RESEARCH

Modeling variability in number marking in additional-language Spanish

Aarnes Gudmestad*, Amanda Edmonds† and Thomas Metzger‡

We extended sociolinguistic methods of investigating variability to number marking on determiners and adjectives in additional-language Spanish in the current study. The participants were learners of Spanish who were pursuing an undergraduate degree in Spanish (*N* = 135) in either the United States or France, and the data came from an argumentative essay. We analyzed all cases where participants marked plurality on noun-modifier pairs (*k* = 1950). A mixed-effects model demonstrated that both linguistic factors and individual characteristics influenced the participants' expression of plurality. The results provided evidence of the multidimensionality of number marking and contributed to knowledge about variability in additional languages.

1. Introduction

In the current study, we examine Spanish, a language that exhibits two agreement relationships between nouns and modifiers: Gender and number. On the one hand, second language acquisition (SLA) research on gender marking is abundant, with investigations resulting in numerous insights on how learners process and use grammatical gender as they acquire an additional language[1] (e.g., Alarcón, 2014; Ayoun, 2007; Hopp & Lemmerth, 2018). On the other hand, there exists little scholarship on number marking in additional languages (e.g., Grey et al., 2015), which means that knowledge about how additional-language learners acquire the ability to distinguish between singular and plural number remains limited. Thus, the aim of the current study is to further the understanding of number marking by investigating the variability in the expression of plurality on nouns and modifiers in the written production of additional-language learners of Spanish.

We analyze plurality because previous research has suggested that the marking of the singular is the default marking for number (e.g., López Prego & Gabriele, 2012), making the expression of plurality the non-default realization of number. Specifically, we extend sociolinguistic methods of analyzing variation (e.g., Tagliamonte, 2006) to investigate the use of overt plural marking in noun-modifier pairs.[2] This approach means that, rather than assessing targetlike rates of agreement

between nouns and modifiers, we conduct a multivariate analysis that examines the linguistic factors and individual characteristics that condition learners' overt marking of plurality on nouns and modifiers (cf. Geeslin & Long, 2014). Specifically, we explore the individual characteristics of L1, program level, and grammar-test score and the linguistic factors of noun gender, modifier type, syllable distance, and animacy. In turn, we provide preliminary evidence that multiple factors work in concert to explain the morphosyntactic phenomenon of number marking, thereby contributing new knowledge about this case of variability in an additional language.

2. Background
2.1. Gender and number marking

Our point of departure is agreement relationships between nouns and modifiers, of which there are two in Spanish. For gender, all nouns are either masculine or feminine. Nouns and modifiers show a variety of endings, but the canonical inflectional morphemes for gender are *-o* for masculine and *-a* for feminine. In terms of number, the inflectional plural morphemes are *-s* and *-es*. There is no overt singular morpheme; singularity is conveyed by the lack of plural inflection. Examples (1)–(3) illustrate these agreement relationships.

(1) *las uvas rojas* 'the_FEM, PLURAL grapes_FEM, PLURAL red_FEM, PLURAL'
(2) *un chico gregario* 'a_MASC, SINGULAR boy_MASC, SINGULAR gregarious_MASC, SINGULAR'
(3) *estos árboles altos* 'these_MASC, PLURAL trees_MASC, PLURAL tall_MASC, PLURAL'

Although number and gender marking both occur with nouns, there are various differences between the two. First,

* Virginia Polytechnic Institute and State University, US

† Université Paul-Valéry Montpellier 3, FR

‡ The Ohio State University, US

Corresponding author: Aarnes Gudmestad (agudmest@vt.edu)

gender is generally recognized to have low communicative value (e.g., Alarcón, 2014; Gudmundson, 2013). This low communicative value is attributed, at least in part, to the fact that the gender of most nouns is arbitrary (e.g., Acuña-Fariña, 2009). Number has higher communicative value, as it changes the referent or meaning. Corbett (2001, p. 3–4) explains:

> There is a difference in meaning between *magazine* and *magazines* (obviously concerning the number of them), which corresponds to a difference in form … The main part of the meaning of singular is that it refers to one real world entity, while the plural refers to more than one distinct real world entity.

Instances where gender changes the referent are much more limited (e.g., *nuestro hijo* 'our$_{MASC}$ son$_{MASC}$' versus *nuestra hija* 'our$_{FEM}$ daughter$_{FEM}$'). The second difference pertains to traditional grammar descriptions in Spanish, and thus to a possible learning target for additional-language learners. In expressing gender, language users generally need to modify the morpheme of the modifier only. For instance, with the adjective meaning 'black', the masculine form is used in *el coche negro* 'the$_{MASC}$ car$_{MASC}$ black$_{MASC}$', and the feminine form is used in *la camisa negra* 'the$_{FEM}$ shirt$_{FEM}$ black$_{FEM}$'. With number, however, language users typically need to add a plural morpheme to both the noun and the modifier to mark plurality, distinguishing them from singular forms and referents (see the examples in (4a–b)). A third difference pertains to the various ways in which learners may overtly mark gender and number in Spanish: There are more possible realizations of number expression, when compared to gender, in additional-language use. With gender we see two possibilities. Using the example of the noun meaning 'movie' in Spanish, the examples in (5a–b) demonstrate that it is possible for learners to use either a feminine or masculine modifier with this feminine noun.[3] With the overt expression of the concept of plurality, however, plural marking can appear on only the noun (6a), on only the modifier (6b), or on both (6c), which results in three possible combinations of plurality for learners.[4]

