

# Explaining Cross-linguistic Differences in Article Omission through an Acquisition Model

Andrea Ceolin

## 1. Introduction

In the course of acquisition, children go through a stage in which functional heads are optionally omitted (Brown 1973, Wexler 1992, Hoekstra and Hyams 1995). For instance, in the acquisition of languages with articles, children utter sentences in which an obligatory article is missing, even after they have started to produce them.

There is evidence that the rate of omission is not the same cross-linguistically. Lleó and Demuth (1999) show that the rate of omission in German children is higher than that found in Spanish children. Chierchia et al. (1999) show that French and Italian children are quicker than children learning English and Swedish in ceasing to omit articles. Kupisch (2007) shows that the rate of omission in German children is also higher than that found in French and Italian children. Finally, Guasti et al. (2008) show that Dutch children drop articles more often than Italian and Catalan children, even though their caregivers show a uniform pattern in the production of bare nouns. This overall pattern suggests a clear cut between Germanic languages on one side and Romance languages on the other.

In this paper, we argue that while the rate of bare nouns is consistent across languages, the co-occurrence of articles and nouns is not. In particular, the use of possessives turn out to be the major source of differences in the distribution of definite articles between Germanic and Romance languages. These differences in the input correlate with the differences in the rates of omission reported in the literature.

In Section 2 and 3 we summarize the main proposals advanced to explain cross-linguistic differences in article omission. In Section 4, we show how differences in the syntax of possessives between Germanic and Romance languages affect the frequency of articles in child-directed speech using Italian and English data from CHILDES. In Section 5 we propose an acquisition model.

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## 2. Prosodic integration of articles

One of the proposals for explaining article omission comes from looking at the development of the prosodic structure in early child speech. Lleó and Demuth (1999) found an interesting correlation between the amount of multisyllabic words in German and Spanish and the development of the prosodic structure in children learning the two languages.

In German, children cannot produce multisyllabic words with an initial unstressed syllable,  $wSw$ , before the age of 2. The same is true for disyllabic words with a  $wS$  pattern. In both cases, the initial syllable is truncated and the words are reduced to  $Sw$  or  $S$  respectively. This can be explained by assuming that children force all their words to follow a basic trochee  $Sw$  pattern, disallowing more than one Foot per word. In Spanish speaking children, however,  $wSw$  words are common during the same period. This is explained by postulating that their prosody allows an extra syllable within the same prosodic word.

Lleó and Demuth (1999) note that these findings correlate with the fact that while multisyllabic words are frequent in the Spanish early target vocabulary (between 20% and 30%), and most of them follow a  $wSw$  pattern, they are instead rare in German (less than 10%). This means that the input in Spanish favors the development of a more complex prosodic structure, while in German a basic trochee is sufficient to produce most of the lexicon, which is mainly composed of monosyllabic or disyllabic words. For this reason, Spanish children develop a more sophisticated prosodic structure earlier than German children.

Moving on to determiners, in Spanish they are generally proclitics: they are unstressed elements and are prosodically cliticized to the following word as extrasyllabic elements.<sup>1</sup> Therefore, it is clear that Spanish children can use the same model they have for multisyllabic words,  $wSw$ , to integrate an article before disyllabic words. In German, the situation is different: determiners are not proclitics, but they require their own Foot. The lexicon does not provide a simple model for the integration of determiners: extrasyllabic elements are not possible at this stage, and thus, determiners do not appear until German children start producing words that require more than one Foot. These facts explain why article omission is more widespread in German than it is in Spanish.<sup>2</sup>

Other works have investigated the relation between article omission and enclisis. For instance, in English, articles can cliticize to the preceding verb if it ends in a strong syllable, and then be analyzed as part of a trochee. The test in Gerken (1996) aims at the production of the two sentences in (1) by eighteen children from Buffalo, NY (in the age range 2;1-2;3). This minimal contrast shows a difference in the rates of omission of the definite article depending on phonological conditions. When the article can be cliticized to the preceding word, it is usually

<sup>1</sup>Masculine articles can be enclitic if preceded by a preposition.

