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CONTEXT AND VOWEL HARMONY: ARE THEY ESSENTIAL TO IDENTIFY UNDERLYING WORD-FINAL /s/ IN EASTERN ANDALUSIAN SPANISH? [1]

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Abstract

Eastern Andalusian Spanish has been studied in detail; however, scholars have focused on production and the debate regarding its phonetic and phonological features is still ongoing. This paper analyses Eastern Andalusian Spanish perceptually to establish whether contextual information (articles, numerals, etc.) and vowel harmony are essential to identify underlying word-final /s/. The correct identification of underlying /s/ has been attributed to contextual information and to vowel harmony; however, no perceptual study has been performed to support these claims. A total of 7126 answers from 153 participants across two experiments are analysed to establish whether context and vowel harmony are necessary to perceive underlying word-final Eastern Andalusian /s/. These experiments examine the ability of Eastern Andalusian speakers to distinguish words with and without word-final /s/ deletion. The results show that neither contextual information nor vowel harmony are necessary to identify underlying /-s/ in Eastern Andalusian Spanish.

Keywords

Eastern Andalusian Spanish, perception of underlying word-final /s/, vowel harmony, phonetics, phonology

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CONTEXTO Y ARMONÍA VOCÁLICA: ¿SON IMPRENCISDIBLES PARA LA IDENTIFICACIÓN DE /s/ FINAL SUBYACENTE EN ANDALUZ ORIENTAL?

Resumen

El andaluz oriental ha sido estudiado en detalle pero el debate sobre sus rasgos fonetico-fonológicos sigue abierto. El presente estudio analiza el andaluz oriental perceptivamente para establecer si la información contextual (artículos, numerales, etc.) y la armonía vocálica son esenciales para identificar /s/ final subyacente. La correcta identificación de /s/ subyacente se ha atribuido a la información contextual y a la armonía vocálica, sin embargo, no se han realizado estudios perceptivos para apoyar estas teorías. Se han analizado un total de 7126 respuestas de 153 participantes en dos experimentos para establecer si el contexto y la armonía vocálica son necesarios para percibir /s/ final subyacente en andaluz oriental. Estos experimentos miden la habilidad de los hablantes de andaluz oriental para distinguir palabras con y sin /s/ final apocopada. Los resultados muestran que ni el contexto ni la armonía vocálica son necesarios para identificar /s/ final subyacente en andaluz oriental.

Palabras clave

andaluz oriental, percepción de /s/ final subyacente, armonía vocálica, fonética, fonología

1. Introduction

Many scholars have devoted studies to Eastern Andalusian Spanish (henceforth, EAS), since Navarro Tomás (1938, 1939) posited that, in this geolect, /a/, /e/, and /o/ open when they precede an aspirated or deleted /-s/. He theorised that this vowel opening results in open vowels gaining phonemic value. Other studies, such as Martínez Melgar (1994) and Sanders (1998), have supported Navarro Tomás (1938, 1939) with acoustic data; however, new findings on this variety of Spanish have prompted further questions. As explained in Herrero de Haro (2017b), there is a strong consensus on certain aspects of EAS, such as the tendency to delete consonants in codas. Yet, there are opposing opinions regarding different features, such as the phonemic inventory of this variety of Spanish.

The most complete description to date of EAS phonetic phenomena can be found in Alvar *et al.* (1973); however, amongst all the features of EAS described in Alvar's linguistic atlas, there are three which will be of paramount importance to ascertain whether context and vowel harmony are necessary to identify underlying /-s/: 1) aspiration or deletion of /-s/; 2) vowel opening; and 3) vowel harmony.

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1. Aspiration or deletion of /s/: In Spanish, word-final /s/ can be part of a lexical form (*o* 'or' vs *os* 'to you [plural familiar]'); it can also mark plurality (*casa* 'house' vs *casas* 'houses') or the second person in various tenses (*come* 'he/she/it eats' vs *comes* 'you [singular familiar] eat'. Nethertheless, word-final /s/ is either deleted or aspirated in many varieties of Spanish, despite its high functional load. In EAS, syllable-final /s/ is either deleted or pronounced as [h] (e.g. Navarro Tomás 1938, 1939; García Marcos 1987; and Gerfen & Hall 2001). Some scholars have found a relationship between sociolinguistic factors (age and socio-cultural level) and the pronunciation of /s/ as [s], [h], or as a complete deletion (García Marcos 1987; Tejada Giráldez 2012). However, not all authors believe that syllable-final /s/ is completely deleted in EAS (Gerfen 2002). Tejada Giráldez (2012) posits that /s/ deletion is the preferred option for speakers of a high socio-cultural level in Granada. Carlson (2012) also presents deletion as the norm for EAS; for this reason, this phenomenon will be referred to as */s/ deletion* or */s/ neutralisation* in this paper. Works such as Torreira (2007a, 2007b and 2012) present pre- and post-aspiration in the underlying forms /st/, /sp/, and /sk/; however, these studies focus on Western Andalusian Spanish, rather than on EAS (see Alvar (1973) for differences between these two varieties).

2. Vowel opening: This is the most relevant consequence of /-s/ deletion on preceding vowels. The deletion of syllable-final /s/ causes opening or laxing of the previous vowel (Alvar *et al*. 1973: map 1696). Vowels can also open or lax when they precede other deleted consonants (Sanders 1998; Lloret & Jiménez 2009); however, there are different views regarding which vowels open before underlying /s/. For Navarro Tomás (1938, 1939), only /a/, /e/, and /o/ open; whereas Salvador (1977) believes that all vowels open except /u/. In contrast, all vowels open according to Peñalver Castillo (2006) and Martínez Melgar (1986, 1994). Navarro Tomás (1938, 1939) posited that EAS vowel opening is a phonological feature. According to him, following /-s/ deletion (and the deletion of the aspiration which sometimes substitutes /s/), the opposition in words such as *la* 'the (feminine singular)' and *las* 'the (feminine plural)' is maintained due to the opening of the vowel. He named this phenomenon *desdoblamiento* (henceforth *vowel doubling*, following the English translation used by Hualde & Sanders 1995). Some authors believe that vowel opening is a phonological

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feature (Navarro Tomás 1938, 1939; Salvador 1977), while others believe that vowel opening is simply a phonetic phenomenon (López Morales 1984; Mondéjar Cumpián 1979).

3. Vowel harmony: When a vowel preceding underlying word-final /s/ opens, this triggers opening of other vowels word-internally up to the stressed syllable (Martínez Melgar 1994; Zubizarreta 1979); this could be referred to as *stress-induced vowel harmony*. On the other hand, vowels which precede stress do not usually open (which could be referred to as *pre-stress-supressed vowel harmony*). Further explanations of the role of stress in EAS vowel harmony can be found in Zubizarreta (1979) and in Jiménez & Lloret (2007). Nethertheless, no consensus has yet been reached regarding which vowels are subject to vowel harmony or how stress influences this phenomenon.

Bishop (2007: 1766) explains how, regarding the phonetic and phonological description of EAS, "it is production which has typically been the focus of this line of research". Many studies analysing EAS phonemic inventory focus on the production of phonic features; nevertheless, insufficient attention has been given to how native speakers of EAS perceive these sounds.

Authors such as Rodríguez-Castellano & Palacio (1948a, 1948b), Salvador (1957, 1977), Alarcos Llorach (1983) and, more recently, Martínez Melgar (1994), Gerfen (2002), Jiménez & Lloret (2007), and Tejada Giráldez (2012), have studied EAS and posited theories on its phonetic and phonemic inventory. However, very few studies have analysed the perception of EAS elements by native speakers of this geolect. This would be necessary to establish whether the nuances between consonants and vowels reported by those scholars (such as vowel laxing, vowel harmony, and gemination) have phonetic or phonemic value.