(4a)   *el plato sucio* 'the$_{SINGULAR}$ plate$_{SINGULAR}$ dirty$_{SINGULAR}$'
(4b)   *los platos sucios* 'the$_{PLURAL}$ plates$_{PLURAL}$ dirty$_{PLURAL}$'

(5a)   *la película* 'the$_{FEM}$ movie$_{FEM}$'
(5b)   *el película* 'the$_{MASC}$ movie$_{FEM}$'

(6a)   *la películas* 'the$_{SINGULAR}$ movies$_{PLURAL}$'
(6b)   *las película* 'the$_{PLURAL}$ movie$_{SINGULAR}$'
(6c)   *las películas* 'the$_{PLURAL}$ movies$_{PLURAL}$'

Thus, although both are nominal agreement relationships, the expression of gender and number in Spanish differ in terms of both communicative weight and the overt marking of the two relationships. In part because of these differences, the acquisition of gender and number appear to be characterized by different learnability issues. This observation finds some support in prior research, which we discuss below, and suggests that number marking is worthy of further investigation.

The limited body of work on number marking has resulted in four important observations. First, studies have indicated that number marking is acquired before gender marking (e.g., White et al., 2004). Second, learners have exhibited improvement in the interpretation and production of number agreement as a function of proficiency, with learners becoming more targetlike as proficiency level increased (White et al., 2004). Additionally, it has been shown that knowledge about number agreement – but not gender agreement – may show development over the course of a stay abroad in the target-language environment. Using a grammaticality judgment task, Grey et al. (2015) found that participants made gains with number but not gender agreement during a five-week stay (cf. Gudmestad et al., 2019). Finally, research has indicated that the singular modifier is the default for learners (López Prego & Gabriele, 2012, McCarthy, 2008). Despite these findings, investigations on number agreement in additional-language Spanish have not yet explored the multiple factors that explain variability in use (see 6a–6c) in a single investigation.

As already mentioned, research on agreement between nouns and modifiers in SLA in general and on additional-language Spanish in particular has focused on gender, rather than number (e.g., Alarcón, 2014). For this reason, we look to the previous research on gender marking to inform our study of plurality marking. First, researchers have observed that learners may variably use feminine and masculine modifiers with the same noun (e.g., *una$_{FEM}$ pareja$_{FEM}$* and *un$_{MASC}$ pareja$_{FEM}$* 'a couple'), including sometimes within the same noun phrase, as shown in example (7), taken from the current dataset.

(7)   *todas los parejas* (L1 French, beginning of degree program)
         'all$_{FEM}$ the$_{MASC}$ couples$_{FEM}$'

Studies that have analyzed additional-language production in Spanish have observed that a range of factors are connected to learners' variability in targetlike gender marking in oral and written language use. We highlight here four factors that are relevant for the present investigation. The most well-studied variable is noun gender, with research consistently showing that learners were more targetlike with gender marking when the noun was masculine (e.g., Finnemann, 1992; Montrul et al., 2008; White et al., 2004). Additionally, several studies have found that, for the factor of modifier type, targetlike gender marking was higher with determiners compared to adjectives (Alarcón, 2010; Bruhn de Garavito & White, 2002; Fernández-García, 1999; White et al., 2004). More recent research has examined distance between the noun and modifier and indicated that learners were more likely to mark gender in a targetlike way the closer the noun and modifier were to each other (Gudmestad et al., 2019, see also Finnemann, 1992; Keating, 2009). Lastly, in Edmonds and Gudmestad (in press) we analyzed written data and

found that learners were more likely to exhibit targetlike gender marking when the noun was singular, compared to plural, which pointed to a possible connection between gender and number marking (see also Finnemann, 1992).

Another issue that has received quite a bit of attention in SLA research on gender marking is the role of L1 influence. Previous investigations have reached different conclusions on whether the presence of grammatical gender in a learner's L1 plays a role in additional-language development of gender marking. Some studies have found that L1s with gender marking facilitate the acquisition of gender in an additional language (e.g., Franceschina, 2001), while others have observed no such effect (e.g., White et al. 2004). In contrast, there exists very little research on the importance of L1 influence on number-marking variability (see White et al., 2004, for work on additional-language Spanish and Chini, 1995, for work on additional-language Italian). In the current study, L1 influence is addressed insofar as we examine usage patterns of L1 speakers of French and English, all of whom are learning Spanish. All three languages – French, English, Spanish – show number marking on certain nouns and modifiers, although differences in the overt marking of number exist.[5] Spanish traditionally marks number overtly on most nouns and modifiers in both the oral and written modalities. Prescriptively, French is similar to Spanish in writing, but in oral language most nouns and many modifiers are not overtly marked for number. Thus, in an example like *le nouveau vélo* [lənuvovelo] 'the_SINGULAR new_SINGULAR bike_SINGULAR'/*les nouveaux vélos* [lenuvovelo] 'the_PLURAL new_PLURAL bikes_PLURAL', the plural marking on the determiner, adjective and noun are visible in the written form, but audible only on the determiner (see Ågren, 2008, for a study of the development of silent plural morphology in additional-language French). Finally, traditionally in English number is overtly marked on most nouns (spoon-spoons and goose-geese) but only on some modifiers in both modalities (e.g., demonstrative determiners *this* and *these* are singular and plural, respectively). Because most of this work on the influence of the L1 has been on gender and the fact that the three languages under consideration in our study all show differences with regard to nominal number marking, we begin to address in the current study the role that the L1 may play in learners' variable use of number marking.

