HISPANIC STUDIES
review

Phonological Awareness and Spelling of Spanish Vowels in Spanish Heritage Language Learners

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Abstract

Spanish heritage language learners (SHL) in secondary and postsecondary education experience significant difficulties with spelling. This study focuses on a subset of errors found in Beaudrie's (2012) corpus of SHLs' misspellings: errors involving vowel omission, addition, and transposition. The study investigates the hypothesis that these errors are the result of underdeveloped phonological awareness (PA), defined as the ability to manipulate and discriminate speech units independent of meaning (Mattingly, 1972). Eighty-one SHL participants completed one language proficiency task and three PA tasks involving the contrast between monophthongs and diphthongs in real words and pseudowords. The results suggest that vowel misspellings involving the letters *e* and *i* are not due to orthographic interference of English spelling, but rather to difficulties in phonological segmentation and discrimination of these vowels. The paper also discusses the links between synchronic and diachronic variability in the Spanish vocalic system and the individual PA development of SHLs.

Introduction

Spelling is an aspect of literacy production in which Spanish heritage language learners (SHL) in secondary and postsecondary education experience significant difficulties (Beaudrie, 2012; Carreira, 2002, among others)[1]. Typically, spelling development takes place during the first school years, and it involves linguistic-cognitive processes, such as phonological awareness and morphosyntactical awareness, in addition to the acquisition of the language's orthographic code. Schooling and literacy education are crucial for spelling development, not only because of the explicit teaching of spelling rules, but also because school literacy activities assist in the development of these underlying cognitive processes. However, because SHLs are typically schooled in English, they skip the natural steps in the spelling acquisition process in Spanish.

Beaudrie (2012) argues that the problem with current spelling curricula for SHLs is that they are designed around the standard orthographic rules for common Spanish spelling patterns, and that they should rather target the specific spelling features in which SHLs' errors are more frequent. However, Llombart-Huesca (2018) argues that while an intervention approach based on targeting frequent errors may achieve a quick improvement, it is likely to encounter a ceiling effect if phonological and morphological awareness is not addressed. This paper focuses on one of these linguistic-cognitive components underlying the development of spelling: phonological awareness (PA). The study stems from the hypothesis that a subset of the spelling errors pro-

1 A heritage language learner is defined as "a language student who is raised in a home where a non-English language is spoken, who speaks or at least understands the language, and who is to some degree bilingual in that language and in English" (Valdés, 2001, p. 38).

duced by SHLs are the result of underdeveloped phonological awareness.

The Role of Phonological Awareness in Reading and Spelling

Before the acquisition of the correspondences between phonemes and graphemes can take place, a child needs to develop awareness of the units of sounds of his or her language. A growing body of research has shown that PA has a crucial role in the acquisition of reading and spelling in languages with alphabetic writing systems (Ball & Blachman, 1988, 1991; Bradley & Bryant, 1983; Defior, 2004; Defior, Jiménez-Fernández, Calet, & Serrano, 2015; Lundberg et al., 1988; Ziegler & Goswami, 2005).[2] Phonological awareness—also referred to as *phonological sensitivity*—is the ability to manipulate and discriminate units of speech independent of meaning (Mattingly, 1972). PA comprises different levels, which include (i) syllabic awareness—the ability to segment and manipulate the syllables that compose a word; (ii) intrasyllabic awareness—the ability to segment and manipulate the onset and coda of a syllable; and (iii) phonemic awareness—the ability to segment and manipulate phonemes. The role of PA in the acquisition of reading and writing seems an obvious one: before the specific graphemes can be applied to each phoneme, the child needs to be able to discriminate those phonemes (tell /i/ apart from /e/, for example) and segment the different units of speech found in larger units. Discrete identified speech units can then be encoded into letters according to the language-specific phoneme-grapheme correspondences (PGCs).

PA is developed initially through language acquisition in an implicit manner, partly as a result of a growing vocabulary that includes words that are distinguished by a single phoneme and even a single articulatory feature (Defior, 2004; Defior et al., 2015). Through pre-literacy activities, such as rhyming songs and games, this implicit knowledge becomes increasingly explicit. This ability, while intuitive and naturally evolving in a rich linguistic environment, needs to be supported and strengthened at school through literacy practices, which include letter knowledge, learning how to read and write, reading aloud, etc. Spelling is based on correspondences between phonemes and letters, while what we naturally produce and hear are not the phonemes themselves, but rather sounds characterized by coarticulation. School literacy practices assist in developing this conceptualization of sound strings into a series of discreet phonemes. Such early literacy practices in the school setting have the potential to close the gap in literacy achievement for children who grow up in conditions of poverty and restricted access to rich pre-literacy environments (Phillips et al., 2008; Lonigan, 2007). PA and early stages of literacy have a reciprocal influence: while PA has a crucial role in the acquisition of reading and writing (Ziegler & Goswami, 2005), the learning of the written word also assists in developing PA through awareness of word segmentation, phoneme discrimination, and conceptualization of sounds (Burgess & Lonigan, 1998; Cataldo & Ellis, 1988, Ehri & Wilce, 1980). As Ehri (2014:18) puts it, "when children learn to read, written words bond to spoken words in memory and change the way people conceptualize their phonological constituents." For example, the influence that spelling exerts on writers/readers' perception or conceptualization of sound makes us believe that we "hear" the *t* in *pitch* but not in *rich* (Ehri and Wilce, 1980). It is also behind adults' puzzlement when children spell the word *natural* as *nachrel* (Kemp, 2016).

Reading and writing do not only involve phoneme-grapheme decoding. A dual mode has been proposed for reading and writing both in transparent and opaque languages. By the *pho-*

2 For a detailed overview of the abilities and strategies used in learning how to write and read in a language with a logographic system, such as Chinese, see Hu (2009).

nological mode (also referred to as *sub-word* or *non-lexical route*) each grapheme-phoneme correspondence is identified and decoded individually. On the other hand, by the *lexical mode* (also referred to as *whole-word* or *visual route*) known words are identified as wholes and matched with their entries in a visual orthographic lexicon, a storage of visual images of written words engraved in our minds after years of reading and writing (Morton, 1980; Valle-Arroyo, 1989; Defior, Justicia & Martos, 1996).

Adult readers have a strong preference for the lexical route, because non-decoding strategies allow rapid, fluent, and accurate reading and writing (Ehri, 1980; Barry & De Bastiani, 1997; Valle-Arroyo, 1989). Recognizing a whole word by sight requires, logically, a previous knowledge of the word. When readers encounter an infrequent or an unknown word, this recognition strategy is not available, and they need to resort to a phonological strategy (Besner, 1999; Coltheart et al, 1993; Meyer et al., 1974; Morton and Patterson, 1980). It is in those cases that the effect of poor PA can be more easily observed, because readers cannot decode the word correctly (e.g., they stumble through the word, skip it altogether, mispronounce it, or say a similar one). When a new word is not properly decoded in reading, it does not become properly encoded in our mental lexicon, which, in turn, will have negative consequences for future spelling and reading of this word, as well as for vocabulary expansion (Ehri & Rosenthal, 2007). Likewise, successful spelling using a lexical mode requires clearly encoded representations of written words in the writer's mental lexicon, to allow an accurate match (the feeling that a word "looks right"). Therefore, in order to become skilled whole-word readers and writers, it is fundamental to go through a successful decoding stage in which accurate orthographic representations are acquired (Share, 1995, 2004).