It was this lack of perceptual studies in EAS which prompted the present investigation, to ascertain whether contextual information and vowel harmony have an essential role in the identification of words affected by word-final /s/ deletion. This paper is part of a bigger project on EAS and, together with articles such as Herrero de Haro (2016, 2017a), seeks to bestow more importance on perceptual tests in dialectology. As such, this paper has been designed to test the following two hypotheses: 1) EAS speakers can identify underlying word-final /s/ without the help of

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contextual elements; 2) vowel harmony is not essential for EAS speakers to identify underlying word-final /s/.

Several theories have been suggested to describe the phonetic-phonological system of EAS (presented in detail in Herrero de Haro (2017b). Amongst many others, there are two recurring theories refuting phonemic *desdoblamiento*: 1) context is needed to perceive deleted /s/ (López Morales 1984); and 2) vowel-harmony (not just word-final vowel opening) needs to be present to identify when /s/ has been deleted (e.g. Contreras Jurado 1975). These two theories refute the phonemic role of *vowel opening* as they reject the idea that open vowels alone maintain the semantic value of underlying /s/. Other claims identified in Section 2, such as whether EAS vowel opening has phonemic value or whether /i/ and /u/ lax in this geolect, have not yet been tested. However, in an effort to clarify what is known about this geolect, I will focus on the role of context and vowel harmony as a first approach to studying EAS perceptually. It is worth noting that, in the revised literature, *vowel doubling* has, mainly, a phonemic dimension, whilst *vowel opening* is usually restricted to phonetic processes.

The present paper is divided in 7 sections. Section 2 includes a brief review of literature on EAS studies and a description of the main arguments against phonemic vowel doubling in EAS, with a stronger focus on the two claims being tested in the perceptual experiments. Section 3 outlines the methodology followed in the study. The results of the experiments are included in Section 4, and a detailed discussion of these is presented in Section 5. The conclusions of the study are presented in Section 6 and, finally, the bibliograhy is presented in Section 7.

2. Previous studies on EAS

As shown in Herrero de Haro (2016, 2017a), both in early EAS studies (e.g. Schuchardt 1881), and in more recent ones (e.g. Kaplan 2012), researchers have focused on speech production, with García Marcos (1987) and O'Neill (2010) being among the few studies dedicated to speech perception in EAS. There are, however, more studies analysing other varieties of Spanish which also exhibit syllable-final /s/ aspiration or

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deletion (e.g., Torreira 2007a, 2007b, 2012 for Western Andalusian Spanish; Hammond 1978 for Miami-Cuban Spanish; and Figueroa 2000 for Puerto Rican Spanish). The conclusions reached for the perception of aspirated or deleted syllable-final /s/ vary across different Spanish geolects: Hammond (1978) did not find any evidence of phonemicisation of vowel quality in Miami-Cuban Spanish; whereas Figueroa (2000) found that vowels were longer preceding underlying /s/ in Puerto Rican Spanish. Terrell (1979) found that Cuban speakers tend to maintain word-final /s/ in the first element of a noun phrase and Torreira (2007b) and Ruch & Harrington (2014) hypothesise that post-aspirated [t] might become the surface representation of underlying /st/ in Western Andalusian Spanish. Finally, Gerfen (2002) and Bishop (2007) believe that, word-medially, a relationship between vowel lengthening, /s/ aspiration, and gemination of /p/, /t/, and /k/ marks underlying /sp/, /st/, and /sk/ in EAS. This, however, does not explain the perceptual value of EAS vowels preceding deleted word-final /s/. López Morales (1983) is the only study which analyses this and he concluded that when /s/ is deleted in EAS, there is either an aspiration, article, numeral, or pronoun which helps carry the functional load of underlying /s/, meaning that vowel opening is a redundant mark of plurality in 97% of cases. Experiment 1 of the present investigation, with isolated words free from contextual information (and aspirations), aims to test if this claim is correct.

All these findings present different solutions to the challenges presented by /s/ aspiration or deletion; however, they all seem to conform to Kiparsky's (1982: 27) distinctiveness condition, " 'there is a tendency for semantically relevant information to be retained in surface structure' across time through functional compensation adjustments in order to protect communicative efficiency" (Hernández-Campoy & Trudgill 2002). Terrell (1979, 1981) considers functional compensation as the core force motivating the strategies which mark underlying /s/ in some varieties of Spanish, "[w]e are, however, not able to rescue a functional explanation for the development of the Murcian 8-vowel system by recasting it as a change of this non-teleological type. Murcian vowel harmony surely arose as a result of a 'remorseless' process which was entirely 'unresponsive to the need to communicate information' " (Hernández-Campoy & Trudgill 2002). However, as the central remit of this paper is to analyse whether

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context and vowel harmony are needed to identify underlying word-final /s/ in EAS, the role of functional compensation in EAS will not be discussed any further.

The most debated characteristic of EAS has been its vowel system. Authors such as Alvar *et al.* (1973: map 1696) defended phonemic vowel doubling as a mechanism to convey the functional load of deleted word-final /s/. Others, such as López Morales (1984) and Martínez Melgar (1986), argued that, even though there is vowel opening in EAS, this is a phonetic feature and EAS speakers cannot distinguish plurals in isolated words. On the other hand, Mondéjar Cumpián (1979), Alarcos Llorach (1958, 1983) and Cerdà Massó (1992) have rejected phonemic vowel doubling in EAS. All these analyses have focused on production, which is useful when describing the phonetic features of EAS, but this presents various issues regarding a phonemic study of EAS.

The phonetic system of a language or geolect can be, and has been, analysed acoustically through the medium of software such as Audacity (Audacity Team 2000) or Praat (Boersma & Weenink 2001). In contrast, the study of phonology presents other challenges. Speakers of a language, or of a geolect in our case, bestow the category of phonemes upon sounds inasmuch as these sounds contrast meaning in the speakers' minds. For example, the characteristics of the tap /ɾ/, pronounced by some speakers of Irish or Welsh English, and of the trill /r/, pronounced by some speakers of Scottish English, have very similar properties to Castilian Spanish /ɾ/ and /r/. Nevertheless, an analysis limited to production will classify both consonants as similar sounds; whilst a perceptual one analysing the perception of a native speaker of English and one of Spanish will show that while /ɾ/ and /r/ are categorised as the same *sound* (allophones of the English phoneme /ɹ/) by English speakers, native speakers of Spanish will recognise /ɾ/ and /r/ as two *different/contrasting sounds* (phonemes). EAS researchers, such as Alonso *et al.* (1950) and Martínez Melgar (1986), have posited different theories regarding the vowel system of EAS but no data from perceptual studies have been used to support claims of phonologisation of certain sounds in EAS.

Mondéjar Cumpián (1979) and Alarcos Llorach (1983) argued that not all EAS vowels belong to the same vowel system because open vowels do not have distinguishing value in all positions where Spanish vowels can appear. For Cerdà Massó (1992), the fact that open vowels are only restricted to word-final position is proof that

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open vowels are not phonemes in EAS. Despite this, Gerfen & Hall (2001), Gerfen (2002), and Bishop (2007) provided evidence that vowel features such as opening and lengthening are also contrastive word-internally, marking contrasts between deleted /s/, /p/, and /k/. According to Gerfen (2002), this distinction is also achieved due to a relationship between consonant and vowel lengthening. These three studies also refute Alarcos Llorach's (1958) and Mondéjar Cumpián's (1979) theories, which claim that *rosca* and *roca* are not distinguished by vowel opening, but by the alteration in the following consonant [ˈrohka/ ˈrokka] vs [roka].