2.2. Variationist approaches to SLA

As the preceding sub-section demonstrates, little research has addressed number marking in additional-language Spanish, and of the research that does exist, it has yet to account for the variability in the use of number marking on nouns and modifiers. In the present investigation, we aim to further understand how additional-language learners of Spanish express number with a focus on how they mark plurality. This attention to plurality is motivated by previous studies that have indicated that plural morphology is the non-default (e.g., López Prego & Gabriele, 2012). Thus, we do not examine singular nouns with singular modifiers in the current study, as this combination typically shows no overt marking of number.

As was shown in (6), there are three possible expressions of plurality for noun-modifier combinations in learner language. In other words, each of the pairs in (6) can be argued to express the same function (i.e., plurality). One approach to understanding the variability among two or more ways of expressing the same function is variationism, and it is this approach that we adopt in the current study. Variationism is a branch of sociolinguistics that seeks to understand language variation and change, by accounting for the linguistic and social (extra-linguistic) factors that condition systematic and dynamic variation (Labov, 1972). The first step in a variationist analysis is identifying a linguistic structure in which a meaning or function can be expressed with more than one form. Examinations of the forms in variation generally involve assessments of the frequency of use of each form and probabilistic models that explain the factors that predict the use of a given form when two or more forms are possible (Tagliamonte, 2006).

Although this area of scholarship originally centered on native speakers, it was subsequently applied to additional-language learners. Much of the variationist SLA work has focused on linguistic structures that are variable among native speakers as well (e.g., subject expression in Spanish), meaning that researchers have investigated the additional-language acquisition of sociolinguistic variation. To demonstrate what variationism can bring to the study of an additional language, we briefly discuss Linford et al. (2018), who examined subject expression in Spanish, focusing on the variation between personal pronouns and unexpressed subjects, as exemplified in (8a–b). They used a written contextualized task to investigate the additional-language development of subject expression during a six-week study abroad experience in Spain. They found that the frequency of selection of personal pronouns decreased and the rate of occurrence of unexpressed subjects increased during the stay abroad. Their multivariate analysis indicated that the same linguistic factors conditioned the selection of subject forms at the beginning and end of the stay abroad. For example, with the factor grammatical person, the participants were more likely to select a personal pronoun compared to an unexpressed subject when there was a third-person subject compared to a first-person subject. They also analyzed participants' self-reported contact with Spanish and found preliminary evidence to suggest that this individual characteristic played a role in the development of variable subject expression.

(8a)   *Yo no sé.* 'I don't know.'
(8b)   ∅ *No sé.* '(I) don't know.'

In addition to work on sociolinguistic variation, a smaller body of scholarship has extended variationist conceptual and methodological tools to grammatical structures that are generally not variable among native speakers (e.g., grammatical gender in Spanish, Gudmestad et al., 2019, plural marking in English, Young 1991), resulting in new knowledge about how learners vary their use of linguistic forms that are seemingly not variable in the

input they receive from native speakers. Thus, regardless of the linguistic phenomenon, variationist SLA has provided detailed explanations of the linguistic and extra-linguistic factors that impact learners' variable use and development (Bayley & Preston, 1996; Geeslin & Long, 2014; Tarone, 2007). We adopt this approach in order to offer a preliminary explanation for learners' variable behavior in the marking of plurality on noun-modifier pairs in Spanish.

3. The current study

Our objective was to begin to understand the linguistic factors and individual characteristics that influenced learners' variable expression of plurality in noun-modifier pairs. The following research questions guided the current study.

(i) What is the rate of occurrence of the three possible expressions of plurality?
(ii) What linguistic and extra-linguistic factors impact additional-language learners' use of plural marking in noun-modifier pairs?

3.1. Method

3.1.1. Participants

The participants were undergraduate students enrolled in a university degree program in Spanish ($N = 135$). Eighty-one were L1 speakers of English at an institution in the United States, and 54 were L1 speakers of French enrolled in a French university. The Spanish programs at these institutions are similar in that students took courses on a range of topics (e.g., grammar, literature, linguistics). The participants were either at the beginning ($n = 67$) or the end ($n = 68$) of their degree program. They had been studying Spanish for an average of 8.06 years ($SD = 3.02$, $range = 1–19$) and had spent an average of 2.12 months in a country where Spanish is the dominant language ($SD = 6.56$, $range = 0–62$ months).[6] Fifteen were men, 119 were women, and one did not report this information. They ranged in age from 19 to 61 ($M = 20.69$, $SD = 4.65$).[7] In terms of experiences with other languages, 18 of the L1 speakers of English reported having studied or being able to speak Arabic, Bisaya, Bulgarian, French, Hebrew, Italian, Japanese, Korean, or Latin; 63 did not have experience with other languages. Among the L2 speakers of French, 48 participants had experience with Arabic, Basque, Catalan, Chinese, Dutch, English, German, Italian, Latin, Occitan, or Portuguese; six did not report experience with other languages.