<sup>2</sup>See Lleó and Demuth (1999:414-415) for a complete account.

not omitted (1a). When it cannot, and is therefore left unfooted, it is often omitted (1b).

- (1) a. He [KICKS the] [PIG]  
 \* S w S-(w) (omission: 16%)  
 b. He [CATCHes] the [PIG]  
 \* S-w \* S-(w) (omission: 46%)

This experiment has been replicated for Italian in Crisma and Tomasutti (2000). In order to recreate the contrast, they test a monosyllabic (*fa* ‘make’) and a disyllabic (*prende* ‘take’) verb that can take the same disyllabic object (*torta* ‘pie’) on a group of Italian children in the age range 2;3-2;9. The pattern reported in (1) for English is interestingly confirmed for Italian (2), even though Italian is very similar to Spanish in displaying a high amount of multisyllabic words, and therefore Italian children should be able to develop a model to integrate articles very early.

- (2) a. [Fa la] [torta]  
 S w S-w (omission: 8.1%)  
 ‘(He/she) makes the pie’  
 b. [Prende] la [torta]  
 S-w \* S-w (omission: 82.6%)  
 ‘(He/she) takes the pie’

We argue that these facts together are potentially problematic for Lleó and Demuth’s explanation if one wants to extend it to explain the different rates of article omission in languages like Italian and English: in fact, what this pattern suggests is that a lexicon that contains a lot of multisyllabic words does not necessarily facilitate the production of articles; on the contrary, it potentially makes it more difficult.

Languages with a high percentage of monosyllabic words like English that allow enclisis should favor articles in the same Foot of the verb, while languages with a low percentage of monosyllabic words should rarely be able to have a footed post-verbal article. As a matter of fact, Italian is indeed such a language. The monosyllabic verb in (2a) is an exception, because words with less than two syllables are extremely rare: 3% of the whole vocabulary, according to Guasti and Gavarró (2003). This means that once also multisyllabic words are taken into account, like the verb *cucina* ‘cook’ and the noun *carote* ‘carrots’, virtually all the combinations of verbs, articles and objects yield an unfooted article (3).<sup>3</sup>

<sup>3</sup>The pattern described predicts that also prosodic words can have unfooted syllables (3c-d), and in fact it is the case that initial syllables in multisyllabic words are truncated in child speech (e.g., *nana* for *banana*), even though the rates are low compared to article omission. This is likely to be a consequence of a constraint on truncation of lexical words (Crisma and Tomasutti 2000:228).

- (3) a. [prende] le [torte]  
 S-w \* S-w  
 ‘(He/she) takes the pies’
- b. cu [cina] le [torte]  
 \* S-w \* S-w  
 ‘(He/she) cooks the pies’
- c. [prende] le ca [rote]  
 S-w \* \* S-w  
 ‘(He/she) takes the carrots’
- d. cu [cina] le ca [rote]  
 \* S-w \* \* S-w  
 ‘(He/she) cooks the carrots’

If we accept this result, then we have to focus on nouns in isolation and preverbal nouns to see if the patterns are different. In fact, the data collected and analyzed in Ferrari and Matteini (2010), a longitudinal study (1;11-2;6) on an Italian child from Tuscany, show that while omission in DPs in object position is attested 19% of the time, both DPs in isolation and preverbal DPs have higher rates of omission (23% and 33%). This result is in contrast with the idea that given the high frequency of *wSw* words Italian children should develop an early model of article integration. However, this result is compatible with the fact that article omission is related to unfooted syllables: in fact, we know that articles in isolation or in subject DPs are always unfooted.

