The productive vocabulary of multimodal and unimodal English as a foreign language learners

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ABSTRACT: This study investigated the productive vocabulary of EFL learners divided into two groups: multimodal (preference for two or three perceptual learning styles) and unimodal (preference for one perceptual learning style). The objectives of this research were twofold: (1) to identify the productive vocabulary of multimodal and unimodal EFL learners; and (2) to ascertain whether there were statistically significant differences between productive vocabulary and the preferences for learning (multimodality or unimodality). The sample consisted of 60 Spanish EFL learners (24 multimodal and 36 unimodal) in the 12th grade. The data collection instruments were the Learning Style Survey (Cohen et al., 2009) to divide the informants into multimodal and unimodal learners, and the 2,000-word version of the Productive Vocabulary Levels Test (Laufer & Nation, 1995, 1999) to measure their productive vocabulary. Then, data were coded and subjected to quantitative analyses. The findings indicated that multimodal learners had more productive vocabulary (1,186 words) than their unimodal peers (948 words). However, there were not statistically significant differences between multimodal and unimodal learners in their productive vocabulary. However, both the effect size and the strength of association were large. Therefore, the results suggested that EFL learners employed different sensory modalities to learn vocabulary.
Key words: multimodality, unimodality, productive vocabulary, perceptual learning style preferences, English as a Foreign Language.

Vocabulario productivo de estudiantes multimodales y unimodales aprendices de inglés como lengua extranjera

RESUMEN: Este estudio investigó el vocabulario productivo de aprendices de inglés como lengua extranjera multimodales (preferencia por dos o tres estilos de aprendizaje) y unimodales (preferencia por un estilo de aprendizaje). Los objetivos fueron: (1) identificar el vocabulario productivo de los estudiantes multimodales y unimodales; y (2) determinar si se encontraron diferencias estadísticamente significativas entre el vocabulario productivo y las preferencias en el aprendizaje (multimodalidad o unimodalidad). La muestra la formaron 24 alumnos multimodales y 46 unimodales, aprendices de inglés como lengua extranjera de 2º de Bachillerato. Los instrumentos utilizados fueron el Learning Style Survey (Cohen et al., 2009), para dividir a los alumnos en multimodales y unimodales, y el Productive Vocabulary Levels Test (Laufer & Nation, 1995, 1999) para medir el vocabulario productivo. A continuación, los datos fueron codificados y sometidos a análisis cuantitativos. Los resultados indicaron que los alumnos multimodales presentaron un mayor vocabulario productivo (1.186 palabras) que los unimodales (948 palabras). No había diferencias estadísticamente significativas en el vocabulario productivo de los alumnos multimodales y unimodales, aunque el

tamaño del efecto y la fuerza de asociación fueron grandes. Estos resultados sugieren que los aprendices de inglés como lengua extranjera utilizan diferentes modalidades sensoriales para aprender vocabulario.
Palabras clave: multimodalidad, unimodalidad, vocabulario productivo, estilos de aprendizaje de percepción, inglés como lengua extranjera.

1. Introduction

Vocabulary acquisition is a crucial element of learning a foreign language (FL) because, as Meara (1996) observed, "all other things being equal, learners with big vocabularies are more proficient in a wide range of language skills than learners with smaller vocabularies" (p. 37). It was not until the 1980s when L2 vocabulary acquisition research started to gradually acquire relevance and when investigations began to proliferate (Meara, 1980). However, productive vocabulary knowledge has not been thoroughly investigated (e.g., Castro García, 2017; Laufer & Nation, 1999; Meara & Miralpeix, 2021). In an FL classroom, L2 vocabulary learning might be affected by learners' individual differences. Language learners use different sensory modalities (visual, auditory, or tactile/kinesthetic), also called perceptual learning styles, to process information and learn vocabulary. These learners might use a specific sensory modality (unimodal learners), or a combination of sensory modalities in balance (multimodal learners). Although the relationship between L2 vocabulary and perceptual learning styles has been investigated (e.g., Hatami, 2018; Pouwels, 1992; Tight, 2010), to the best of the author's knowledge, no study has examined the influence of perceptual learning styles on productive vocabulary, considering learners' multimodal and unimodal learning preferences.