3.1.2. Data collection

The participants completed three tasks during class time, and data collection took about 50 minutes (i.e., time to explain procedure and complete the tasks). The first task, which we borrowed from the LANSGSNAP corpus http://langsnap.soton.ac.uk/, e.g., Mitchell et al., 2017) was an argumentative essay in Spanish.[8] The topic was whether gay couples should be able to adopt children. The participants were given three minutes to brainstorm ideas and 15 minutes to write the essay. They wrote an average of 168.49 words ($SD = 47.14$, $range = 50–284$).

The second instrument was a multiple-choice grammar test that has been used in other variationist SLA research (Geeslin & Gudmestad, 2010). It contained 25 items, was contextualized in a story written in Spanish, and covered a range of grammatical structures (e.g., object pronouns, prepositions, verb tenses). The participants were given six minutes to complete it. Collectively, they scored an average of 14.9 points out of a possible 25 ($SD = 3.7$, $range$: 6–23). Their mean scores according to L1 were 14.02 ($SD = 3.42$, $range = 6–23$) for English and 16.35 ($SD = 3.77$, $range = 7–23$) for French, and the average score by program level was 13.04 ($SD = 3.19$, $range = 6–20$) for the beginning level and 16.84 ($SD = 3.25$, $range$ 8–23) for the end level. The final task was a background questionnaire that elicited demographic data and information on their language experiences. They had 10 minutes to fill it out.

3.1.3. Data coding and analysis

We coded every instance of a determiner or adjective that modified a referent as a separate token ($K = 5,483$). In cases where a noun was modified by more than one modifier (e.g., a determiner and an adjective), we coded each noun-modifier pair as a separate token. Determiners occurred in the noun phrase only, whereas adjectives appeared in or outside of the noun phrase. The current dataset was limited to instances where participants overtly expressed plurality, either on the noun, modifier, or both ($k = 1,950$); the 3,533 singular$_{NOUN}$-singular$_{MODIFIER}$ pairs were thus not included in the analysis. Overt expressions of plurality were either plural morphemes (i.e., −s and −es) or lexical forms (e.g., *dos* 'two'). Examples from our data are available in (9) and (10); the instances of plurality that we analyzed are underlined and the excerpts presented reproduce verbatim what the participants wrote.[9]

(9) *Muchas veces, argumentos en contra son basadas en rasones religiosa, pero los argumentos no tienen lugar en el espacio de gobierno.* (L1 English, end of degree program)

'Many$_{PLURAL}$ times$_{PLURAL}$, arguments$_{PLURAL}$ against are based$_{PLURAL}$ on religious$_{SINGULAR}$ reasons$_{PLURAL}$, but the$_{PLURAL}$ arguments$_{PLURAL}$ do not have a place in government.'

(10) *Si dos hombres o dos mujer van a educar un niño es la igual cosa que un hombre y una mujer.* (L1 French, beginning of degree program)

'If two$_{PLURAL}$ men$_{PLURAL}$ and two$_{PLURAL}$ woman$_{SINGULAR}$ are going to educate a child it is the same thing as a man and a woman.

We coded the data for one dependent variable and several independent variables. The dependent variable was plurality. There were three possible ways of expressing plurality on noun-modifier pairs: Plural$_{NOUN}$-plural$_{MODIFIER}$, plural$_{NOUN}$-singular$_{MODIFIER}$, and singular$_{NOUN}$-plural$_{MODIFIER}$.[10] These three different combinations are illustrated in examples (9) and (10): In (9) there are three instances of plural$_{NOUN}$-plural$_{MODIFIER}$ pairs and one plural$_{NOUN}$-singular$_{MODIFIER}$ pair, and example (10) illustrates both a plural$_{NOUN}$-plural$_{MODIFIER}$ pair and a singular$_{NOUN}$-plural$_{MODIFIER}$

pair. We investigated seven fixed effects (independent variables), drawing on previous research in SLA on number and gender marking and on scholarship on typological differences. Three of the fixed effects were individual characteristics: L1, program level, and grammar-test score. With L1, we distinguished between native speakers of English and French. Proficiency was addressed in two ways: Program level and grammar-test score. Program level differentiated between participants at the beginning and end of their undergraduate degree program in Spanish and enabled us to consider development using cross-sectional data. Grammar-test score, a continuous factor, was the score each participant earned on the test. It examined whether explicit knowledge of prescriptive grammar influenced plurality expression in writing. The final four fixed effects were linguistic factors: Noun gender, modifier type, syllable distance, and animacy. Noun gender refers to whether the noun was feminine or masculine according to descriptive grammar.[11] We analyzed this factor because there is evidence that the marking of gender and number may influence each other (Edmonds & Gudmestad, in press). We opted to code for modifier type (e.g., Alarcón, 2010) and syllable distance (e.g., Gudmestad et al., 2019) because these factors have been found to be important for gender marking. Since gender and number marking both occur in noun-modifier pairs, we decided to explore whether the same patterns found for gender would also be observed for number. Modifier type differentiated between determiners and adjectives. Syllable distance was a continuous factor that measured the number of syllables between the noun and modifier.[12] In example (9), the distance in syllables between the noun and the modifier is zero for all noun modifier pairs, except for *argumentos en contra son basadas,* for which the distance is four syllables. Due to the strong right skew of syllable distance (from a statistical perspective), we transformed this variable by adding 1 and taking the natural logarithm to obtain a less highly skewed measure of syllable distance. Lastly, animacy distinguished between animate and inanimate nouns. This factor is motivated by typological research that has highlighted the importance of animacy for number (Corbett, 2001). We also included a random effect for participant in the analysis to account for variability in number marking among the individuals from the greater population of additional-language learners of Spanish.

