Morphosyntactic features versus morphophonological features in L2 gender acquisition:

A cross-linguistic perspective

11428

**Abstract**

This paper aims to demonstrate the reliability of morphosyntactic versus morphophonological features in the acquisition of L2 gender of inanimate nouns across languages. Based on Kibort and Corbett’s (2010) classification, the current research proposes that the presence of determiner (a morphosyntactic feature) is more reliable than noun-final morphemes (morphophonological feature) in the process of adjective agreement within the Determiner Phrase (DP) across languages. To test this hypothesis, the current research compares English second language (L2) learners of Hebrew and Spanish. Both languages have a binary gender system for nouns; however, Hebrew lacks a determiner with gender value, but provides a plural ending morpheme that encodes both number and gender. In contrast, Spanish has a gendered article that facilitates gender acquisition (Grüter, Lew-Williams, and Fernald, 2012), but it lacks a plural ending morpheme that indicates gender. 32 L1 English-L2 Spanish learners and 32 L1 English- L2 Hebrew learners with different proficiency completed an adjective- agreement elicited production task and adjective-agreement forced-choice task in their respective L2, highlighting the role of the determiner in Spanish and the role of transparency-plural ending morphemes in Hebrew in the experimental items in each target language. The data were analyzed using GLMM model. The results revealed that Spanish L2 learners performed more accurately on the tasks than L2 Hebrew learners, offering evidence for the relevance of syntactic agreement knowledge over phonological cues in gender acquisition.

Keywords: morphosyntactic features, morphophonological features, gender, Spanish, Hebrew

**1 Introduction**

Several studies have examined the importance of morphosyntactic features in the acquisition of L2 gender, stating that L2 learners used gender markings on determiners to establish predictive syntactic agreement relations (Oliphant,1998; Hopp, 2013; Grüter et al, 2012, Halberstadt, Kroff, and Dussias, 2018). On the other hand, research on various languages emphasize the role of noun-ending transparency that leads gender acquisition(Szagun, Stamper, Sondag, & Franik, 2007; Foote, 2014). Therefore, it remains unclear whether the gender information encoded in the determiner is more reliable for L2 learners than transparent ending morpheme in the acquisition of inanimate nouns. To disentangle the role of the two type of morphemes, the present study contributes adopting a cross-linguistic perspective, testing whether the presence of the determiner before an opaque noun will facilitate adjective agreement, comparing with a language that has a genderless determiner, but it provides plural ending morpheme that marks both number and gender. This is the case of Hebrew that, unlike Spanish, lacks a determiner with gender information, but it contains plural transparent noun ending morphemes that facilitate gender assignment.

To this end, the present work provides a theoretical analysis of two linguistic systems that provide different gender features that impact the L2 acquisition of gender, and how some features are relevant for the acquisition of gender properties in inanimate nouns across languages. Also, the current research is concerned with the role of syntactic knowledge in the acquisition of gender of the target nouns: it proposes that syntactic gender agreement facilitates the acquisition of L2 gender, whereas noun-final morphemes, which are not governed by syntactic rules (Kibort and Corbett, 2010), delay the process of acquisition of gender in inanimate nouns across languages.

