

The Effect of Variable Input on Comprehension: Evidence from Spanish

Karen Miller^{1,2} and Cristina Schmitt²

¹Calvin College and ²Michigan State University

1 Introduction

Language acquisition researchers agree that the grammar the child constructs is the result of the interplay between an innate capacity for language learning and properties of the input. Researchers differ, however, on the weight one should give to the input, and which properties of the input are necessary for the child to converge on a grammar that is like the adult grammar. Since we know that languages change, it must be the case that the input that adults provide for children (E-language) is not always sufficient for the child to construct a grammar that is identical to the grammar of the adults. There must be cases in which children acquire a grammar that is slightly different from their parents (Kroch 2001).

Although we can say that the innate component is likely to be the same within the population of typically developing children (however large or small it may be, and however specific it may be), as noted by Wilson and Henry (1998), the input that each child receives will vary qualitatively and quantitatively as a result of the variety of speakers each child comes into contact with (e.g. speakers of different language varieties, young child speakers whose language is still developing vs. adult speakers) and the variety of language settings (e.g. formal

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vs. informal) that the speakers interact in. One very obvious way that the input can vary is if it reflects the opposite values of a particular setting. In this sense, the input can vary in terms of the relative frequencies of the tokens that instantiate one setting or the other.

Yang (2004) proposes a model that takes into consideration parameter setting, frequency and reliability of the input. The idea is that the cumulative effect of the input combined with a theory of a restricted search space (UG) can explain language acquisition and language change. According to Yang, children make hypotheses within the limits of UG that are punished or rewarded depending on their ability to account for particular properties of sentences in the input. If the input is unambiguous and frequent, acquisition happens early. If, on the other hand, the input is inconsistent, the child (a) may take longer to set a parameter; (b) may set the opposite value of the adult's grammar; or (c) may allow for two opposite values of a parameter to coexist in a mature speaker.

Studies that examine the role of frequency in the input have shown that frequent forms may become productive faster than less frequent forms, which is consistent with Yang's proposal. Berko (1958), for example, found that, while the frequent English plural allomorphs [s] and [z] become productive in children by 4 years of age, children do not productively use the less frequent English plural allomorph [ɪz]. Importantly, however, although these allomorphs differ in frequency, their presence in the input is reliable, because their distribution is categorical. In other words, specific phonetic contexts will trigger one and only one of the three forms, providing the child with consistent and reliable input from where to build the appropriate rule to capture the distribution of the plural allomorphs in English.

Studies that deal with unreliable input are not as frequent, in spite of the fact that it is very common in natural language for different forms of a particular morpheme to have non-categorical probabilistic distributions that are sensitive not only to linguistic but also to extra-linguistic factors (e.g. speech style, education, gender) (for studies examining unreliable input see Johnson et al. 2005, Kam Hudson and Newport 2005). Johnson et al. (2005) found, for example, that English-speaking children who are exposed to an input where the third person singular (3SG) marker is optionally produced in the adult speech, are delayed in their ability to use the presence or absence of the 3SG in comprehension tasks. Given Yang's model, this is not surprising since the input for these children involves evidence both for the morphological realization and also for the non-realization of 3SG. Other studies that examine the acquisition of variation proper have shown that as far as production goes, children end up producing the variable forms with the same relative frequencies of the adult (see Smith et al. (2005) among others).

In this paper we expand the empirical domain of research involving unreliable input, and we compare production and comprehension of plural morphology by children exposed to dialects of Spanish that vary in the reliability and frequency of morphological number marking. In the Chilean Spanish spoken in Punta Arenas, number is not always overtly marked in the adult speech but in

Mexican Spanish (Mexico City) it is reliably and consistently marked. We address the following two questions: (i) how will comprehension and production of plural morphology in Chilean Spanish child language compare to that in Mexican Spanish child language? (ii) Will the different rates of omission affect the comprehension of the plural marker?

