ON EXPERIMENTAL LEXICAL PRODUCTION IN SPANISH AS L1 AND L2. THE INFLUENCE OF TEST MODALITY AND RESPONSE TIME

Carmela Tomé Cornejo
Universidad de Salamanca

Abstract: This study investigates lexical production in Spanish as L1 and L2 in an experimental context. Based on a series of lexical availability tasks, words produced by native and non-native speakers of Spanish are contrasted in relation to test modality, oral or written, and response time. The production of native speakers is characterized by being significantly higher and more accurate, while L2 responses reflect lower lexical competence, the influence of L1 and divergent acquisition patterns. Although previous studies had not found significant differences between the number of responses produced orally and in writing, we find that such differences exist, but that they are conditioned by the response time, which affects differently the production in L1 and in L2, although their evolution describes a similar trajectory in both cases. This methodological factor would also cause the neutralization of the qualitative differences between oral and written responses in both groups of participants.

Key words: lexical production, lexical availability, lexical competence, Spanish as a foreign language (SFL).

1. INTRODUCTION

The evocation of lexical units in relation to a category, that is, the production of available words, differs substantially between L1 and L2 (Hernández & Tomé, 2017). The psycholinguistic (and even neuroanatomical) processes involved differ (in L2, different procedures for storing, searching, and retrieving lexical material are assumed,[1] in which, for example, the frontal cortex is involved),[2] and the cognitive factors that predict lexical selection are altered. According to the results of Hernández, Izura, and Ellis (2006), in Spanish as L1, the words that represent typical examples of a category, which correspond to familiar concepts and which have been acquired early are significantly more available (that is, they are selected earlier and to a greater extent) than those that are atypical, unfamiliar examples and have been acquired later. In contrast, when native English speakers with an intermediate level of Spanish solve the task in L2, concept familiarity loses significance and cognateness between L1 and L2 words becomes a determining factor. In this case, a word is more available the more typical it is as an example of the category to which it belongs, the sooner it has been learned in L2, and the more it resembles its translation in L1 (Hernández, Izura & Tomé, 2014).

Given that solving the task in L2 implies changes in the cognitive processes that support it, we proposed that differences will also be presented in how lexical production is affected by the modality of the test and the response time. On the one hand, it has been shown that bilingual speakers are less efficient than monolingual speakers in tasks that require access and retrieval of lexical material, such as picture naming or lexical decision tasks (Gollan *et al.*, 2007; Bialystok & Craik, 2010). In the words of Bialystok, Craik, and Luk (2008:523):

> Producing words in a second language takes longer than producing the comparable word in a first or stronger language (Chen & Leung, 1989), but even well-balanced bilinguals responding in their stronger language often perform more poorly than monolinguals in that language.

On the other hand, the written modality involves the implementation of costlier cognitive and motor mechanisms than does the oral modality. In oral production, the processes of memory retrieval are faster: the representations

---

[1] In L2, the activation is assumed in parallel with lexical representations of both languages, so that informants must not only select the intended node but must also do so in the appropriate language (Hoshino, 2006:12; Costa, 2008:206; Poarch, 2013:24).

[2] When bilingual speakers face lexical selection in the nondominant language by image-naming tasks, activation is recorded in the left dorsolateral prefrontal cortex and in the anterior cingulate cortex, but the pattern is different when the task is carried out in L1 (Bialystok, Craik & Luk, 2008:525). Rodríguez-Fornells *et al.* (2005 *apud* Bialystok, Craik & Luk, 2008:525) conclude that, for bilingual speakers, naming entails a conflict between their two linguistic systems that has an impact on response time and accuracy. To compensate for this, the frontal cortex, responsible for executive function, is used.

stored in the phonemic buffer remain active for less time while accessing motor speech patterns, since the corresponding articulatory routines are shorter than those of writing of letters and words. In this way, the selected word is kept activated in the graphemic buffer (represented and segmented in its corresponding syllables) for more time while the peripheral processes of selecting allographs and the patterns of manual writing take place, as well as its implementation (Alfonso & Álvarez, 2009:38). In addition, native and nonnative informants will rely on lexical and phonological routes to varying degrees, and for L2 Spanish speakers, the written modality may pose an added difficulty because their knowledge of orthographic rules is less stable.

Qualitatively, it is stated that for native speakers the oral resolution of the task will motivate a greater spontaneity in the answers than the written modality. In contrast, in the case of L2 Spanish students, oral responses may be less spontaneous: the production of words in L2 is a more conscious task and requires greater concentration and planning, which may lead to smaller qualitative differences between oral and written production in this group of informants.

Therefore, it is proposed that, in both groups of native speakers and of nonnative speakers, there will be quantitative and qualitative differences between oral and written production, although to a different extent, and that these differences will be conditioned by response time.

The impact of test modality on lexical availability tasks has already been studied with native informants (Hernández Muñoz, 2005, 2010). Contrary to expectations, in these studies, no statistically significant differences were found between oral and written production, and the variation was limited to the qualitative level, with more peripheral associations and linkages in the oral responses, more repetitions, more enumerations of subordinate elements such as *mueble de interior* (*indoor furniture*), *mueble de exterior* (*outdoor furniture*), *mueble de salón* (*living room furniture*), *mueble de cocina* (*kitchen furniture*), and more comments outside of the interview (Hernández Muñoz, 2005:101-104, 2010:154-155), among others.

This paper extends these analyses in two ways: first, because it studies the impact of test modality on the elicited lexicon in both L1 and L2, and, second, because it considers the influence of the temporal factor by analyzing how lexical production evolves in each group of informants in each modality as the response time progresses. The quantitative analysis comprises the comparison of oral and written production in L1 and L2, and the study of the evolution of responses over time in relation to the test modality. From a qualitative perspective, the responses produced by each group of speakers, the compatibility between the lexical units elicited orally and in writing, and the number of repetitions committed in each modality are analyzed.

2. METHODOLOGY

The starting task is a lexical availability test or semantic fluency task, that is, a controlled and continuous association task, in which the informants have a time limit (i.e., response time) to provide examples for each of the semantic categories that are presented to them, known as centers of interest (IC) in the field of linguistics. The subsequent application of a formula that simultaneously measures the frequency and order of the words produced determines the availability index (AI) of each term, which is interpreted as a measure of the ease with which a word occurs in relation to a semantic category. For example, if we think of animals, many people would produce the word *perro* (*dog*) before the word *libélula* (*dragonfly*), which would therefore be less available. The quality of availability is attributed, therefore, to a word in relation to the other words that comprise its semantic category.

For this study, a total of 155 surveys were analyzed: 43 written and 32 oral surveys answered by native speakers of American English learning Spanish as a foreign language at the intermediate level[3] and 40 written and 40 oral surveys completed by first-year students at the Universidad de Salamanca, all native Spanish speakers. The average age in all groups was approximately twenty years old.[4]

The categories proposed as prompts were *Parts of the body*, *Clothing*, and *Animals.* In the four tests, prompts were presented in different orders, and the response time for each was four minutes (twice the usual duration of studies of lexical availability, including those of Hernández Muñoz, 2005, 2010). In the written surveys, the questionnaire consisted of eight pages: a cover page to prevent participants from reading the title of the first category ahead of time, six pages headed by the titles of the centers of interest, followed by a table with numbered columns,[5] and a final sheet with sociological questions.