**Background**

***Morphosyntactic and morphophonological features in gender acquisition.***

Assignment and agreement properties of the noun are the central notions in gender acquisition. *Assignment* refers to the lexical property of the noun that involves semantic and formal principles (Comrie, 1999), and *agreement* refers to the overt manifestation of assignment choices based on the properties of the noun (Audring, 2008). The differentiation of these properties has led several authors to distinguish between noun- final morphemes that manifest assignment (morphophonological features) and final morphemes that express agreement (morphosyntactic features in determiners and adjectives) (Kirova, 2016; Camacho and Kirova, in press). Therefore, the difference between morphosyntactic and morphophonological features resides in the fact that the former is governed by syntactic rules, but not the latter. However, it is not very clear how noun- final morphemes that mark assignment are not governed by syntactic or agreement rules. Kibort and Corbett (2010) explained this difference making a differentiation between morphemes. They distinguished between morphosemantic and morphosyntactic features. Morphosemantic features are “semantically charged” and are reflected in morphology. Some values, such as gender, must follows syntactic rules (e.g., agreement) in order to be acquired, irrespective of whether or not the noun-final morpheme has semantic value. For example, inflectional morphemes in animate nouns have a semantic-syntactic value, whereas inanimate noun-ending morphemes do not have a semantic value. Based on the previous statement, any linguistic system would be satisfied between the differentiation of morphosemantic and morphosyntactic features if every morphosyntactic value would have a unique morpheme realization. For instance, in the case of the noun and its gender node, we could think that the syntactic rule for the feminine gender node will always be manifested with *-x* realization, and the masculine node with *-y* realization. Therefore, the noun-final morpheme would be a manifestation of the syntactic rules that underlie the agreement operation. However, the fact that there are abundant exceptions of noun-final morphemes that do not follow the rules, means that some morphemes are not governed by syntactic rules, as is the case of morphophonological morphemes. Morphophonological features, then, are morphemes that are independent from syntactic rules. In the case of nouns and gender within the DP, the final morpheme of the noun is not governed by syntactic agreement unlike the final morpheme in determiners and adjectives. Therefore, the former it is called a morphophonological feature, and the latter a morphosyntactic feature.

Given this explanation, there is abundant research that has showed the primacy of morphosyntactic features over morphophonological features in the acquisition of Spanish as a second language. Camacho and Kirova (2016, in press) proposed that gender acquisition converges with the L1 agreement system only when L2 speakers automatize and rely on the process of syntactic gender agreement. The authors administered a self-paced reading grammaticality judgment task to a group of L1 English-L2 Spanish learners and concluded that participants do rely on morphosyntactic cues as they acquire Spanish gender. They seem to switch from a morphophonological strategy (using gender morphemes on nouns to deduce gender) to morphosyntactic strategy (using gender morphemes on determiners and modifiers) at their proficiency goes up. Grüter, Lew Williams, and Fernald (2012) investigated whether difficulties in mastering gender in L2 Spanish learners can be best characterized as production-specific performance problems or issues with retrieval information in real-time language use. One important result of their study is that differences between L1 and L2 lied on the lexical representation of grammatical gender or gender assignment. These differences were due to in L1 acquisition there is a strong association between nouns and gender-marked modifiers, most importantly determiners, unlike the process of word learning within a L2 context. Therefore, the more the l2er focus on determiners, the more target like-acquisition. However, languages such Hebrew that lack gendered determiners to predict gender in the input point to a need to examine L2 gender acquisition in a linguistic system that does not provide a well-demonstrated facilitated element in the target process. Consequently, the present work examines whether the presence of a gendered determiner will facilitate the acquisition of adjective agreement within the DP when the input does not provide a transparent noun suffix.

In Hebrew, there is a lack of studies that investigate the relevance of morphosyntactic features versus morphophonological features in L2 acquisition of gender of inanimate nouns. However, several authors have investigated gender acquisition in Hebrew L1 population (Gollan and Frost, 2001; Ravid and Schiff, 2012). A seminal work that could shed light on how L2 learners process gender was performed by Levy (1980). The author conducted a longitudinal study and a cross-sectional study of pluralization patterns in children acquiring Hebrew as their native language. The author showed that L1 Hebrew children in the period of acquisition of age 2-3 were insensitive to the syntactic notion of gender, which in Hebrew is governed by noun-adjective agreement. He concluded that children make maximal use of the available morphophonological clues for pluralization rather than on morphosyntactic features, which are set by the agreement relation between the noun and the adjective. If L2 acquisition follows a similar pattern of development (Ellis,1994), it is plausible that L2 learners of Hebrew would focus on nominal suffixes to make predictions about gender properties. However, the paucity of studies on Hebrew L2 learners means that such a question is yet to be investigated.