We began the data analysis by assessing the frequency of use of different noun-modifier pairs. We then turned to the multivariate analysis. We first examined whether there were any strong correlations between the fixed effects using the statistical software R (R Core Team, 2019). Next, we fit a generalized linear mixed model with the statistical software SAS. This mixed-effects model enabled us to determine how individual characteristics and linguistic factors worked conjointly to significantly influence learners' variable expression of plurality.

3.2. Results

The frequency of use of each noun-modifier pair is available in **Table 1**. The $plural_{NOUN}$-$plural_{MODIFIER}$ pair was the most frequent, constituting over 90 percent of the data. Both the $plural_{NOUN}$-$singular_{MODIFIER}$ and $singular_{NOUN}$-$plural_{MODIFIER}$ pairs occurred in the dataset, but they were less frequent, making up about 6.5 percent and about 1.5 percent of the data, respectively.

The next steps in our analysis led to the removal of two fixed effects. First, noun gender and animacy were strongly correlated, which meant that one of the two should be removed from the analysis.[13] We chose to continue to investigate noun gender rather than animacy, because of previous work on gender marking that suggests that gender and number marking are connected in additional-language Spanish. Second, we found that L1 was not a statistically significant predictor of plurality expression, so we removed it from the analysis. Our final model included five fixed effects, in addition to the random effect for participant. The significant factors were program level, grammar-test score, syllable distance, modifier type, and noun gender. Given that three patterns of expressing plurality were attested in our data, we modeled the dependent variable with a multinomial logistic approach. The mixed-effects model compared a reference-point category of the dependent variable to each of the other categories. Since the $plural_{NOUN}$-$plural_{MODIFIER}$ pair was the most frequent noun-modifier pair, we selected it as the reference point. Therefore, in one model, $plural_{NOUN}$-$singular_{MODIFIER}$ pairs and $singular_{NOUN}$-$plural_{MODIFIER}$ were each compared to the $plural_{NOUN}$-$plural_{MODIFIER}$ pairs. Denoting the $plural_{NOUN}$-$plural_{MODIFIER}$ pair as the reference point also meant that we compared the pair in which the number marking on the noun and modifier matched each other against the two pairs in which there was a mismatch in plurality marking (i.e., one element was plural and the other was singular). These results are available in **Tables 2** and **3**, respectively. It is important to note that although we present the results in two separate tables in order to improve readability, they come from one model.

The nominal fixed effects also had reference points: They were beginning of the program (program level), masculine (noun gender), and determiner (modifier type). The continuous variables do not have reference points. The estimate in the tables shows the log-odds of using the non-reference point category of the dependent variable. A positive estimate denotes a higher likelihood of using either $plural_{NOUN}$-$singular_{MODIFIER}$ (**Table 2**) or $singular_{NOUN}$-$plural_{MODIFIER}$ (**Table 3**), whereas a negative estimate signifies a lower log-odds of using these mismatched categories, compared to the reference point category. The *p*-value indicates whether the effect is significant ($\alpha = 0.05$; significance is when $p < \alpha$). Details of the random effect of participant are not included due to space constraints. The McFadden's R^2 revealed a moderate model fit ($R^2_{McFadden} = 0.2074$; Smith & McKenna, 2013).

Table 1: Frequency of use of plurality pairs.

Noun-modifier pair	#	%
$plural_{NOUN}$-$plural_{MODIFIER}$	1795	92.05
$plural_{NOUN}$-$singular_{MODIFIER}$	126	6.46
$singular_{NOUN}$-$plural_{MODIFIER}$	29	1.49
Total	1950	100

Table 2: Results for the fixed effects in the regression model: Plural$_{NOUN}$-singular$_{MODIFIER}$ vs. plural$_{NOUN}$-plural$_{MODIFIER}$.

Effect	Estimate	SE	df	*p*-value	Confidence intervals	
					Lower	Upper
Intercept	−2.307	0.621	1938	0.0002	−3.525	−1.089
Program level [Beginning]						
End	−0.991	0.329	1938	0.003	−1.636	−0.346
Grammar-test score	−0.117	0.046	1938	0.010	−0.206	−0.028
Noun gender [Masculine]						
Feminine	−0.560	0.224	1938	0.012	−0.100	−0.122
Modifier type [Determiner]						
Adjective	1.861	0.276	1938	<0.0001	1.320	2.402
Syllable distance	2.129	0.260	1938	<0.0001	1.620	2.638

Note: The reference point for the dependent variable is *plural$_{NOUN}$-plural$_{MODIFIER}$*. The reference points for the nominal independent variables are in brackets.

Table 3: Results for the fixed effects in the regression model: Singular$_{NOUN}$-plural$_{MODIFIER}$ vs. plural$_{NOUN}$-plural$_{MODIFIER}$.

Effect	Estimate	SE	df	*p*-value	Confidence intervals	
					Lower	Upper
Intercept	−3.491	1.177	1938	0.003	−5.798	−1.183
Program level [Beginning]						
End	−0.581	0.630	1938	0.356	−1.815	0.654
Grammar-test score	−0.166	0.084	1938	0.049	−0.332	−0.001
Noun gender [Masculine]						
Feminine	0.988	0.440	1938	0.025	0.125	1.851
Modifier type [Determiner]						
Adjective	0.779	0.423	1938	0.066	−0.050	1.609
Syllable distance	0.696	0.632	1938	0.271	−0.543	1.935

Note: The reference point for the dependent variable is *plural$_{NOUN}$-plural$_{MODIFIER}$*. The reference points for the nominal independent variables are in brackets.