The present study explores the productive vocabulary knowledge of EFL learners in the last course of Spanish post-secondary education (2nd of Baccalaureate, equivalent to the 12th grade), based on their multimodal and unimodal learning preferences. This research is of paramount importance for FL education, since it reveals the number of words available for communication, and it unveils whether the preference for one or several perceptual learning styles contributes to the development of productive vocabulary. EFL teachers could acknowledge their students' learning preferences and whether more instruction on vocabulary is required. In this regard, teachers could plan their classes and teaching materials according to their students' needs.

2. Literature review

2.1. Vocabulary

Vocabulary is a fundamental aspect in foreign language acquisition (FLA) (Laufer, 1998; Meara, 1990; Nation, 1990), since the knowledge of the vocabulary of a language would allow learners to communicate effectively. Researchers have investigated the number of words that are necessary to understand both written and spoken texts in a foreign language. However, a consensus has not been reached regarding the exact vocabulary size. For example, 3,000

word families are required to comprehend a text, 5,000 word families to read for pleasure, 8,000 to 9,000 word families to understand a written text and 6,000 to 7,000 word families for a spoken text (Laufer & Aviad-Levitzky, 2017; Nation, 2006; van Zeeland & Schmitt, 2013). Research on word frequency has indicated that the knowledge of the 2,000-3,000 most frequent words would allow FL learners to communicate both orally and in written form (Nation & Waring, 1997; Schmitt & Schmitt, 2014; van Zeeland & Schmitt, 2013). Therefore, investigations on the vocabulary size of EFL learners would allow teachers and researchers to acknowledge their threshold vocabulary level and whether more instruction is necessary to read and comprehend texts (Laufer, 1998; Laufer & Aviad-Levitzky, 2017). It would also be beneficial for learners to know their most challenging aspects to be able to address them and enhance their learning.

Two types of vocabulary can be distinguished: receptive and productive. Receptive vocabulary concerns the perception of a linguistic form and the understanding of its meaning in listening and reading (Meara, 1990). Productive vocabulary, on the other hand, involves the production of words in speaking and writing to convey meaning (Nation, 2001). Productive vocabulary can be classified into two types: controlled and free. Controlled productive vocabulary pertains to the production of words when they are triggered by a task (see Section 3.2.2.). In contrast, free productive vocabulary refers to the use of words at one's free will (Laufer & Nation, 1999). In this regard, words are not prompted but used by learners by choice, such as in a writing task. It is widely acknowledged that receptive vocabulary precedes productive vocabulary and it is larger (e.g., Cheng & Matthews, 2018; Nation, 1990; Webb, 2008). Productive vocabulary has been underinvestigated, and few assessment methods exist to estimate it. Among them, the Lexical Frequency Profile (Laufer & Nation, 1995) measures free productive vocabulary through a composition task, whilst the Productive Vocabulary Levels Test (PVLT) (Laufer & Nation, 1995, 1999) assesses controlled productive vocabulary. On the other hand, Webb (2008) used translation tests. Another method has been to use a word association task, in which prompts related to daily life situations act as cues so that test takers can write the words that first come to their minds (e.g., Jiménez Catalán, 2014; Jiménez Catalán & Montero-SaizAja, 2020). The present study is devoted to controlled productive vocabulary, since our aim is to ascertain the amount of words learners are ready to use for effective communication. Research on productive vocabulary is essential to acknowledge the vocabulary size of FL learners in a given educational level and context, and to tackle any issues that might arise in the acquisition of vocabulary.