Armon-Lotem and Amiram (2012) investigated the acquisition of the Hebrew gender system with L2 learners, working with participants with different L1s: Russian and English. Importantly, Russian, unlike English, has gender morphology. The authors concluded that Russian L1 speakers paid more attention to formal information due to the syntactic similarity with their L1 agreement system, while L1 English speakers paid more attention to semantic information, given the absence of such agreement in their native language. Since English L1-Hebrew L2 learners appear reticent to rely on semantic information when they face inanimate nouns, they must find other linguistic resources in the input to acquire gender as noun-final morpheme and the agreement property between constituents within the DP. Since Hebrew has no determiner with a gender value, but the system does provide a salience phonological gendered plural morpheme, the present works wonders whether the comparison of two type of morphological features across languages will shed light of the reliability of cues in gender acquisition. In other words, due to the presence of the plural noun-final morphemes with gender value in Hebrew, the present work examines whether this type of feature facilitates L2 gender acquisition or not while comparing the L2 acquisition of the Spanish gender system in parallel.

*Functional similarities in Hebrew and Spanish and its acquisition as a second language*

Hebrew and Spanish are languages with no common ancestor (Dryer, Matthew S. & Haspelmath, Martin, 2013. ) however, they share several functional categories, and one of them is gender. In Spanish and Hebrew, all nouns are classified in terms of grammatical gender, which is arbitrary and distinct from natural gender. Nouns are divided into two classes, masculine and feminine, and as such, gender is an inherent lexical feature on nouns (Corbett, 1991). L2 learners must track these features in the input to acquire each noun’s gender, and as such make use of the different clues available to them the input.

Spanish has morphophonological cues that reveal the gender feature of nouns. The most reliable of these cues occur as transparent noun-ending morphemes, of which *-o* indicates masculine gender and *-a* indicates feminine. However, this is not a one-to-one correspondence: there are several opaque gender suffixes for nouns, such as *-e* (*calle ‘*street’(F); *puente ‘*bridge’(M))*.* On the other hand, a second source of information in Spanish to predict gender is distributional (Mariscal, 2008). The author argued that gender feature is specified by the elements systematically distributed around the head noun. She states that the most informative of these items is the definite/indefinite article, which occurs more frequently than the other elements before the head noun.

Table 1. *Gender and number distribution in definite/indefinite articles in Spanish*

<Insert Table 1 about here>

Adjectives in Spanish are also distributed within the DP and agree in gender with the noun that they modify. The adjective-final morpheme typically overtly represents the noun-adjective internal agreement, as in example (1.a). There are, nonetheless, several lexical exceptions in which the adjective-final morpheme does not mark gender, such as in example (1.b):

(1) a. El aut-o negr-o

The. DEF.M. SG. car-M.SING. black-M. SG.

“the black car.”

b. El aut-o verde

The DEF.M.SG. car-M.SG. green-SG.

“the green car”

Like Spanish, Hebrew, provides transparent and opaque ending morphemes that overtly represent the noun’s gender node. Feminine gender is marked, typically through the suffixes *-ah* (e.g., *simxah* ‘happiness’) or *-t* (*xanut*  ‘shop’). Masculine nouns are unmarked; in other words, nouns lacking a feminine ending are typically masculine. As in the case of Spanish, however, some feminine nouns do not have the most frequent feminine ending morpheme, (e.g., *even* ‘stone’, *erex* ‘country/land’), and a very small number of nouns ending with *-ah* or *-t* are masculine (*laylah* ‘night’, *cevet* ‘crew’) (Meir, 2006).

Another relevant distinction between Hebrew and Spanish is in Hebrew the plural morpheme is mostly determined by the gender of the noun (Levy, 1980). Plural forms are gender marked. But, in contrast with singular forms, explicit marking exists in both masculine and feminine plural nouns (Gollan and Frost, 2001). Hebrew has both a masculine plural suffix *-im* and a feminine plural suffix *-ot*. Almost all masculine nouns form their plural with the morpheme -*im* and the feminine nouns with the ending -*ot.* For example:

(2) a. hoe-l be hoel-im

tent- M.SG. and tent- M.PL.