Another argument against phonemic vowel doubling in EAS is the fact that this vowel system would have five or six degrees of openness, which Alarcos Llorach (1958) and Mondéjar Cumpián (1979) considered excessive. Alarcos Llorach (1976 [1965]: 217) explains that the difficulty in maintaining the five degrees of openness in Latin resulted in those five degrees later being reduced to four; this argument has often been used by some scholars (such as Alarcos Llorach 1958 and Mondéjar Cumpián 1979) to show the unlikelihood of phonemic EAS vowel opening. However, García Marcos (1987) and O'Neill (2010) have shown that EAS is a geolect in evolution, so a reduction in the degrees of vowel opening might not have occurred yet, but could happen in the future, once the system has settled and readjustment processes start.

The following two arguments against phonemic EAS vowel doubling are the most relevant for the present study and they will be tested in the perception experiments.

Firstly, López Morales (1984) argues that EAS vowel opening is not a phonemic feature, but a phonetic one; he found that when word-final /s/ is deleted in EAS, numerals, articles, or subject pronouns are used in 97% of cases. Therefore, he considers vowel opening a redundant marker of plurality or of the subject *tú* and rejects the phonemic value of open EAS vowels. Likewise, Contreras Jurado (1975) also believes that EAS speakers need the context in order to distinguish between singular and plural words. The first experiment in the present study will analyse this and EAS speakers will have to identify underlying word-final /s/ in isolated words (without the help of the context, numerals, articles, or subject pronouns).

Secondly, Contreras Jurado (1975) considers that the distinction between words with and without word-final /s/ deletion in EAS is not based on the opposition *non-open*

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vowel phoneme / *open vowel phoneme*, but on an opposition between *word not affected by the prosodeme of openness* and *affected word*. As a result, Contreras Jurado (1975) and Cerdà Massó (1992) consider the vowel system of EAS to be the same as that in Castilian Spanish but with an extra suprasegmental feature. Contreras Jurado (1975) argues that, to distinguish EAS plurals, all vowels in a word, or at least the stressed and final vowel, have to be substituted by an open vowel. He illustrates this with the word *masa* [ˈmasa] 'mass', where both open central vowels need to be substituted by [ạ] to form EAS plural *masas* ['mạsạ] 'masses'. Contreras Jurado (1975), Gómez Asensio (1977), Mondéjar Cumpián (1979) and Cerdà Massó (1992) believe that the altering of various sounds to mark plurality or the subject *tú* means that vowel opening cannot be considered a phonemic feature; they classified vowel opening as a prosodic feature which affects the word globally. However, these theories fail to explain why EAS speakers can distinguish monosyllabic words. Once again, this hypothesis of vowel opening having to operate word-globally in order to convey the semantic load of deleted /s/ has not been tested using perceptual tests. One could argue that these theories could be true for words which only have underlying /s/ word-finally, but the situation is rather different for other words. For example, words with word-internal deleted consonants already have open vowels prior to word-final /s/ deletion (Salvador 1957; Sanders 1998; Hernández-Campoy & Trudgill 2002); therefore, the only contrast regarding vowel opening will be in word-final position (e.g. *carne* [ˈkạn:e] 'meat' vs *carnes* [ˈkạn:ẹ] 'meats'; *cesta* [ˈΘẹt:a] 'basket' vs *cestas* [ˈΘẹt:ạ] 'baskets'). The second experiment will test the perception of this type of contrast, which will clarify if word-global vowel harmony is, in fact, essential to carry the semantic load of underlying word-final /s/.

This paper has been designed to test these last two claims regarding the identification of an underlying /s/ in EAS. Thus, the aim of this paper is to establish whether contextual syntactic features (context, numerals, articles, or subject pronouns) and vowel harmony are essential to identify underlying word-final /s/ in EAS.

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3. Methodology

3.1 Materials

This first experiment analyses the perception of underlying word-final /s/ in EAS words when this is the only deleted consonant (e.g. *casas* 'houses', *tienes* 'you sing. have', etc.) and it was designed to test Hypothesis 1: EAS speakers can identify underlying word-final /s/ without the help of contextual elements. It is worth pointing out that ethical clearance was obtained for every stage of the study from the researcher's institution, the Office of Education in Almería, and for each school involved.

Ninety-seven speakers from Western Almería were recorded during free conversations in December 2013. The recordings captured informal conversations, with an average length of seven minutes, and the topics discussed ensured a relaxed atmosphere (e.g. holidays, hobbies, etc.). Additionally, the researcher undertaking the fieldwork is a native speaker from Western Almería and his local accent helped participants feel at ease using a vernacular EAS accent, as opposed to situations where the locals try to speak with a normative accent to match that of the researcher-observer (e.g. Martínez Melgar 1986). Once the conversations were recorded, these were analysed by the researcher, who chose only items pronounced clearly and which displayed a stereotypical Western Almería accent, such as plural and singular words, verbs in the *tú/él/ella* form (also contrasted by word-final /s/), etc. The author analysed these items perceptually and, when in doubt, Praat (Boersma & Weenink 2001) was used to ensure they contained standard features of EAS (e.g. vowel opening and consonant germination). These items were then copied and pasted onto a different track. The participants also read a list of words and a few items from these readings were taken to complement the experiment with less frequent tokens (e.g. /-u/ vs /-us/). However, a closer analysis of the words extracted from the conversations displayed coarticulatory processes in the first segment of some words, which could help participants identify an underlying /s/. For example, the germination of /p/ in *pistas* ['p:ɪt:ạ] 'tracks/clues' could indicate a preceding plural article *las* [lạ] (Horn (2013) explains this process in detail for Western Andalusian Spanish). As a result, tokens displaying coarticulatory processes which could help participants identify an underlying

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/s/ in a previous article were removed. The tokens taken from free conversations were at the beginning of a phrase, after pause, at the end of a phrase or before pause; thus avoiding lenited consonants or other phonetic elements which could help the participant know whether there was an underlying /s/ (e.g. (*la) gata* [(la) ˈɣata] 'the female cat' or word-initial germination, as previously explained). Where there was a risk of the following segment giving clues about a previous word, the token to be used for the experiment was segmented after the last vowel and no trace of the following sound was left. Likewise, the tokens taken from reading samples had been pronounced as isolated words and were free of coarticulatory effects which could help participants guess whether /s/ had been deleted. Thus, elements which have been identified by López Morales (1984) as carrying the functional load of deleted /s/ (i.e. articles, pronouns, etc.) were not present in the stimulus. Experiment 1 had 50 tokens and it took approximately eight minutes to complete. Tokens 1 to 24, 26, and 38 were taken from informal conversations and the rest were taken from a list of isolated words read by the participants. The tokens for Experiment 1 were pronounced by five speakers from Western Almería. Furthermore, 10 words from this experiment had some background noise or were very quiet, which made it difficult for participants to hear. Participants were told to leave answers blank if they had not been able to distinguish a word clearly; this was done to discourage guessing.

Given the problems with word-initial segments explained above, in Experiment 2 most words were taken from the list of words read by speakers from Western Almería, with only tokens 1 to 4, 6, 7, 9, 28, 35, 36, 48, and 50 being taken from free speech. The tokens for Experiment 2 were pronounced by 10 speakers from Western Almería. Finally, the researcher recorded himself reading numbers 1-50 in a normative Spanish accent. A token was placed after each number so that participants knew which question they were answering at all times (e.g. [número] *uno … casa* [ˈuno ˈkasa] '[number] one … house'; [número] *dos… libros* [dos ˈlị̩ßrǫ̣], '[number] two … books'etc.).

The second experiment had 50 tokens in total (10 with background noise); it took approximately eight minutes to complete and was prepared in exactly the same way as the Experiment 1, although the tokens used were different. For this experiment, the tokens were words with word-internal consonant deletion, (i.e. vowel opening is already

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present in its singular form, as in *fresco* 'fresh' (Salvador (1957) or *tacto* 'touch' (Hernández-Campoy & Trudgill 2002). As vowel opening is not restricted to the vowel preceding /s/ deletion in EAS, /s/ deletion in this geolect is marked by opening all vowels in a word (e.g. Contreras Jurado 1975 and Cerdà Massó 1992). For this reason, Experiment 2 was designed to test the second hypothesis: vowel harmony is not essential for EAS speakers to identify underlying word-final /s/. The experiment analyses whether EAS speakers can perceive word-final /s/ deletion in words such as *pacto* [ˈpạt:o] 'pact' vs *pacto* [ˈpạt:ọ] 'pacts' (/a/ was already open in the singular). The theory which considers vowel harmony essential to perceive /s/ deletion will be refuted if EAS speakers can distinguish between these words without the help of context.