2.2. Perceptual learning styles

Learning styles are also fundamental elements in FLA, since they allow teachers and researchers to identify the different learning preferences that learners have. They can be defined as "an individual's natural, habitual, and preferred way(s) of absorbing, processing, and retaining new information and skills" (Reid, 1995, p. viii). However, learning styles have been sharply criticized. Supporters (e.g., Barbe et al., 1979; Lovelace, 2005) advocate the matching of teaching and learning styles for effective learning. Other researchers (e.g., Pashler et al., 2009; Willingham et al., 2015) are against this idea because no conclusive evidence has been found. We agree with the latter viewpoint in that matching both styles will not ensure successful learning. Notwithstanding, we support a balanced instruction in which

teachers consider all learning styles in the classroom (not all at the same time as proponents argue) so that students can get the most out of their learning (e.g., Natividad & Batang, 2018; Payaprom & Payaprom, 2020). From the large number of models and classifications that have been proposed (e.g., Briggs Myers, 1962; Coffield et al., 2004; McCarthy, 1990), perceptual learning styles were selected because they are the most significant perceptual modalities that can be found in an FL classroom (Barbe et al., 1979; Tight, 2010).

Perceptual learning styles, also referred to as modality preferences or learning preferences, are "the variations among learners in using one or more senses to understand, organize and retain experience" (Reid, 1987, p. 89). The senses of sight, hearing, and touch are thought to be the most relevant modalities found in an FL classroom (Barbe et al., 1979; Tight, 2010). Therefore, this study will be dedicated to the visual, auditory, and tactile/kinesthetic perceptual learning styles, as they make teachers aware of how their students prefer to learn. Visual learners like to receive information through the sense of sight. They enjoy reading, seeing charts, images, and taking detailed notes. Auditory learners like to receive information through hearing. They prefer listening to lectures, oral instructions, participating in discussions, and role-play activities. Tactile and kinesthetic styles are usually grouped together because, although they are not the same, they are somehow related. Tactile learners prefer to learn through the sense of touch, whereas kinesthetic learners like learning through movement. These learners like moving, doing experiments, or building things (Dörnyei, 2005; Dörnyei & Ryan, 2015; Oxford, 2003). All in all, FL learners can have a unique preference for learning (unimodal learners), or they can have a mixed-modality preference (multimodal learners) and use two or three styles in balance. Research on perceptual learning styles is crucial because it indicates the general preferences for learning a FL, and it sheds some light on the FL learning process. It also makes learners cognizant of their learning preferences, as well as their strengths and weaknesses.

2.3. Review of studies

Few studies have examined the relationship between L2 vocabulary learning and perceptual learning styles. For example, Shen (2010) investigated the effect of perceptual learning style preferences on L2 lexical inferencing with EFL university students in Taiwan. Before inferencing strategy instruction, results suggested that group learners achieved the best outcomes in the lexical inferencing test, followed by individual, kinesthetic, tactile, auditory, and visual learners. In the lexical inferencing posttest, auditory and visual learners outperformed the other participants. Similarly, Tight (2010) researched the relationship between perceptual learning style matching and the acquisition and retention of L2 Spanish nouns with American university students. Regarding unimodal learners, visual was reported to be their most favored modality (38%), followed by auditory (16%), and tactile/kinesthetic (9 %) modalities. Visual was also the preferred modality of multimodal learners (15%), followed by auditory (12%), and tactile/kinesthetic (5%) modalities. In fact, the rest (4%) were multimodal learners who had a tie between their two highest modalities. Findings indicated that mixed modality instruction was the most beneficial for the acquisition and retention of L2 vocabulary. Moreover, style matching seemed to result in a greater retention than style mismatching.

Other studies found that the relationship between L2 vocabulary learning and perceptual learning styles was not effective. Yeh and Wang (2003) studied whether Taiwanese EFL

university students' perceptual learning styles influenced the effectiveness of three types of vocabulary annotations (text annotation only, text plus picture, and text plus picture and sound). Results suggested that the text plus picture vocabulary annotation was the most effective. However, perceptual learning styles did not appear to influence the effectiveness of vocabulary annotations. They tended to prefer visual to auditory annotations. Likewise, Kassaian (2007) examined whether matching the instructional method (visual or aural) with Iranian EFL university students' perceptual learning styles enhanced their vocabulary acquisition and retention. Findings indicated that the words which were presented visually were acquired and retained better than auditory ones, despite being visual or auditory learners. Results also showed that perceptual learning styles did not have an effect on the retention of the material instructed. In the same vein, Hatami (2018) explored whether there was a relationship between Iranian EFL university students' perceptual learning styles and L2 incidental vocabulary acquisition and retention through reading, when matched to their input mode. Most of the participants were visual learners (47%) followed by mixed-modality preference (33%), tactile/kinesthetic (11%), and auditory (9%) learners. Significant differences between the reading group and incidental vocabulary acquisition and retention were not found. Findings also revealed that perceptual learning style matching did not influence incidental word learning through reading.