“tent and tents”

b. o-t be oti-ot

letter- F.SG. and letter- F.PL.

“letter and letters”

There are, however, a few lexical exceptions for masculine singular nouns that form the plural with the feminine plural ending morpheme *-ot*, as well as exceptions for the feminine singular noun that forms the plural with *-im.* For instance:

(3) a. shulja-n be shuljan-ot

table-M.SG. and table- F.PL

“table and tables”

*b. ebe-n be eban-im*

*stone- F.SG and stones- M.PL.*

*“stone and stones”*

A second source of information to predict gender is the adjective-final morpheme. The adjective is always overtly represented with the ending morpheme *-ah* for feminine singular, while the masculine form, by contrast, has no such ending. Alike, the adjective plural morpheme is always -*im* for masculine plural and *-ot* for feminine plural, regardless the irregularity status of the singular noun, without exception.

(4) a. ebe-n kados-ha

stone-F.SG. holly-F.SG

“holy stone”

b. aban-im kadosh-ot

stones-M.PL holly-F.PL.

“holly stones”

Within the DP, Hebrew exhibits syntactic agreement with adjectives, but not with determiners. The definite and indefinite determiners are not marked for gender nor number. In the following examples, the definite determiner does not show any ending matching with gender nouns.

(5) a. ha ebe-n ha-kados-ha

The stone-F.SG. the holly-F.SG

“the holy stone”

b. ha aban-im ha kadosh-ot

The stones-M.PL. the holly-F.PL

“the holly stones”

In sum, the two gender systems differ in the agreement process between constituents within the DP. The internal agreement process reflects a relationship between two head constituents. The relationship may be seen as sharing of a grammatical feature between the elements (Pesetsky and Torrego, 2007). The authors argued in favor of a view of Agree as feature sharing. They proposed that certain features on lexical items appear to come from the lexicon unvalued and receive their value from a valued instance of the same feature, present on another lexical item. For example in:

(6) la canción bonita

DET NOM ADJ

GENDER GENDER GENDER

[ F] [ F ] [ F ]

the determiner, the noun, and the adjective have feminine value because of a property of NOM, that is to say the noun is listed in the lexicon as feminine. Neither the determiner nor the adjective exists from the lexicon with a value for gender. The gender feature of DET and ADJ is lexically unvalued and gets valued as a consequence of a syntactic process of agreement with the gender feature of NOM. Agreement involving Hebrew DP presents a similar picture.

(7) ha derej ha gdola

DET NOM DET ADJ

GENDER GENDER

[ F ] [ F ]

The determiner in Hebrew, however, does not share a copy with the gender property NOM since DET has no gender value. DET does not need to receive any value from NOM. Therefore, there are fewer morphosyntactic features within the DP to determine the lexical property of gender in Hebrew than Spanish.

In sum, to disentangle the role of the two type of morphemes in gender acquisition, the current work compared two gendered linguistic systems with different features in the input to predict the gender agreement within the DP, proposing that the morphosyntactic feature of the determiner is more reliable than the morphophonological feature of the transparent noun-ending morpheme in gender acquisition across languages.

**This study**

The present study tests the hypothesis that L2 learners find morphophonological morphemes less reliable than morphosyntactic morphemes for predicting adjective-gender agreement. The hypothesis is based on previous studies that claim that the syntactic knowledge of gender underlies target-like acquisition in L2 learners in several languages (Italian: Oliphant, 1998; German: Hoppe, 2013; Spanish: Grüter, et al. ,2012). A promising test case for this hypothesis can be found by examining how L1 English speakers behave when they learn Hebrew, whose gender system provides a salience plural noun-final morpheme with gender value. If the presence of the determiner with gender value is crucial in L2 gender acquisition, I argue that L1 English-L2 Spanish speakers will perform better in acquiring of gender of inanimate nouns than L1 English-L2 Hebrew learners. In addition, if morphophonological information is less reliable in the process of adjective-agreement, I predict that L1 English-L2 Hebrew learners will have lower accuracy in assigning adjective gender on plural nouns. Therefore, research questions asks whether morphosyntactic features are more reliable than morphophonological features in the acquisition of gender of inanimate nouns across languages.