The paper is divided as follows: Section 2 introduces the properties of plural morphology in the Spanish dialects and gives a quick survey of the acquisition of plural morphology in Spanish. Section 3 presents the results of a naming task with both Chilean and Mexican children. Section 4 presents results from a comprehension experiment. Section 5 re-examines the results from the naming task discussed in section 3 and Section 6 summarizes the conclusions.

2 Background

2.1 Plural morphology in Spanish

Spanish has two plural forms: [s] and [es]. [s] occurs after vowels and [es] after consonants. Since most Spanish words end in vowels, [s] is the most frequent form. In the Mexico City dialect of Spanish, number is consistently and systematically marked not only on the noun but also in the determiner and on the adjective. However, other dialects of Spanish present a more complex picture due to a phonological process of weakening of syllable-final [s], which can either be omitted or surface as [h] (Lipski 1986, 1999; Poplack 1980; Cepeda 1995). In Chilean Spanish this tendency results in a reduction of non-morphological /s/ as in (1) and also of morphological /-s/, as in (2) to \emptyset or [h].

- | | |
|---|---|
| (1) Tengo lápiz.
I-have pencil
'I have a pencil.'

[lapis] [lapih] [lapi] | (2) Tengo bolitas.
I-have marble-pl
'I have marbles.'

[bolitas] [bolitah] [bolita] |
|---|---|

Cepeda (1995) reported that in Chilean Spanish the highest rate of syllable final /s/ omission occurs with the plural marker /-s/, rather than with non-morphological /s/. She found that for 34 adult Chilean speakers, plural /-s/ was omitted on 54% of all nouns (4580 tokens) and on 60% of all postnominal adjectives (785 tokens). Omission of plural marking in determiners (*esos* 'these.PL', *unos* 'some.PL', *las* 'the.f.PL') was lower than in nouns and adjectives. And within determiners, omission of the plural morpheme in monosyllabic determiners like (*las*, 'the.f.PL', *mis* 'my.PL') occurred only 13% of the time while omission of the plural morpheme in polysyllabic determiners (*unos*, 'some.PL' *algunos* 'some.PL') occurred 34% of the time.

Furthermore, the rate of omission was linked to social class, with omission being much more common in the language of working-class speakers compared to middle-class and upper-class speakers. A summary of the distribution of the different forms is given in Table 1, adapted from Cepeda (1995).

Table 1. Social distribution of word-final /s/ in Chilean Spanish.

	Social Strata		
	High	Mid	Low
Retention [s/h]	.68	.65	.50
Deletion Ø	.32	.35	.50
Tokens	5338	4968	5791

2.2 Acquisition of plural morphology in Spanish

Subsequent to the publication of Berko (1958), several researchers began to carry out similar studies in a variety of languages, including Spanish. Kernan and Blount (1966) tested 92 5–12 year old working-class Mexican Spanish-speaking children from the city of Guzman in the state of Jalisco, Mexico on a Berko style task that required children to provide the plural forms of singular nouns. Subjects were shown novel objects and told “*Este es un feto. Ahora hay otro. Hay dos de ellos. Hay dos ____.*” (“This is a feto. Now there is another one. There are two of them. There are two ____.”). Children produced the correct plural marker 93%–100% of the time on novel words requiring the [s] allomorph but only between 38% (for the younger children) to 53% (for the older children) of the time for novel words requiring the [es] allomorph. In an almost identical task, Perez-Pereira (1989) showed that for real and novel words requiring the [s] allomorph, 109 3–6 year old Spanish-speaking children from La Coruña, Spain (in Galicia) produced the correct allomorph more than 92% of the time; however, for words requiring the [es] allomorph rates were much lower. The experiments reported in Kernan and Blount (1966) and Perez-Pereira (1989) are in line with Berko (1958) showing that the less frequent allomorph is less productive than more frequent allomorph in children. However, it is not clear from these two studies whether children associate plural morphology with ‘more than one’, given that their experimental sentences involved numerals. Children could be simply making the noun agree with the numeral.