On the other hand, Pouwels' (1992) research showed mixed results. He investigated the impact of perceptual learning styles on a vocabulary test using pictorial, verbal and pictorial-verbal aids in L2 university students in the United States. Most informants were visual learners (41.77%), followed by auditory (29.11%) and parity (29.11%) learners. Results confirmed that parity learners obtained better results in the vocabulary test, followed by visual and auditory learners. Findings also indicated a statistically significant positive correlation between visual learners and the combination of picture and verbal aids, but the correlation was negative with auditory learners.

As it can be inferred from this review of studies, no concluding evidence has been found to support the relationship between perceptual learning styles and L2 vocabulary learning. Furthermore, these studies only investigated intentional (Kassaian, 2007; Pouwels, 1992; Tight, 2010), and incidental (Hatami, 2018) L2 vocabulary acquisition, lexical inferencing (Shen, 2010), or vocabulary annotations (Yeh & Wang, 2003). However, investigations into the productive vocabulary size of multimodal (mixed-modality preference) and unimodal (single modality preference) EFL learners are lacking in the literature. The current study aims at contributing to fill this gap in L2 vocabulary and perceptual learning style studies by examining the productive vocabulary size of multimodal and unimodal EFL learners and identifying whether perceptual learning style preferences influence the knowledge of productive vocabulary. This investigation would determine whether the preference for one or several modalities when learning EFL vocabulary contributes to a higher productive vocabulary knowledge. It would make EFL teachers aware of their students' vocabulary size and learning preferences, and it would indicate whether new instructional approaches are needed. Therefore, this study addresses the following research questions:

1. What is the productive vocabulary knowledge of multimodal and unimodal EFL learners?
2. Are there any statistically significant differences between productive vocabulary and the preferences for learning of EFL learners?

3. METHODOLOGY

This study is a quantitative, cross-sectional, descriptive, and correlational research.

3.1. Participants

A group of 60 EFL learners participated in this investigation. This group comprised 24 multimodal (mixed-modality preference) and 36 unimodal (single modality preference) students. They attended the last course of Spanish post-secondary education (equivalent to the 12th grade) in a state school in La Rioja, a monolingual autonomous community in the north of Spain. Their mean age was 17.1 years old, and all of them were learning English as a Foreign Language, which was taught as a curricular subject. Their instructional level was B1, which was the level assigned to this course by the educational board of this community. Respondents differed in their mother tongue. The majority of them (78.33%) had Spanish as their L1, but the rest (21.67%) had other languages as their mother tongue, which were only spoken at home. Their L1 was Arabic (10 %), Bulgarian (1.67%), Macedonian (3.33%), and Romanian (6.6 %).

3.2. Data collection instruments

3.2.1. Learning Style Survey (LSS)

The Learning Style Survey (LSS) was developed by Cohen et al. (2009) to determine eleven learning style preferences. However, only the first part of this questionnaire "How I use my physical senses" was selected for this study. This part pertains to the perceptual learning styles (visual, auditory, and tactile/kinesthetic), which are the styles we use to divide learners into multimodal and unimodal. It is composed of 30 behavioral statements: 10 each correspond to the visual, auditory, and tactile/kinesthetic modalities. Reflecting on their behavior in learning, the participants had to circle their answer based on a five-point Likert scale (ranging from 0 = never to 4 = always). For example, item one reads as follows: "I remember something better if I write it down." This questionnaire was selected for four reasons. Firstly, it is appropriate for language learning. Secondly, items are more L2 specific than in the Perceptual Learning Style Preference Questionnaire (Reid, 1987) and the Style Analysis Survey (SAS) (Oxford, 1995), since "it contains some L2-learning specific items, mixed with non-subject-specific ones" (Dörnyei, 2005, p. 146). Thirdly, it includes one part which examines perceptual learning styles specifically, it is based on Oxford's SAS (1995) and it is an improved version (Cohen & Weaver, 2005). And finally, the test re-test reliability of the first part of this survey is reported to have a correlation of .74 (Tight, 2010).