Although no studies have been conducted on college-age SHLs' phonological awareness in Spanish, I hypothesize that lack of early school literacy experience in Spanish halts the development of PA required for a complete and successful spelling development.[3] Although PA transfers across languages, and bilingualism seems to be associated with superior PA (Durgunoğlu, 2002; Gottardo, Yan, Siegel, & Wade-Wooley, 2001), biliteracy rather than bilingualism seems to be the key aspect in successful L2 literacy learning (Shwartz, Leikin, & Share, 2006). In addition, learning to read in a non-consistent orthography, such as English, leads to a lesser reliance on phonological processing strategies than learning how to read and write in a consistent orthography, such as Spanish (Frith, Wimmer, & Landerl, 1998). Therefore, since SHLs are typically schooled in English and do not start the formal study of Spanish until they are in secondary school or even college, it is likely that they have become whole-word readers without having had the opportunity to progress to that stage from a decoding stage.

The Spanish Vowel System

The Spanish orthographic system is alphabetic, and it is considered a shallow system, because its relationship between graphemes and phonemes is fairly transparent. In languages with a shallow—or transparent—orthographic systems, such as Finnish or Turkish, PGCs are relatively consistent and productive, that is, they consist of one-to-one spelling-to-sound and sound-to-spelling correspondences. Languages with deep—or opaque—systems, such as French or English—are characterized by a lack of consistency in their PGCs, and contain ma-

3 The lack of early school literacy in Spanish also negatively affects spelling development in other ways, such as students not learning the Spanish-specific orthographic code and the lack of development of morphological awareness, among other factors.

ny-to-one spelling-sound and sound-spelling correspondences, irregular spellings, and silent letters. The distinction between deep and shallow orthographies is not clear-cut, as these two types of systems are found in a continuum. In addition, in both types, more inconsistencies are found in spelling than in reading.

Despite the transparency of the Spanish orthographic system, Spanish orthography has a few complex PGCs, most of them involving consonants. In some cases, one grapheme is associated with more than one phoneme (for example, *c* → /k/ *cota,* and /s/ *cena*), one phoneme is associated with more than one grapheme (for example, /x/→*j jabón,* and *g gente*), or a grapheme is not associated with any phoneme (such as *h habla*). Consequently, the most common errors involving consonants are the result of addition or omission of the silent grapheme *h* and of grapheme substitution in complex PGCs, which involve /s/, /b/, /r/, /x/, /g/, /k/ and /j/, each of which can be represented by more than one letter in the Spanish spelling system.

Spelling of vowels, on the other hand, are found in simple PGCs: /a/ /e/ /i/ /o/ /u/ are always spelled as *a, e, i, o, u*, respectively. The only complexity in vocalic PGCs involve the semivowel /j/, which is spelled as *i* (/ajɾe/ → *aire*), except when it is in word-final position, in which case it is spelled as *y* (/soj/ → *soy*, /rej/ → *rey*).[4] This simplicity in the vocalic PGCs would explain why errors in vowels have not been found to be very common in monolingual Spanish-speaking children. In the corpus analyzed by Justicia, Defior, Pelegrina, and Martos (1999), vowels constituted only 2.6% of spelling errors. However, among English-Spanish bilinguals, the error rate in vowels is much higher. Bahr et al. (2015) found a rate of 19% of vowel errors (such as *pudia* for *podía*) of all non-accent errors among 20 students who had acquired Spanish at home as a first language and who were enrolled in an ELL (English Language Learners) program in a public middle school (grades 6–8) in the U.S. Errors in vowels were also more frequent in the adult SHLs' samples analyzed by Beaudrie (2012), at a rate of 23% of the non-accent-related misspellings. Most errors found in vowels were substitutions, especially involving *e/i* (*envitados* for *invitados, divirtir* for *divertir*), and a few involving *a/e* (*fuerta* for *fuerte*) and *o/u* (*gosto* for *gusto*).[5] Other errors involving vowels were omissions (*perjucios* for *perjuicios*), inversions (*teine* for *tiene*), and additions (*fuiemos* for *fuimos*), as well as diphthongization of /ea/, such as in *bromiando* for *bromeando*.

Beaudrie (2012) suggests that these errors are explained by interference from English spelling, and states that this explanation is supported by the overuse of *e* to represent /i/, as in ***e**nvitados* for ***i**nvitados* and ***e**ncreíble* for ***i**ncreíble,* which accounted for 60% of the vowel substitutions. However, as Llombart-Huesca (2018) suggests, English orthographic interference would not explain the misspelling in the examples reported in Beaudrie's (2012) study. First, in English, /i/ is represented by *e* in stressed position, in words such as del**e**te or s**e**cret, while all misspells of *e* for *i* reported by Beaudrie are found in unstressed position (***e**nvit**a**do, **i**ncre**i**ble* [stressed syllable underlined]). In addition, the examples given by Beaudrie are cognates spelled with *i* in English (***i**nvited, **i**ncredible*), which makes a purely orthographic interference explanation even more difficult to maintain.

Instead, following Llombart-Huesca's (2018) theoretical suggestion, this study explores the possibility that most vowel errors found in Beaudrie's (2012) corpus, as well as most errors involving syllables—syllable omission and syllable transposition—are the result of underdeveloped phonological awareness. One argument for considering these misspells as resulting from difficulties in phonological awareness is the fact that they involve simple PGCs, that is, they are

4 An exception is the word *y* [*and*], which is pronounced as /i/.
5 The *a* for *e* error in *fuerta* for *fuerte* should probably be considered a grammar error, the result of inflecting the invariable adjective *fuerte* in the feminine.

not the result of misapplying a contextual orthographic rule. Due to the simplicity of the vocalic PGCs, it is difficult to defend that errors in the spelling of vowels are due to orthography, with the exception of the alternation between *y* and *i* (which was the cause of error in only two cases in the entire corpus).

According to Llombart-Huesca (2018), further basis for considering the exploration of the misspellings shown above as resulting from difficulties in PA is the fact that they involve pairs of vowels that are very close in place of articulation: [e] and [i] are both front vowels, and [o] and [u] are both back vowels. This articulatory—and perceptual—closeness makes these vowels an area of intrinsic phonological fragility and variability. Synchronic variability in sounds is explained by the same general articulatory tendencies and prosodic factors that are behind diachronic changes (Chitoran and Hualde, 2007). Throughout the evolution of Spanish these two vowels have been subject to changes in vocalic quality, omissions, and additions as a result of general articulatory processes such as assimilation, dissimilation, epenthesis, and metathesis. The following are just a few examples: /sápjat/ > */sájpat/ > /sépa/; /kás**e**u/ > /kás**j**u/ > */k**á**jsu/ > /k**é**so/; /s**é**ja/ > /s**j**é**j**a/ > /s**í**ja/; /b**é**ni/ > /b**í**ne/; /p**ó**s**wi**/ > /p**ú**s**i**/ > /pús**e**/. These diachronic changes and intrinsic instability have crystalized into sinchronic allomorphic variation (s**e**ntir / s**ie**nte / s**i**ntió; p**o**der / p**ue**de / p**u**do; *to feel* and *to be able: infinitive / 3s present / 3s preterit*).