Beginning with the plural$_{NOUN}$-singular$_{MODIFIER}$ versus plural$_{NOUN}$-plural$_{MODIFIER}$ comparison (**Table 2**), we found that the participants at the end of their degree program showed a lower likelihood of producing a plural$_{NOUN}$-singular$_{MODIFIER}$ pair compared to the participants at the beginning of the degree program. Regarding the grammar test, the higher the participants scored, the lower their likelihood of using a plural$_{NOUN}$-singular$_{MODIFIER}$ pair. A negative parameter estimate was also found for the factor noun gender: The participants were less likely to use this mismatched pair when the noun was feminine. For the final two factors, the model showed that the learners were more likely to use a plural$_{NOUN}$-singular$_{MODIFIER}$ pair when the modifier was an adjective and as the distance between the noun and the modifier increased. Another way of framing these results is that learners exhibited a higher likelihood of producing a matched plurality pair, compared to marking plurality only on the noun, in the following conditions: When the participants were at the end of their degree program, the higher they scored on

the grammar test, with feminine nouns, with determiners, and the closer the noun and modifier were together.

The results for the singular$_{NOUN}$-plural$_{MODIFIER}$ versus plural$_{NOUN}$-plural$_{MODIFIER}$ comparison are available in **Table 3**. The effects for program level, modifier type, and syllable distance did not significantly influence the use of the singular$_{NOUN}$-plural$_{MODIFIER}$ versus plural$_{NOUN}$-plural$_{MODIFIER}$ pairs. We found two significant effects for this comparison. The higher the participants scored on the grammar test, the lower the likelihood of using singular$_{NOUN}$-plural$_{MODIFIER}$ pair. The participants also exhibited higher log-odds of using a singular$_{NOUN}$-plural$_{MODIFIER}$ pair when the noun was feminine. In other words, the learners were more likely to use a matched plurality pair, versus only marking plurality on the modifier, the higher they scored on the grammar test and with masculine nouns.

When we compare the results for the plural$_{NOUN}$-singular$_{MODIFIER}$ pair and singular$_{NOUN}$-plural$_{MODIFIER}$ pair, we see one similarity: Both showed a negative estimate for the grammar-test score. Stated another way, mismatched

plural marking between a noun and modifier was less likely as the score on the grammar test increased. The findings for the other fixed effects differed between the plural$_{NOUN}$-singular$_{MODIFIER}$ and singular$_{NOUN}$-plural$_{MODIFIER}$ pairs.

4. Discussion

Regarding the first research question that addressed frequency, all three possible ways of expressing plurality in noun-modifier pairs were instantiated in these data, although at different frequency rates. Specifically, noun-modifier pairs in which plurality was only expressed on the modifier or on the noun accounted for 1.49 percent and 6.46 percent of the data, respectively. More than 90 percent of the data showed plural marking on both the noun and modifier. Moreover, we found that plurality was more often expressed on the noun than on the modifier in this dataset: When the frequency of both the plural$_{NOUN}$-plural$_{MODIFIER}$ and plural$_{NOUN}$-singular$_{MODIFIER}$ pairs are combined, we see that 98.51 percent of all expressions of plurality in noun-modifier pairs showed plural marking on (at least) the noun. This finding may have to do with the fact that the noun, not the modifier, is the entity that is changed in the real world by the addition of the plural morpheme (Corbett, 2001). Moreover, these learners had high rates of plural$_{NOUN}$-plural$_{MODIFIER}$ pair use. Some researchers might consider that these participants have acquired number marking on noun-modifier pairs, given that they used a plural modifier with a plural noun more than 90 percent of the time (cf. Gass et al., 2013). We believe, however, that examining learner populations like this one is important because the participants still show variability in use and it is possible to learn about later points along the developmental trajectory by modeling this type of additional-language behavior (cf. Gudmestad et al., 2019; Bartning et al., 2009; Tarone et al., 1976).

Concerning the second research question about the factors predicting use, we found that two individual characteristics – program level and grammar-test score – and three linguistic factors – noun gender, modifier type, and syllable distance – predicted variability in plurality expression. L1 and animacy were not included in the final mixed effects model. With respect to the L1 factor, we found that this individual characteristic was not significant (cf. Franceschina, 2001). Although number marking on noun-modifier pairs differs in English, Spanish, and French, we found no significant difference between L1 speakers of English and French in their plurality expression in additional-language Spanish in written production. These results were similar to White et al. (2004), who analyzed controlled oral production and comprehension tasks. If L1 specific patterns of number marking had impacted use, it would have been reasonable to expect more plural$_{NOUN}$-singular$_{MODIFIER}$ pairs from the English L1 learners than the French L1 learners, given the fact that most modifiers in English are not inflected for plurality. This finding led us to question whether the nature of number marking in general may facilitate learning regardless of the L1 and additional-language combinations that we examined. To support this observation, we turn to research conducted within usage-based approaches to language, which has identified input characteristics that support learning. Indeed, Ellis (2012, p. 265), in an article on variable competence, states that the learning of constructions that are "high on the dimensions of type-frequency, salience, functionality, semanticity, non-redundancy, and reliability of form-function mapping" may be less challenging. With respect to plurality in Spanish, it would seem that some of these characteristics are united: The plural morpheme is frequent, functionally transparent, carries clear semantic meaning, and enjoys a reliable form-function mapping. Thus, the nature of number marking in Spanish may support learning, regardless of the learner's L1. Avenues for future research regarding the role of the L1 would include exploring whether L1 differences may be visible at earlier points along the developmental trajectory, as a function of modality (oral versus written), or as a function of learning experiences (e.g., largely naturalistic versus instructional learning).