Bedore and Leonard (2001) examined production of plural morphology in SLI (specific language impairment) and typically developing Mexican Spanish-speaking working-class children living in the metropolitan area of San Diego, California. Children were acquiring Spanish as their first language and had minimal contact with English. 45 children participated in the study: 15 SLI children, 15 age matched controls (4;0–5;6), and 15 MLU matched controls (2;4–3;10). In one of their several tasks children were shown pictures of plural and singular objects and asked, “¿*Qué hay aquí?*” (“What’s here”). Importantly for this task, the Spanish existential ‘*hay*’ (‘there is/are’) does not have any number information associated with it; it is used with both plural and singular nouns. This means that children who produce plural nouns may not be doing so for reasons of agreement (i.e. agreement between the existential and the NP) but

rather because they associate the plural morpheme with ‘more than one’. The results of their study showed that 4;0–5;6 year-old typically developing children produced the plural morpheme on real word nouns when presented with pictures of plural objects 96% of the time, the 2;4–3;10 year old typically developing children did so 75% of the time but the SLI children only 56% of the time. Cantú-Sánchez and Grinstead (2004) carried out an experiment with 10 SLI and 20 typically-developing 4 year old (10 age-matched, Mean Age: 4;7 and 10 MLU matched, Mean Age: 4.0) Spanish-speaking children from Mexico City in a task similar to that of Bedore and Leonard (2001). They showed a picture of a single object to children followed by a picture of two objects and said, *Aquí tengo una mariposa. ¿Y, aquí?* (Here I have a/one butterfly. And here?). The results showed that typically-developing children produced the plural allomorphs [s] and [es] on real word nouns on average about 97% of the time for the MLU matched group and 93% of the time for the Age matched group, while SLI children only produced the plural morpheme on average about 82% of the time. At least for the typically developing children, Cantú-Sánchez and Grinstead’s (2004) results are in line with those of Bedore and Leonard (2001). However, it is unclear from these two studies whether children were producing bare plurals, indefinite plurals or ‘quantifier + plural noun’ constructions to describe the pictures depicting plural sets and, for this reason, there is no way of telling what exactly in their responses was responsible for the ‘more than one’ interpretation. For example, if children produced *una vaca* (a/one.SG cow.SG) for a picture of a single cow and *unas vacas* (one.PL cows.PL) for a picture of several cows, the only difference between the two responses being the plural morpheme, then it would be clear that children are using the plural morphology as a way to encode ‘more than one’. However, if the child produces *una vaca* (a/one.SG cow.SG) for the singular picture and *vacas* (cows.PL) for the plural picture, we cannot conclude that the plural morpheme is being used to distinguish plural from singular given that the plural morpheme is not the only difference between the two responses given by this child. It is important to note that in a separate task, Bedore and Leonard attempted to elicit indefinite plurals but children did not produce just indefinite plurals, rather they also produced bare plurals, which indicates that children most likely produced both indefinite plurals and bare plurals in the task just described above, but it is unclear to what extent. We will come back to this point in Section 5. In any case, for the purposes of the present paper it can be concluded from these two studies that by 4 years of age typically developing Mexican Spanish-speaking children produce plural morphology when describing pictures of plural objects.

Finally, Kvaal et al. (1988) collected spontaneous speech samples from 15 Mexican-American monolingual Spanish-speaking working-class children between the ages of 2;0 – 4;8 who lived in or around San Diego, California. They showed that children began producing the plural morpheme by 2;0 years of age. Their findings are consistent with a similar study by Marrero and Aguirre (2003) who found that two Peninsular Spanish-speaking children started producing the plural morpheme by 1;9 years of age. Interestingly, Marrero and Aguirre also

found that a Canary Island Spanish-speaking child did not start producing plural nouns until 3 years of age and at that time omitted the plural morpheme approximately 20% of the time. They suggested that this delay and subsequent omission of plural morphology could be due to the aspiration of the plural morpheme in dialects of Canary Island Spanish; however, they provided no details about the linguistic input this particular child was exposed to.