Although the modern Spanish vowel system is considered to be relatively simple, and fairly stable across Spanish dialects (Hualde, 2005; Morrison & Escudero, 2007), some works have challenged this view, and have revealed intra-speaker and cross-dialectal vocalic differences.[6] Unstressed vowel reduction has been found in Bolivia (Gordon, 1980; Sessarego, 2012), Ecuador (Lipski, 1990), Peru (Delforge, 2006, 2008, 2009), and Spain (Marín Gálvez, 1995). Other authors describe greater degrees of reduction and even deletion of unstressed vowels in Central Mexican Spanish (Boyd-Bowman, 1952; Lope Blanch, 1972; Matluck, 1952). Another phenomenon that challenges the view of a stable vocalic system in Spanish is vowel raising in unstressed vowels, which has been observed in Judeo-Spanish, Colombia, northwestern Spain, Puerto Rico, and Mexico (Barajas, 2016; Holmquist, 1998, 2005; McCarthy, 1984; Navarro Tomás, 1948; Oliver Rajan, 2008; among others). According to Penny (2000), in low educated groups and in rural environments, we find both merger and hesitation between the two vowels, as in c**i**vil / c**e**vil, m**o**rir / m**u**rir, l**e**cción / l**i**cción (where the first word is the standard). This author states that while standard Spanish includes the five vowels (/a, e, i, o, u/) in both stressed and unstressed syllables, rural and some urban varieties in Spain and in America, as well as Judeo-Spanish, mantain the atonic vocalic system that was in place between the earliest medieval times and the seventeenth century.[7] This system has only three phonemes (/I/ /a/ /U/), in which /I/ may be realized as either [i] or [e], and /U/ as [u] or [o], according to coarticulatory factors.

Regarding Spanish-English bilinguals' vowel production, Menke and Face (2010) observe some centralization in /e/ and /u/ in the horizontal axis. Similarly, Ronquest (2012) finds centralization and reduction of unstressed vowels as compared to stressed vowels, and report that /o/ and /u/ are not significantly different from each other, also in the horizontal axis.

Variation in the pronunciation of /e/ is also observed in hiatus resolution, which appears at times as diphthongization—in which /e/ becomes either a high glide ([j]) or a mid-glide ([e̯]), especially in unstressed position, or as elision of the first or second vowel in the sequence (Garrido,

6 Martínez Celdrán and Fernández Planas (2007) and Willis (2008) suggest that unstressed vowels have the tendency to be more centralized in spontaneous, less careful speech, compared to the speech elicited in a laboratory setting or even news broadcasts.

7 These mergers are considered standard in Judeo-Spanish (Penny, 2000, p. 191).

2007; Hernández, 2009). According to Frago-Gracia and Franco-Figueroa (2001) [cited in Garrido 2007], hiatus diphthongization is a generalized characteristic of American Spanish (with the exception of Paraguay, where the influence of Guarani tends to favor hiatus maintenance).

Due to the variable vocalic system—especially in unstressed position—it is likely that students have difficulties to conceptualize vowels into the 5 vocalic phonemes in which the Spanish spelling system is based, which would explain their difficulties in the spelling of unstressed vowels.

This study is a first exploration of PA in SHLs. The first aim of the study is to investigate the hypothesis that the subset of spelling errors observed in SHLs involving vowels, such as *e / i* substitutions and inversion, reported in Beaudrie (2012) and Bahr et al. (2015) are due to PA difficulties in the conceptual identification, discrimination, and segmentation between close vowels—specifically *e / i*.

The second aim of this study is to explore the connection between general language proficiency and PA in SHLs. Vocabulary has been shown to be the language measure more strongly correlated with PA for children. As explained above, PA is developed initially as a result of a growing vocabulary that includes minimal pairs that start defining the individual phonemes of the language (Defior, 2004; Defior et al., 2015). Therefore, SHLs with a larger vocabulary should have more developed PA. However, as explained above, college-age SHLs have moved to non-decoding reading and writing strategies without having had the opportunity to progress to that stage from a decoding stage, due to lack of early literacy instruction in Spanish. Therefore, the connection between PA and vocabulary may have disappeared, or, as Ziegler and Goswani (2005) put it, might be obscured by task difficulty and developmental factors.

This study

Participants

The participants of this study were 81 students (41 females, 40 males; age range 18 -34, mean age 20.1), who at the time of the data collection were enrolled in a Spanish for Native Speakers (I) course, and had not taken any other Spanish course at a college level. Information about participants was collected through a linguistic background questionnaire. Most participants came from Mexican families, and all reported either being born in the US or living in the US since age 3 or earlier. They had all been schooled in the United States, were exposed to Spanish at home since birth to different degrees, and they reported having Spanish as the first language they learned at home. In addition, they had selected *Only Spanish, Mostly Spanish* or *Spanish and English* as the language they speak now with their parents, and *Only Spanish* or *Mostly Spanish* as the language they speak with their grandparents. The average time participants had studied Spanish in secondary school was 1.9 academic years with a range of zero to six years. (The few students who had not studied Spanish in high school had studied either French or American Sign Language).

To assess and establish their proficiency in Spanish, participants completed a proficiency test adapted from the *Diploma de Español como Lengua Extranjera* (DELE), which has been used in several other studies of L2 learners and SHLs (Montrul, 2002). The test consists of a cloze passage and a multiple-choice vocabulary test, and the maximum possible score is 50. Based on this test, and following the practice in other studies, participants were divided into groups: twenty-four participants fell into the advanced group (50-41 scores), forty-one into the interme-

diate group (40-31 scores), and sixteen into the low group (30 and below scores). The test was administered at the end of the experimental tasks, to avoid the possibility that seeing printed words in Spanish interfered with the spelling decisions made in the PA tasks. Reliability statistics, computed using Cronbach's alpha, were high (r = 0.827), which is similar to that reported in other studies that use this test. (See Table 1 for participants' information.)

Table 1. *Mean score, range and standard deviations (SD) on participants' data*

Participants (n=81)	Mean	Range	SD
Age	20.1	18-34	2.8
Proficiency (DELE) score	35.4	19-49	6.5
Years of Spanish classes in secondary school	1.9	0-6	1.3

Tasks

Students completed the tasks during the second day of class, before any class instruction had taken place. The three PA tasks involved the contrast between monophthongs and diphthongs. The election of this contrast responds to the findings that, at least in children, complexity of syllable structure better captures the meaningful variance of PA than do task differences (Stahl & Murray, 1994). These phonological tasks thus allowed us to assess the participants' ability to manipulate syllables containing two vowels.

Pseudoword Dictation (PWD) Task

The first of the three PA tasks administered was a pseudoword dictation. Participants were read 35 Spanish-sounding pseudowords and were required to write them as Spanish words. The use of pseudowords eliminates the frequency effect and, therefore, is considered a more reliable measure of PA than real words are (Rohl & Tunmer, 1988). In addition, it has been argued that spelling tasks may reveal phonological deficit much more clearly than reading tasks (Defior & Tudela, 1994).

