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ARTICLE

Reading, Spelling, and Visual Lexical Decision in English: the Case of Spanish Children with Dyslexia

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ABSTRACT

The primary challenge that children with dyslexia face is the difficulty in learning the alphabetic code and forming orthographic representations of words. Consequently, their reading and writing abilities lack fluidity. Given factors, it is possible that children with dyslexia may encounter difficulties when learning English as a Foreign Language. This research investigates the significance of lexical frequency and orthographic rime consistency in the reading and spelling processes of English as a Foreign Language among Spanish children diagnosed with dyslexia. The study included 36 participants aged between 9 and 12, of whom 16 were clinically diagnosed with dyslexia. Three tasks were designed using 28 English words, varying in lexical frequency and orthographic consistency: word reading aloud, spelling to dictation, and visual lexical decision. Our analysis focused on accuracy, indicating that children diagnosed with dyslexia consistently exhibited poorer performance across all tasks compared to their counterparts. While lexical frequency exerted an influence on both groups, orthographic consistency exclusively impacted the control group. The findings suggest that Spanish children with dyslexia predominantly depend on lexical frequency for reading and spelling in English. In contrast, typically developing children, in addition to frequency, also show sensitivity to orthographic consistency skills.

Keywords: developmental dyslexia, EFL, lexical frequency, orthographic consistency, Spanish children

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1. Introduction

Developmental dyslexia is a neurobiologically based learning difficulty that involves significant challenges in both reading and spelling (Afonso et al., 2019; Cook and Ryan, 2016; Grainger et al., 2003; Hulme and Snowling, 2009; Lyon et al., 2003; Snowling, 2020). These difficulties arise from an unexpected deficit in the phonological component of language (Goswami and Bryant, 1990; Hulme et al., 2005; Serrano and Defior, 2008; Stanovich and Siegel, 1994). When compared to their typically developing peers, reading abilities in children with dyslexia are marked by slow speed and a high rate of errors (Davies et al., 2013; Suárez-Coalla and Cuetos, 2015). Similar difficulties are evident in spelling, as their spelling is characterized by ongoing difficulties in both speed and accuracy, regardless of the orthographic system (Afonso et al., 2015, 2019; Angelelli et al., 2010; Swanson and Hsieh, 2009). In this context, phonological processing difficulties, the primary cause of dyslexia, may also impede the acquisition of reading and spelling skills in a foreign language (FL).

In light of the aforementioned, two main theories attempt to explain how literacy skills develop in a FL. According to the *Linguistic Interdependence Hypothesis,* proficiency in a foreign language (FL) is influenced by the learner's proficiency in their first language (L1), as cognitive and linguistic skills can transfer between languages (Cummins, 1979). Consequently, it is anticipated that Spanish-speaking children with dyslexia will experience significant difficulties in reading and spelling in English as FL. Conversely, *the Script-Dependent Hypothesis* proposes that literacy skills are influenced by the orthographic structure of each language (Lindgren et al., 1985). Therefore, specific difficulties may occur depending on the orthographic system.

Considering the orthographic characteristics is crucial in addressing reading and spelling acquisition. Orthographic systems are classified based on criteria such as orthographic consistency and syllabic complexity. Orthographic transparency denotes a high degree of consistency or correspondence grapheme-phoneme (G-P), while opacity signifies a low level of G-P consistency (Alegría and Carrillo, 2014; Seymour et al., 2003). Additionally, orthographic depth or syllabic complexity dictates the linguistic units and reading and spelling strategies (Borleffs et al., 2019; Carioti et al., 2021). In transparent orthographic systems, such as Spanish, G-P, and P-G conversion rules are consistent and straightforward. This consistency ensures that children develop precision in reading and spelling from an early age, relying predominantly on small units such as graphemes (Alegría and Carrillo, 2014; (Cuetos and Suárez-Coalla, 2009). Consequently, they lean towards a sublexical strategy, as proficiency in applying G-P correspondence rules is sufficient for successful decoding (Cuetos and Suárez-Coalla, 2009). However, even in orthographic systems with a high degree of consistency or correspondences between graphemes and phonemes, research suggests that children are capable of developing representations for larger linguistic units (Burani et al., 2002; Suárez-Coalla et al., 2016).