3.2 Procedure

A second research trip to Western Almería took place in June 2014. Initially, it was planned to include participants from a more varied age group, but it proved difficult to gather enough responses from various age groups to obtain meaningful data. The objective was to perform the experiment with as many local speakers as possible, so the decision was made to carry out the perception experiments with only students from local primary and secondary schools; this made it possible to gather multiple answers in a short period of time. The participants were asked to listen to the audio and choose the word that they had heard in each case. An answer sheet was given for Experiment 1 (Appendix 1) and for Experiment 2 (Appendix 2). Respondents had to include their gender, age, and hometown. The participants were asked to give further explanations if they had not lived in the same town since they were four years of age and, to ensure that all participants were native speakers of EAS, answers from respondents who had not lived in Western Almería since the age of four were discarded.

The participating schools were a primary and secondary school in El Ejido and a secondary school in Adra (26 km west from El Ejido, bordering the province of Granada).

The respondents were asked to choose an answer only when they were confident that it was correct. Likewise, they were asked to leave questions blank if they had not heard a sound correctly due to classroom noise, poor quality of the recording, etc.. In

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hindsight, this presents a limitation as the experiment does not record whether a blank answer is due to not being able to differentiate words or whether it is due to not having heard a token properly, (e.g. a classmate coughing). This will be avoided in future work by including an option for each of those cases but, in order to minimise that limitation in the present study, a percentage will be calculated including blank answers as errors and another one not including blank answers in the count. As shown in Herrero de Haro (2016), even Spanish phonemes essential in oral communication, such as /e/ and /i/, are not necessarily distinguished accurately in 100% of cases. As such, counting blank answers as errors in the identification of underlying /s/ will impact negatively on the overall percentage of accuracy; however, it will make the results of this study more difficult to refute if even despite this, a statistical analysis shows that underlying /s/ is being identified accurately. It is also worth noting that some of the tokens were very difficult to discern due to background noise, low volume, etc. (as they were taken from free conversations). This was done to discourage guessing; the fact that respondents left the answers blank instead of guessing should therefore be taken as confirmation of the reliability of the data collected.

4. Results

The results for both experiments are included below and will be discussed in detail in § 5.

4.1 Results from Experiment 1

As previously stated, the first experiment was designed to test whether EAS speakers can identify underlying word-final /s/ without the help of contextual elements when /s/ is the only neutralised consonant in the word (e.g. *libros* [ˈlit̪βɾo̪] ‘books’, *sabes* [ˈsa̪βe̪] ‘you sing. Know’).

The experiment was completed by three groups of students from a secondary school in El Ejido: Group 1 comprised 12 male and 10 female speakers between the ages

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of 14 and 16; Group 2 comprised 16 males and 13 females between the ages of 14 and 15; and Group 3 comprised 12 male and 18 female speakers between the ages of 13 and 14. Group 1 performed the experiment using an individual MP3 player per student, while the other two groups listened to the stimuli using the interactive board's speakers. It is accepted that it would have been better if all groups had listened to the stimuli in exactly the same way but, regretfully, the MP3 players were not available when groups 2 and 3 were tested. This, however, had no effect on perception performance. The table below shows perception data for Experiment 1 (throughout this paper, p-values have been obtained through chi-square tests and the baseline p-value for determining statistical significance is 0.05).

	14-16 years old from El Ejido	**14-15 years old from El Ejido**	**13-14 years old from El Ejido**	**All groups**
Total answers	1100	1450	1500	4050
EAS singular (correct/all correct)	487/660=73.78%**	614/870=70.57%**	605/900=67.22%**	1706/2430=70.20%**
EAS plural (correct/all correct)	293/440=66.59%**	365/580=62.93%	327/600=54.5%*	985/1620=60.80%**
Aggregated correct /aggregated all correct	780/1100=70.90%**	979/1450=67.51%**	932/1500=62.13%**	2691/4050=66.44%**
Blank answers: EAS singular	14 (2.12%)	67 (7.7%)	123 (19.12%)	204 (8.4%)
Blank answers: EAS plural	6 (1.36%)	56 (9.65%)	94 (15.66%)	156 (9.63%)
Total blank answers	20 (1.82%)	123 (8.49%)	217 (14.46%)	360 (8.88%)
EAS singular (correct/all correct-blank answers)	487/646=75.38%**	614/803=76.46%**	605/777/=77.86%**	1706/2226=76.63%**
EAS plural (correct/all correct-blank answers)	293/434=67.51%**	365/524=69.65%**	327/506=64.62%**	985/1464=67.28%**
Aggregated correct/all correct -blank answers)	780/1080=72.22%**	979/1327=73.77%**	932/1283=72.64%**	2691/3690=72.92%**

* p-value < 0.05 ** p-value <0.0001

Table 1. Results from Experiment 1

The data above are also presented in the graphs below to facilitate its interpretation.

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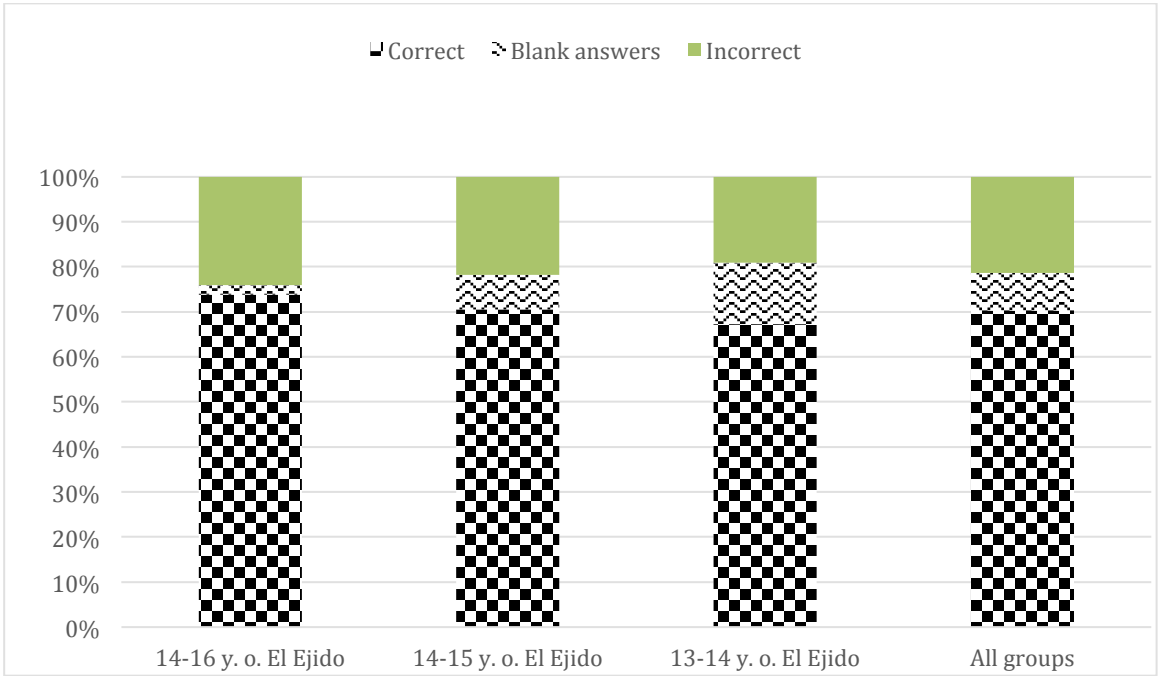