---

[3] At the time the tests were conducted, the participants attended Spanish classes in International Courses at the Universidad de Salamanca, so they had taken a standardized test to prove their competence.

[4] Specifically, the group of Spanish students who took the written test presented an average age of 20.21 years, compared to an average of 20.75 years for the group of nonnative speakers who resolved it orally. For native informants, the mean age is 19.48 years in the case of written tests and 20.5 in oral tests.

[5] Each category was divided into two sheets: in the first, below the name of the category, the table had the columns numbered from 1 to 4 and in the second, from 5 to 8.

In the instructions, the participants were informed that they should begin writing their answers in the first column and that, after a few seconds, they would hear a beep indicating that they should continue writing their answers in the next column. Each beep marked a change to the next column until column number eight. When the four minutes were up, instead of a beep, participants listened "change of category". In this way, they were warned that a new center of interest started: they should, therefore, pay attention to the name of the category and begin providing the corresponding examples, again under column number one. This methodology allowed us to measure the number of responses generated in each 30-second time interval in the written surveys, as well as in the oral ones.

3. QUANTITATIVE RESULTS

3.1 Production in L1 and L2

Table 1 shows the total words (TW) or tokens, the different words (DW) or types, the words per informant (PI), and the cohesion index (CI), both in L1 and L2, without considering the test modality. This cohesion index is obtained by dividing the average of responses (PI) by the number of different words to measure the degree of agreement in the answers of the participants. The values oscillate between 0 and 1, which tells us if the categories are compact (value towards 1) or diffuse (value towards 0).

Table 1. Quantitative indices in L1 and L2.

	L1				L2			
	TW	DW	PI	CI	TW	DW	PI	CI
Parts of the body	3046	299	38.08	0.13	1427	114	19.03	0.17
Clothing	2549	363	31.86	0.09	1143	138	15.24	0.11
Animals	3544	384	44.3	0.12	1102	138	14.69	0.11

In all categories, native speakers produced more tokens and more types than L2 Spanish speakers. On average, nonnative students of Spanish contributed 21.73 fewer words across all centers of interest. The differences observed in the averages (Figure 1) are significant in the three categories studied regardless of whether they are considered individually or the results are taken together (in all cases, $p = 0.000$). In the group of native speakers, the most productive category was *Animals*, while for Spanish-language students, *Parts of the body* elicited more examples. For both groups of speakers, this latter center of interest presented a greater agreement of responses.
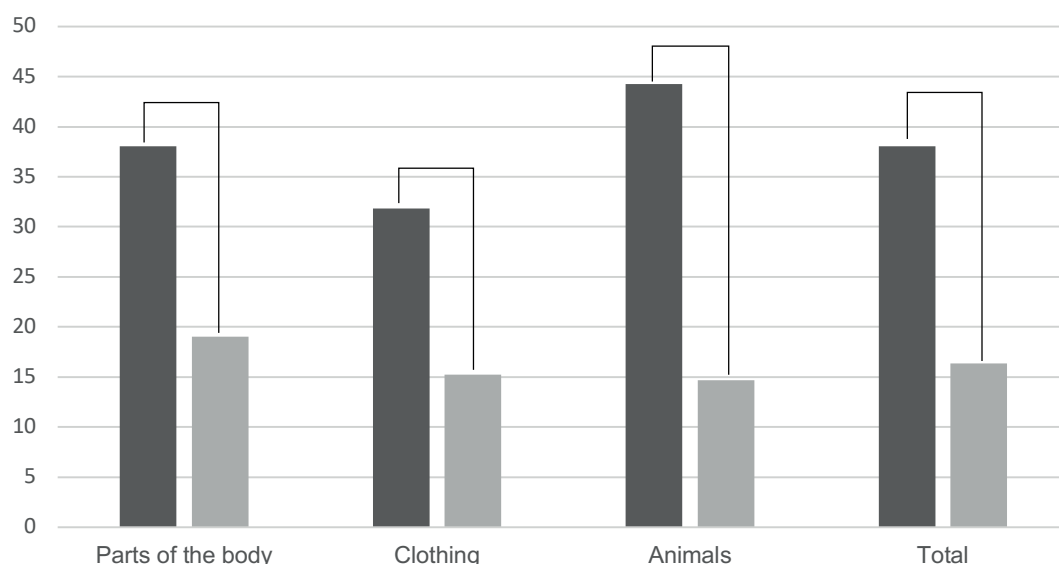

Figure 1. L1 and L2 response averages in both test modalities.

The type of speaker assumes, therefore, statistical significance as a variable in terms of the average number of answers per informant and explains 73.55% of the variance of the total ($r = -8457$).

3.2 Oral and written production

As Figure 2 shows, the differences noted in the previous section regarding production in L1 and in L2 are maintained when considering test modality. In both oral and written tests, the average production of native speakers is much higher than that of nonnative speakers.

The differences recorded in each group of informants for each modality are, however, minimal: in the group of native speakers, the overall average of oral answers exceeds by 1.04 the written answers, while in the group of nonnative speakers, written production is greater than oral by 0.14. These results show less marked differences than those obtained by Hernández Muñoz (2005:96, 2010:149), which seems to indicate an equalization trend in the number of examples provided in each modality as the response time increases. In any case, the application of Student's t-test shows that test modality is not a statistically significant variable in any group, either in the overall averages or in the averages of each category (Table 2).
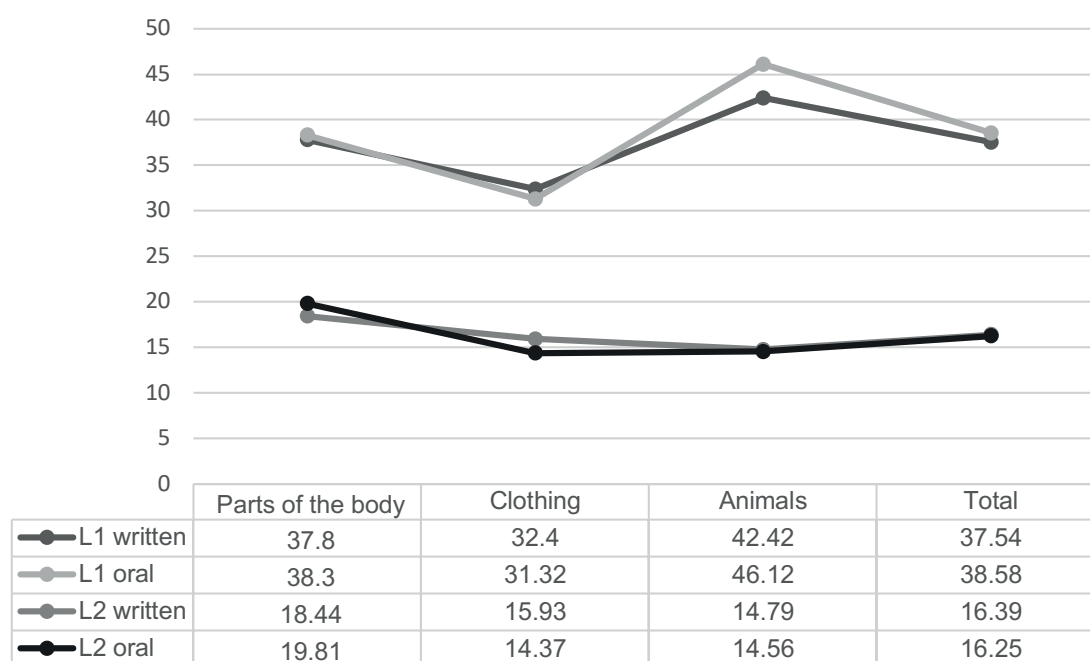
	Parts of the body	Clothing	Animals	Total
L1 written	37.8	32.4	42.42	37.54
L1 oral	38.3	31.32	46.12	38.58
L2 written	18.44	15.93	14.79	16.39
L2 oral	19.81	14.37	14.56	16.25

Figure 2. Average of responses in each modality for each group of informants.