In contrast, opaque orthographic systems, like English, exhibit inconsistent and complex G-P conversion rules (Katz and Frost, 1992; Richlan, 2014). This intricate G-P relationship favours the development of strategies based on intermediate units: syllables, morphemes, and rimes (Chee, 2020; de Simone et al., 2021; Goswami et al., 2001, 2003; Wang et al., 2012). The rime is formed by the concatenation of the vowel and its coda (Chee, 2020). Numerous studies have investigated rime-level consistency and concluded that rimes are particularly relevant, due to the high inconsistency of English vowels. Multiple studies support that rime consistency is a significant unit, influencing reaction times and accuracy across reading and spelling performance (Balota et al., 2004; Chee, 2020; Suárez-Coalla et al., 2023, 2024; Yap and Balota, 2009).

The acquisition of reading and spelling skills is indeed influenced by several variables, among which lexical frequency plays a significant role. This phenomenon, widely documented across various languages and populations (Caravolas et al., 2005;

Martinet et al., 2004), is referred to as the word frequency effect. According to this, words that are encountered frequently are processed with greater speed and accuracy, suggesting the utilization of a lexical or direct reading strategy (Brysbaert et al., 2018; Takashima et al., 2016). This effect is attributed to the robust orthographic representations of high-frequency words, which facilitate both reading and spelling (Bonin et al., 2016).

Several studies have identified word frequency as a significant determinant of lexical access in first language and foreign contexts (Brysbaert et al., 2016, Diependaele et al., 2013; Gollan et al., 2008). About Spanish dyslexic's children, existing literature indicates that they primarily employ a serial reading strategy, while typically developing children would employ lexical reading strategies from the first stages of learning to read. Despite this, evidence suggests that dyslexics are also influenced by the variable of frequency and employ lexical strategies when reading and spelling (Barca et al., 2006; De Luca et al., 2008), as well as when they are reading and spelling in English as FL (Suárez-Coalla et al., 2020).

Besides, with regard to learning English as FL, the distinctions between the L1 and English orthographic systems are critical, as children will have to cope with two, sometimes very different, orthographic codes. In this sense, learners of English whose native language is Spanish may encounter challenges in acquiring the English G-P correspondence rules and in adapting to different levels of linguistic granularity. In this sense, research by Suárez-Coalla et al. (2023) underscored the significance of Spanish-speaking children's semantic knowledge when reading in English. Nonetheless, some regularities within the English language emerge with increased reading experience. Similar results were found for English spelling (Suárez-Coalla et al., 2024). Children demonstrated a higher likelihood of accurately spelling words with a more consistent nucleus, underscoring the development of sensitivity to English orthographic regularities, particularly concerning nucleus and rime consistency, as they gain more experience. However, no similar studies exist in the Spanish population with dyslexia.

The development of reading and spelling skills, as well as the manifestations of dyslexia, are contingent upon the orthographic system's attributes. Specifically, empirical evidence suggests that reading and spelling development is slower in opaque orthographic systems, with dyslexic difficulties being more salient. Notably, accuracy issues are more pronounced in transparent orthographies than in opaque ones (Wimmer and Goswami, 1994; Ziegler and Goswami, 2005). Conversely, in languages characterized by transparent orthographic systems, errors among children with dyslexia may be less prevalent, with reading speed emerging as a primary indicator (Suárez-Coalla and Cuetos, 2012).

Limited research exists regarding the process of acquiring reading and spelling skills in English as FL among people with dyslexia, and even fewer have focused on Spanish-speaking people with dyslexia. Hereafter, we provide a detailed account of the most significant studies, to our knowledge, that have investigated the literary skills of Spanish dyslexic populations in English as FL.

In the study by Suarez-Coalla and colleagues (2020), the researchers aimed to pinpoint specific challenges and reading approaches utilized by Spanish-speaking children with dyslexia in English reading, comparing them to typically developing readers. This study evaluated the proficiency of dyslexics in understanding and applying English grapheme-phoneme correspondences when confronted with unfamiliar words, and explored potential difficulties they may encounter in navigating English orthographic regularities. Additionally, the investigation sought to determine whether these children had developed a solid understanding of the spelling patterns of English words or were susceptible to phonological interference from their native Spanish language. To achieve these objectives, a group of Spanish dyslexic's children completed four reading-related tasks: phoneme discrimination, visual lexical decision, word reading aloud, and oral versus written semantic classification. The findings indicate that children with dyslexia encounter difficulties in applying En-

glish G-P conversion rules, leading them to adopt a direct strategy to read. Additionally, Spanish-speaking children with dyslexia struggled to develop orthographic representations of English words.