**Methods**

***Participants***

The sample pool included 128 participants: 32 L1 English-L2 Spanish learners (L2SP), 32 L1 English- L2 Hebrew learners (L2HB), 32 Spanish-dominant Spanish-English bilinguals (L1SP), and 32 Hebrew-dominant Hebrew-English bilinguals (L1HB). The L2 Spanish learners and part of the L2 Hebrew learners were students from a higher education institution on the East Coast, and part of the L2 Hebrew learners were from a theological seminary on the East Coast. The control group consisted of Spanish native speakers from a higher education institution in Chile, and the native Hebrew speakers were from a higher education institution in Israel. Participants' ages ranged from 18-28, and they were in the process of completing undergraduate or graduate studies. The control data were collected in Chile and Israel. Due to the absence of a monolingual population in Israel (most Israelis can speak English reasonably well, as it is a required second language for students in both Hebrew and Arabic schools, (Uhlmann, 2011), Chilean Speakers and Israeli speakers were all sequential bilinguals, adult English L2 learners. Participants had completed at least college-level studies. All the participants were born in each target country, and they had been raised there. The Spanish and Hebrew L2 data was collected on the East Coast of the United States. The L2 Spanish participants had been studying Spanish for some years after the age of 10. The L2 Hebrew learners had also been studying for some years. All L2 participants were native speakers of English, born and raised in a monolingual English family, and their community speaks English too. The L2 speakers did not speak any other language besides English and the target language. The proficiency of the experimental groups was measured by MINT scores (Gollan, Weissberger, Runnqvist, Montoya and Cera, 2012), taking the results as a continuous variable. There are 68 total points possible on the test. Since MINT results were not discrete, a histogram with results by group was created to display variability within each group.

Figure 1. Variability MINT scores by group.

<Insert Figure 1 about here>

One two-tailed T-test was run to compare means between L2 Hebrew (M 25,2 SD 14,2) and L2 Spanish (M 25,5 SD 11,7). There were no significant differences between means by group (t = 0.32416, df = 838.82, p-value = 0.7459), which supports the null hypothesis that the means are equal.

*Materials*

The lexical items selected for the experimental tasks come from the textbooks used in each institution’s foreign language department: *Dicho y Hecho* (Potowski, Sobral, Dawson, 2014) for Spanish and *Hebrew from Scratch*, Part 2 (Chayat, Israeli, Kobliner, 2013) for Hebrew. For Spanish, I selected eight high-frequency inanimate opaque nouns (four feminine and four masculine) and eight low-frequency inanimate opaque nouns (four feminine and four masculine). Although the Spanish plural noun morpheme does not encode gender information, I used the plural version of the nouns to match the tasks in each language as much as possible. For Hebrew I selected eight plural high- frequency inanimate transparent nouns (four feminine and four masculine) and eight plural low- frequency inanimate transparent nouns (four feminine and four masculine). The decision to choose opaque nouns in Spanish and transparent nouns in Hebrew is based on the available gender cues that participants had in the task. In the case of Spanish, the opaque noun is always precede with the determiner with gender value (los/las) unlike Hebrew where the noun is preceded by a genderless determiner, but with a plural noun ending morpheme with gender value.