Table 2. Student's t-statistics for oral-written responses.

	Sig. (bil.)	
	L1	L2
Parts of the body	0.86	0.33
Clothing	0.61	0.22
Animals	0.25	0.88
Total	0.64	0.89

3.3 Evolution of responses over time

The responses that Spanish native speakers and nonnative speakers provided in each 30-second period verify that, as shown in Figure 3, there is a negative relationship between the passage of time and the number of generated lexical units: as time passes, production decreases. However, this relationship is not a linear trend but a curve that displays a very sharp decline after the first stages of the output and then stabilizes, assuming a much more gradual negative trend line.
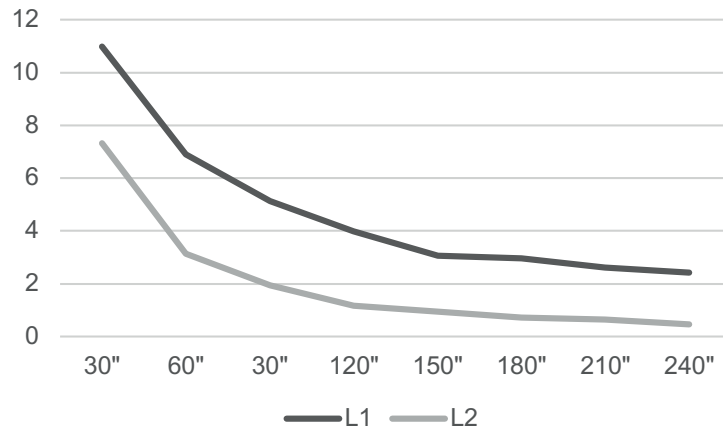
Figure 3. Evolution of the total responses in L1 and L2.

The distribution over time of the responses of L1 Spanish speakers and L2 Spanish students illustrates a similar trajectory. Although native speakers elicit more terms in all time intervals, the line indicating the performance of speakers of Spanish as L2 runs parallel to that of the native speakers.

There are also no notable divergences in the individualized study of the three semantic categories used as prompts, especially in the case of foreign students, as shown in Figures 4 and 5. Among native speakers, the production of *Animals* seems to stabilize earlier, but the difference is not particularly marked.
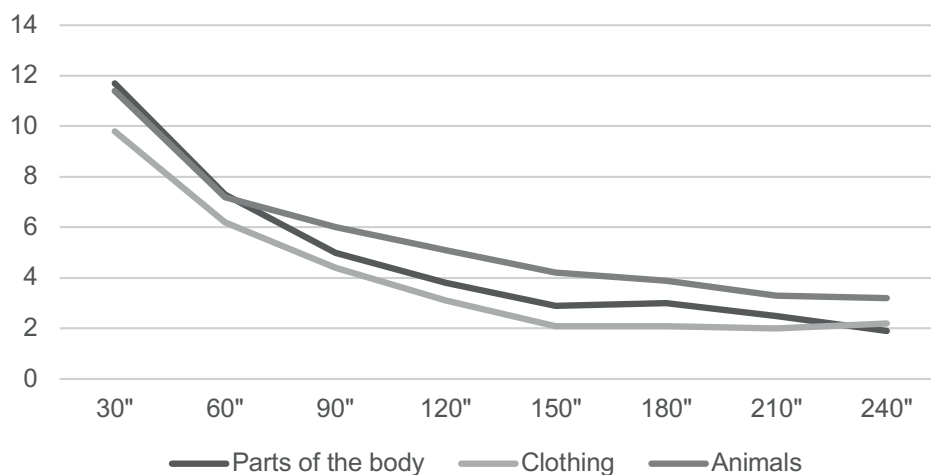

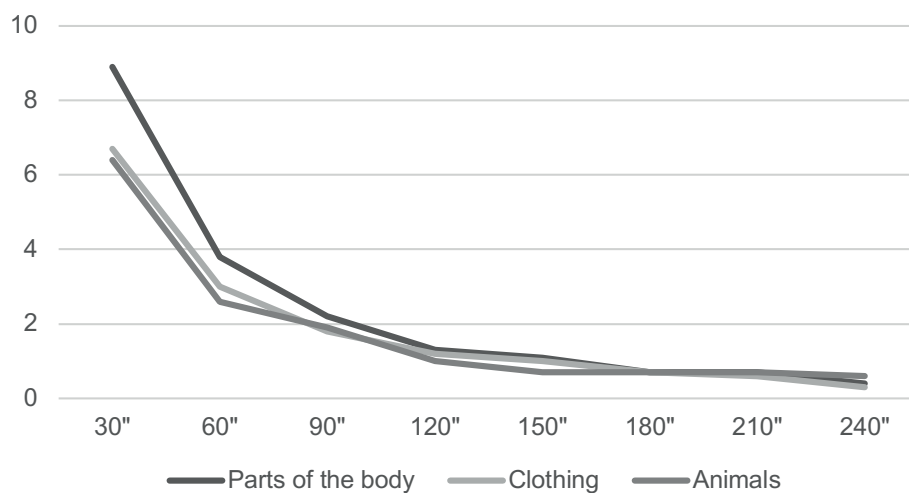**Figure 4.** Evolution over time of the responses in L1.

Figure 5. Evolution over time of the responses in L2.

Comparing the averages obtained in each modality in each of the 30-second intervals studied, it is verified that, in the first stages of the output, there are significant differences between the number of oral and written responses. However, as the response time progresses, the averages of both modalities are approached. In Spanish as L1, the difference between the means reached in each modality ceases to be significant after two and a half minutes if a level of significance of $p < 0.01$ is considered and after three minutes with a $p < 0.05$. For the group of SFL speakers, modality differences cease to be significant after one and a half minutes, since in the following interval the differences between the average of the written and oral answers are no longer significant (Table 3).

Table 3. Student's t-statistics for oral-written responses in each time interval.