Taken together these experiments show that, when evidence for plural morphology is consistent in the adult speech, Spanish-speaking children (1) start producing the plural morpheme by 2 years of age and (2) productively use all allomorphs of the plural morpheme on real words by at least 4 years of age, at least after quantifiers and numerals and when describing plural sets.

3 Production

3.1 Experiments 1, 2 and 3: Chilean and Mexican adults

The first step in determining the role of the input in the acquisition of plural morphology is to replicate Cepeda's study for Punta Arenas Chilean Spanish and confirm the claim that Mexico City Spanish consistently marks plural with [s]. 6 Mexican adults and 4 Chilean Spanish-speaking adults participated in a Free Speech Task, a Repetition Task and a Naming Task. In the Naming Task adults were presented with pictures and asked *¿Qué son?* [What are.PL they?].

The data confirmed that, while Mexican adults always produced plural as [s] or [es], Chilean adults produced the plural as [s], [h] and \emptyset . In order to determine whether Chilean adults produced [h] vs. \emptyset (omission) for the plural morpheme, the Chilean data was coded for reliability by two speakers of Chilean Spanish (one native and one bilingual speaker). Cases in which the coders disagreed on whether the speaker said [h] or \emptyset were discarded. Overall approximately 25% of the Chilean data was discarded.¹ The summary of the Chilean coding results are shown in Table 2.

The results of Experiments 1, 2, and 3 show that (1) for Mexican Spanish-speaking adults plural morphology is obligatorily marked as [s] on all elements inside the DP and (2) for Chilean Spanish-speaking adults, there is a variable amount of plural marking, depending on various factors, with more [s] in the Naming Task and Repetition Task in Nouns than in the Free Speech; in the Free Speech Task there is a fair amount of omissions, which means that there is more inconsistency in the input between singular vs. plural, at least for nouns. In addition, the plural is present (either as [s] or [h]) almost always on determiners and often absent on bare nouns and nouns preceded by quantifiers and numerals. The results here for the determiner, however, must be examined with care, given that the free speech sample contained mostly monosyllabic definites (*los*

¹ This is actually an important point. The fact that native Chilean speakers can disagree on whether there is plural marking or not speaks to the point of the inconsistency in the input. Further analysis of the input will determine the exact nature of the disagreement between the coders. (See Miller and Schmitt 2006.)

‘the.PL’, *mis* ‘my.PL’) and not indefinites (*unos* ‘some.PL’, *algunos* ‘some.PL’), and Cepeda (1995) noted that definite determiners were the more likely to carry plural morphology in Chilean adult speech.

Table 2. Summary of Chilean Data in Experiments 1, 2, 3.

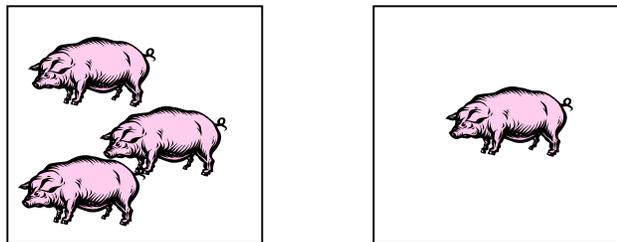
		Determiner	Noun
Free Speech	[s]	0	6% (8/146)
	[h]	99% (107/108)	69% (101/146)
	∅	1% (1/108)	25% (37/146)
Naming	[s]	0	61% (19/31)
	[h]	100 (3/3)	39% (12/31)
	∅	0	0
Repetition	[s]	29% (7/24)	57% (17/30)
	[h]	71% (17/24)	43% (13/30)
	∅	0	0

3.2 Experiment 4: Child Production

11 Mexican working-class (MexWC) children (4;0-4;7), 12 Chilean work-

ing-class (ChWC) children (4;2-4;11) and 7 Chilean middle-class (ChMC) children (4;2-4;11), 8 Mexican adults and 14 Chilean adults participated in a Naming Task. Subjects were presented with pictures of plural sets of

Figure 1. Sample Materials for Experiment 4.