I decided to include lexical frequency as a variable in order to examine the relevance of different type of cues irrespective of their frequency. Furthermore, none of the words was a cognate between the respective L2 and English, since cognates that have phonological overlap can facilitate storage in the lexicon and subsequently affect gender acquisition (Amengual, 2016). The frequency selection process consisted of counting the number of times that a noun with the features mentioned above appeared in the textbook. Then, I organized the data in a frequency table that showed for each noun, how many times the item appears in the book. Finally, I compared the frequency of each noun in the L2 textbooks with that of frequency corpora for Spanish (Davies, 2017) and Hebrew (Linzen, 2009), and selected the eight nouns with the highest frequency and the eight nouns with the lowest frequency to use in my experimental tasks. The items included in the tasks are illustrated in table 2.



*Experiment 1: adjective agreement Elicited Production Task (EPT)*

*method*

The goal of this task was to assess gender agreement in participants' spoken production by eliciting noun-adjective sequences. The task also attempts to measure whether the presence of the Spanish determiner (but the lack of a gendered final noun morpheme) gave an advantage in English Spanish L2 or whether the presence of plural noun ending morphemes (but the presence of a genderless determiner) hinder the production of adjective agreement in L2 Hebrew learners.

Before the trials began, participants were asked the color of the following words. On each trial, participants saw a written word. He/she needed to read the word aloud. Then a colored square appeared, and the participant was asked to say aloud the color of the word. For example, in the Spanish version for the written target noun *puentes* (‘bridges’), the image of a black square was presented. In the Hebrew version, for the written target האוֹהֲלִים (‘tents’) the image of a red square was presented

For example

Figure 3. Agreement elicited production task (EPT) experimental trial in each target language.

<Insert Figure 3 about here>

In the Spanish version it was expected that the students would produce the adjective based on the article (las(F.P)), e.g., *blancas (‘*white (F.P.)). In the Hebrew version it was expected that the students would produce the adjective based on the plural final morpheme (-*im* (M.P), e.g. האַדוֹמִים (red (M.P)). The experimenter provided feedback on three practice items, which did not include either the target nouns or the gender agreement relation between noun and adjective. The practice items were singular transparent nouns, and there was a number agreement between the item and the color. The experiment was designed and presented using Psychopy software.

*Results*

Descriptive statistics were run to reveal the performance of the 132 participants distributed in the four groups (L2SP, L2HB, L1SP, L1HB). Each participant completed 16 EPT test items distributed randomly by the software Psychopy. L1 groups performed at ceiling on this task, indicated by a mean accuracy of 96% (SD = 0.18) in the L1SP and 97% (SD = 0.18) in the L1HB group. In the L2 group, by contrast, accuracy was significantly fewer. However, responses by L2SP (M = 0.57; SD = 0.49) were more accurate than L2HEB (M = 0.29; SD = 0.49).

For the current analysis it is also useful to calculate the proportion of accurate responses by frequency condition. All groups showed better performance in high frequency than low frequency condition, as we can appreciate in the figure 4. At the left of each block the L2 group results are displayed; at the right, L1 group.

Figure 4. Proportion of accurate response by frequency condition across groups in EPT results.

<Insert Figure 4 about here>

The responses of L2 Spanish (L2SP) were more accurate than L2 Hebrew (L2HB), supported by mean by frequency condition in each group. L2SP outperformed L2HB in high-frequency condition. Proportion of accurate responses in L2SP group were above chance (above the cross-sectional white line) unlike L2HB response, that were below chance. However, in low-frequency condition, both L2 group responses were below chance. On the other hand, the comparison groups for both target languages displayed expected patterns, showing accurate responses across conditions, as we can appreciate in table 3

Table 3. *Mean by groups by frequency condition.*

<Insert Table 3 about here>



A GLMM was run to found whether the experiment results were affected by group condition (LI-L2). The model did find significant differences for group condition (β = 4.4, SE = 0.23, z = 19.2, p < 0.01), showing that EPT results were affected by whether participants were native speaker or L2 learners. Regarding language condition (Hebrew-Spanish) the model also displayed differences in EPT results (β = 1.2, SE = 0.18, z = 6.86, p < 0.01) indicating a relevant finding for the current work, that language features influence on answers accuracy. Lexical frequency condition also showed significant effects **(**β = -1.41, SE = 0.18, z = -7.77, p < 0.01), demonstrating that this condition had a task-effect, irrespectively the target language.