Regarding writing skills, a recent investigation aimed to examine the effect of language transfer (Álvarez-Cañizo et al., 2023). Furthermore, their study delved into the potential impact of other language abilities, such as spelling, vocabulary and reading on writing proficiency in both English FL and Spanish as native language. The findings revealed that dyslexia group exhibit comparable levels of competence in written composition across both languages, hinting a potential transfer of language skills between native language and FL. Moreover, fundamental language skills were found to be more strongly associated with the characteristics of written composition in English compared to Spanish, highlighting the significant influence of such abilities on the quality of written composition in English.

On the other hand, it has been reported that Spanish-speaking young adults with dyslexia have significantly lower English reading comprehension than the control participants, despite spending more time reading English texts. As for text production, disparities were observed between the dyslexic and control group in terms of spelling errors, lexical diversity, and productivity (Pérez-Litago et al., submitted).

In light of the preceding discussion, while there are some references to the theme in scientific literature, the preceding studies have divergent objectives and target populations. Given the importance of reading and spelling abilities in English as FL, and the paucity of investigations focusing on Spanish-speaking children with developmental dyslexia, this investigation set out to provide information on this issue. We aimed to investigate reading, spelling, and visual recognition of English words in Spanish children with dyslexia. Specifically, we tried to determine if these children rely on lexical frequency or whether they are sensitive to the orthographic consistency of English.

We tested 32 Spanish-speaking children between 4th and 6th of primary school on three tasks: word reading, spelling to dictation, and visual lexical decision. The words were English monosyllabic, with lexical frequency and rime consistency manipulated in their selection. We expect to find a notable impact of orthographic consistency in typically developing children, reflecting their proficiency in leveraging such consistency. In contrast, we hypothesize that children with dyslexia will not demonstrate this degree of sensitivity to orthographic consistency, thereby underscoring potential distinctions in reading, recognition, and spelling approaches between dyslexic and non-dyslexic individuals.

2. Materials and methods

2.1 Participants

The study involved sixteen Spanish children diagnosed with developmental dyslexia (DYS). Their ages ranged from fourth (nine years old) to sixth grade of primary school (12 years-old) (8 girls, *Mage*=10,87 years, *SD*=.094). These participants were selected from various speech therapy centers in Oviedo, Asturias. The performance of children with developmental dyslexia was compared with a chronological-age control group (CON), also between fourth and sixth grade of primary school (8 girls, M_{age}=11 years, *SD*=1.14). All participants were native speakers of Spanish and had English as FL. They possessed normal or corrected vision, had no cognitive impairments aside from dyslexia, and fell within the normal IQ. Participants experiencing any physical or sensory disability were excluded from the study.

The diagnosis of dyslexia was confirmed using the PROLEXIA battery (Cuetos et al., 2020), a Spanish tool designed for the early detection and differential diagnosis of dyslexia. This battery evaluates critical abilities affected in dyslexia, including phonological awareness, phonological memory, phonological recoding, processing related to reading (learning and automatization of the alphabetic code and existence of orthographic representations), and processing related to spelling (mastery and automation of the rules of P-G conversion, and difficulties

in the development and access to orthographic representations). The control group underwent assessment using the PROLEXIA battery as well. Still, they only completed 4 tasks (reading words, reading pseudowords, spelling words to dictation and spelling pseudowords to dictation) to confirm the absence of any dyslexic symptoms. All control group participants obtained adequate scores on standardized reading and spelling tasks. Data for demographic characteristics and scores obtained in assessment tests are provided in **Table 1.**

The study was approved by the Ethics Committee of Research of the Principality of Asturias. Informed written consent was obtained from the parents of all participating children prior to the study. Only children whose parents provided consent were included in the study.

Table 1. Summary of demographic characteristics of participants and scores in assessment tests.

		Dyslexia	Control	*p-value*
Age		10.87 (0.94)	11.0 (1.14)	>.05
Words reading	Accuracy (out of 20)	14.62 (3.05)	18.06 (1.76)	=.001***
	Speed (s)	54.68 (19.56)	38.12 (12.96)	=.008 **
Pseudowords reading	Accuracy (out of 20)	12.0 (3.72)	16.56 (1.99)	=.000***
	Speed (s)	69.06 (26.2)	55.0 (17.0)	=.82
Words spelling	Accuracy (out of 12)	6.25 (2.38)	10.53 (1.80)	=.000 ***
	Speed (s)	72.31 (26.25)	49.20 (11.49)	=.024*
Pseudowords spelling	Accuracy (out of 12)	9.56 (2.22)	9.73 (0.96)	=.786
	Speed (s)	73.06 (29.3)	54.0 (10.21)	=.024*

Note: * < .05, ** < .01, *** < .001

2.2 Materials

Three tasks were performed in English: reading word, word spelling-to-dictation, and visual lexical decision task.