3.2.2. Productive Vocabulary Levels Test (PVLT)

The Productive Vocabulary Levels Test (PVLT), designed by Laufer and Nation (1995, 1999), was used to determine the controlled productive vocabulary knowledge of the informants. It is a quantitative measure which examines vocabulary growth by analyzing discrete, selective, and context dependent vocabulary (Moreno Espinosa, 2010). Particularly, the

2,000-word parallel version (version A + version C) was selected, since the knowledge of the 2,000 most frequent words seems to allow learners to communicate both orally and in written form in a foreign language (Nation & Waring, 1997; Schmitt & Schmitt, 2014; van Zeeland & Schmitt, 2014). This version consists of 30 different sentence contexts where students have to complete the word that fits in each particular sentence. The first letters are provided in each sentence in order to trigger the target word. It is considered to be a reliable and valid measure of productive vocabulary size (Laufer & Nation, 1999). For example, the first item reads as follows: "They will restore the house to its orig_____ state." We decided to choose this instrument because our objective was to measure controlled productive vocabulary, specifically the 2,000-word version. These are high-frequency words which belong to the basic vocabulary of the language (Nation, 2006). Knowing those words would imply that learners would be able to use them effectively in different communicative contexts.

3.3. Procedure and analysis

Data were collected in one session during school time. Participants were presented with a background questionnaire, the LSS and the PVLT tests. The headmaster of the participating school signed a written consent for the administration of these questionnaires to participants. Students, their parents, and tutors were informed of the research purpose of these tasks and its voluntary basis. The background questionnaire included questions to obtain information on learners' age, gender, nationality, mother tongue, other languages spoken at home, their instruction in EFL, and their previous experience with English. Part one of the LSS was distributed in Spanish after being granted the permission to use the questionnaire and translate it into Spanish by The Center for Advanced Research on Language Acquisition (CARLA), University of Minnesota. It was translated into Spanish because this was the L1 of the majority of the respondents (78.33%) and the L2 of the rest (21.67%), who both spoke and used Spanish in their daily life with a native-like fluency. It was thought that as they did not have the same command in the English language, their better understanding of this test would imply more accurate responses. They had 10 minutes to complete the LSS. In contrast, the PVLT test was administered in English, since our aim was to determine the informants' productive vocabulary knowledge in EFL. The time allotted to complete this test was 10 minutes as well. At the beginning of the tests, written instructions were given in English or Spanish, depending on the test, and they were also given orally in Spanish to clarify what students were being asked to do.

Once data were collected, responses were coded and entered into a Microsoft Excel file. Afterwards, all the tests were corrected and marked. Regarding the LSS, scores for each perceptual learning style were obtained by summing the points of each item: zero was the lowest point per item and four was the highest. As there were 10 items per modality, 40 was the maximum score in each. The modality which had the highest overall score was established as informants' perceptual learning style preference, and these types of learners were regarded as unimodal. Following Tight (2010), if there was not a difference of at least three points between the highest and the following highest modality, informants were considered to have a mixed-modality preference, that is, multimodal learners. Concerning

the PVLT, zero was the lowest score and 30 was the highest. Following Nation (1990, p. 78), the productive vocabulary knowledge was calculated as the number of correct answers multiplied by the total number of words of the test (2,000) and divided by the number of items (30). We decided that a word was correct if it was well-written both grammatically and orthographically. The first letters of the target word and context are given as a clue, so it is easier to find out to which word it refers. Besides, knowing a productive word entails the knowledge of its form (pronunciation, writing, spelling, word parts), meaning (word form, concepts, references, associations), and use (grammatical function, collocations, constraints on use) (Nation, 2001; Qian & Sun, 2019).