*Adjective agreement comprehension forced-choice task.*

*Method*

The goal of this task was the same than the adjective- agreement FCT, however this task provided via comprehension rather than production, whether gender features were present in learner grammars. The items in this task were the same as those in the EPT. In the Spanish version, participants were presented with a written sentence containing a gendered article + an opaque noun construction. In the Hebrew version, learners read a genderless article + gender marked noun, together with a choice of two adjectives with gender marked. For example:

Figure 5. FCT experimental tasks in each target language.

<Insert Figure 5 about here>

*Results*

Mean results across the four groups and frequency conditions were similar than EPT results. The main difference between EPT results was that L2 groups performed above chance (above the cross-sectional white line) in low-frequency condition. Figure 6 illustrate differences in frequency condition by group (L2ers at the left, L1ers, at the right)

Figure 6. Proportion of accurate responses by frequency condition in FCT task

<Insert Figure 6 about here>

Regarding high frequency condition L2SP mean was higher (M = 0.83; SD = 0.39) than L2HB mean (M = 0.76; SD = 0.49), alike low-frequency condition, where L2HB results were lower (M = 0.59; SD = 0.43) than L2SP results (M = 0.70; SD = 0.46). Like the previous task, errors were exceedingly rare in the L1 group, showing a slight difference of L1SP group in high-frequency condition ((M = 98; SD = 12) over L1HB group (M = 0.96; SD = 0.18). In low- frequency condition, native Hebrew speakers results (M = 0.98; SD = 0.12) and native Spanish speakers results (M = 0.98; SD = 0.15) were similar.

These results support previous findings of missing morphology production, indicating that even in cases where surface morphology is never acquired, it is still possible for the learner to determine the syntactic status of the linguistic structure in the target language (e.g., Lardiere,1998; Prévost and White, 2000). Nevertheless, mean differences in FCT results between L2ers indicate that type of morphology cue has an effect accessing to the grammatical knowledge.

A GLMM was run to found whether the experiment results were affected by group, language and frequency condition. The model reinforced the results in descriptive statistics. Alike EPT significant main effect was found for group condition (β = 3.11, SE = 0.52, z = 5.91, p < 0.01), language condition (β = 3.11, SE = 0.52, z = 5.91, p < 0,01) and lexical frequency condition (β = -1.90, SE = 0.27, z = -6.83, p < 0.01).

These results replicate previous finding (Grüter et al, 2012; Hopp, 2013; Halberstadt et al, 2018) confirming that, within a language, the reliability of the determiner is higher than the reliability of noun-ending morphemes. The current work extends the previous findings, providing evidence of the role of the determiner over noun-final morpheme with gender information across languages.

**Discussion**

The purpose of this study was to investigate whether morphosyntactic features were more reliable for L2 learners than morphophonological features in the process of adjective-gender agreement in inanimate nouns across languages. Because of the contrast between the gender systems of the target languages, the study aimed to examine differences among morphosyntactic and morphophonological cues that yield different outcomes in the process of predicting noun- adjective agreement. The current research examines the possibility that transparent ending morphemes are less consistent in the acquisition of gender in the target nouns. Overall, the results suggest that syntactic cues are more reliable for L2ers than phonological cues, even when the Hebrew plural final noun morpheme is highly predictive of the noun gender (Gollan and Frost, 2001).