A total of 28 English monosyllabic words manipulating two variables: lexical frequency (high frequency vs. low frequency), and rime consistency (high rime vs. low rime) were selected. The words were chosen based on their frequency from a database developed in our laboratory (Martínez-García et al., in preparation). It compiles word frequency data from English textbooks used in Spanish primary education schools. Rime consistency (nucleus+coda) was determined according to the consistency norms that Chee and colleagues (2020) established for 37,677 English words.

The stimuli consisted exclusively of one-syllable nouns between 3 and 5 letters long (M=4.0; SD=0.61); and between 2 and 5 phonemes (M=3.25; SD=0.64). Polysemous words, cognates, as well as homophonous words were avoided. According to our database, the English lexical frequency, ranged from 0.5 to 40.5 occurrences (M=13.23, SD=13.50) while the consistency scores of the rime from 0.19 to 1 (M=0.67, SD=0.31) (Chee et al., 2020).

Considering the manipulated variables, the stimuli were categorized into four groups:

- High-Frequency (HF) and High Rime (HR) words (*MHF* = 24.86, *SD* = 10.46; *MHR* = 0.96, *SD* = 0.02)
- HF and Low Rime (LR) words (*MHF* = 24, *SD* = 10.46; *MLR* = 0.40, *SD* = 0.11)
- Low-Frequency (LF) and HR words (*MLF* = 2.14, *SD* = 1.55; *MHR* = 0.97, *SD* = 0.02)
- LF and LR words (*MLF* = 1.93, *SD* = 1.94; *MLR* = 0.36, *SD* = 0.12).

Furthermore, to conduct the visual lexical decision task, 28 pseudowords were generated by Wuggy software (Keuleers and Brysbaert, 2010). A list with all the stimuli can be found in the Appendix.

2.3 Procedure

Participants completed the three tasks, one at a time, over a given period, in a distraction-free environment: the dyslexic group at the Language Psychology Laboratory of the University of Oviedo, while the control group in their school during regular school hours. Participants performed the tasks sequentially.

a) Reading word. Stimuli were presented visually in 12-point Arial font. Each trial began with a fixation point (black asterisk) displayed in the center of the screen for 500 ms, followed by a blank screen displayed for another 500 ms; then, the stimulus appeared and remained on the screen for 1,500 ms. Before starting the task, participants received oral and written instructions: "On the screen, you will see English words. Your task is to read them aloud as quickly and precisely as you can. Even if you don't know a word, try to read it too". The experimental stimuli were randomized. The experimental task was executed on an HP x360 laptop, and participant's responses were captured in .WAV files via DMDX software (Forster and Forster, 2003). Subsequently, the recordings were examined utilizing CheckVocal software (Protopapas, 2007) to obtain accuracy scores from each word category. The task lasted around 4 minutes.

b) Word spelling-to-dictation. For the spelling-to-dictation task, participants received the stimulus orally through headphones. The auditory stimuli were recorded by a bilingual person using a professional recorder and microphone. Children had to write their responses, using an Intuos Inking Pen, on a lined sheet of paper – one line per word – affixed to a graphic tablet (Wacom Intuos 5) connected to an HP x360 laptop. For presenting the stimuli and recording digital responses, the Ductus programme was employed (Guinet and Kandel, 2010). Children were instructed to transcribe the heard stimuli quickly and accurately as possible, using lowercase letters. Verbal instructions provided by the experimenter guided the participants through the task: 'This is a writing task. You will hear isolated words in English through these headphones. You will have to write them as quickly and accurately as possible. Even if you don't know a word, try to write it too. When you have heard the word, you can write it on the first line on this sheet of paper with this pen". Each stimulus commenced with the simultaneous display of an auditory cue and a 500-ms fixation point. Subsequently, the auditory stimulus was presented 500 ms after the cessation of the fixation point. To randomise the presentation of the stimuli, two different lists were created. Two practice trials preceded experimental stimuli. The task lasted around 5 min. Accuracy was considered for the statistical analysis.