	30"	60"	90"	120"	150"	180"	210"	240"
L1	0.000	0.000	0.000	0.000	0.004	0.043	0.283	0.638
L2	0.000	0.000	0.015	0.12	0.3	0.6	0.96	0.899

The modality of the test does, therefore, constitute a statistically significant variable in the generation of available words, but it is conditioned by the response time. As Figures 6 and 7 show, both in the group of native speakers and in that of nonnative speakers, oral production exceeds that of written in the first phases of the output, but as time lapses, the two productions tend to equalize. In both figures, the vertical bar marks the last interval in which the differences between the means reached in the oral tests and those obtained in the written tasks are significant at a significance level of 0.01.
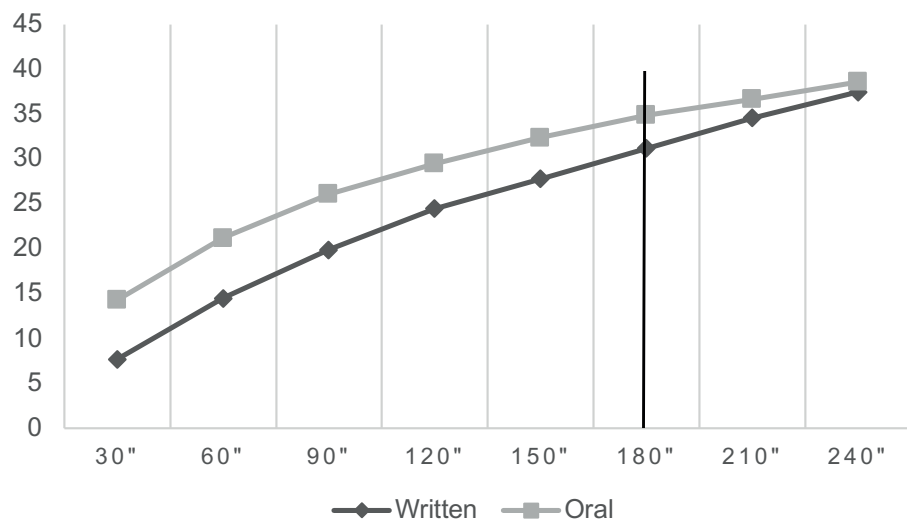

Figure 6. Evolution over time of the averages of native speakers.
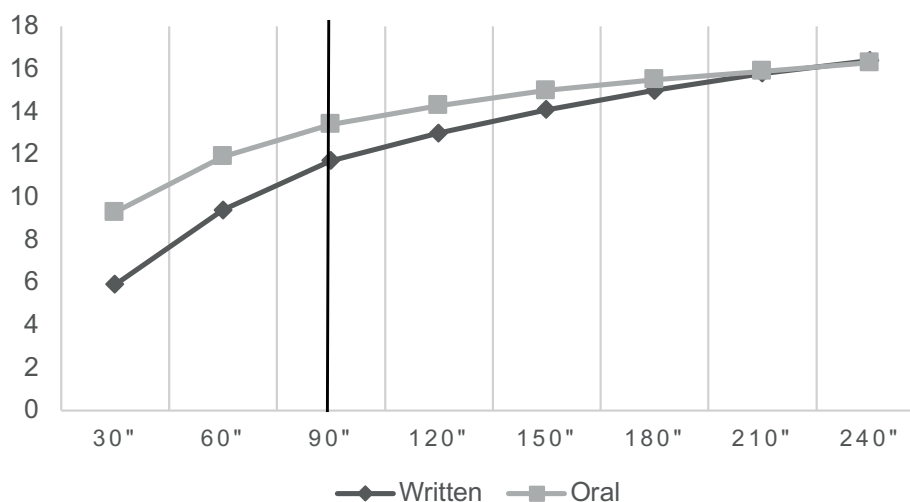

Figure 7. Evolution over time of the averages of nonnative speakers.

4. QUALITATIVE RESULTS

4.1 Lexical availability in L1 and in L2

In general terms, the words produced by nonnative speakers also appear in the list of native speakers, which also includes many other available words, as reflected in the quantitative results. After restricting comparable data according to the availability index (AI) and considering only the lexical units that reach an AI of at least 0.02, as recommended by Bartol (2001, 2008), we found that, in all the categories, more than 81% of the words provided by SFL speakers are also recorded in the list of native speakers (Table 4). The low compatibility rates obtained between the two sets are due precisely to their disparate extension.

Table 4. Compatibility of L1 and L2 responses.

		Parts of the body	Clothing	Animals
Shared words	Native speakers	29.55%	30.97%	26.92%
	Nonnative speakers	92.86%	81.4%	92.45%
Exclusive words	Native speakers	70.45%	69.03%	73.08%
	Nonnative speakers	7.14%	18.6%	7.55%
Compatibility		28.89%	28.93%	26.34%

Nonnative speakers produce a total of 15 exclusive words with an AI above 0.02 (3 in *Parts of the body*, 8 in *Clothing* and 4 in *Animals*). Of these, 11 are recorded in the native speakers' list in more advanced positions: *sangre* (*blood*), *espina* (*spine*); *traje de baño* (*bathing suit*), *jeans*, *gafas* (*glasses*), *reloj* (*watch*), *gafas de sol* (*sunglasses*), *pantalones largos* (*long pants*); *pescado* (*fish*), *camarón* (*shrimp*), *aligátor* (*alligator*). Thus, we find only 4 words that native speakers do not update: *cuerpo* (*body*), as a supraordinate term of *Parts of the body*; *bolsa*, probable interference from English *bag* ('bolsa', 'bolso'), *zapatos de tenis* (*tennis shoes*), although native speakers record *tenis* in rank 97, and *marisco* (*seafood*), more linked to the semantic field of food than to the one of animals.

Therefore, the most available words in L2 are also used in L1, although some are more accessible when the task is solved in the second language, as shown in Table 5, which lists the 30 most available words in each group. SFL speakers tend to prioritize cognates —for example, *estómago* (*stomach*) (rank 11 in L2 and 41 in L1); *suéter* (*sweater*) (10 in L2 and 66 in L1), *traje de baño* (*bathing suit*) (13 in L2 and 179 in L1), *sandalias* (*sandals*) (16 in L2 and 31 in L1), *jeans* (17 in L2 and 145 in L1); *pingüinos* (*penguins*) (24 in L2 and 47 in L1)—, and syntagmatic groups that in L1 are lexicalized in simple units, such as *dedos de los pies* (*toes*) (24 in L2 and 58 in L1) or *pantalones cortos* (*shorts*) (6 in L2 and 46 in L1). Likewise, nonnative speakers prioritize supraordinate-level terms —*cara* (*face*) (16 in L2 and 32 in L1); *ropa interior* (*underwear*) (19 in L2 and 60 in L1), when native speakers produced *sujetador* (*bra*)*, calzoncillos* (*briefs*)*, medias* (*tights*), *bragas* (*panties*) and *tanga* (*thong*); *pescado* (*fish*) (11 in L2 and 211 in L1), *ave* (*bird*) (21 in L2 and 132 in L1) or *insecto* (*insect*) (26 in L2 and 137 in L1)—, and their list present more peripheral terms of the category, such as names of accessories for *Clothing* —*cinturón* (*belt*), *gafas* (*glasses*), *gorra* (*hat*), *reloj* (*watch*), *corbata* (*tie*)*, pendientes* (*earrings*)—or insects for *Animals* —*mariposa* (*butterfly*), *mosca* (*fly*)—. Such differences are related to a less profound lexical knowledge in L2.

Table 5. Available words in L1 and in L2 (exclusive words are highlighted).