Target words were distributed the following way: ten pseudowords included stressed /i/ in a closed syllable (CVC) (e.g. *camilto*); ten pseudowords included the diphthong *ie* (e.g. *pariené)* and nine pseudowords included the sequence *ea*, of which four had a stressed *a* (e.g. *cale<u>a</u>to*), and five were in a pretonic position *e.g* (polea<u>dor</u>).[8] Five pseudowords did not include any *i* or *e* and were used as distractors. All items were randomized.

The inclusion of items with stressed /i/ was aimed to testing Beaudrie's (2012) suggestion that use of *e* for *i* was due to English orthographic interference. If this was the case, we should expect to find *e* (and perhaps other English spellings, such as *ee, ea, ei,* or *ie*) to represent /i/ in stressed syllables. The inclusion of items with two contiguous vowels (the *ie* diphthongs and *ea* hiatus) aimed at testing an area of phonological difficulty. A finer-grained distinction within *ea* items (with stressed and non-stressed *a*) was motivated by the fact that this particular sequence is very commonly pronounced as [ja] in certain varieties of Spanish, and commonly spelled as *ia* by SHLs. The use of pseudowords with [ea] aimed to determine whether the spelling *ia* in real words (*e.g. brom<u>ia</u>ndo* for *brom<u>ea</u>ndo*) simply represents the students' pronunciation of these

8 Because of a misprint, one of the *ea* items had to be excluded from its group and was considered a distractor. Results in this task were calculated as percentages.

particular words, or if PA is involved. If students also have difficulties with those spellings in pseudowords, it could not be maintained that they are simply reproducing the words as they pronounce them, but rather, as they conceptualize the sounds they are hearing.

The answers were coded the following way: only the spelling of the target vowel was scored; that is, a misspelling in other parts of the word was not considered (such as *bariené* for *pariené*, *photilo* for *fotilo*, or *calleato* for *caleato* etc.). When the /i/ was spelled as *i*, a score of 1 was given, and a misspell of the *i* was scored as 0. For the *ie* diphthongs, only the first vowel was considered: a spelling of *ie* as either *ie, ia,* or *i* was considered "correct" and given a score of 1. All other spellings of the first vowel (*ei, e*) were considered incorrect and given a score of 0. In addition, the different spellings given to the diphthong were noted, such as correct spelling of the entire diphthong, reduction into a monophthong, error in one vowel only, error in both vowels, and presence/absence of metathesis—that is, movement of the diphthong into another syllable. For the words with the *ea* sequence, only the spelling of the first vowel was considered. The items on the spelling task had good internal reliability (Cronbach's alpha= 0.873).

Syllable Counting (SC) Task

For this task, participants listened to 40 words (20 target items and 20 distractors), presented in randomized order, and were asked to write the number of syllables they contained, without writing the words. Target words were four and five syllables long (half of each), while distractors included words of other syllable lengths. Structural factors (diphthong vs. non-diphthong) were also manipulated to determine whether participants process diphthong syllables differently than non-diphthong syllables. Ten words contained one diphthong (e.g. *manifiesto, cualitativo*) and ten only contained monophthongs (*dedicado, transportábamos*). No target words included vowels in hiatus, such as *co-me-rí-a*, or *te-a-tro*, since correct syllabification of those types of words might reveal more about specific syllabification instruction than phonological processing. A correct number of syllables was scored as 1, and an incorrect number was scored as 0. Reliability coefficient (Cronbach's alpha) for this task was 0.835.

Syllable Identification (SI)

For the last PA task, participants listened to sentences, and for each of them they were asked to indicate whether they had heard a specific syllable or not. The sentences were divided in four sets of ten sentences each, and each set had a target syllable. Target syllables were *pla*, *tra*, *mien* and *pien*. Five sentences in each set contained the target syllable, and five did not. The ones that did not contain the target syllable contained similar syllables, such as *pendiente* (target syllable: *pien*). Reliability coefficient for this task reached 0.76.

Results

Pseudoword dictation task (PWD)

The means and standard deviations for the results obtained in each of the measures (spelling of *i* in CVC syllable, spelling of *i* in CVV syllables, and spelling of /e/ in *ea* strings) are displayed in Table 2.

Table 2. *Results of PWD Task. Mean percentages of correct responses.*

Participants (n=81)	Mean (SD)
i in CVC (monophthong)	98.02 (9.8)
i in CVV (–*ie*– diphthong)	74.81 (27.3)
e in *ea* (stressed and non-stressed)	65.16 (26.39)
e in *ea* (non-stressed)	43.95 (34.55)
e in *ea* (stressed)	83.33 (27.95)

Results in the spelling of letter *i* in the *ie* diphthong (CVV) were compared with the results in the spelling of *i* in a monophthong (CVC). The results of a paired-samples t-test showed a significant difference between the spelling of letter *i* in the diphthong and the spelling of that letter in a monophthong: monophthong (M = 98.02; SD = 9.8) vs. diphthong (M = 74.81; SD = 27.3; t(80) = 8.1; p < 0.001). A closer look at the spellings of words with the /je/ diphthong showed that the sequence *ie* as a whole had a rate of correct spellings of 68%. The responses that had errors in both vowels reached 13% of the total responses (for example, *mafeanar* for *mafienar*), while errors consisting of reduction of the diphthong to a monophthong were a 16%, as in *mafenar*. Many of these reduction cases were accompanied by metathesis, that is, the diphthong was moved to a different syllable, as in *mafeniar*. The few errors in the /i/ in the monophthong condition were *e*. No instances of other English spellings, such as *ee , ea, ei, ie*, and *y* were found.

A paired-samples t-test was performed to compare the results of spelling of *e* in the *ea* string in the two conditions: with stressed *a* and with unstressed *a*. Spelling of *ea* proved to be more difficult in a pretonic syllable, with more accurate results obtained in stressed [eá] (M= 83.33; SD = 27.95) than in unstressed [ea] (M = 43.95; SD = 34.55; t(80) = 11.25; p < 0.001). The two vocalic sequences (*ie* and *ea)* were then compared. The rate of correct spelling of *e* in *ea* was significantly lower than that of *i* in *ie*: *e* in *ea* (M = 65.1; SD = (26.3) vs. *i* in *ie* (M = 74.81; SD = 27.3); t(80) = 2.7; p < 0.01).

Syllable Counting Task (SC)

Table 3 displays mean percentage and standard deviations for results obtained in all target items.

Table 3. *Results of SC Task. Mean Percentage and Standard Deviations of Correct Responses*

Participants (n=81)	Mean (SD)
All target items	86.67 (16.4)
No diphthong	90.5 (16.2)
Diphthongs	82.8 (20.2)

The results of a paired-samples t-test showed that students performed significantly better in the counting task when the words did not contain any syllable with diphthongs than when the

words contained one diphthong: no diphthong (M = 90.5; SD = (16.2) vs. diphthong (M = 82.8; SD = 20.2); t(80) = 4.2; p < 0.001).