c) Visual lexical decision. Children had to decide, as quickly as possible, wheter the word presented was a real word in English (e.g. "lunch") or not (e.g. "lunce"). Prior the task, two practice trials were administered followed by 56 stimuli (28 real words and 28 pseudowords created by Wuggy software (Keuleers and Brysbaert, 2010). Prior to each stimulus presentation, a central fixation point was displayed on the screen for 500 ms, succeeded by a blank screen for an additional 500 ms, after which the stimuli were displayed and remained visible for 1,500 ms. Participants were directed to respond promptly by pressing two predefined keys on the laptop keyboard: if the letter sequence constituted a real word, participants were instructed to press the "L" key, and if not, they were to press the "S" key. Each key was labeled with a sticker to make them stand out and to deter children from accidentally pressing adjacent keys. Stimuli were randomized for each participant and displayed in lowercase letters at the center of the screen. The DMDX software was utilized to execute the task (Forster and Forster, 2003). The task duration was approximately 5 minutes. Accuracy was considered for the statistical analysis.

2.4 Analysis plan

Generalised Linear Mixed Models (GLMM), using the binomial family and the Laplace approximation for the likelihood, were constructed to determine the factors influencing reading, spelling, and lexical decision accuracy. Group, consistency and frequency were considered as fixed effects, while word and

subject as random effects. The absence of collinearity between the factors was tested, and an ICC of 0.269 was obtained for reading, 0.428 for spelling and 0.218 for lexical decision. The significance level used was 0.05. Statistical analysis was carried out with R software (R Development Core Team, 2022), version 4.3.1, specifically using the *lme4, car, and performance* libraries.

3. Results

3.1 Reading accuracy

For the reading accuracy analysis, we included 896 responses (543 correct responses = 60.60 %; 353 incorrect responses = 39.39%). The mixed effects logistic regression analysis showed group effect, $\chi 2_{(1)} = 25.476$, $p < 0.001$, that is, the control group was more likely to read accurately compared to the dyslexia group; and group * rime consistency interaction, $\chi^2_{(1)} = 6.278$, $p < 0.05$, as children without dyslexia benefit from rime consistency, but not children with dyslexia (**Table 2**).

Table 2. Group by rime consistency interaction in reading accuracy (%)

	Group	
Consistency	**Control**	**Dyslexia**
High	81.25	45.53
Low	69.19	46.42

3.2 Spelling accuracy

For the spelling accuracy analysis, we included 896 responses (270 correct responses = 30.13 %; 626 incorrect responses = 69.86 %). The mixed effects logistic regression analysis showed group effect, $\chi^2_{(1)} = 15.289$, $p < 0.001$, as control children have higher spelling accuracy than children with dyslexia; lexical frequency effect, $\chi^2_{(1)} = 7.237$, $p < 0.01$, as high lexical frequency words have a higher probability of spelling accuracy than low lexical frequency ones; and group * lexical frequency * rime consistency, $\chi^2_{(1)} = 4.3074$, $p < 0.05$, as children without dyslexia showed superior performance in high-consistent-frequent words than in low-consistent-frequent words, but it was not the same for children with dyslexia (**Table 3**).

Table 3. Group by lexical frequency by rime consistency interaction in spelling accuracy (%)

		Group	
Consistency	**Frequency**	**Control**	**Dyslexia**
HIGH	HF	65.17	22.32
	LF	32.14	13.39
LOW	HF	42.85	22.32
	LF	32.14	10.71

3.3 Visual lexical decision accuracy

For the lexical decision accuracy analysis, 896 responses were included (504 correct responses = 56.25 %; 392 incorrect responses = 43.75 %). The mixed effects logistic regression analysis showed a group effect, $\chi^2_{(1)} = 11.416$, $p < 0.001$, as the control group showed better performance in the lexical decision task than children with dyslexia; lexical frequency effect, $\chi^2_{(1)} = 12.126$, $p < 0.001$, as high lexical frequency words had a higher probability of spelling accuracy than low lexical frequency ones; a lexical frequency * rime consistency, $\chi^2_{(1)} = 4.024$, $p < 0.05$, as the effect of consistency was more evident in high-frequency words; and a group * lexical frequency * rime consistency, $\chi^2_{(1)} = 4.889$, $p < 0.05$, indicating that children without dyslexia showed better performance in high-consistent-frequent words than in low-consistent-frequent words, but this was not the same for children with dyslexia (**Table 4**).