	Parts of the body		Clothing		Animals	
	Native speakers	Nonnative speakers	Native speakers	Nonnative speakers	Native speakers	Nonnative speakers
1	brazo/s	ojo/s	pantalón/es	camiseta/s	perro/s	perro/s
2	ojo/s	cabeza	camiseta/s	pantalón/es	gato/s	gato/s
3	mano/s	brazo/s	camisa/s	camisa/s	león/a/es	pájaro/s
4	nariz	mano/s	calcetín/es	vestido/s	tigre/s	vaca/s
5	pie/s	pie/s	chaqueta/s	zapato/s	elefante/s	elefante/s
6	cabeza	nariz	**jersey/s**	pantalón/es corto/s	jirafa/s	león/a/es
7	pierna/s	pierna/s	falda/s	falda/s	serpiente/s	caballo/s
8	dedo/s	dedo/s	vestido/s	chaqueta/s	caballo/s	pez/es

Table 5, continued on next page

Table 5, continue from previous page

	Parts of the body		Clothing		Animals	
	Native speakers	Nonnative speakers	Native speakers	Nonnative speakers	Native speakers	Nonnative speakers
9	boca	boca	abrigo/s	calcetín/es	vaca/s	tigre/s
10	oreja/s	pelo/s	bufanda/s	**suéter/es**	pez/es	oso/s
11	cuello	**estómago**	zapato/s	traje/s	ratón/es	**pescado/s**
12	rodilla/s	oreja/s	**sujetador/es**	sombrero/s	gallina/s	cerdo/s
13	hombro/s	diente/s	**calzoncillo/s**	**traje/s de baño**	**ballena/s**	jirafa/s
14	uña/s	rodilla/s	sudadera/s	blusa/s	**cebra/s**	mono/s
15	codo/s	espalda	**media/s**	bufanda/s	**delfín/es**	**toro/s**
16	muñeca/s	**cara**	**bragas**	**sandalia/s**	tiburón/es	serpiente/s
17	espalda	**garganta**	guantes	**jeans**	conejo/s	**rana/s**
18	tobillo/s	**piel**	bota/s	**cinturón/es**	cerdo/s	**pollo/s**
19	pecho	**corazón**	**cazadora**	**ropa interior**	mono/s	ratón/es
20	diente/s	labio/s	blusa/s	abrigo/s	oveja/s	tortuga/s
21	pelo/s	cuello	gorro	**bolsa/s**	águila	**ave/s**
22	**cadera/s**	lengua	**(pantalón/es) vaquero/s**	**gafas**	**cocodrilo/s**	conejo/s
23	**ceja/s**	hombro/s	**zapatilla/s**	sudadera/s	**rata/s**	gallina/s
24	**muslo/s**	**dedo/s (del/de los) pie/s**	**tanga/s**	bota/s	tortuga/s	**pingüino/s**
25	**antebrazo/s**	pecho	**shorts**	**gorra**	pájaro/s	oveja/s
26	lengua	tobillo/s	sombrero/s	**reloj/es**	**hipopótamo/s**	**insecto/s**
27	labio/s	uña/s	**chándal/es**	gorro	oso/s	**mariposa/s**
28	**frente**	muñeca/s	**bañador/es**	**corbata**	**loro/s**	tiburón/es
29	**pestaña/s**	**hueso/s**	**americana/s**	guantes	**leopardo**	**lobo/s**
30	**tronco**	codo/s	traje/s	**pendiente/s**	**hámster/es**	**mosca/s**

4.2 Oral and written production in L1 and in L2

To calculate the compatibility indexes between the oral and written terms, comparable data are again restricted according to the availability index (AI), considering only terms with an AI greater than or equal to 0.02. Thus, as Table 6 shows, in Spanish as L1, the compatibility between the words elicited in the written test and those generated in the oral test exceeds 59% in all categories. *Parts of the body* presents the highest agreement between the two sets, followed by *Animals* and, finally, *Clothing*. On the other hand, *Parts of the body* is the prompt that produces the lowest coincidence between written and oral responses in Spanish as L2, although in this case compatibility exceeds 61% in all categories.

Table 6. Compatibility of oral and written responses.

	Parts of the body	Clothing	Animals
L1	75.34%	59.33%	60.35%
L2	61.82%	64.15%	64.18%

Contrary to expectations, the modality of the test does not seem to have an impact on the register of terms used by native speakers, as can be seen in the category *Parts of the body*. In both the written and oral modalities, unmarked words (*manos* (*hands*), *brazos* (*arms*), *nariz* (*nose*), *ojos* (*eyes*), etc.) predominate, as well as formal or even technical terms, favored by the context in which the task was performed. Thus, among the words exclusive to the oral corpus, we find, for example, terms such as *esófago* (*esophagus*), *faringe* (*pharynx*), *ovarios* (*ovaries*), *páncreas* (*pancreas*), *escápula* (*scapula*), *ligamentos* (*ligaments*), *arterias* (*arteries*) or *húmero* (*humerus*). When the task is solved orally, enumerations of subordinate-level items —such as *camiseta de manga larga* (*long-sleeved T-shirt*),

camiseta de manga corta (*short-sleeved T-shirt*) or *camiseta sin tirantes* (*strapless T-shirt*)— do not seem to be prioritized, as Hernández Muñoz (2005, 2010) pointed out. Although such examples represent exclusive words obtained in the oral test, in the written corpus, *chaqueta de cuero* (*leather jacket*), *chaqueta de lana* (*wool jacket*), *cazadora de pana* (*corduroy jacket*) or c*amisa de cuadros* (*plaid shirt*) are also found as exclusive words. Similarly, both lists contain peripheral associations: as exclusive words from the written corpus we find, for example, *moda* (*fashion*), Bershka (store name), *bonito* (*nice*) or *feo* (*ugly*) in the *Clothing* field, and *comida* (*lunch*) and *almuerzo* (*brunch*) in *Animals*; as exclusive words from the oral list we find *taparrabos* (*loincloth*), *tiendas* (*shops*) or *vestimenta* (*clothes*), in *Clothing*, and *salvajes* (*wild*), *zoológico* (*zoo*) and *jaula* (*cage*) in *Animals*.

This similarity between the results of both modalities, which may be related to the wide time limit, is intensified in the case of nonnative speakers due to their lower lexical competence. Body parts words are mostly neutral or formal in both lists (with fewer anatomical technicalities than in the case of native speakers) and subordinate-level units and peripheral associations appear in all three centers of interest regardless of test modality.