Syllable Identification Task (SI)

Table 4 displays the results of the Syllable Identification (SI) task.

Table 4. *Results of SI Task. Mean percentages and Standard Deviations of correct responses* Participants (n = 81)

	All items	mien	pien	tra	pla
Mean	89.04	84.19	87.28	92.09	92.59
(SD)	(8.99)	(13.12)	(13.6)	(10.57)	(10.09)

A one-way repeated measures ANOVA was conducted to compare the effect of the target syllable (*tra, pla, pien, mien*) on the syllable identification results. There was a significant effect of the target syllable on syllable identification, Wilks' Lambda = 0.621; *F* (3,78) = 15.8; p < 0.001. Bonferroni post hoc tests showed that participants performed significantly better in each of the two syllables in the non-diphthong condition (*tra* and *pla*) than those in the diphthong condition (*pien* and *mien*). Results for *tra* (M = 92.09; SD = 10.57) were significantly better than results for *pien* (M = 87.28; SD = 13.6; p = 0.01) and significantly better than results for *mien* (M = 84.19; SD = 13.12; p < 0.001). Likewise, results for *pla* (M = 92.59; SD = 10.09) were significantly better than results for *pien* (M = 87.28; SD = 13.6; p = 0.005) and significantly better than results for *mien* (M = 84.19; SD = 13.12; p < 0.001). However, there were no significant differences between the results of the two syllables in the same condition (*tra* vs. *pla*; and *pien* vs. *mien*).

In order to examine any potential correlations among the different measures of PA and the proficiency task (DELE), correlation analyses were conducted (See Table 5). A Pearson correlation test revealed that the results of the two syllable awareness tasks were significantly correlated with one another (r = 0.313; p < 0.05). The results of the *Pseudoword Dictation* (PWD) task moderately correlated with the two syllabic awareness tasks, although this correlation was stronger with the *Syllable Identification* (SI) task (r = 0.45; p < 0.01) than it was with the *Syllable Counting* (SC) task (r = 0.23; p < 0.05). The results of the proficiency task (DELE) also correlated with those of the *Syllable Identification* (SI) task, but not with those of the *Syllable Counting* (SC) task. No correlation between DELE and *Pseudoword Dictation* results was found, either.

Table 5. *Correlations between measures*

	DELE	PWD	SC	SI
DELE	-	.182	.152	.449 (**)
PWD	-	-	.235(*)	.450 (**)
SC	-	-	-	.313 (*)
SI	-	-	-	-

(**) p < 0.01 (*) p < 0.05

Discussion

This study was set to explore the hypothesis that a subset of the spelling errors SHLs make

are due to underdeveloped phonological awareness. More specifically, the study was interested in the vowel errors reported by Beaudrie (2012): *e* / *i* substitutions (e.g. *divirtir* for *divertir, envitado* for *invitado*), vowel omission (e.g. *perjucios* for *perjuicios*), diphthongization of *ea* into *ia* (e.g. *bromiando* for *bromeando*), and vowel inversions (*teine* for *tiene*). In order to determine that PA was behind this particular set of errors, other explanations need to be refuted: (1) that students are reproducing these words as they are available in their input—that is, that they write *bromiando* and *divirtir* because that is how they pronounce these words—and (2) that these errors are due to English orthographic interference, as suggested by Beaudrie (2012).

The specific aspects of PA investigated in this study were phonological discrimination between /e/ and /i/ and phonological segmentation between these two sounds when appearing in a diphthong. The presence of two contiguous vowels had a clear effect at different levels of PA. In the *Pseudoword Dictation* task, the letter *i* in diphthong (CVV *ie*) had a correct spelling rate of 78.41%, significantly worse than that letter in a monophthong, which achieved a quasi-perfect score (98.02%). The fact that an almost perfect score was obtained in stressed /i/ in the monophthong condition casts further doubt on the English orthographic interference explanation, since this is the syllabic setting where we find *e* as the spelling of /i/ in English. In addition to identification of the vowel, the presence of a diphthong also caused difficulties in intrasyllabic phonological segmentation. A closer look at the spellings of words with the /je/ diphthong showed some cases of reduction of the diphthong to a monophthong, as in *mafenar*.

The presence of a diphthong also seems to disrupt PA at a higher level. In the *Pseudoword Dictation* task, many of the reductions cases were accompanied by metathesis, that is, the diphthong was moved to a different syllable, as in *mafeniar,* which suggests that a diphthong was heard, but the participant had difficulty placing it in the correct syllable. That is, the mere presence of a diphthong may disrupt the phonological perception of the entire syllable, and this perceptual disruption may even be visible at a suprasyllabic level. This phenomenon could be behind "transposition errors" reported in Beaudrie (2012), such as *oldivar* for *olvidar*, or *gruadar* for *graduar.* Further support for this observation is obtained in the other two tasks. In the *Syllable Identification* task, significantly more errors were produced when attempting to identify syllables with diphthongs than syllables without diphthongs. These difficulties were also observed outside of the confines of the target syllable itself. In the *Syllable Counting* task, participants produced significantly more errors in counting syllables when the word contained a diphthong than when the word did not contain any diphthong.

The study also looked at a specific subset of errors involving vowels found in Beaudrie's (2012) corpus of spelling errors: spelling of *-ea-* as *-ia-*, such as the case of *bromiando* for *bromeando.* These misspellings could correspond to an accurate representation of the students' linguistic variety, that is, students write *bromiando* because this is the word they have heard and that they use. Alternatively, difficulties in PA could also be at the source of these errors, that is, students conceptualize [ea] as /ja/ themselves. Participants' correct spelling rate of *e* in *ea* was 65.1%. Although no control of *e* in monophthongs was made, spelling of *e* in *ea* was the lowest found in all types of words. Further evidence that diphthongization is due to phonological awareness is found in the fact that the lack of stress in *a* in the *ea* sequences had a great effect in producing "ia" spellings, with almost as half correct spelling rate in the non-stressed *a* condition. Placing the *ea* sequence in a pretonic position made the sequence even more susceptible to an *e/i* merge.

As suggested by Llombart-Huesca (2018), these two possible explanations—underdeveloped PA and accurate representation of non-standard pronunciations—could be considered together in a unifying account. The same phonological processes found in diachronic change and in

synchronic dialectal and social variation—substitution, epenthesis, metathesis, and deletion—are found in children's typical development of phonological awareness (Edwards, 1992; Ingram, 1974), and were also behind the errors produced in the PWD task. Exposure to fine-grained phonological distinctions produce increasingly more fine-grained perceptual distinctions (Defior, 2004; Defior et al., 2015). But a speaker whose input and output only contains [ja] and not [ea] will not develop the ability to perceive these two sequences as phonemically distinct. In addition, lack of development of early literacy in Spanish that would strengthen phonological discrimination and segmentation might further promote a reduced vocalic system. As explained earlier, exposure to the written word influences writers/readers' perception of sounds through the conceptualization of these sounds into the phonemes that enter into a PGC. Wide exposure to print, comprising words as *pelear* and *bromear*, as well as *espiar* and *enviar* is likely to develop finer-grained perceptual distinctions between these two sequences. Therefore, a vocalic sound might be perceived and conceptualized as /e/ or as /i/ depending on previous exposure to those words in written form.