Table 4. Group by lexical frequency by rime consistency interaction in lexical decision accuracy (%)

		Group	
Consistency	**Frequency**	**Control**	**Dyslexia**
HIGH	HF	83.93	50.00
	LF	50.00	33.93
LOW	HF	70.53	52.68
	LF	66.07	42.85

4. Discussion

This study aimed to provide information about

the reading and spelling skills in English as FL on Spanish-speaking children with dyslexia, in comparison to proficient Spanish readers. Specifically, we sought to investigate the impact of lexical frequency and orthographic consistency to determine whether Spanish dyslexic children primarily depend on lexical reading and spelling, based on word frequency, or if they exhibit sensitivity to the orthographic consistency of English. Three tasks were performed (reading-aloud, spelling to dictation and visual lexical decision) by Spanish children with and without dyslexia, ages 9–12. As we expected, based on previous literature, Spanish-speaking children with dyslexia exhibited significantly poorer performance across all tasks compared to the control group, marked by a high number of errors.

In the reading aloud task, our observations indicate that participants with dyslexia showed reduced accuracy compared to control participants, as evidenced by a significant group effect. This pattern aligns with previous research studies conducted on Spanish children with dyslexia learning English as a FL (Suárez-Coalla et al., 2020), as well as with the typical performance observed within the dyslexic population (Davies et al., 2013; Suárez-Coalla and Cuetos, 2012). Additionally, our findings revealed that typical Spanish readers exhibited a higher likelihood of accurately reading words with more consistent rime compared to those with less consistent rime. This interaction between group and rime consistency suggests that rime consistency plays a crucial role in EFL reading accuracy among children without dyslexia, consistent with prior research (Chee et al., 2020; Yap and Balota, 2009). These findings imply that typically developing children are proficient in developing intermediate units (Chee, 2020; de Simone et al., 2021; Goswami et al., 2001, 2003; Schmalz et al., 2016), and have acquired a series of English reading patterns, which leads them to read more accurately. These results agree with those reported by other investigations that determine that the development of such units enhances reading proficiency and exerts influence on reaction times and accuracy (Chateau and Jared, 2003; Chee, 2020; Hayes et al., 2006; Suárez-Coalla et al., 2024; Yap and Balota, 2009). On the contrary, children with dyslexia do not seem to benefit from rime consistency during reading in English, indicating a deficit developing larger linguistic units. This finding aligns with previous literature indicating that dyslexic children encounter difficulties in grasping coding patterns and developing orthographic representations beyond the level of graphemes (Suárez-Coalla et al., 2020).

Considering the spelling to dictation task, we again observed poorer performance in the dyslexia group compared to the control group, with a significantly higher error rate. These findings confirm the impact of dyslexia on spelling abilities (Afonso et al., 2019; Angelelli et al., 2010; Swanson and Hsieh, 2009). Additionally words with high frequency of occurrence were spelt more accurately than low-frequency words in both groups, effect well-documented in the literature (Afonso et al., 2019; Suárez-Coalla et al., 2016). Moreover the dyslexia group's higher accuracy in spelling high-frequency words compared to low-frequency words suggests adopting a lexical spelling strategy and the potential formation of orthographic representations for high-frequency words. Given the characteristics of the English language and the challenges faced by children with dyslexia in mastering its alphabetic code, characterized by inconsistent and complex conversion rules, it is plausible that they are compelled to adopt lexical strategies (Wang et al., 2012). Despite opting for a lexical strategy, children with dyslexia exhibit a high error rate, indicating significant challenges in developing accurate spelling representations of words as previous studies suggest (Martínez-García et al., 2019; Suárez-Coalla, Ramos, et al., 2014).

However, the most notable finding in the spelling-to-dictation task pertains to the interaction between frequency and consistency across different groups. Control participants exhibited superior performance on high-frequency words with high rime consistency compared to those with low rime consistency, indicating a consistency benefit. However, this consistency advantage was not observed in low-fre-

quency words, as accuracy remained constant regardless of rime consistency. In the group with dyslexia, there was no benefit from the rime consistency as their performance on high-frequency words with high rime consistency was the same as for those with low rime consistency. These results suggest that children with dyslexia benefit only from prior exposure to the word (lexical frequency). In contrast, children without difficulties benefit from lexical frequency and rime consistency when spelling high-frequency words.