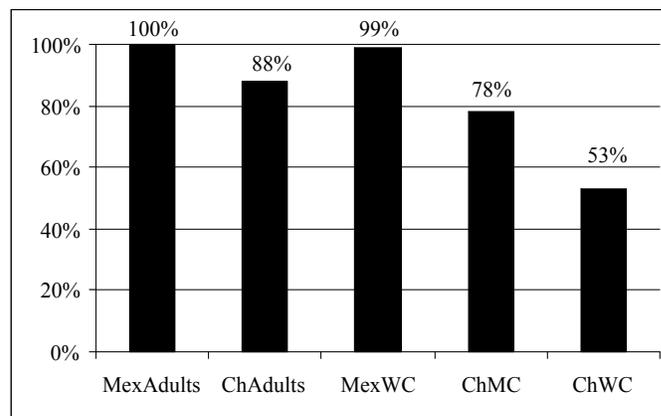
animals vs. pictures of single animals (Figure 1) and asked *¿Qué hay aquí?* (‘What’s here?’).² Materials contained 8 singular and 8 plural pictures and the nouns required the /-s/ allomorph (*chanchos/cochinos* ‘pig’, *perros* ‘dog’, *abejas* ‘bee’, *vacas* ‘cow’, *elefantes* ‘elephant’) and /-es/ allomorph (*pezes* ‘fish’, *ratones* ‘mouse’).

The results are shown in Figure 2. All but one child produced [s] as the plural morpheme at least once in the experiment, and most children produced [s] as the plural morpheme at least 50% of the time. A one way ANOVA showed significant differences between the three groups of children ($F(2,29)=7.067$, p

² Notice that unlike the previous experiment with adults here the question carries no number marking.

<.01). Post hoc independent t-tests showed that only MexWC children are significantly different from ChWC children ($t(1,21) = 4.496, p < .01$). ChMC are not significantly different from MexWC ($t(1,16) = 1.625, p = .155$) nor from ChWC children ($t(1,17) = -1.233, p = .234$). It is clear that the properties of the input that Chilean and Mexican children receive affects their production of the plural morpheme but it is also important to note that both Chilean children and Mexican children produce the plural as [-s] when referring to plural entities to varying degrees.

Figure 2. Percentage of plural morpheme pronounced as [s].



4 Comprehension

Up to this point, we have shown that both Chilean and Mexican adults and both Chilean and Mexican children produce the plural morpheme as [s] to some degree when referring to plural sets. The next question then is whether these differences in the input (the adult speech) and in children's production correlate with differences in child comprehension of the plural morpheme as indicating 'more than one'. If inconsistency in the input affects acquisition, then these three groups of children should perform differently. If on the other hand, inconsistency does not matter, and any evidence in the input of plural morphology is adequate to acquire the morpheme, then the three groups of children should not behave differently, given that the plural morpheme is available in the input of all three groups of children at least part of the time. Given that the free speech of the Chilean adults shows that [h] is a prominent variant of the plural, Chilean children were tested both on [s] and on [h].