The study also aimed to find out whether or not general proficiency correlated with PA measures. To measure proficiency, the cloze-portion of DELE, which mostly measures vocabulary and it is commonly used for research purposes to classify heritage speakers into advanced, intermediate and low proficiency, was used. The results show that success in writing pseudowords correlates with success in syllable identification, which suggests that successful writing of vowels in pseudowords is facilitated by PA, at least at the level of intrasyllabic awareness. On the other hand, the results showed that proficiency (in DELE's terms) correlated with syllable identification in real words, but not with writing of pseudowords. Therefore, general proficiency was only related to PA in a task that involved real words—the SI task—and was not related to PA when pseudowords were involved—in the PWD task—that is, when participants could not use their previous knowledge of words. This suggests that the connection between better spelling performance and more advanced PA was mediated by lexical knowledge. High general proficiency assists with spelling because students have a more extensive vocabulary and familiarity with Spanish words, but not because it has produced a more developed PA.

Conclusions, Pedagogical Implications, and Limitations of this Study

The results of this study suggest that vowel misspells involving the letters *e* and *i* are not due to orthographic interference of English spelling, but rather to difficulties in phonological awareness (segmentation and discrimination of these vowels). The apparent stability of a symmetric five vowel system—unsupported from a synchronic point of view—is further challenged when we look outside of the standard varieties of Spanish. Likewise, the simplicity of the Spanish vocalic spelling system (five phonemes - five letters) is also challenged when we look at the spellings of SHLs—native speakers of the language who not only are exposed to a simplified vocalic system, but who also have not received early literacy in Spanish in which the five vocalic phonemes are discriminated and consistently represented by five vowels. Underdeveloped PA might be behind other spelling errors, such as those involving *o* / *u* substitutions and reductions, as well as other errors consisting in omission of entire syllables, such as *derían* for *deberían* (Beaudrie, 2012).

The findings of this study have some implications for spelling instruction. First, the study revealed some PA and spelling difficulties in *e/i* when these vowels are found with a contiguous vowel. Improvement in this area of spelling cannot have a simple orthographic approach, since

these spelling errors are not due to breaking any contextual orthographic PGC. Literacy activities aimed at promoting PA, especially those consisting in the discrimination and segmentation of *e* and *i* could be implemented with the aim to improve the spelling of these words. On the other hand, the results showed that the relation between PA and spelling was mediated by lexical knowledge, which could be used to support a pedagogical strategy oriented toward vocabulary expansion and to leave aside PA-building pedagogical strategies. However, while students with more vocabulary and higher general language proficiency might have an increased sensitivity to diphthongs, this sensitivity only applies to words they already know. Therefore, learning new words that are phonologically complex, such as long words with diphthongs will most likely prove difficult, since new words are, in essence, pseudowords.

Therefore, while underdeveloped PA might be at the root of only a subset of spelling errors, and other causes—such as lack of knowledge of orthographic conventions, underdeveloped morphological awareness, reduced vocabulary, and a weak visual lexicon—might be the cause of many other spelling errors, SHL researchers and pedagogues should not disregard the effect of PA in SHL's literacy development. Not addressing PA may produce a ceiling effect in spelling and reading development in less frequent and new words, long words, and words with two contiguous vowels. Finally, our interest in addressing SHLs' phonological awareness, both in research and pedagogy, is not only related to spelling. Underdeveloped phonological awareness is a predictor of difficulties in other areas of literacy development, such as reading and vocabulary expansion.

With respect to the type of activities that can be used in the SHL classroom aiming to develop PA, many tasks have been proposed to both assess and develop this skill in children and adults. Such tasks consist in manipulating the phonemes in words through isolation, identification, categorization, blending, segmentation, deletion, and rhyming tasks. (A review of these tasks can be found in Defior [1996], and in the Report of the National Reading Panel [2011].) The following are just a few examples given in Spanish by Defior (1996):

Acoustic duration task, introduced as "mow – motorcycle" task, by Rozin, Bressman, and Taft (1974): Identifying the longest word in a pair.

Isolating units task (Fox & Routh, 1976; Stanovich, Cunningham, & Cramer, 1984; Wallach & Wallach, 1976; Williams, 1979, 1980; Yopp, 1988): Identifying the syllable or phoneme found in a specific position of a word.

Eliminating units task. Asking to say a word without one of its sounds (e.g. "How do you say *rosa* without the 'r'?")

Working with pronounceable pseudowords (and/or less frequent words) can also increase phonemic awareness, either by asking students to read such words or write them in dictation. Reading pseudowords forces the reader to decode graphemes into phonemes, since there is no stored word in their memory to match the printed word. Working with pseudo-words also has the advantage of developing one specific aspect of general metalinguistic awareness: the ability to shift focus from meaning to formal aspects of language (Cazden, 1974; Hakes, 1980, Bialystok, 1994, Llombart-Huesca, 2017).

Although some of these activities might seem childish or cause surprise to mature students, they are modified and used in adult literacy development classes (McShane, 2005). McShane also recommends explaining to adult students the role of these activities in their development, as well as not make them the sole focus of instruction but rather use them in conjunction with more holistic activities.

Finally, it should be acknowledged that the results of this study are limited in a number of

ways. First, only one linguistic group, that of SHL learners, was studied, which limits the generalizability of the results beyond the sample of speakers tested in this study. Future studies should refine the instruments used here, and include additional measures for PA and other phonological contexts, in order to obtain a deep understanding of spelling in SHLs and the role that different linguistic-cognitive skills have in the development of spelling. Finally, further research should look at the effects of PA and reading and vocabulary acquisition.

Works Cited

Ball, E.W. and B. Blachman. (1991). Does Phoneme Awareness Training in Kindergarten Make a Difference in Early Word Recognition and Developmental Spelling? *Reading Research Quarterly*, *26,* 49-66.

Bahr, R. H., E. Silliman, R. L. Danzak, and L. C. Wilkinson. (2015). Bilingual Spelling Patterns in Middle School: It is More Than Transfer. *International Journal of Bilingual Education and Bilingualism, 18*(1), 73–91.

Barajas, J. (2016). Vowel Raising and Social Networks in Michoacán: a Sociophonetic Analysis. In S. Sessarego and F. Tejedo-Herrero (Eds.), *Issues in Hispanic and Lusophone Linguistics,* 8 (pp. 241-260). Philadelphia, PA: John Benjamins.

Barry, C. and P. De Bastiani. (1997). Lexical Priming of Nonword Spelling in the Regular Orthography of Italian. *Reading and Writing, 9*, 499–517.

Beaudrie, S. (2012). A Corpus-Based Study on the Misspellings of Spanish Heritage Learners and their Implications for Teaching. *Linguistics and Education*, *23*, 135-44.

Besner, D. (1999). Basic Processes in Reading: Multiple Routines in Localist and Connectionist Models. In P. McMullen and M. Klein, (Eds.), *Converging Methods for Understanding Reading and Dyslexia.* Cambridge, MA: MIT Press.

Bialystok, E. (1994). Analysis and Control in the Development of Second Language Proficiency. *Studies in Second Language Acquisition, 16*(2), 157-168.