Figure 1. Perception results for EAS singular

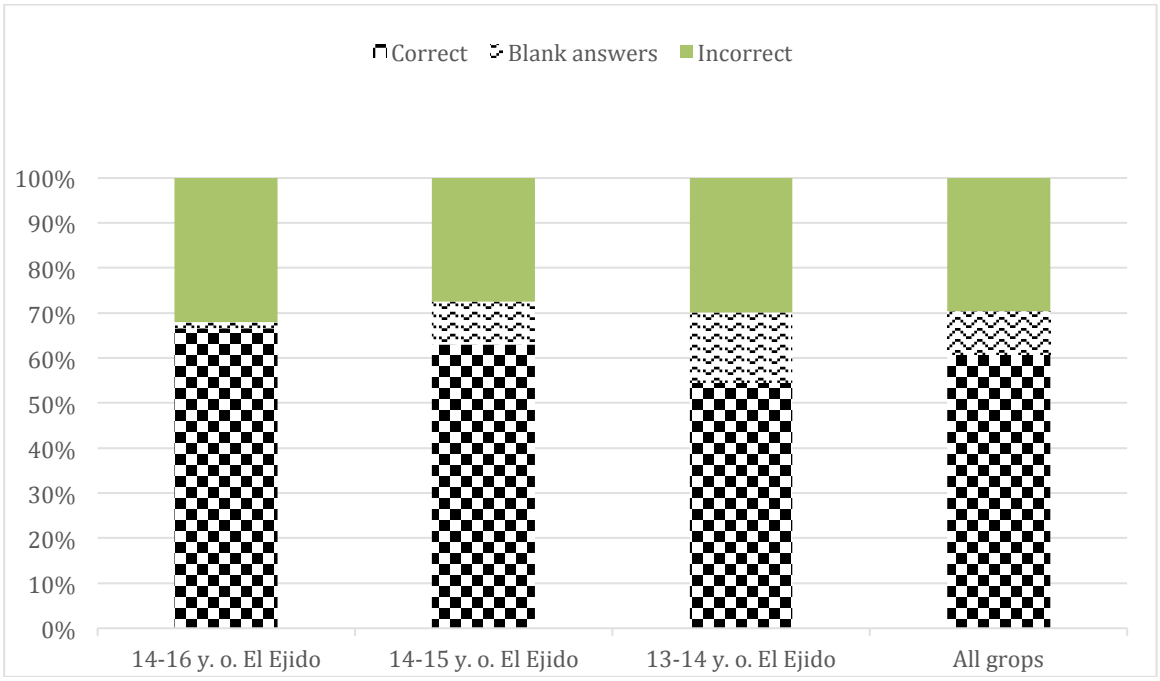


Figure 2. Perception results for EAS plural

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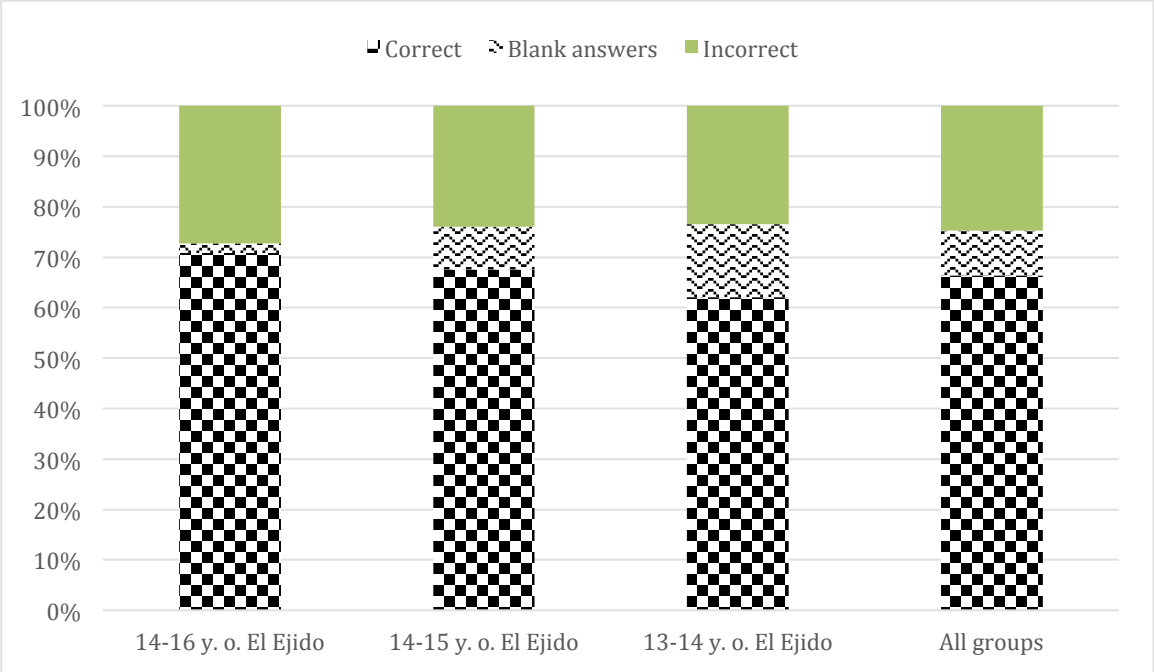


Figure 3. Perception results for EAS singular and plural

The three groups who completed this experiment were secondary school students from El Ejido and the results are presented per group and then aggregated. *EAS singular* are the answers obtained when testing items which do not have final /s/ deletion (e.g. *choza* 'hut' or *ve* 'he/she sees'). *EAS plural* are the answers obtained when testing items whose final /s/ has been deleted. As explained in the introduction, *Andalusian plurals* (Contreras Jurado 1975), include all words with an underlying final /s/ (e.g. *libros* 'books' or *ves* 'you sing. see'). The absence of word-final /s/ marks more contrast than just *singular* vs. *plural* but *EAS plural*/*Andalusian plurals* will be used at times for the clarity of the argument. *Correct/all correct* refers to how many items, out of all the possible correct answers, were identified correctly (i.e. blank answers are counted as incorrect answers here). *Aggregated* is the sum of the results obtained for EAS singulars and plurals. *Blank answers* is the amount of times that participants did not decide whether a token had final /s/ deletion (respondents were asked to leave questions blanks if they were not sure of the right answer or if they could not hear a token properly). Finally, *all correct-blank answers* are the amount of possible correct answers out of all the answers submitted (e.g. if 20 students do the test and 2 enter blank answers, then the amount of *all correct-blank answers* will be 18).

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As shown in Table 1, a chi-square test (p-value <0.0001) suggests that EAS speakers can identify underlying word-final /s/ without the help of any contextual information when word-final /s/ has been deleted. A detailed analysis of the data is provided in § 5.1.

It was decided to analyse whether the identification of a deleted /s/ varied across different grammatical categories. However, this analysis should be taken more as anecdotal data rather than as concrete evidence; a discrepancy between the amount of tokens used from different grammatical categories will not yield definite statistical data.

This analysis shows a much lower percentage of correct identification for adjectives and adverbs; however, these results must be taken with caution. Out of the 50 tokens used for Experiment 1, only one was a direct object pronoun, while 26 were nouns; this discrepancy does not allow us to achieve any definite results, but it is useful to observe these differences. Nevertheless, the important fact is to notice that underlying /s/ is correctly identified in all grammatical categories. For readers who might find it useful, a table and a figure containing more specific data on this analysis have been included in Appendix 3 and 4.