The results of the two tasks supported the hypothesis by revealing that the L2 Spanish group outperformed the Hebrew L2 group. These results aligned with previous studies of gender acquisition by Camacho and Kirova (in press). As these authors stated, when L2 learners process input in a more sophisticated way, they redefine their gender assignment strategy. They start focusing on the morphology of determiners and adjectives, and they start making better predictions since these categories are more reliable than the morpheme on the noun. Since Spanish provides determiner- noun agreement within the DP and Hebrew provides a salience plural noun ending morpheme with gender value, it is possible to state that the process of focusing in morphosyntactic cues facilitate adjective gender agreement. A large body of research in Spanish have demonstrated the strong relationship between determiner and transparent noun final morpheme ((Grüter et al, 2012; Halberstadt et al, 2018; Kirova, 2016) . The present work contributes providing data that syntactic features are in fact relevant in predicting opaque noun-adjective agreement relationship when the lexical-component of gender has not match with the surface gender morpheme.

One explanation for the previous statement deals with the DP hypothesis (Abney (1987). Following Chomskian framework, the author analysis noun phrases as DPs, headed by the functional category D. D decides the category and the distribution of the elements in the nominal structure. The DP hypothesis has been applied to a variety of languages, including Spanish since focusing on the determiner is a well-demonstrated strategy in predicting gender features. Conversely, Wintner (2000) claimed that the definite article in Hebrew is an affix, retaining the view that the head of noun phrases in Hebrew is the noun. If that is the case, the affix combines with nominal elements in the lexicon and hence is inaccessible to syntactic processes. If Hebrew definite article is lexically attached to the noun rather than be subjected to syntactic rules, L2 speakers need to focus on ending phonological cues. Although Hebrew plural final noun morpheme is highly predictive of the noun gender, the problem resides in cases of clash between plural noun suffix and noun gender, unlike Spanish where “D” always encoded transparent gender information, with a very few exceptions ( e.g el agua).

Tasks results also showed the relevance of lexical frequency in predicting noun-adjective agreement, showing that frequency has an impact on the comprehension and production of gender features. In addition, the same results yielded differences in production and comprehension tasks. L2 Hebrew learners differed widely in low-frequency condition among the two experiments. In production task, outcomes were below chance unlike FCT task, where the proportion of accurate responses were above chance. The previous results are consistent with the frequency lag-hypothesis (Gollan, Slattery, Goldenberg, Van Assche, Duyck and Rayner, 2011), that states that lexical effect has a strong impact on lexical accessibility for comprehension rather than production, concluding that production is a process driven by semantic constraint, whereas comprehension is frequency-driven. Based on the current data, it is possible to state that high-frequency factor has a positive impact in accessibility to mental representation of gender features in the target languages and low EPT L2HB results may not be as accurate reflecting Hebrew l2ers syntactic knowledge of gender grammatical features.

In sum, the results of the present study showed that L2 Spanish learners make use of morphosyntactic strategies when the nouns have opaque endings, suggesting that the acquisition of syntactic knowledge plays a fundamental role in L2 gender process irrespectively the transparency of the noun and the word lexical frequency.

**Conclusion**

This study investigated the role of morphosyntactic versus morphophonological features in the acquisition of inanimate nouns in L1 English-L2 Hebrew and L1 English-L2 Spanish learners. Therefore, the present work corroborated the important role played by the determiner with gender value across languages within the DP in gender L2 acquisition. The current investigation also examined the reliability of noun-ending morphemes in the target process, showing that transparent morphophonological features are less reliable than the determiner in the target process. One comprehension task and one production task were conducted to determine the effects of morphosyntactic versus morphophonological features in the target nouns. The data showed that overall, the presence of the gendered determiner has a main effect on gender acquisition when the learner has no phonological cues in the input. Also, the same results indicated that consistency of gender information encoded in the article provided by the input is crucial in the process of noun- adjective agreement. On the other hand, the presence of transparent plural noun-ending is less reliable when Hebrew l2ers needs to match the noun with the appropriate gender of the adjective. Taken together, these findings suggest that syntactic knowledge facilitates the acquisition of gender in inanimate nouns across languages.

**Abbreviations**

DP: determiner phrase

F: feminine

M: masculine

PL: plural

SG: singular

DET: determiner

DEF: definite

NOM: nominative

ADJ: adjective

**Competing Interests**

The authors have no competing interests to declare

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