4.1 Experiment 5: Act-out task

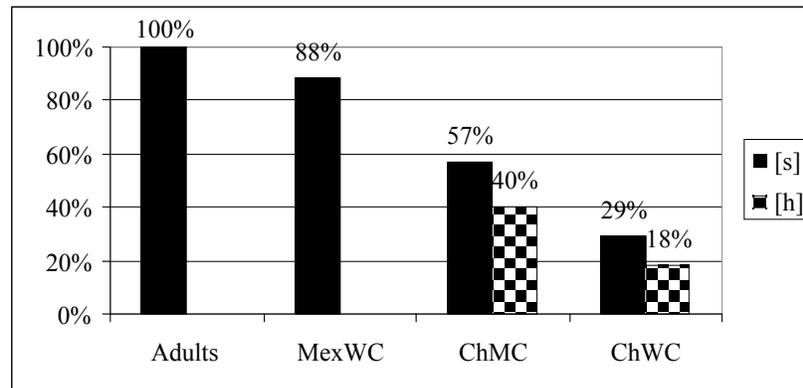
Experiment 5 tested child comprehension of plural vs. singular indefinite nouns phrases (*una* ‘a/one’ vs. *unas* ‘some’). Fourteen MexWC children (4;7–5;10; Mean 5;2); fifteen ChMC children (4;8–5;11; Mean 5;3) and fifteen ChWC children (4;7–5;11; Mean 5;3) participated in the experiment where the plural was pronounced as [s]. Sixteen adults (10 Chilean and 6 Mexican) participated in the experiment as controls. In order to guarantee that the poor results by Chilean children were not to be associated to the fact that [s] is less frequent in the free speech input, eleven ChWC children (4;9–6;4 mean 5;7) and nine ChMC children (5;1–6;1; mean 5;8) participated in exactly the same experiment, except for the fact that the plurals were pronounced as [h]. The Act-Out consisted in presenting the child with sets of miniature toys (2 different sets at a time) and asking them to act out requests as in (3).

- (3) a. Pon **una bolita** en la caja.
Put a/one marble.SG in the box.
‘Put a/one marble in the box’
- b. Pon **unas bolitas/unah bolitah** en la caja.
Put some.PL marbles.PL in the box.
‘Put some marbles in the box’

There were four targets: two feminine nouns: *bolitas* ‘marbles’ and *arañas* ‘spiders’ and two masculine nouns: *autos* ‘cars’ and *monos* ‘monkeys’. Four types of controls were included: the cardinal numbers 2 and 3, and also *muchos* ‘many’ and *pocos* ‘few’ and *todos* ‘all’. Children performed at ceiling (100% plural responses) on all controls but *pocos*, where the plural responses varied from 75% to 80%. The percentage of plural responses in the indefinite plural condition (*unas* ‘some’) is shown in Figure 3.

A one-way ANOVA showed significant differences between the three groups when the plural morpheme was pronounced as [s] for both Mexican vs. Chilean children ($F(2,41) = 4.902$, $p < .05$) and also when the plural morpheme was pronounced as [s] for Mexican and [h] for Chilean children ($F(2,31) = 7.625$, $p < .01$). Post hoc independent t-tests showed that the difference between ChMC vs. ChWC is significant for [s] ($t(1,28) = -2.127$, $p < .05$) but not for [h] ($t(1,18) = -.433$, $p = .663$). We also found no differences between the feminine vs. masculine nouns. Clearly the properties of the input that Chilean and Mexican children receive affect their comprehension of the plural morpheme. It is clear that they are not using [s] or [h] as a reliable marking for ‘more than one’. While *unas* ‘some’ is plural for Mexican children, several Chilean middle-class and most Chilean working-class children treated *unas/unos* (‘some’) as singular.

Figure 3. Percentage of plural responses in plural indefinite condition.