In conclusion, the prosodic explanation is appropriate to explain article omission, but it comes with specific predictions. First, it would predict English articles to be easier to produce than Italian ones because of the possibility of avoiding unfooted syllables by cliticizing the determiner in the preceding word. Second, it would also predict them to be easier to produce than German ones, because contrary to the former, the latter cannot generally cliticize (Lleó and Demuth 1999:415). However, both predictions have not been met in cross-linguistic analyses.<sup>4</sup>

### 3. The semantic approach

An alternative explanation suggested in Guasti et al. (2008) relies on Chierchia (1998) and Chierchia et al. (1999), where the Nominal Mapping Parameter (NMP)

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<sup>4</sup>See Chierchia et al. (1999). Also, even though it would seem counterintuitive given the morphological and phonological complexity of German determiners, it is the case that children learning English are no better than German ones in learning articles. Surprisingly, the data in Brown (1973) discussed in Lleó and Demuth (1999) and the data in Kupisch et al. (2009) show that German children perform slightly better than children learning English.

is proposed as a universal strategy to map nouns into predicates and arguments. This explanation is inspired by the Universal Grammar models proposed in Wexler (1992), Hoekstra and Hyams (1996) and Abu-Akel and Bailey (2000).

In Romance languages, nouns are always mapped to predicates, and therefore they need an overt determiner to occupy argument positions. In classifier languages like Chinese, all nouns are mapped to arguments. Germanic languages instead represent an intermediate case: they allow arguments where D is not overt only when nouns are mass or kind-denoting (Longobardi 1994). Since the availability of determinerless arguments is lexically specific in Germanic languages, it means that children learning Germanic languages have to map nouns onto different semantic categories before deciding whether articles should or should not be used in argument position, and an imperfect mapping can cause article omission.

The authors do not provide quantitative arguments in favor of this idea, but a simple test can be done by checking if there is any correlation between article omission and mass nouns.

Ferrari and Matteini (2000) find that the child they studied drops articles at the same rate before mass and count nouns. Moreover, looking at the data in the Calambrone corpus on CHILDES, we notice another interesting pattern that questions the semantic explanation: not only children do drop articles in front of clear animate nouns, but they also alternate omission and production of articles. This is evident with the common noun in (4-5), *bimbo* ‘baby’.<sup>5</sup>

- (4) a. un bimbo (CHILDES, Calambrone, Mart02)  
a baby
- b. e@p bimbo (Mart03)  
D baby
- c. 0w bimbo (ma)ngia 0w banana (Mart06)  
- baby eat.3SG - banana  
‘The baby is eating a banana’
- (5) a. [non] c’è più 0w bimbo (CHILDES, Calambrone, Viola01)  
Not is+CL anymore - baby  
‘The baby is not here anymore’
- b. c’è e@p bimbo (Viola05)  
is+CL D baby  
‘There’s a baby’

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<sup>5</sup>In the Calambrone corpus, @p indicates a placeholder for determiners and 0w indicates omission.

- c. no è 0w bimbo (Viola08)  
 not is - baby  
 '(He/She) is not a baby'

Kupisch et al. (2009) find similar phenomena in English child directed speech data.

Another argument against Chierchia's model is that children seem to know that the word has a plural version, even in the stage in which they are still omitting articles. This is unexpected if they were still misclassifying count nouns, because we would not expect a productive use of the plural as in (6).

- (6) tati e@p bimbi (Viola05)  
 many D baby.PL  
 'Many children!'

These observations suggest that children are going through a stage in which in the absence of specific semantic categories, the production of articles is optional rather than obligatory, as first suggested in Valian (1986) and in Abu-Akel and Bailey (2000). A crucial question to ask is how the obligatoriness of the article is learned.

#### 4. Input data

Previous analyses that focused on input data (Kupisch 2007, Guasti et al. 2008) showed that even though Romance and Germanic languages behave differently in terms of rates of omission, their rates of bare nouns are comparable, and thus we cannot explain omission as an attempt by children to match their input. In this section we argue that contrary to previous claims, the input that children learning Romance and Germanic languages receive is not uniform. The focus will be on the properties of possessive constructions, which represent the main distinctions in the syntax of the noun phrase between Romance and Germanic languages.