4.2 Results from Experiment 2

This experiment was also designed to ascertain whether EAS speakers can identify underlying word-final /s/ without any contextual information (e.g. articles, numerals, etc.). More specifically, this experiment tests whether vowel harmony is essential for EAS speakers to identify underlying word-final /s/. As explained in §3.1, word-final /s/ was not the only deleted consonant in the words used in this experiment, unlike Experiment 1. For example, in EAS, /ɾ/ is deleted in the singular form of the word *carne* [ˈkn̥:e] ‘meat’, consequently, this word in plural *carnes* [ˈkn̥:e̥] ‘meats’ has two deleted consonants, word-internal /ɾ/ and word-final /s/. Contreras Jurado (1975), Gómez Asensio (1977), Mondéjar Cumpián (1979), and Cerdà Massó (1992), amongst others, argue that EAS open vowels, caused by /s/ deletion, cannot be phonemes because all vowels in the word have to be open to mark plurals. There was already vowel opening prior to word-final /s/ deletion in the words used in this experiment, which will show

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whether EAS speakers can identify underlying word-final /s/. Experiment 2 was completed by three groups: Group 1 was formed of 12 male and 10 female speakers between 14 and 16 years of age from El Ejido; Group 2 comprised of 13 males and of 14 females between 12 and 14 years of age from Adra; and Group 3 was formed of 14 male and 9 female speakers between 11 and 13 years of age from El Ejido. Once again, Group 1 was the only group who performed the experiment using an individual MP3 player per student. The table below shows the results for Experiment 2.

	14-16 years old from El Ejido	**12-14 years old from Adra**	**11-13 years old from El Ejido**	**All groups**
Total answers	1100	1350	1150	3600
EAS singular (correct/all correct)	566/726=77.96%**	752/891=84.39%**	634/759=83.53%**	1952/2376=82.15%**
EAS plural (correct/all correct)	273/374=72.99%**	332/459=72.33%**	263/391=67.26%**	868/1224=70.91 %**
Aggregated (correct /aggregated all correct)	839/1100=76.27%**	1084/1350=80.29%**	897/1150=78%**	2820/3600=78.33%**
Blank answers: EAS singular	40 (5.51%)	9 (1.01%)	44 (5.8%)	93 (3.91%)
Blank answers: EAS plural	25 (6.68%)	7 (1.53%)	39 (9.97%)	71 (5.8%)
Total blank answers	65 (5.91%)	16 (1.19%)	83 (7.22%)	164 (4.55%)
EAS singular (correct/all correct-blank answers)	566/686=82.5%**	752/882=85.26%**	634/715=88.67%**	1952/2283=85.5%**
EAS plural (correct/all correct-blank answers)	273/349=78.22%**	332/452=73.45%**	263/352=74.71%**	868/1153=75.28%**
Aggregated (correct/all correct -blank answers)	839/1035=81.06%**	1084/1334=81.25%**	897/1067=84.06%**	2820/3436=82.07%**

* p-value < 0.05 ** p-value <0.0001

Table 2. Results from Experiment 2

The results from Table 2 have also been represented in the graphs below.

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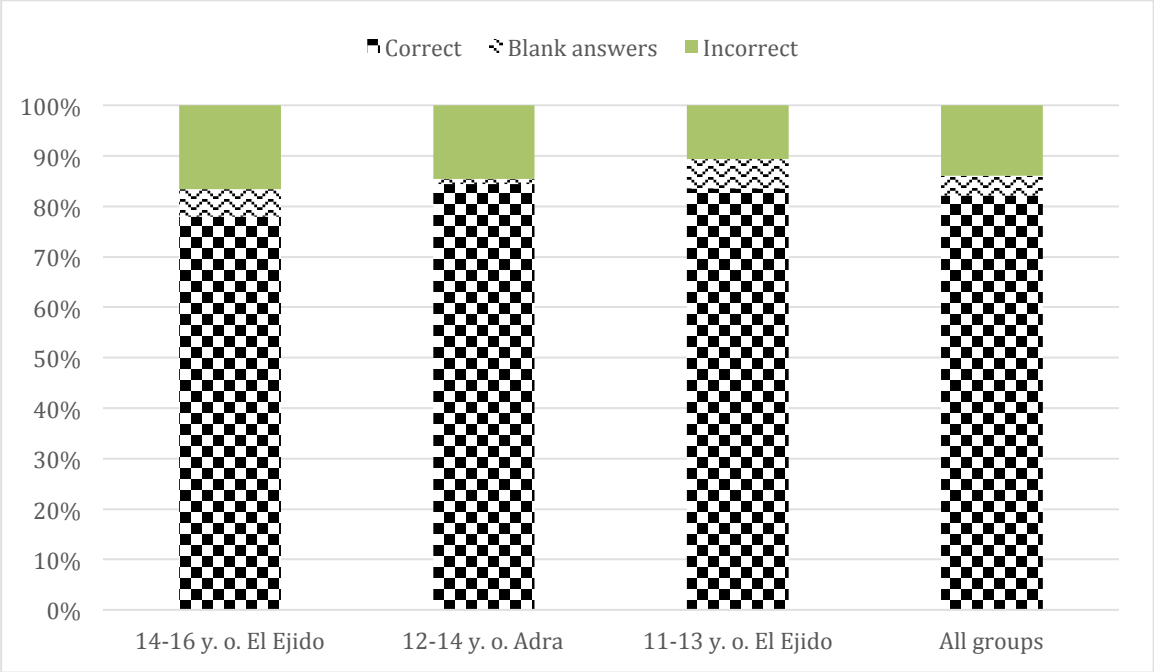


Figure 4. Perception results for EAS singular words with word-medial deleted consonant

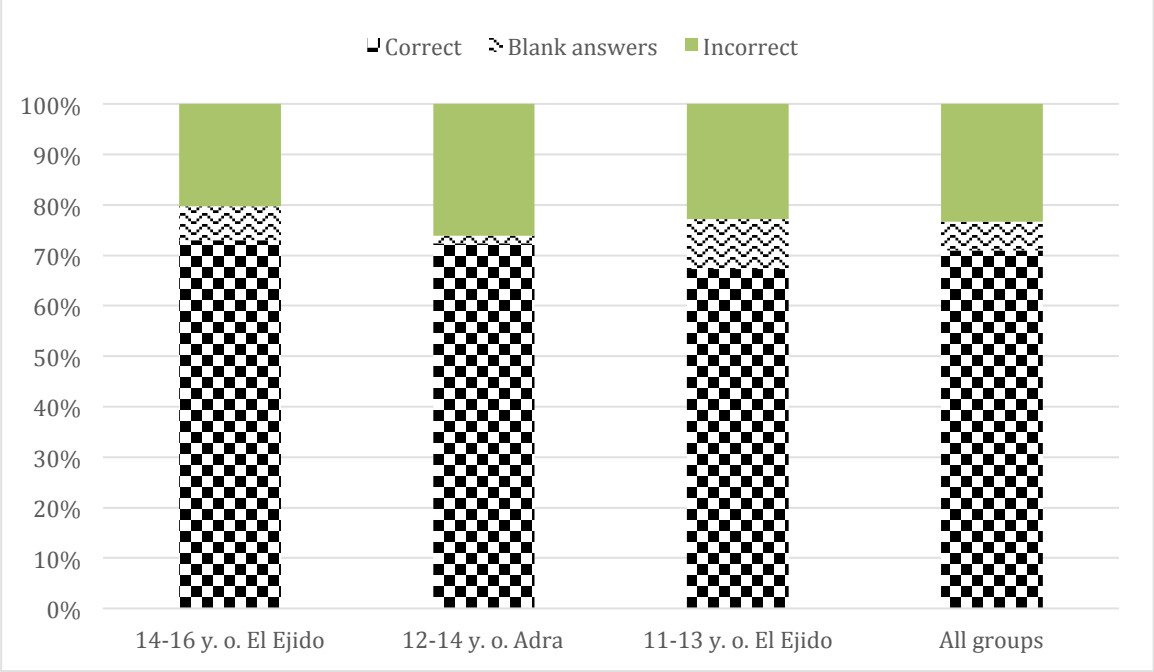


Figure 5. Perception results for EAS plural words with word-medial deleted consonant