5 Potential evidence for distinct grammars

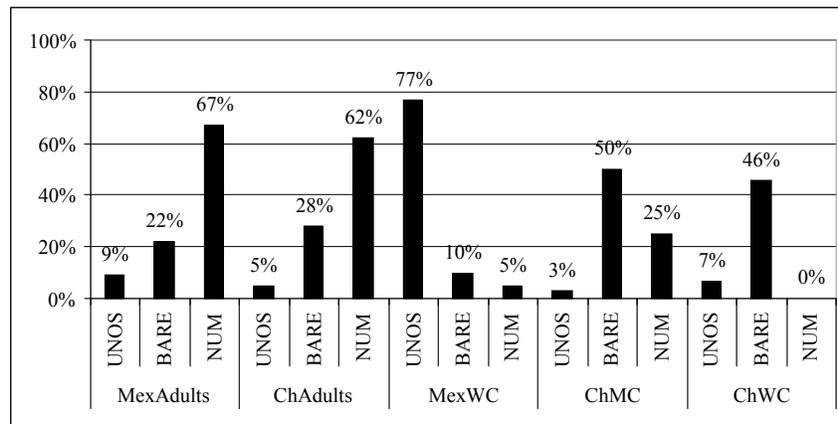
In this section we wish to revisit the Naming Task presented in Section 3 in order to reconsider the possible responses to the experimental question *¿Qué hay aquí?* ('What's here?'). For the picture that has a single animal (e.g. one pig), the most typical response from all child and adult subjects was the indefinite singular (i.e. *un chancho* 'a/one pig'). For the picture with a set of animals (e.g. three pigs) there were at least three possible responses: (1) the indefinite plural (*unos chanchos* 'some pigs'), (2) the bare plural (*chanchos* 'pigs') or a plural headed by a numeral (*3 chanchos* '3 pigs'). A closer examination of the distribution of child responses for the plural pictures reveals a very interesting pattern. Figure 4 shows that Mexican and Chilean adults behave alike. Most responses have numerals and a fair amount of responses use the bare plural and indefinite plurals.³ MexWC children, on the other hand, overwhelmingly use the indefinite (e.g. *unos chanchos* 'some pigs') when describing the plural set, while ChWC and ChMC children almost never use the indefinite plural and instead use the bare plural (*chanchos* 'pigs') around 50% of the time.⁴ In other words, for Chilean children *unos/unas* ('some.PL') is not an option to indicate plurality. Instead, another strategy needs to be used. Given that Mexican children produce

³ We attribute the larger number of numeral responses by adults and ChMC children to the fact that the plural sets were easily countable (consisted of only three or four animals) and also to the assumption that these particular subjects most likely have had more counting experiences than the other two child groups.

⁴ Only one ChMC and one ChWC child used the indefinite plural. The percentages do not add up to 100% for each group because only the nouns that had the plural morpheme [s] (shown in Figure 2) and that were headed by numerals, the indefinite plural or occurred bare were included in this graph.

minimal pairs when describing the plural vs. singular pictures that only differ in the presence or absence of the plural morpheme (*unas vacas* ‘some.PL cows.PL’ vs. *una vaca* ‘a cow’) is another indicator that Mexican children understand that the plural morpheme [s] indicates ‘more than one’. Chilean children, however, used mainly the bare plural (*vacas* ‘cows.PL’ vs. *una vaca* ‘a cow’), suggesting that they do not consider plurality in *unas* a reliable way to describe a set in a Naming task.⁵

Figure 4. Percentage of the Type of Plural Noun Produced in Exp. 4.



6 Conclusion

Our results empirically support Yang's model: in dialects of Chilean Spanish, plural marking is variable and unreliable in the input and the ability to use plural morphology in comprehension is delayed in children. In the dialect of Mexico City, plural marking is invariant, and no such delay is observed. Furthermore, the Naming task has shown that the two groups vary dramatically in their choices to encode plurality, suggesting that they have different strategies for marking plurality. It seems safe to say that, while number marking in the determiner is part of the grammar of Mexican children, this is not the case for the Chilean children, at least the WC children (see Miller and Schmitt 2006 for their behavior in other types of NPs).

⁵ It should be noted that for the masculine nouns the shape of the determiner is also different in the plural vs. singular (*unos chanchos* ‘some.PL pigs.PL’ vs. *un chanchito* ‘a/one pig’); however in our recordings of Mexican children we found that they often still produced minimal pairs in the masculine cases by producing the singular indefinite as *uno chanchito* ‘one pig’, which is ungrammatical in adult Spanish.

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