Finally, the repetitions that each informant produced in the different semantic categories were counted and nonparametric comparison of means tests applied. This shows, first, that native Spanish speakers generated more repetitions in the written test than in the oral test, contrary to our initial hypothesis. The average number of repetitions in the written survey is higher than the average of repetitions in the oral survey in all the centers of interest considered, as reflected in Figure 8. On the other hand, the behavior of foreign students with respect to repetitions is as expected: in all the categories, the average number of repetitions in the oral test exceeds that in the written test (Figure 9). However, the differences noted do not reach statistical significance in any of the groups of participants (Table 7).
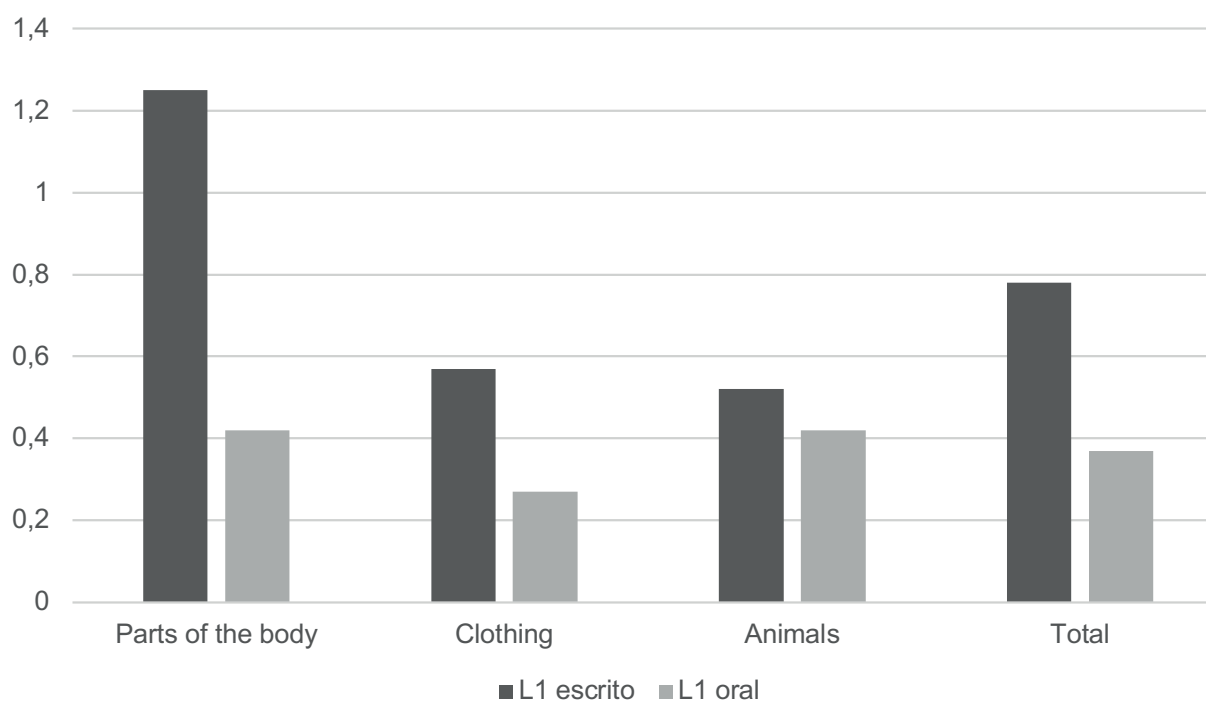

Figure 8. Average number of repetitions in oral and written tests, native speakers.
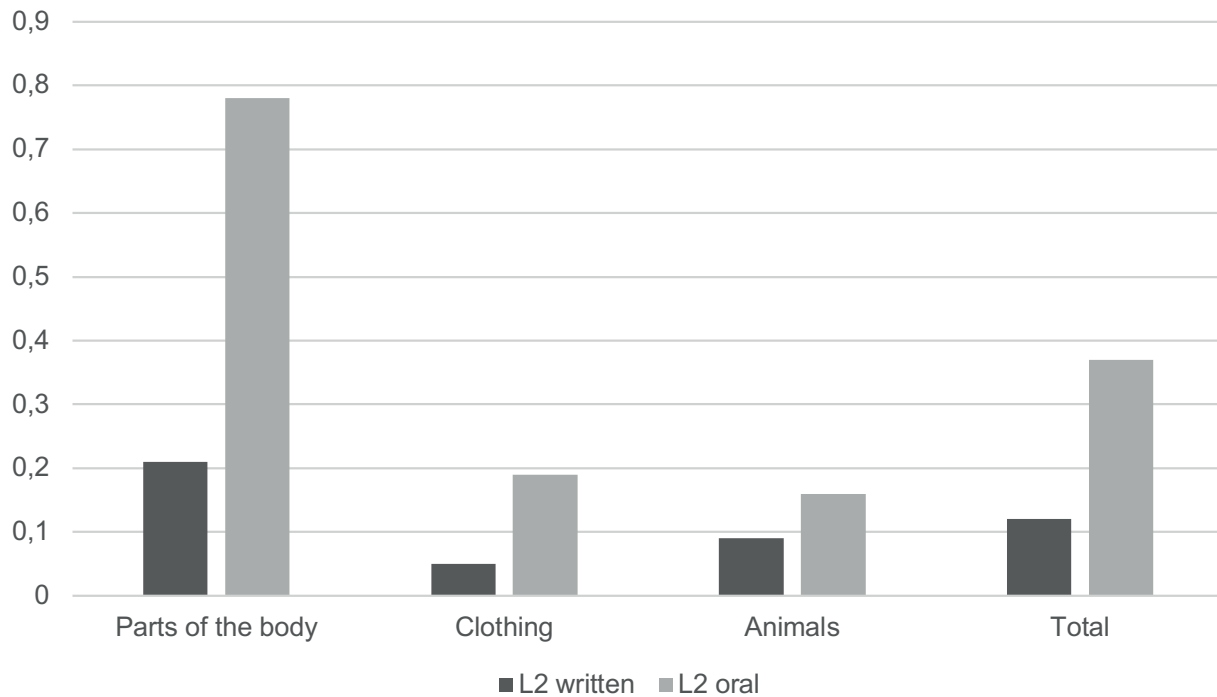
Figure 9. Average number of repetitions in oral and written tests, SFL speakers.

Table 7. Mann-Whitney U-statistics of oral and written test repetitions.

	Sig. (bil.)	
	L1	L2
Parts of the body	0.140	0.247
Clothing	0.390	0.202
Animals	0.291	0.958
Total	0.628	0.346

5. DISCUSSION

The experimental lexical production in L2 is significantly lower than the production in L1 in all the categories studied. As expected, a greater knowledge of the language in which the task is carried out affects the generation of more items. It can be assumed, therefore, that the lexical production by SFL students will also increase as their level of competence improves. The category that shows the greatest production differences in native and nonnative speakers is *Animals*: in L1 it is the most productive, while in L2 it generates the fewest words. These results reflect a pattern of acquisition of the L1 lexicon different from that of L2 when it is not learned during childhood. In L1, this category is present from a very early age and presumably has a large number of members. In contrast, for adolescents or adults who study a foreign language, animal names are a category of lower communicative profitability, so they tend to be learned later and in smaller quantities.

Parts of the body is the most productive category in Spanish as an L2 and the most compact one in both groups of participants according to the cohesion index. This is an indicator of the influence that the semantic category proposed as a prompt has on the vocabulary that is selected. *Parts of the body* is a category with well-defined limits, allowing clear judgment about whether an item belongs to the category: if and only if such an example can be located in human anatomy, it belongs to the category *Parts of the body.* This property promotes agreement between the responses produced while facilitating the generation of items. Given this semantic field, the informants do not hesitate in their answers or delay in beginning to respond, since they are faced with a perfectly delimited category. In addition, two favorable circumstances must be added to this fact. First, the human body is a subject that is studied in school (both L1 and L2) and, second, the body itself facilitates the implementation of strategies that help recall the lexicon more effectively: it is enough to mentally review the body itself, following a certain order, or to look at another test-taker's body, as Hernández Muñoz (2005) points out.

Regarding the modality of the test, it does not appear to significantly affect the number of responses generated in L1 or in L2 with a time limit of four minutes. The differences observed in the averages obtained on the written and oral tests, both by native speakers and by SFL speakers, are not statistically significant in either the individualized study of each center of interest or in the general average. This result agrees with those of Hernández Muñoz (2005, 2010), who did not find significance in the number of words elicited during a response time of two minutes.

However, these results are nuanced when the temporal distribution of responses is examined. Test modality does have a significant impact on the available words elicited, but its influence is conditioned by the response time. The oral available lexicon is characterized by a greater number of words generated in the early stages, while in the written modality the progression is more constant. These results are more in agreement with the description of the cognitive and motor processes involved in the oral and written production of words. The processes of memory retrieval are slower in written availability: the selected lexical units must remain active for longer while the corresponding motor processes are operating, which takes more time than the phonoarticulatory processes that make the production of sounds possible.

