence for language influence in Carlotta was provided in previous studies (Müller et al. 2002). Influence in the two balanced bilinguals would also explain the relative “nearness” of the Italian and the German acquisition curves. Further research will be done on monolingual data to see whether the results obtained here can be repeated.

The study proceeded from the assumption that children are equipped with coexisting structures, NP and DP, from the start. However, the fact that determiners tend to be omitted initially speaks in favor of a default setting in the sense that the weights of G_{DP} and G_{NP} are preset to 0 and 1 respectively. The default corresponds to the structurally less complex and more economical option. This assumption is in line with the idea that child language is guided by Economy of Representation and meets one of the core ideas of the Minimalist Program. Lastly, it may still be the case that children’s earliest determiners do not imply an underlying DP-structure. They could be memorized-strings or gender markers (implying that the child projects up to an intermediate level between NP and DP). Both options do not imply the semantic and pragmatic knowledge of specificity associated with the D-level. To approach this issue a fine-grained analysis of children’s early determiners is required.

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