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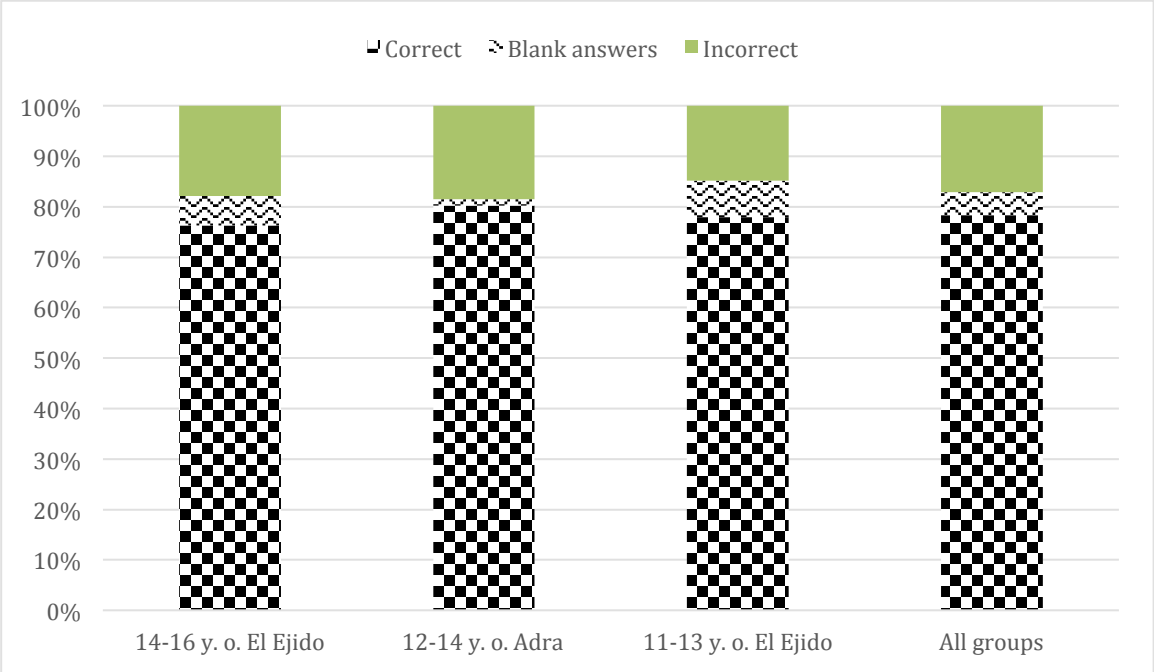


Figure 6. Perception results for EAS singular and plural words with word-medial deleted consonant

Once again, chi-square tests (p-value <0.0001) suggest that EAS speakers can identify underlying word-final /s/. This correct identification has been made without the help of contextual information or vowel harmony (word-internal vowel opening was already present prior to word-final /s/ deletion). These results are analysed in detail in § 5.2.

It was decided to also include an analysis for the rate of correct identification of an underlying /s/ across different grammatical categories for Experiment 2. However, it is important to remember once again that a discrepancy between the number of tokens used from different grammatical categories does not allow for definite conclusions. There are no major discrepancies between the percentages of correct identification of word-final /s/ deletion in different grammatical categories; however, one limitation of these results is the large imbalance between the amount of tokens from each grammatical category (e.g. 2 tokens were adjectives whereas 35 tokens were nouns). However, it is important to note that the correct identification of underlying word-final /s/ happens in all grammatical categories. Exact figures for this analysis can be found in Appendix 5 and 6.

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5. Discussion

Experiment 1 and Experiment 2 test the perception of underlying word-final /s/ deletion in EAS but each examines words with different structures in order to test two different hypotheses. Thus, the results for these experiments will be discussed in different sections.

5.1 Discussion of results: Experiment 1

Experiment 1 focuses on pairs of words in which the only deleted consonant is word-final /s/. The experiment contained 4050 tokens, of which 2691 were correctly identified (66.44%). Out of the 4050 tokens, 2430 were *Andalusian singulars* and 1620 were *Andalusian plurals*. However, 10 words in this experiment had some background noise or were very quiet, which made them difficult for participants to hear. These tokens were included to make sure that participants did not simply guess an answer. If we ignore the blank answers received, the final amount of available tokens was 3690, which brings the percentage of correctly identified tokens up to 72.92%.

The correct identification of 2691 words (72.92%) has a p-value below 0.0001, which means that this result is extremely statistically significant. It is noteworthy that counting blank answers as mistakes will reduce the percentage of accurate discrimination down to 66.44%. However, the p-value in this case is still below 0.0001. In fact, although there tends to be a difference of around 10% in accuracy depending on whether or not we count blank answers as errors, an analysis shows that in all cases the p-value is below 0.0001 except in the results of 13- to 14-year-olds from El Ejido for *Andalusian singulars*; in this case, the accuracy rate is 54.4% and the p-value is 0.0275, though this is still statistically significant.

Andalusian singulars were identified correctly in 76.63% of cases (70.20% if we count blank answers as errors); *Andalusian plurals* were correctly identified in 67.28% of cases (60.8% if we count blank answers as errors). Both rates of accuracy are statistically significant with a p-value below 0.0001 in both cases.

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In all instances, tokens have been presented in isolation with no contextual information. The words used belonged to different grammatical categories and were removed from different sections of free conversations or reading samples, meaning that the identification of EAS words contrasted by final /s/ deletion does not rely on contextual information (syntactic information, numerals, etc.). Likewise, this distinction is not linked to a specific type of grammatical category.

5.2 Discussion of results: Experiment 2

In this experiment, there is word-internal deletion in all words, which causes vowel opening word-internally. This means that, unlike the previous experiment, word-internal vowel opening is not due to final /s/ deletion (vowel harmony), but to the deletion of other consonants (e.g. the singular word *cesta* [ˈθe̞t:a] 'basket' already has word-internal vowel opening in the singular and it contrasts with its plural, *cesta* [ˈθe̞t:a̞] 'baskets', due to vowel opening word-finally). Therefore, if these words can be distinguished, this distinction cannot be attributed to word-wide vowel harmony.

This experiment analysed 3600 tokens, of which 2820 were identified correctly (78.33%). Out the 3600 tokens, 2376 were *Andalusian singulars* and 1224 *Andalusian plurals*. As explained in § 3.2 and 4.1, 10 of the words included in the experiment had some background noise or were intentionally considerably lower in volume than other words. This made identification much more difficult for these tokens and discouraged guessing. Participants entered a total of 164 blank answers, making the total number of answers submitted 3436. If we calculate the accuracy rate based on this, the percentage of tokens identified correctly increases to 82.07%.

The aggregated results show a total of 2820 items correctly identified (82.07%), which has a p-value below 0.0001, meaning that this amount of correct answers is extremely statistically significant. If we counted blank answers as errors, the percentage of correct answers would decrease to (78.33%), but this still shows a p-value under 0.0001. Whether we discard blank answers or count them as errors makes a difference in the rate of accurate identification of around 5%, although despite this, p-values always remain under 0.0001.

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Andalusian singular words were correctly identified at a rate of 85.5% (82.15% if we count blank answers as errors), whilst *Andalusian plurals* had a correct rate of identification of 75.28% (70.91% if we count blank answers as errors). Despite this difference, both rates of accuracy present a p-value <0.0001.