Boyd-Bowman, P. (1952). La pérdida de vocales átonas en la altiplanicie Mexicana. *Nueva Revista Mexicana de Filología Hispánica*, *6*(2), 138-140.

Bradley, L., and P. Bryant. (1983). Categorizing Sounds and Learning to Read—A Causal Connection. *Nature*, *301*, 419–421.

Burgess, S. R. and C. J. Lonigan. (1998). Bidirectional Relations of Phonological Sensitivity and Prereading Abilities: Evidence from a Preschool Sample. *Journal of Experimental Child Psychology*, *70,* 117-141.

Carreira, M. (2002). When Phonological Limitations Compromise Literacy: A Connectionist Approach to Enhancing the Phonological Competence of Heritage Language Speakers of Spanish. In S. Hammadou (Ed.), *Literacy and the Second Language Learner*. Greenwich, CT: IAP.

Cataldo, S., and N. Ellis. (1988). Interactions in the Development of Spelling, Reading and Phonological Skills. *Journal of Research in Reading, 11*(2), 86-109.

Cazden, C.B. (1974). Play and Metalinguistic Awareness: One Dimension of Language Experience. *The Urban Review*, *7*(1), 28-39.

Chitoran, I. and J. I. Hualde. (2007). From Hiatus to Diphthong: The Evolution of Vowel Sequences in Romance, *Phonology*, *24*(1), 37–75.

Coltheart, M., Curtis, B., Atkins, P., and Haller, M. (1993). Models of Reading Aloud: Dual Route and Parallel Distributed Processing Approaches. *Psychological Review*, *100*, 589-608.

Defior, S. (1996). Una clasificación de las tareas utilizadas en la evaluación de las habilidades fonológicas y algunas ideas para su mejora. *Infancia y Aprendizaje, 73,* 9-63.

Defior, S. (2004). Phonological Awareness and Learning to Read: A Crosslinguistic Perspective. In: P. Bryant and T. Nunes (Eds.), *Handbook on Children's Literacy* (pp. 631-649). London: Academic Press.

Defior, S., F. Justicia, and F. Martos. (1996). The Influence of Lexical and Sublexical Variables in Normal and Poor Spanish Readers. *Reading and Writing: An Interdisciplinary Journal, 8*, 487-497.

Defior, S., G. Jiménez-Fernández, N. Calet, and F. Serrano. (2015). Learning to Read and Write in Spanish: Phonology in Addition to Which Other Processes? *Studies in Psychology, 36*(3), 571-591.

Defior, S. and P. Tudela, (1994). Effect of Phonological Training on Reading and Writing Acquisition. Reading and Writing. *An Interdisciplinary Journal, 6,* 299-320.

Delforge, A. M. (2008). Unstressed Vowel Reduction in Andean Spanish. In Laura Colantoni & Jeffrey Steele (Eds.), *Selected Proceedings of the 3rd Conference on Laboratory Approaches to Spanish Phonology* (pp. 107-124). Somerville, MA: Cascadilla Proceedings Project.

Delforge, A. M. (2009). The Rise and Fall of Unstressed Vowel Reduction in the Spanish of Cusco, Peru: A Sociophonetic Study. Ph.D. dissertation. Davis: University of California.

Durgunoğlu, A.Y. (2002). Cross-linguistic Transfer in Literacy Development and Implications for Language Learners. *Annals of Dyslexia, 52*, 189–204.

Edwards, M. L. (1992). In Support of Phonological Processes. *Language, Speech and Hearing Services in Schools*, *23*, 233–40.

Ehri, L. C. (1980). The Development of Orthographic Images. In U. Frith (Ed.), *Cognitive Processes in Spelling* (pp. 311–338). London: Academic Press.

Ehri, L. C. (2014). Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning. *Scientific Studies of Reading*, 18:1, 5-21.

Ehri, L. C. and L. S. Wilce. (1980). The Influence of Orthography on Readers' Conceptualization of the Phonemic Structure of Words. *Applied Psycholinguistics*, *1*, 371–385.

Ehri L.C and J. Rosenthal. (2007). Spellings of Words: A Neglected Facilitator of Vocabulary Learning. *Journal of Literacy Research*, *39*(4), 389–409.

Fox, B. and D.K. Routh. (1976). Phonemic Analysis and Synthesis as Word-Attack Skills. *Journal of Educational Psychology, 68,* 70-74.

Frago-Gracias and Franco-Figueroa (2001). *El español de América*. Servicio de Publicaciones Universidad de Cádiz.

Frith, U., H. Wimmer and K. Landerl. (1998). Differences in Phonological Recoding in German and English-Speaking Children. *Scientific Studies of Reading, 2,* 31–54.

Garrido, M. (2007). Diphthongization of Mid/Low Vowel Sequences in Colombian Spanish. In J. C. Holmquist, A. Lorenzino, and L. Sayahi (Eds.), *Selected Proceedings of the Third Workshop on Spanish Sociolinguistics* (pp. 30-37). Somerville, MA: Cascadilla Proceedings Project.

Gottardo, A., Yan, B., Siegel, L. S., & Wade-Wooley, L. (2001). Factors Related to English Reading Performance in Children with Chinese as a First Language: More Evidence of Cross Language Transfer of Phonological Processing. *Journal of Educational Psychology*, *93,* 530–542.

Gordon, A. (1980). Notas sobre la fonética del castellano en Bolivia. *Actas del Sexto Congreso Internacional de Hispanistas*, 349-52.

Hernández, E. (2009). *Resolución de hiatos en verbos-ear: un estudio sociofonético en una ciudad mexicana*. (Doctoral Dissertation.) Columbus, OH: The Ohio State University.

Holmquist, J. C. (1998). High-lands High vowels: A Sample of Men's Speech in Rural Puerto Rico. *Papers in Sociolinguistics: NWAVE-26,* 73-79.

Holmquist, J. C. (2005). Social Stratification in Women's Speech in Rural Puerto Rico: A Study of Five Phonological Features. In L. Sayahi and M. Westmoreland (Eds.), *Selected Proceedings of the Second Workshop on Spanish Linguistics* (pp. 109-119). Somerville, MA: Cascadilla Proceedings Project.