In any case, as time progresses, the production of available words drops, but the trend is not linear; instead, in both L1 and L2, a negative trend curve is described: in the first stages of the output, a strong decline is observed, whereas in the later stages the decline is increasingly gradual.

The lines that describe the evolution of the responses over time of the L1 and L2 Spanish speakers run parallel, although native speakers' production is higher than that of SFL speakers at all time intervals. The generation of available words presents, therefore, a similar trajectory whether the test is conducted in a first language or in a foreign language, but native speakers are more efficient, which agrees with the results obtained in tasks that equally require access to vocabulary and the retrieval of lexical material (Bialystok, Craik & Luk, 2008; Bialystok & Craik, 2010).

No significant differences are obtained when analyzing the production of words in each of the three centers of interest considered. However, this result may be because all three categories have a similar internal organization.

On the one hand, in the group of Spanish native speakers, the difference between the means reached in the written and oral modalities ceases to be significant after two and a half minutes ($p < 0.01$). The fact that in the works of Hernández Muñoz (2005, 2010) no significant differences were found between the averages reached in the oral and written tests with a response time of two minutes for each category may be related not only to the influence of the time limit granted but also to the type of semantic categories used as prompts. While three categories of similar characteristics were used in this investigation, in the studies by Hernández Muñoz (2005, 2010), *Muebles* (*Furniture*) is included, a much smaller and more diffuse category.[6]

On the other hand, in the group of SFL speakers, the differences between the means reached in both modalities lack significance after one and a half minutes. The generation of available terms requires an effort that increases as the time lapses, which causes a gradual fall in production. This effort is even greater when the task is solved in a second language: the size of the known vocabulary is lower, even in more balanced bilinguals,[7] and the most easily accessible words are exhausted beforehand, so the two productions equalize within a shorter period.

From the above it follows that the time needed to produce the most available words in relation to a semantic category will vary depending on the type of informant and the test modality.

From a qualitative point of view, the analysis of the most available words in L1 and L2 shows that the lexical production in L2 is conditioned by participants' L1 and by these speakers' lower competence. Thus, the L2 favors a greater availability of the cognates (*estómago – stomach*) and of the syntagmatic groups that in the L1 are lexicalized as simple units (*dedos de los pies – toes*), as well as of peripheral terms (such as *cinturón* (*belt*) for *Clothing*) and supraordinate-level terms (such as *ave* (*bird*) for *Animals*).

The influence of the L1 can easily be explained if cascade processing is assumed, with the activation of the L1 up to the phonological level, and an organization of the bilingual memory as proposed by the Revised Hierarchical Model (Kroll & Stewart, 1994). According to these models, unbalanced bilinguals rely on the L1 to access the lexical forms of the L2, since the connections between these and the conceptual representations are weaker. If the lexical representations of both languages are formally similar (that is, if they are cognates), the L2 words obtain a higher level of activation than their competitors, which causes them to be generated earlier and more often in the availability test. In fact, according to the results of Hernández, Izura, and Tomé (2014),

---

6   In Hernández Muñoz (2010), the category *Professions* is also incorporated.

7   This is recognized by Bialystok, Craik and Luk (2008:535): "bilinguals often maintain a vocabulary that is smaller than that of a comparable monolingual, and this fact may reduce the efficiency of lexical retrieval".

cognateness is in fact one of the predictive variables of lexical availability in L2, as it also exerts a facilitating effect in tasks of word recognition, picture naming, memorization, etc. (Hoshino & Kroll, 2008; De Groot & Keijzer, 2000; Friel & Kennison, 2001; Tonzar, Lotto & Job, 2009). In the same line, the mediation of the L1 and the effects of priming would favor the greater availability shown in the L2 syntagmatic groups that are encoded in the L1 as a single word.

In contrast, the production of peripheral terms requires an intense activation of the category to which they belong according to the pattern of synaptic plasticity. From the prototypical core of the category, the informant moves through associated lexical networks (Ávila Muñoz & Sánchez-Sáez, 2014), which are much less extensive in the case of L2. This characteristic means that nonnative speakers produce peripheral words of the category and less specific terms, such as *ropa interior* (*underwear*) instead of *sujetador* (*bra), calzoncillo* (*brief), medias* (*tights), bragas* (*panties*) and *tanga* (*thong*).

In relation to test modality, a relatively high compatibility was found between the words elicited in the written and oral tests, both in L1 and in L2. In the group of native speakers, the match exceeds 59% in the three centers of interest considered and, in the group of Spanish language learners, it exceeds 61%.

In the study by Hernández Muñoz (2005:98-99), the agreement between the oral and written answers for *Parts of the body*, *Clothing*, and *Animals* is considerably less than that of our work. This discrepancy is mainly because her study does not limit the comparison according to the availability index of the words. In a first step, she calculates the compatibility of the two sets for all the words in the lists and, next, she excludes from the comparison the words contributed by a single informant. In fact, when only the words produced by two or more informants are considered, the agreement increases significantly:

· *Parts of the body* increased in compatibility from 39% to 47%.

· *Clothing* reaches a 43% agreement compared to the previous of 23%.

· *Animals*, which in the comparison of the complete listings showed a compatibility of 53%, now has 60%.

Moreover, these percentages are similar to those presented in Hernández Muñoz (2010:152), where she restricts the comparison to words with an AI greater than 0.02. In that case, *Parts of the body* reaches a compatibility of 47.41%; *Clothing*, of 36.62%, and *Animals*, of 58.9%.

In this sense, our results may have been higher due to the increase in response time, which is double that of the previous studies. As in the quantitative results, oral and written production could be matched as the response time elapses. In fact, this conclusion is also supported by the similarity observed between the written and oral lists in relation to the register of the elicited words (which do not show a greater colloquiality in the oral tests), the chaining of subordinate-level terms and the peripheral associations. In contrast to previous work, the oral modality is not characterized by greater spontaneity in the responses of native speakers nor of non-native speakers, for whom the task involves greater effort and favors the updating of all the terms they are able to recall, regardless of the modality of the task.

Finally, native speakers produced more repeated words in the written survey than in the oral survey, unlike the SFL speakers. Again, the long timeframe for responding could be responsible for the results of the written tests in L1. Likewise, the actual layout of the questionnaire, with each category distributed in two pages to control the response time as explained in note 5, could have facilitated the production of repetitions: to check all their previous answers, the informants had to return to the previous page. In any case, the statistical tests carried out indicate that the differences observed in the number of repetitions generated in both modalities lack significance.

6. CONCLUSIONS

The available lexicon of nonnative speakers is essentially different from that of native speakers, both quantitatively and qualitatively. In L2, lexical production is significantly lower and the responses show the influence of the participants' L1, in addition to a more limited lexical proficiency and a differentiated learning pattern. This gap between the lexical availability of L1 and L2 could, however, be reduced as competence develops in L2. In this sense, it would be expected that a higher proficiency level in the L2 would correspond to greater lexical production, greater diversity in the answers and, according to the main models of lexical organization and word production, lower mediation of the L1.

This finding leads us to rethink, as defended in Hernández and Tomé (2017), the very concept of collective available lexicon for L2, at least in the same terms as for L1. Thus, although the sum of a significant number of individual available lexicons may represent the available lexicon of a set of speakers of the same mother tongue, the variability in the lexical availability of L2 imposes a smaller scope. In contrast to the lexicon available in Spanish of Spain, one would have to think, for example, of the vocabulary available in Spanish for intermediate-level English-speaking students, for example, as in this case.