The sample was analyzed using RStudio version 1.2.5019 to perform descriptive and inferential statistics. The Kolmogorov-Smirnov test was run to determine the normality of the sample, and the Levene Test was conducted to identify whether there was equality of variances. The Wilcoxon Rank Sum Test was also performed to ascertain statistically significant differences between productive vocabulary and the perceptual preferences for learning. Finally, the effect size was calculated using Becker's (1998) Effect Size Calculators.

4. Results

The first research question aimed to identify the productive vocabulary knowledge of EFL multimodal and unimodal learners. Table 1 presents the descriptive statistics for multimodal and unimodal learners in the study of their productive vocabulary knowledge, particularly their word estimates. Out of the 2,000 most frequent words that the PVLT measured, multimodal learners obtained a mean of 1,186 words, whilst their unimodal peers' mean was 948 words. Table 1 also shows that both multimodal and unimodal EFL learners reached a maximum of 1,733.33 words. However, the minimum of word estimates was different. It was of 400 words for multimodal learners and 200 for the unimodal group. Therefore, the overall productive vocabulary knowledge of this sample was lower than 1,000 words in the case of unimodal students, and a little higher in multimodal learners.

Table 1. Descriptive statistics for multimodal and unimodal learners' productive vocabulary

Learning preferences	N	Mean	SD	Min.	Max.
Multimodal	24	1,186.11	394.64	400	1,733.33
Unimodal	36	948.15	469.5452	200	1,733.33

Table 2 shows multimodal and unimodal learners' productive vocabulary classified by each perceptual modality preference. Regarding multimodals, visual, auditory, and tactile/kinesthetic learners appeared to have the highest productive vocabulary available, since their mean was 1,400 words. They were followed by visual and tactile/kinesthetic (1,224 words), auditory and tactile/kinesthetic (947 words), and visual and auditory (933 words) learners. In contrast, findings suggested that visual learners had the highest productive vocabulary of the unimodal group, since they were reported to have a vocabulary size of 1,009 words. They were followed by tactile/kinesthetic (872 words), and auditory (822 words) learners.

Table 2. Productive vocabulary of multimodal and unimodal learners according to their perceptual learning styles (T/K stands for tactile/kinesthetic)

Multimodal learners				Unimodal learners			
Perceptual styles	*N*	*Mean*	*SD*	*Perceptual styles*	*N*	*Mean*	*SD*
Visual and auditory	2	933.33	94.281	Visual	21	1,009.52	479.484
Visual and T/K	11	1,224.24	389.042	Auditory	3	822.22	214.303
Auditory and T/K	5	946.67	512.944	T/K	12	872.22	507.287
Visual, auditory, and T/K	6	1,400	245.855				

The second research question aimed to ascertain whether there were statistically significant differences between productive vocabulary knowledge and EFL learners' learning preferences. The data were normally distributed in the multimodal group (p= .7128), but not in the unimodal group (p = .074) according to the Kolmogorov-Smirnov test. A Levene Test confirmed the homogeneity of variance, as the Pr(>F) was higher than 0.05 (0.07417).

The Wilcoxon Rank Sum Test was then implemented to identify whether there were statistically significant differences between productive vocabulary and learning preferences (multimodality and unimodality). Findings indicated that there were not statistically significant differences in the productive vocabulary of multimodal and unimodal learners (see Table 3).

Table 3. Wilcoxon Rank Sum Test

Wilcoxon Rank Sum Test	
W	*p-value*
558.5	.05677

Regarding the effect size for the comparison between two means, results suggested that there was a large effect size, as Cohen's *d* was 1.057 (see Table 4). Similarly, the strength of association was both positive and large.

Table 4. Effect size

Cohen's *d*	Effect-size *r*
1.057	.467

5. Discussion

The first research question aimed to identify the productive vocabulary of multimodal and unimodal EFL learners in the 12th grade. Our results revealed that the overall productive vocabulary of multimodal learners (1,186 words) was higher than that of unimodal learners (948 words). However, neither of the two groups of learners had a productive vocabulary size of 2,000 words, so they might have issues communicating in English orally and in written form (Nation & Waring, 1997; Schmitt & Schmitt, 2014; van Zeeland & Schmitt, 2013). These findings seem to be consistent with the study conducted by Pouwels (1992), which showed that the parity group outperformed visual and auditory learners in a vocabulary test. The difference lies in that Pouwels (1992) investigated intentional L2 vocabulary acquisition, whilst the present study focused on EFL productive vocabulary knowledge. Likewise, Fadel and Lemke (2012) also claimed that multimodal learners achieved better results in learning than unimodal learners.