First, a difference in the DP internal structure is the role of possessive determiners and adjectives in Romance languages. This phenomenon is not uniform because some languages like Spanish (7b) have possessive determiners like English (7a) and the other Germanic languages, while in others like Italian (7c) the possessive cannot occupy a D position, and therefore an article is required.<sup>6</sup>

- (7) a. Our friends  
 b. Nuestras amigas  
 our.PL-F friend.PL-F  
 c. Le nostre amiche  
 the.PL-F our.PL-F friend.PL-F

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<sup>6</sup>The Spanish examples are from Mare (2014).

Moreover, in Romance languages of both types the possessive can also be placed after the noun, typically with a focus interpretation (Bernstein 2005:65), and in this case also languages of the Spanish type require an element in D (8a).

- (8) a. Las amigas NUESTRAS  
the.PL-F friend-PL-F our.PL-F  
b. Le amiche NOSTRE  
the.PL-F friend.PL-F our.PL-F

This is a contrast that does not contribute to the amount of bare nouns, but predicts a higher amount of articles in Romance languages independently on their syntactic status. Since English and other Germanic languages do not have this possibility (*\*The old friends of hers*, from Bernstein 2005), this pattern contributes to a higher frequency of articles not only in languages of the Italian type, where the article is always obligatory, but also in Spanish.

Second, a peculiar property of Germanic languages is that every language allows a construction in which a nominal argument is expressed through the suffix *-s*, which has clitic properties in English. This construction is lacking in Romance languages, which must use a construction with the definite article and a preposition as the only possibly strategy to license nominal arguments (9). In this case, the genitive suffix in Germanic languages is completely replacing the definite article in both Spanish and Italian:

- (9) a. Mary's house  
b. La casa de Maria  
the.SG-F house of Maria  
c. La casa di Maria  
the.SG-F house of Maria

Third, in Romance languages the definite article is normally used instead of the possessive if possession is 'inalienable', e.g., it refers to body parts or kinship nouns (Rigau and Picallo 1999, Gueron 2006, Nakamoto 2010). For example, the common sentence in (10) usually has a possessive determiner in English but a definite article in Italian.

- (10) a. Open your mouth (CHILDES, Providence, Nai02)  
b. Apri la bocca (CHILDES, Calambrone, Rosa08)  
open the.SG-F mouth  
'Open your mouth'

In order to quantify the discrepancy in the input caused by the constructions presented in this section, we use child-directed speech data from the Calambrone corpus (Cipriani et al. 1989) for Italian and the Providence corpus (Demuth and McCollough 2009) for English. The electronic corpora are available in CHILDES

(MacWhinney 1991). The data have been tagged for part of speech using Tree-Tagger (Schmid 1994).

The focus of our attention is the distribution of definite and indefinite articles. The reason why we only focus on these categories and ignore other determiners (like demonstratives and quantifiers) is that they have been traditionally used as means of studying the determiner phrase in child language (Valian et al. 2009, Yang 2013). Most importantly, they are uniform from the prosodic viewpoint in the two languages studied, contrary to other D elements.

We analyze data coming from the mother's speech in the two corpora. We extracted article and possessives counts for the 100 most frequent nouns in the target language in Italian and English, which resulted in a total of 4877 tokens for Italian and 55575 tokens for English. The sample size should be appropriate, given that Fenson et al. (1994) estimated the total number of words that children know at about 16 months to be within a few hundred. Since articles can be present as clitics on prepositions in Italian, preposition + article forms were included in the count, and elements tagged by TreeTagger as prenominal adjectives were automatically ignored in both languages.<sup>7</sup> The results are displayed in Figure 1.

The first histogram represents Italian: the dark bar defines the presence of articles before the noun, while the grey bar represents possessives. We see a lot of variation in terms of presence of articles.