We turn now to questions of language proficiency and its influence on plurality expression. In this study, we included two variables that present different visions of language proficiency. Whereas program level presumably taps into general language proficiency, hypothesizing that language majors at the beginning and end of their university education will differ, the grammar-test score offered a narrower conceptualization of language proficiency, using a discrete-choice test that provides an indication of learners' explicit knowledge about prescriptive grammar. The issue of proficiency assessment in SLA is a thorny one (see discussions in Hulstijn, 2012; Leclercq et al. 2014; Thomas, 2006), and we argue that the inclusion of two different measures in the current study offers unique and complementary insights into the role proficiency plays in the development of number marking. The finding for program level indicated that there was a change over the course of the degree program in the use of plural$_{NOUN}$-singular$_{MODIFIER}$ pairs but not singular-plural pairs (at least with respect to plural$_{NOUN}$-plural$_{MODIFIER}$ pairs). More specifically, learners at the beginning of their degree program were more likely to use noun-modifier pairs in which plurality was only marked on the noun than learners at the end of their degree program. No change, however, was seen in the use of noun-modifier pairs in which plurality was only marked on the modifier. This finding could indicate that the use of singular$_{NOUN}$-plural$_{MODIFIER}$ pairs was relatively stable across the developmental trajectory. It is also possible, however, that learners at lower levels than the language majors who participated in this study might make greater use of singular$_{NOUN}$-plural$_{MODIFIER}$ pairs. The effects seen for grammar-test score allow us to nuance the findings with respect to the use of singular$_{NOUN}$-plural$_{MODIFIER}$ pairs. The results for this factor suggest that the expression of plurality on the modifier only may not be stable, because a higher score on the grammar test was significantly connected to a lower likelihood of using singular$_{NOUN}$-plural$_{MODIFIER}$ pairs.

The linguistic factors of syllable distance and modifier type were motivated by previous work on gender marking. In our own previous research, for example, we found

a higher likelihood of targetlike gender marking (i.e., matched gender between the noun and modifier) when the noun and modifier were closer together and when the modifier was a determiner compared to an adjective (Gudmestad et al., 2019). The results in the current study for the comparison between plural$_{NOUN}$-singular$_{MODIFIER}$ pairs and plural$_{NOUN}$-plural$_{MODIFIER}$ pairs aligned with these findings, suggesting that the expression of gender and number may be influenced by at least some of the same factors. To begin with syllable distance, the participants were more likely to mark plurality on the noun only (plural$_{NOUN}$-singular$_{MODIFIER}$ pairs) as the distance between the noun and modifier increased. This finding may reflect the fact that non-adjacency of agreement relationships has been found to pose challenges for learning (Kempe & Brooks, 2008). In other words, in written production, non-adjacency may lead to more mismatches in plurality expression between nouns and modifiers. Regarding modifier type, we found that plural$_{NOUN}$-singular$_{MODIFIER}$ pairs were more likely when the modifier was an adjective than a determiner. This result parallels findings from research on gender that reports learners showing lower rates of targetlike gender marking with adjectives than with determiners. This pattern was found by Dewaele and Véronique (2001) in their investigation of additional-language French. They suggested that both the higher frequency of determiners and the greater variety with adjectives contributed to higher rates of targetlike use with gender agreement on determiners, compared to adjectives. The comparison between matched pairs and singular$_{NOUN}$-plural$_{MODIFIER}$ pairs, however, did not identify either syllable distance or modifier type as significant. Our initial hypothesis was that a small number of specific adjectives or determiners may have been overrepresented among the singular$_{NOUN}$-plural$_{MODIFIER}$ pairs, which could have impacted the usage profile. After looking at the full list of singular$_{NOUN}$-plural$_{MODIFIER}$ pairs, we determined that this was not the case. We have since collected more data in order to explore this issue in future work.

Finally, prior investigations on gender marking also led us to investigate noun gender. Research has indicated that targetlike gender marking is facilitated by the default noun gender – masculine (e.g., Finnemann, 1992; Montrul et al., 2008) and the default number category – singular (Edmonds & Gudmestad, in press). In the current study, we explored whether the default noun gender impacted plurality marking. With plural marking, we did not observe that the default gender consistently led to matched plural marking. Instead, we found on the one hand that plural$_{NOUN}$-plural$_{MODIFIER}$ pairs were more likely than singular$_{NOUN}$-plural$_{MODIFIER}$ pairs when the noun was masculine, which aligned with research on gender marking. However, we also found results that diverged from patterns observed for gender marking: Plural$_{NOUN}$-plural$_{MODIFIER}$ pairs were more likely than plural$_{NOUN}$-singular$_{MODIFIER}$ pairs when the noun was feminine. While the results for noun gender were complex, they offer additional evidence for the interrelationship between the expression of gender and number in additional languages. As stated in the literature review, previous research on gender marking in additional-language Spanish has shown that participants were less likely to be targetlike when the noun was plural (Edmonds & Gudmestad, in press), and the current study found that gender significantly impacted plurality expression. Taken together, this body of research appears to support the understanding that gender and number marking influence each other, although in different ways, and demonstrates that it is worth exploring both agreement relationships together.