Based on their perceptual learning styles, those multimodal learners who used the visual, auditory, and tactile/kinesthetic modalities in balance appeared to have the highest productive vocabulary size (1,400 words). An interpretation of this finding might be that if in a particular case these learners find it difficult to learn vocabulary with a specific style (e.g., visual), as they can use the three of them equally well, they can resort to the other two styles (e.g., auditory, and tactile/kinesthetic). In this regard, they seem to have better opportunities of success in vocabulary learning than unimodal learners, who depend on a single modality. Brain-related evidence has confirmed our interpretation: "A word network consisting of many components, i.e., visual, aural, kinetic, olfactory, etc. […] stores and retrieves information more efficiently than a small network" (Macedonia, 2015, p. 2). Our results also indicated that visual and auditory learners had the lowest productive vocabulary size of the multimodal group. This finding might be related to the conclusion Mansourzadeh (2014) reached, which pointed to the ineffectiveness of learning English vocabulary through audio-visual aids. On the other hand, visual unimodal learners seemed to have the highest vocabulary size (1,009 words). This might be because textbooks, apart from being the main medium of instruction in EFL learning (e.g., Gibbons, 2015; Hutchinson & Torres, 1994), are also the major source of vocabulary input (e.g., Jiménez Catalán & Mancebo Francisco, 2008; Nordlund & Norberg, 2020). EFL textbooks usually include readings which introduce the vocabulary to be learnt in the unit and then exercises to practice that vocabulary. Therefore, EFL students primarily learn vocabulary from visual materials, which might explain why visual learners had a higher productive vocabulary. Our results also suggested that auditory learners had the lowest productive vocabulary size (822 words). This finding supports the studies conducted by Brown et al. (2008) and van Zeeland and Schmitt (2013) which reported the difficulty EFL learners have to recognize the meaning and recall vocabulary learnt through listening. Another plausible explanation might be that listening is thought to be the most difficult skill in EFL learning (e.g., Goh, 2002; Nushi & Orouji, 2020), what might also hinder vocabulary acquisition.

The second research question aimed to ascertain whether there were statistically significant differences between productive vocabulary and learning preferences (multimodality and unimodality). The results of the present study indicated that there were not statistically significant differences. However, the effect size and the strength of association were large.

In this respect, this finding corroborates the results obtained by Yeh and Wang (2003), Kassaian (2007), and Hatami (2018), since they confirmed that perceptual learning styles did not influence L2 vocabulary learning. These studies differed from ours because they investigated the relationship between perceptual learning styles and vocabulary annotation, intentional and incidental vocabulary acquisition, respectively. They did not research the impact of learning preferences (multimodality and unimodality) on the productive vocabulary knowledge of EFL learners. This outcome implies that learning preferences, that is, being multimodal or unimodal, do not influence the learning of vocabulary. An interpretation of this finding might be that 12th grade multimodal and unimodal informants have been exposed to the same method of vocabulary instruction in EFL since they started the Spanish education system. This vocabulary input predominantly comes from the activities found in the textbooks (e.g., reading, listening, role-play) (Jiménez Catalán & Mancebo Francisco, 2008; Nordlund & Norberg, 2020). Although there were not significant differences, the productive vocabulary size of Spanish 12th graders was very low (around 1,000 words), after studying English for at least 11 years.