First, the top two rows show kinship nouns, a category that generally does not require a definite article. The first gap is the word *colore* 'color', which in both languages has a very low article count because it is mostly used in interrogative sentences, where the article is not used. The second gap is the word *terra* 'floor/soil', which is almost never used with articles because the Italian equivalent of 'on the floor', *a terra*, does not require it. Most of the other cases of low article use can be explained with a similar fact, namely the lexicalization of a preposition + noun combination as an adverb. Other exceptions are the words *paura* 'hunger' and *fame* 'fear', which are used in the equivalent of English 'Are you scared?' and 'Are you hungry?' but are nouns, and *amore* 'love', which is used as a filler and not as a common noun.

Apart from these cases, the other nouns display a high amount of definite or indefinite articles. The grey bar that represents possessives is hardly visible, and it means that possessives rarely show up in speech prenominally.<sup>8</sup>

In the second histogram we see the data for English. The main thing to notice is that here the dark bars are shorter in the overall, and this is connected to the fact that the grey bars, that are coding for the presence of possessives, are very long

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<sup>7</sup>Although, one might note that the fact that adjectives are always prenominal in Germanic languages while they are both prenominal and postnominal in Romance languages can be another fact to take into account to explain why determiners might be more difficult to learn in Germanic languages.

<sup>8</sup>As we said previously, possessives can also occur postnominally with a focus reading, but in these cases they would display an article prenominally.