Moreover, beyond lower competence, the resolution of the lexical production task in L2 supposes the initiation of different cognitive processes and, consequently, an unequal influence of certain methodological factors, such as test modality or response time. Although in previous studies no statistically significant differences were found between the number of responses produced orally and in writing, it has been found that such differences exist but that they are conditioned by the response time, which has different effects on production in L1 and in L2, even though its evolution describes a similar trajectory. Likewise, response time seems to neutralize as well the qualitative differences previously observed in the oral and written corpora of available words.

These results are more consistent with the cognitive and motor processes involved in the production of oral and written words, and with the characterization of lexical knowledge in L1 and in L2. In addition to supposing a small advance in this sense, this work contributes important methodological considerations for the two main applications that lexical availability tests have in the field of the didactics of foreign languages: the evaluation of learners' lexical competence and the selection of vocabulary. Indeed, lexical availability in the L2 can serve as a partial proficiency test, and may be used to diagnose the conceptual fields in which students have more problems. The available items, independent and decontextualized, offer, on the one hand, an estimate of the size of the most accessible thematic vocabulary and, on the other, a partial measure of its depth, based on the subsequent analyses that are carried out. In L1, lexical availability can serve as a vocabulary selection tool, adding to the frequency in the group of lexical-statistical criteria related to the description and use of the language. According to the results of this work, each of these applications will impose different methodological conditions related not only to the objective they pursue but also to the type of participant.

ACKNOWLEDGEMENTS

REFERENCES

Alfonso, O., & Álvarez, C.J. (2009). "La sílaba también es importante en la escritura de palabras", *Ciencia Cognitiva: Revista Electrónica de Divulgación* 3/2, 36-38.

Ávila-Muñoz, A.M., & Sánchez-Sáez, J.M. (2014). "Fuzzy sets and prototype theory representational model of cognitive community structures based on lexical availability trials", *Review of Cognitive Linguistics, 12*, 133-159. https://doi.org/10.1075/rcl.12.1.05avi

Bartol Hernández, J.A. (2001). "Reflexiones sobre la disponibilidad léxica", In J.A. Bartol *et al.* (eds.) *Nuevas aportaciones al estudio de la lengua española. Investigaciones filológicas*. Salamanca: Luso-Española Ediciones, 221-236.

Bartol Hernández, J.A. (2008). "Variación léxica del español: los léxicos disponibles de Aragón y Soria", in M.L. Arnal (ed.) *Estudios sobre disponibilidad léxica en jóvenes aragoneses.* Zaragoza: Institución Fernando el Católico, 207-226.

Bialystok, E., &. Craik, F.I.M. (2010). "Cognitive and Linguistic Processing in the Bilingual Mind", *Current Directions in Psychological Science*, *19*/1, 19-23. https://doi.org/10.1177/0963721409358571

Bialystok, E., Craik, F.I.M., & Luk, G. (2008). "Lexical Access in bilinguals: Effects of vocabulary size and executive control", *Journal of Neurolinguistics, 21*, 522-538. https://doi.org/10.1016/j.jneuroling.2007.07.001

Costa, A. (2008). "Speech Production in Bilinguals", In T.K. Bhatia & W.C. Ritchie (eds.) *The Handbook of Bilingualism*. Oxford: Blackwell Publishing, 201-223. https://doi.org/10.1002/9780470756997.ch8

De Groot, A.M.B., & De Keijzer, R. (2000). "What is hard to learn is easy to forget: The roles of word concreteness, cognate status, and frequency in foreign language vocabulary learning and forgetting", *Language learning, 50*, 1-56. https://doi.org/10.1111/0023-8333.00110

Fernández, A.L., Marino, J.C. & Alderete. A.M. (2004). "Valores normativos en la prueba de Fluidez Verbal-Animales sobre una muestra de 251 adultos argentinos", *Revista Argentina de Neuropsicología, 4*, 12-22.

Friel, B.M., & Kennison, S.M. (2001). "Identifying German–English cognates, false cognates, and non-cognates: methodological issues and descriptive norms", *Bilingualism: Language and Cognition*, *4*/03, 249-274. https://doi.org/10.1017/S1366728901000438

Gollan, T.H., Fennema-Notestine, C., Montoya, C. & Jernigan, T.L. (2007). "The bilingual effect on Boston naming test performance", *Journal of the International Neurological Society, 13*, 197-208. https://doi.org/10.1017/S1355617707070038

Hernández Muñoz, N. (2005). *Hacia una teoría cognitiva integrada de la disponibilidad léxica: el léxico disponible de los estudiantes castellano-manchegos*. Salamanca: Ediciones Universidad de Salamanca.

Hernández Muñoz, N. (2010). "El cambio de canal en la producción léxica experimental", *LEA, 32*/2, 141-171.

Hernández Muñoz, N., Izura, C., & Ellis, A. (2006). "Cognitive Aspects of lexical availability", *European Journal of Cognitive Psychology, 18*, 734-755. https://doi.org/10.1080/09541440500339119

Hernández Muñoz, N., & Tomé Cornejo, C. (2017). "Léxico disponible en primera y segunda lengua", in F. del Barrio (ed.) *VenPalabras1. Palabras, Vocabulario Léxico. La lexicología aplicada a la didáctica y a la diacronía*. Venecia: Edizioni Ca'Foscari, 99-122.

Hernández Muñoz, N., Izura, C., & Tomé Cornejo, C. (2014). "Cognitive factors of lexical availability in a second language", in R.M. Jiménez Catalán (ed.) *Lexical availability in English and Spanish as a Second Language.* Dordrecht, Heidelberg, New York, London: Springer, 69-186. https://doi.org/10.1007/978-94-007-7158-1_10

Hoshino, N. (2006). *A psycholinguistic study of native language constraints on speaking words in a second language*. Pennsylvania: Pennsylvania State University.

Hoshino, N., & Kroll, J.F. (2008). "Cognate effects in picture naming: Does crosslanguage activation survive a change of script?", *Cognition, 106*/1, 501-511. https://doi.org/10.1016/j.cognition.2007.02.001

Kroll, J.F., & Stewart, E. (1994). "Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations", *Journal of Memory and Language, 33*, 149-174. https://doi.org/10.1006/jmla.1994.1008

Ostrosky-Solís, F., Lozano, A., Ramírez, M. & Ardila, A. (2007). "Same or different? Semantic verbal fluency across Spanish speakers from different countries", *Archives of Clinical Neuropsychology, 22*/3, 367-378. https://doi.org/10.1016/j.acn.2007.01.011

Poarch, G.J. (2013). *Cross-linguistic interaction, lexical representation, and cognitive control in second language learners, bilinguals, and trilinguals*. Nimega: Radboud University Nijmegen.

Ramírez, M., Ostrosky-Solís, F., Fernández, A. & Ardila, A. (2005). "Fluidez verbal semántica en hispanohablantes: un análisis comparativo", *Revista de Neurología,* 41/8, 463-468. https://doi.org/10.33588/rn.4108.2004597

Tonzar, C., Lotto, L., & Job, R. (2009). "L2 Vocabulary Acquisition in Children: Effects of Learning Method and Cognate status", *Language Learning, 59*, 623-646. https://doi.org/10.1111/j.1467-9922.2009.00519.x