6. Conclusions

This study investigated the productive vocabulary knowledge of EFL learners in the last course of Spanish post-secondary education in La Rioja (Spain), based on their multimodal and unimodal learning preferences. The results indicated that the productive vocabulary of multimodal learners was slightly higher than that of unimodal learners, although both had a knowledge of around 1,000 words. Accordingly, these 12th grade Spanish EFL learners would not be able to use the language effectively for communicative purposes. Considering their perceptual learning styles, those multimodal students who used the three modalities in balance seemed to have the highest vocabulary knowledge, whereas visual and auditory learners had the lowest. Thus, learning EFL vocabulary through the three modalities appeared to result in a higher vocabulary size. In the case of unimodal students, visual learners appeared to have the highest productive vocabulary available, whilst auditory students had the lowest. This result might be explained by the predominance of textbooks in Spanish EFL education (Jiménez Catalán & Mancebo Francisco, 2008). Finally, no statistically significant differences were observed in the productive vocabulary knowledge of both groups (multimodal and unimodal learners) regarding their learning preferences. In fact, the findings showed that there was a large effect size and a positive and large strength of association. Therefore, this implies that 12th grade multimodal and unimodal EFL learners' productive vocabulary knowledge did not differ significantly, regardless of their different learning preferences (similar to Hatami, 2018; Kassaian, 2007, see Section 2.3.). However, this might only be the case of our multimodal and unimodal informants, who have been exposed to similar EFL vocabulary input in the Spanish educational system. More research is needed to determine whether this is the norm for Spanish EFL learners.

The present study presents several limitations. Firstly, it is limited by its small sample size, as only 60 students participated in this research. The second limitation of this study

was that it was only conducted in one state school of post-secondary education. Accordingly, the findings reported cannot be taken as representative of either the population of 12th grade students, or the autonomous community of La Rioja. Another constraint was that the division into multimodal and unimodal learners was made only considering the results obtained in the LSS questionnaire. We did not contrast these results with other tests that also identified perceptual learning styles, or with oral interviews with the students to compare whether the learning preferences they believed to have are the ones they actually use in the process of learning. Likewise, their productive vocabulary knowledge was only measured with one instrument. It was not contrasted with other productive vocabulary tests or tasks, so this might have affected the findings.

Several implications for EFL instruction arise from this investigation. Our findings indicated that the productive vocabulary of 12th grade Spanish EFL learners was around 1,000 words. Therefore, more instruction on EFL vocabulary would be necessary so that learners would be able to communicate in the English language, since the knowledge of at least 2,000-3,000 words is required for that (Nation & Waring, 1997; Schmitt & Schmitt, 2014; van Zeeland & Schmitt, 2013). Furthermore, the instruction of EFL vocabulary could also include tasks based on authentic input to practice and strengthen the vocabulary learnt from the textbooks and curricular materials (e.g., Rajendran, 2020). Although Spanish EFL students' learning preferences did not seem to influence their productive vocabulary knowledge, teachers could accommodate their teaching materials to their learners' perceptual learning styles to improve their learning (balanced instruction). In this regard, students would become more positive and motivated, since the instruction would be more learner-centered and inclusive of all learning preferences, not favoring one particular learning style (e.g., Natividad & Batang, 2018; Payaprom & Payaprom, 2020). All in all, new teaching methodologies and a more learner-centered approach would be beneficial for Spanish EFL learners in their language learning in general and in vocabulary learning specifically.

Some interesting areas of future research could be to conduct a longitudinal study at the beginning and at the end of the academic year in the 12th grade. At the beginning, PVLT and LSS questionnaires could be distributed to determine EFL learners' productive vocabulary and perceptual learning styles, respectively. Then, teachers and learners could be instructed in perceptual teaching and learning styles respectively to become familiar with other ways of teaching and learning and enhance it. After knowing their learners' learning styles, teachers could teach them vocabulary not only from textbooks but also from authentic exposures. They could design vocabulary exercises that cater for all the different learning styles (e.g., readings, videos, role-plays) to increase their EFL vocabulary. At the end of the academic course, learners' productive vocabulary and learning styles could be measured again to notice whether their productive vocabulary knowledge has remained the same or improved, and divide them again into multimodal and unimodal learners and explore whether any changes have occurred after the instruction in these styles. Future investigations could also include oral interviews with the participants to contrast whether the learning preferences they believe they have according to the questionnaire match the preferences they actually have for learning.

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