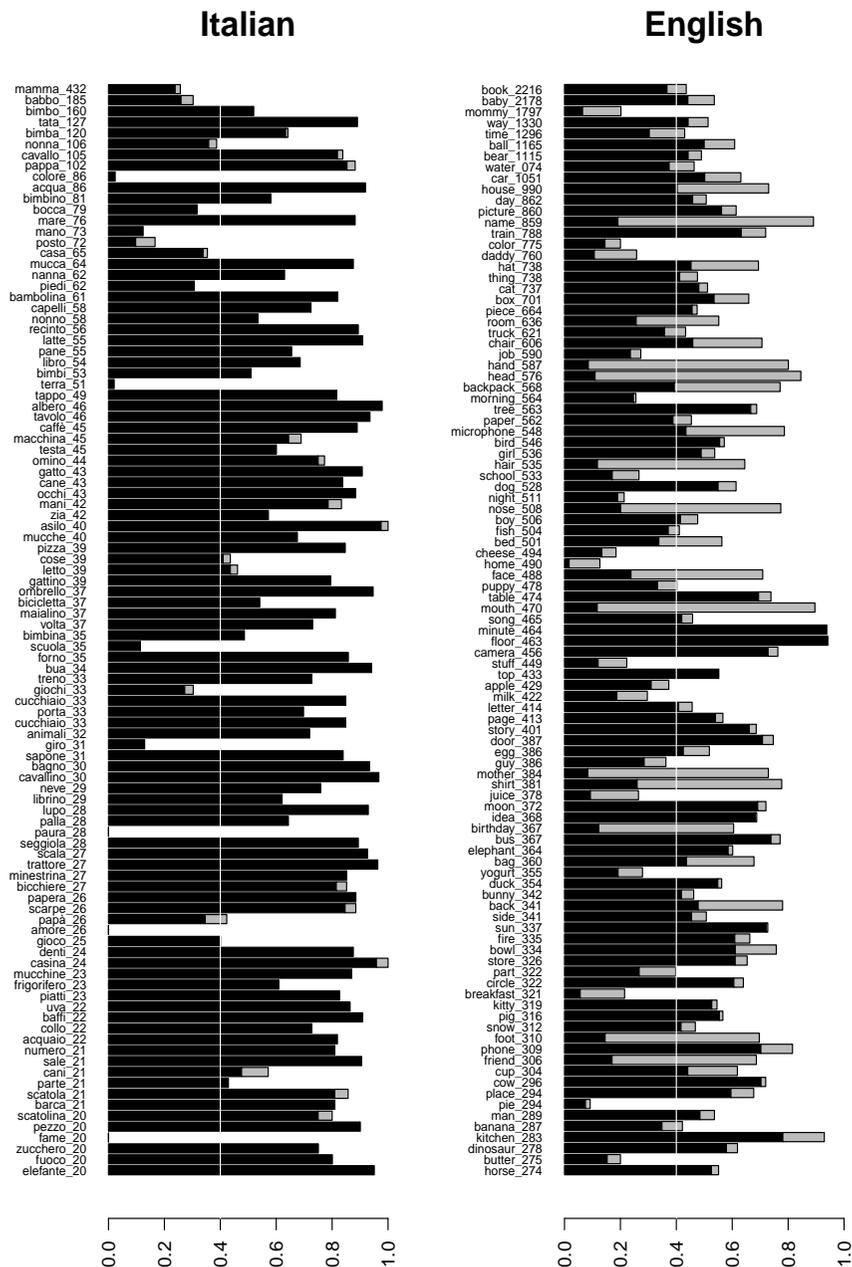


Figure 1: Top-100 Nouns in Italian and English target language. The dark bar represents article use, while the grey bar represents possessive use.

compared to what we see for Italian. The only two nouns that are widely used with an article are *floor* and *minute*. In most of the other cases, articles are used about half of the time or less. Interestingly, there are several cases in which possessives are used even more than articles. This is true for all body parts (*hand, head, hair, nose, face, mouth, foot*) but also for other kinds of nouns (*name, mother, shirt, birthday, friend*).

## 5. An acquisition model

The data analyzed in the preceding section show that the differences in the distribution and in the syntax of possessives in Romance and Germanic languages turn out to have a high impact on the overall ratio of articles in the input. This finding has some implications from the perspective of acquisition.

Let us assume, following Valian et al. (2009), that children have a syntactic D category from the start of combinatorial speech and all they need to learn is the restrictions in their use; for instance, they have to learn that *a* can be used only with singular nouns, and therefore *a cars* is ungrammatical. Crucially, they also need to learn which nouns can appear without an overt determiner and the conditions under which a determiner should not be used. In particular, if pragmatic considerations do not require the use of a demonstrative or a possessive, the choice would be between using an article or not (e.g., *I want an apple* vs *I want apple*). How do they choose between the two options? There are two questions we have to ask about the generalization of article use:

- (11) How many times does an article have to occur with a noun in order for the child to make the hypothesis that articles are syntactically obligatory with that noun?
- (12) How many different article-noun combinations does the child need to see in order to generalize the use of articles to the whole N class rather than having to guess, for each single noun, whether an article is required or not?

Questions similar to (11) have been clearly addressed in previous several works. First, Newport (1999) and Singleton and Newport (2004) present a longitudinal study on Simon, a child who learned ASL from two deaf parents who were not ASL native speakers. The input to which Simon was exposed was occasionally ambiguous, in the sense that obligatory grammatical morphemes were not always present in the input where they were syntactically required. Newport showed that as long as the morphemes were present in about 60% of the contexts in which they were required, Simon acquired them as obligatory elements, and produced them more often than his parents in a way which was comparable to ASL learners from families of native speakers. On the other hand, for other thresholds their acquisition failed. The study was replicated on children and adults through an artificial language experiment in Schuler, Horowitz and Newport (2017), and it turned out

that 40% was a safe threshold for regularization: as long as a morpheme appeared 40% of the time, in absence of more frequent competitors, children assumed that it was obligatory. If its frequency was lower, regularization failed. An important feature of this model is that while it is sensible to token frequencies, children do not attempt to match their input frequencies, but they instead attempt to regularize their input using the most frequent morphemes.

The second question (12) has been addressed in Yang (2016) through the Tolerance Principle, and subsequently in Schuler (2017). According to the Tolerance Principle, a rule that is generalized over a list of elements can tolerate a number of exceptions  $\theta$  only if  $\theta$  is lower than the number of elements ( $N$ ) out of the natural logarithm of  $N$ :

$$\theta < \frac{N}{\ln(N)}$$

It follows from here that a rule can be generalized over a set of  $N$  elements only if there is sufficient evidence for it, i.e., if the number of potential exceptions does not go beyond this threshold: this condition has been defined as the Sufficiency Principle in Yang (2016). Note that this model is not sensible to token frequencies: for each noun, the child only has to decide whether there is an obligatory morpheme or not.