Lastly, to our knowledge, the current investigation was the first to examine the multifaceted nature of additional-language number marking in language production. Scholars in SLA and learner corpus research have advocated for investigations of additional languages that reflect the complexities of additional-language development and use (Gries, 2015; Plonsky & Oswald, 2017). Variationist SLA is one approach that offers tools for conceptualizing and analyzing the multidimensionality present in additional-language variability and acquisition (cf. Gudmestad et al., 2019). For one, this approach tends to focus on the linguistic forms that participants use to express a given function. We observed three ways in which learners marked plurality on noun-modifier pairs. Including these three pairs in our analysis enabled us to shed new light on the diverse ways in which learners expressed plurality, observations about variability in number marking that would not have been possible with a focus on targetlike use (i.e., the binary opposition between matched and mismatched pairs). The multivariate statistical analysis also resulted in observations about the range of linguistic factors and individual characteristics that worked together to predict the variable use of the three plurality pairs present in our data. In short, by employing a variationist approach, we have begun to explain the intricate and systematic variability in the expression of plurality in additional-language Spanish (cf. Geeslin & Long, 2014).

5. Conclusion

The present study investigated plurality expression in noun-modifier pairs in written production by additional-language learners of Spanish. We found that although participants marked plurality on both the noun and the modifier in most cases, there were instances in which participants overtly expressed plurality on the noun or the modifier only. Our variationist analysis indicated that the variability in the use of these expressions of plurality was conditioned by a range of individual characteristics and linguistic factors, namely program level, grammar-test score, modifier type, syllable distance, and noun gender. However, we did not find evidence of differences as a function of the L1 of the learners; L1 French and L1 English participants behaved similarly in their expression of plurality. Given that SLA research on number marking on noun-modifier pairs is limited, there are various avenues for future research. These include analyzing both oral production and data from learners who have had less experience with Spanish than those investigated in the present study. It may also be worth examining whether the status of Spanish in both countries and in the specific communities where participants live is connected to

developmental patterns (i.e., the proportion of Spanish speakers in the United States is larger compared to France). Furthermore, there are other potentially important factors in need of study, such as possible differences between mass and count nouns. Lastly, given that gender and number agreement both occur between nouns and modifiers but that their mechanics and communicative weight differ, it is worth comparing variable patterns of use between gender and number marking within the same learner population and dataset. In summary, the current study has initiated the exploration of variable plurality expression in additional-language Spanish and found that learners' use of the three types of noun-modifier pairs that are overtly marked for plurality vary in complex ways, whereby linguistic constraints and individual characteristics of the participants influence use in written production.

Notes

[1] We use this term in referring to any language learned after the first language (L1), in line with the framework laid out by The Douglas Fir Group, 2016.

[2] In the current study, a noun-modifier pair refers to the use of a noun with a modifier (determiner or adjective). Although the noun is listed first in the plurality pairings, it is possible that the modifier precedes the noun (e.g., *los libros* 'the books').

[3] It is worth noting that our examination of different additional-language datasets has indicated that learners generally do not change the gender morpheme of the noun (e.g., *película*).

[4] Varieties with /s/ weakening can show variable overt marking of the plural morpheme (Díaz-Campos, 2011). We, moreover, have not added an asterisk to any examples. Other than brief descriptions in some research on language contact, we know of no empirical investigations on number agreement in noun-modifier pairs in native-speaker language production. Thus, although some of the examples in the paper contain errors in terms of prescriptive grammar rules, there does not exist strong evidence as to the ungrammaticality of these examples in real-world language use.

[5] We recognize that the presentation of the similarities and differences among these languages is brief. Space constraints prevent us from elaborating further on the morphological and phonological features of number marking in these languages.

[6] We did not observe any outliers in the expression of plurality, which could be explained by length of time abroad.

[7] One participant elected not to share the number of years spent studying Spanish and one did not indicate age.

[8] We used this task because we have future plans to compare the LANGSNAP data with our own.

[9] Although we do not analyze gender marking in the current study, we note that the $argumentos_{MASC}$-$basadas_{FEM}$ pair in (9) shows that the participants are developing this feature along with number marking.

[10] The $plural_{NOUN}$-$plural_{MODIFIER}$ pair is the accurate pair according to prescriptive grammar and the participants are exposed to this norm through explicit instruction. However, in the current study we attempt to begin to move away from conceptualizing learners' plurality expression in this manner in order to try to avoid, to a certain degree, the monolingual bias in SLA (e.g., Ortega, 2014).

[11] There is a limited number of nouns whose gender varies by region. None of these nouns occurred in the dataset.

[12] We opted to count syllables because we believe that it provides a finer grain approach to distance (as compared to syntactic distance or linear distance measured by words). Distance has been operationalized in different ways and merits a systematic comparison in future research.

[13] Feminine nouns were positively correlated with animate nouns and masculine nouns were positively correlated with inanimate nouns.

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