To enhance our comprehension of the ability to recognize words employed by Spanish children with dyslexia during English literacy processing, we conducted a visual lexical decision task. This task included both real words and pseudowords, providing insight into the recognition of written words. In this task, we observed an increase in accuracy percentages for both groups, most likely because recognizing a word is easier than reading or spelling it. Consistent with our previous findings, control children outperformed dyslexic children, manifesting higher accuracy rates. Additionally, we observed a lexical frequency effect, with both groups showing higher accuracy rates for high-frequency words. This implies the utilization of a lexical strategy and the support in orthographic representations. Furthermore, the frequency effect is partially influenced by consistency. The results indicate that the impact of consistency is more pronounced in words with high lexical frequency. Finally, control participants seem to benefit from rime consistency since, as in the spelling task, they exhibited superior performance on high-frequency words with high rime consistency compared to those with low rime consistency. This advantage was not observed neither in the low-frequency words nor in the group with dyslexia. Both groups benefit from lexical frequency; however, only children without difficulties benefit from rime consistency.

5. Conclusion

In conclusion, our study reinforces prior research on dyslexia in the context of English as FL, underscoring the arduous nature of English reading and spelling for Spanish children with dyslexia. Our findings highlight their challenges in acquiring English G-P and P-G conversion rules, leading them to rely predominantly on a lexical strategy for reading and spelling. Additionally, our research reveals their struggle to form orthographic representations of words, as evidenced by their lack of benefit from rime consistency.

These results are significant as they provide deeper insights into the specific difficulties faced by dyslexics in multilingual contexts, particularly when learning a language with complex orthographic rules like English. Understanding these challenges is crucial for developing tailored educational strategies to support dyslexic individuals in foreign language learning contexts. Future research could explore the developmental trajectory of dyslexic individuals as they transition into adolescence, higher education, or adulthood. Investigating whether older learners demonstrate increased sensitivity to rime consistency or other linguistic features would provide insights into how dyslexic difficulties evolve over time. This longitudinal approach could help understand whether the difficulties observed in younger dyslexic children persist into adulthood or undergo transformative changes, thereby informing the design of age-appropriate interventions and educational strategies.

In summary, our study not only contributes to the literature by elucidating the unique challenges faced by dyslexic learners in foreign language contexts but also sets the stage for future investigations that can further enhance educational practices and support mechanisms for this population.

Author contributions

Conceptualization, PS-C, CM-G, and MV-H; methodology, CM-G; formal analysis, PS-C; investigation, MV-H; resources, PS-C and CM-G; data curation, MV-H; writing—original draft preparation, CM-G and PS-C; writing—review and editing, all authors; funding acquisition, PS-C. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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Appendix

		Word	Freq	Legth	N_Phon	Rime	Pseudoword
High-Frequency (HF)	**High-Rime (HR)**	Lunch	40.5	5	4	1	Lunce
		Snake	19.5	5	4	0.97	Snoke
		Leg	25	3	3	0.94	Leb
		Horse	26	5	4	0.93	Hurse
		Sun	36	3	3	0.96	Cun
		Fet	13	4	3	0.95	Fout
		Wall	14	4	3	0.97	Waps
	Low-Rime (LR)	Dog	37	3	3	0.38	Dob
		Wood	22	4	3	0.54	Wied
		Shoe	32	4	2	0.32	Shie
		Glove	14	5	4	0.48	Snove
		Aunt	14	4	3	0.33	Aint
		Doll	11.5	4	3	0.23	Doms
		Job	37.5	3	3	0.5	Jeb
Low-Frequency (LF)	**High-Rime (HR)**	Bill	1.5	4	3	0.98	Bist
		Beef	1.5	4	3	1	Boaf
		Wife	1.5	4	3	1	Winx
		Rink	3.5	4	4	0.95	Rint
		Bay	5	3	2	0.96	Bak
		Nook	0.5	4	3	0.97	Nool
		Ploy	1.5	4	3	0.95	Pley
	Low-Rime (LR)	Bush	0.5	4	3	0.28	Bunt
		Pork	0.5	4	4	0.31	Pord
		Root	2.5	4	3	0.38	Reat
		Worm	2	4	4	0.33	Werm
		Frost	1	5	5	0.19	Fronk
		Beak	6	4	3	0.51	Boak
		Hood	1	4	3	0.53	Cood