In our data, for Italian, the number of nouns which do not reach the 40% threshold in article use is 13. We have seen that these are cases in which a prepositional phrase is lexicalized or cases of kinship nouns. This means that for these nouns, children might not have enough evidence to conclude that the morpheme is obligatory. However, this number is lower than the threshold determined by the Tolerance Principle, which is 21. On the contrary, the number of nouns in English that do not reach the threshold is 42.

What these numbers suggest is that, in principle, children learning Romance languages do not need to perform any semantic mapping before generalizing the article use: they can just assume that an article is always needed and learn word by word all the cases in which an article is not required in argument position. On the other hand, in English, the number of exceptions is high enough that the learner cannot generalize based on just the input they hear because the number of nouns with which article use is low is considerable.

One might ask why the fact that children hear possessives instead of articles is relevant. Contrasts like the one previously described in (10) are particularly interesting from this viewpoint. In particular, (10a) is not informative for children learning English to decide whether, in the absence of a possessor, the sentence *Open mouth* would be grammatical or not, like in the case of *Do you want my coffee?* and *Do you want coffee?*. However, (10b) has a default definite article which serves no specific semantic purposes but to occupy the D position, as in the Italian sentences in (13).

- (13) a. Ti piace il caffè?  
 You.CL like.3SG the.SG-M coffee?  
 'Do you like coffee?'
- b. Passami la penna.  
 Give-me.CL the.SG-F pen  
 'Give me your pen'

In the case of nouns like *mouth* and *pen*, children learning English need to hear sentences with the definite article and with a generic reading to map the noun, and this can take some time if generic readings are not common.

Something worth mentioning is that German behaves differently compared to English in preferring constructions with the definite article in sentences like (10). This observation is worth future investigation because it can explain why children learning German are not worse than children learning English when it comes to producing articles: the requirement of an extra Foot in the prosodic structure might in fact be balanced by a less ambiguous input when it comes to article use.

In conclusion, we hold the position that the absence of clear evidence for the obligatoriness of articles might explain their temporary optional use. Our account of the phenomenon is compatible with that of Guasti et al. (2008), and it differs only in the fact that while Romance children can learn how to correctly generalize articles without paying attention to semantic categories, the same does not happen with children learning English, who are exposed to an input which contains many nouns in which articles are not consistently present; this means that semantic and pragmatic knowledge is necessary to categorize their lexicon and generalize determiners within specific subcategories.

## 6. Conclusion

In this paper, we discuss how differences in the input might play a role in learning the distribution of articles in Germanic and Romance languages. Previous literature (Kupisch 2007, Guasti et al. 2008) denied any role of the input because variation in the presence of bare nouns across caregivers of different languages does not match the ratio of article omission in children learning those languages. For this reason, the phenomenon has been explained focusing on prosodic constraints (Lleó and Demuth 1999) and semantic factors (Chierchia et al. 1999).

The results presented in this paper show instead that focusing on the overall frequency of articles rather than limiting the investigation to bare nouns might indeed reveal a role of the input in explaining why Romance children acquire articles faster than Germanic children. In particular, something as simple as the syntax and the semantics of possessive constructions has a major impact on the overall article ratio, making it more difficult for children acquiring Germanic languages to learn which nouns require an article in argument position and the conditions under which articles must be omitted.

The explanation proposed does not imply that phonological factors do not play a role in the production of articles. It is entirely possible that the optionality of articles in child language is influenced by other factors like prosody, but is not entirely determined by them, as argued in Section 2. However, considering the influence of the input in the acquisition of articles might indeed be used to explain cross-linguistic patterns that were not captured by previous accounts.

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