Hu, M. (2009). Phonological Awareness in Mandarin of Chinese and Americans. (Doctoral Dis-

sertation.) Auburn, AL: Auburn University.
Hualde, J. I. (2005). *The Sounds of Spanish*. Cambridge: Cambridge University Press.
Ingram, D. (1974). Phonological Rules in Young Children. *Journal of Child Language, 1*, 29–64.
Justicia, F., S. Defior, S. Pelegrina, and F. J. Martos. (1999). The Sources of Errors in Spanish Writing. *Journal of Research in Reading*, *8*, 487–497.
Kemp, N. (2016). Children's First Language Acquisition of the English Writing System. In V. Cook and D. Ryan (Eds), *The Routledge Handbook of the English Writing System* (pp. 191-204). London: Routledge.
Lipski, J. M. 1990. Aspects of Ecuadorian Vowel Reduction. Hispanic Linguistics 4: (1) 1-19.
Llombart-Huesca, A. (2017). "Morphological Awareness and Heritage Language Learners." *Linguistics and Education, 37,* 11-31.
Llombart-Huesca, A. (2018). Understanding Spelling Errors in Spanish Heritage Language Learners". *Hispania, 101(2),* 211-223.
Lonigan, C.J. (2007). Vocabulary Development and the Development of Phonological Awareness Skills in Preschool Children. In R.K. Wagner, A.E. Muse, and K.R. Tannenbaum (Eds.) *Vocabulary Acquisition: Implications for Reading Comprehension* (pp. 15-31). New York: Gilford.
Lope Blanch, J. (1972). En torno a las vocales caedizas del español mexicano. *Estudios sobre el español de México.* México: Editorial Universidad Nacional Autónoma de México.
Lundberg, I., J. Frost, and O. Peterson. (1988). Effects of an Extensive Program for Stimulating Phonological Awareness in Preschool Children. *Reading Research Quarterly*, *23,* 263-284.
Martínez Celdrán, E, and A. M. Fernández Planas. (2007). *Manual de fonética española*. Barcelona: Ariel Lingüística.
Matluck, J. (1952). La pronunciación del español en el valle de México. *Nueva Revista de Filología Hispánica*, *6*(2), 109-120.
Mattingly, I. G. (1972). Reading, the Linguistic Process, and Linguistic Awareness. In J.F. Kavanagh y I.G. Mattingly (Eds.), *Language by ear and by eye: The relationships between speech and reading* (pp. 133-47). Cambridge, MA: MIT Press.
Marín Gálvez, R. (1995). La duración vocálica en español. *Estudios de Lingüística de la Universidad de Alicante, 10*, 213-226.
McCarthy, J. (1984). Theoretical Consequences of Montañés Vowel Harmony. *Linguistic Inquiry*, 15, 291-318.
McShane, S. (2005). *Applying Research in Reading Instruction for Adults: First Steps for Teachers.* National Center for Family Literacy, 2005. (Available at http://www.nifl.gov/partnershipforreading/publications/applyingresearch.pdf)..
Menke, M., and T. Face. (2010). Second Language Spanish Vowel Production: An Acoustic Analysis. *Studies in Hispanic and Lusophone Linguistics*, *3*(1), 181-214.
Meyer, D.E., R.W. Schvaneveldt, and M.G. Ruddy (1974). Functions of Graphemic and Phonemic Codes in Visual Word-Recognition. *Memory and Cognition, 2,* 309–321.
Montrul, S. (2002). Incomplete Acquisition and Attrition of Spanish Tense/Aspect Distinctions in Adult Bilinguals. *Bilingualism: Language and Cognition, 5*, 39–68.
Morrison, G.S. and P. Escudero. (2007). A Cross-Dialect Comparison of Peninsular- and Peruvian-Spanish vowels. *Proceedings of the 16th International Congress of Phonetic Sciences*, 1505-1508. Saarbrücken, Germany.
Morton, J. (1980). The Logogen Model and Orthographic Structure. In U. Frith (Ed.), *Cognitive Processes in Spelling* (pp. 117–113). London: Academic Press.

Morton, J. and Patterson, K. (1980). A New Attempt at an Interpretation, or an Attempt at a New Interpretation. In: Coltheart, M., Patterson, K. and Marshall, J. (Eds.), *Deep Dyslexia* (pp. 91-118). London, UK: Routledge and Kegan Paul.

Navarro-Tomás, T. (1948). *El español en Puerto Rico: Contribución a la geografía lingüística hispanoamericana*. Editorial Universitaria, Universidad de Puerto Rico

Oliver Rajan, J. (2008). *Vowel Raising in Puerto Rican Spanish*. (Doctoral dissertation). Chicago, IL: University of Illinois at Chicago.

Penny, R. (2000). *Variation and Change in Spanish.* Cambridge UP. Cambridge, UK.

Ravid, D. and S. Gillis. (2002). Teachers' Perception of Spelling Patterns and Children's Spelling Errors: A cross-Linguistic perspective. In M. Neef, A. Neijt and R. Sproat (Eds.), *Consistency in Writing Systems* (pp. 71-95). Tübingen: Niemeyer Verlag.

Report of the National Reading Panel. (2001) Teaching Children to Read. An Evidence-Based Assessment of the Scientific Research Literature on Reading and its Implications for Reading Instruction. Retrieved January 15, 2016 from https://www.nichd.nih.gov/publications/pubs/nrp/Documents/report.pdf.

Rozin, P., B. Bressman, and M. Taft. (1974). Do Children Understand the Basic Relation Between Speech and Writing? The Mow-Motorcycle Test. *Journal of Reading, 6,* 326-334.

Sessarego, S. (2012). Vowel Weakening in Afro-Yungueño: Linguistic and Social Considerations. *Papia*, 22(2), 279-294.

Share, D.L. (1995). Phonological Recoding and Self-Teaching: Sine Qua Non of Reading Acquisition. *Cognition*, 55, 151–218.

Share, D.L. (2004). Orthographic Learning at a Glance: On the Time Course and Developmental Onset of Self-Teaching. *Journal of Experimental Child Psychology*, 87, 267–298.

Stahl, S.A. and B.A. Murray. (1994). Defining Phonological Awareness and its Relationship to Early Reading. *Journal of Educational Psychology,* 86, 221-234.

Stanovich, K. E.; Cunningham, A.E.; Cramer, B.B. (1984). Assessing Phonological Awareness in Kindergarten Children: Issues of Task Comparability. *Journal of Experimental Child Psychology, 38,* 175-190.

Valdés, G. (2001). Heritage Languages Students: Profiles and Possibilities. In J. K.Peyton, D. A. Ranard, & S. McGinnis (Eds.), Heritage Languages in America: Preserving a National Resource (pp. 37–77). Washington, DC: Center for Applied Linguistics/Delta Systems

Valle-Arroyo, Francisco. (1989). Errores en lectura y escritura. Un modelo dual. *Cognitiva*, 2(1) 35-63.

Wallach, M.A. and L. Wallach. (1976). *Teaching All Children to Read.* Chicago: University of Chicago Press.

Williams, J.P. (1979). The ABD's of Reading: A Program for the Learning - Disabled. In Resnick, L.B. and Weaver, P. A. (Eds.), *Theory and Practice of Early Reading.* Hillsdale, NJ: LEA.

Williams, J.P. (1980). Teaching Decoding with an Emphasis on Phoneme Analysis and Phoneme Blending. *Journal of Educational Psychology, 72,* 1-15.

Willis, Erik W. (2008). No se comen, pero sí se mascan: Variación de las vocales plenas en la República Dominicana. In *Actas del XV Congreso Internacional de la Asociación de Lingüística y Filología de América Latina (ALFAL)*. Montevideo, Uruguay.

Yopp, H.K. (1988). The Validity and Reliability of Phonemic Awareness Tests. *Reading Research Quarterly, 23,* 159-177.

Ziegler, J. and U. Goswami. (2005). Reading Acquisition, Developmental Dyslexia, and Skilled Reading across Languages: A Psycholinguistic Grain Size Theory. *Psychological Bulletin, 131,* 3-29.