These results indicate that EAS speakers can identify underlying word-final /s/ even when there are other open vowels word-internally prior to /s/ being deleted. As in Experiment 1, all these tokens have been presented in isolation and participants have not been able to use contextual information to identify tokens correctly (articles, numerals, etc.). Likewise, the tokens belonged to a range of syntactic elements, meaning that this distinction is not restricted to a particular grammatical category. Furthermore, the correct distinction of words which had deleted consonants word-internally (thus open vowels) indicates that, in contrast to what Contreras Jurado (1975), Mondéjar Cumpián (1979) and Cerdà Massó (1992) posited, vowel harmony is not an essential element in the correct identification of underlying word-final /s/. The data obtained from this experiment suggest, but they do not demonstrate, that the essential element in identification is vowel quality word-finally.

Herrero de Haro (2016, 2017a) argued that EAS speakers use differences in vowel quality to identify the correct vowel, or rather, to identify which consonant has been deleted, if any. However, at this point, it cannot be discarded that the perception of deleted /s/ is due to suprasegmental elements not yet identified. I defend vowel quality as the distinguishing feature, as the analyses carried out in Herrero de Haro (2016, 2017a) show a regular pattern of variation of F1 and F2 in vowels preceding underlying /s/. However, the importance of suprasegmental features cannot yet be ruled out. Further research is needed to identify the distinguishing feature in operation.

5.3 General discussion of data obtained

It is assumed by some researchers (e.g. Zubizarreta 1979; Sanders 1998; Jiménez & Lloret 2007; and Lloret & Jiménez 2009), that the type of word-internal vowel opening present in Experiment 1 is caused by vowel harmony. In contrast, the type of word-internal vowel opening in Experiment 2 is caused by word-internal consonant deletion in

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EAS. As a result, words with word-final /s/ deletion are the only ones with word-internal vowel opening in Experiment 1, whilst all words in Experiment 2 have word-internal vowel opening due to coda deletion (Salvador 1957; Sanders 1998; Hernández-Campoy & Trudgill 2002). Kaplan (2012) explained that the perception of a feature is increased by repeating the feature as many times as possible. As such, one would expect tokens in Experiment 1 to be easier to distinguish than those in Experiment 2, as vowel harmony reflecting word-final deletion is a feature present word-wide.

The overall accuracy rate for Experiment 1 was 72.92% (66.44% if we count blank answers as errors), while Experiment 2 had an accuracy rate of 82.07% (78.33% if we count blank answers as errors). The difference between both is 9.15% (11.89% if we count blank answers as errors). The p-value of a two-tailed t-test for that difference has a value of 0.0218. This is statistically significant and confirms that, as opposed to what it was expected, EAS words contrasted by the deletion of word-final /s/ are not easier to distinguish when word-wide vowel opening (vowel harmony) is a result of word-final /s/ deletion. It could be argued that 72.92% and 82.07% accuracy rates in these experiments are not indicative of accurate identification of /s/ in EAS; however, chi-squared tests suggest they are.

Following the recommendations of one of the reviewers, it was decided to investigate whether there was any correlation between the percentage of correct and incorrect identification of underlying /s/ and lexical frequency. Tokens which had been identified correctly at a rate of 90% or higher and tokens which had been identified incorrectly at a rate of 50% or lower were analysed against the *Corpus de Referencia del Español Actual* (Real Academia de la Lengua Española 2000). The assumption was that if there was, in fact, any correlation between lexical frequency and correct identification, then the token correctly identified by the participants in those cases should be more frequent than the option which they did not choose (for example, if *casa* 'house' is more common in Spanish than *casas* 'houses' and participants chose *casa* in most cases, it could be argued that participants were basing their answers not [only] on perceptual cues, but [also] on lexical frequency). The same could be said if incorrectly chosen tokens were less frequent than the correct ones which participants did not choose. As shown in Appendix 7, there is no correlation between these two assumptions and the

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correct identification of tokens in Experiment 1. Likewise, in Appendix 8 we can see that, in fact, three out of the four tokens identified under the 50% threshold in Experiment 2 were more frequent than the options which the participants did not choose. The only correlation between lexical frequency and correct or incorrect identification of items can be found in Experiment 2: in 15 out of the 17 cases in which the correct answer had been identified correctly at a rate of 90% or higher the correct answer was also the most frequent word in Spanish. Nevertheless, this type of correlation does not occur in Experiment 1 or explain the items identified incorrectly below chance level for Experiment 2; if this correlation was meaningful, it would have an effect in the other cases as well. Thus, there is no basis to assume that the correct identification of tokens in Experiment 2 is linked to lexical frequency.

5.4 Implication of the results

Supporters of EAS vowel doubling, such as Alvar (1955) and Salvador (1957), categorised vowel opening as a phonological feature due to its role in contrasting EAS words. In contrast, detractors of vowel opening consider it a phonetic feature with no phonological relevance. Both positions have been justified in different ways and explained in Herrero de Haro (2017b).

As explained in Herrero de Haro (2017b), supporters of vowel doubling based their view on the fact that vowel opening is the distinguishing feature in words such as *le* [le] ‘to him/her’ and *les* [le̞] ‘to them’. Studies such as Martínez Melgar (1994) and Sanders (1998) showed clear vowel opening following /s/ deletion through their acoustic analyses. Vowel opening contrasts vowels word-finally and, as such, is phonologically relevant. Thus, vowel opening causes the vowel system to increase from a system of five vowels to one of eight (Navarro Tomás 1938, 1939); Alonso *et al.* 1950); one of nine (Salvador 1977); or even one of 10 vowels (Alvar 1955; Salvador 1957 and Peñalver Castillo 2006).

As explained in § 2, detractors of vowel doubling have presented clear arguments to support their view. The present paper focuses on studying these two:

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1. Vowel opening exists; however, it is a phonetic feature, not a phonological one, and contextual elements are needed to perceive deleted /s/ (Contreras Jurado 1975; and López Morales 1984). According to authors who support this position, the distinction between words like *le* and *les* does not lie in the opening of the vowel, but in other syntactic elements included in the speech (articles, numerals, etc.). This means that this feature cannot be considered a phonological one; thus they do not think that EAS open vowels have phonological value.

2. Vowel-harmony (not just word-final vowel opening) needs to be present to perceive when /s/ has been deleted (Contreras Jurado 1975). Vowel harmony means that vowels in the stressed syllable and all other vowels thereafter open as a result of word-final /s/ deletion (different authors argue about which vowels are affected by vowel harmony, and this controversy is explained in Herrero de Haro (2017b). Consequently, vowel opening cannot be considered a phonological feature as it affects more than one vowel in the word and it is not segment-specific (Cerdà Massó 1992), meaning that this feature operates like a prosodeme (Contreras Jurado 1975).

The experiments in the present study have analysed both of these claims and the results obtained present evidence which contradicts them:

1. In Experiment 1 the participants listened to a series of words contrasted by deleted word-final /s/. These words were played with no contextual information whatsoever but EAS speakers could still identify words correctly in 72.92% of cases (66.44% if we count blank answers as errors). A p-value analysis shows that the correct identification of these words is highly statistically significant, indicating that EAS speakers can identify underlying word-final /s/ without the help of context, numerals, articles or other elements proposed by López Morales (1984). These results confirm Hypothesis 1: EAS speakers can identify underlying word-final /s/ without the help of contextual elements.

2. The test in Experiment 2 contains words with deleted word-internal consonants. These deletions cause vowel opening in the preceding vowels (Salvador 1957; and Hernández-Campoy & Trudgill 2002). These open vowels remain open following word-final /s/ deletion and, as such, word-internal vowel opening (as a result of vowel harmony) does not differ here between words with or without underlying

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word-final /s/. Thus, vowel harmony cannot be considered to be carrying the semantic load of deleted /s/. As a result, vowel harmony cannot be considered the feature which distinguishes words with or without underlying word-final /s/. Likewise, the fact that monosyllabic words are identified correctly in 77.58% of cases (74.77% if we count blanks as errors) in Experiment 1 also indicates that vowel harmony is not responsible for distinguishing words with and without word-final /s/ deletion (vowel harmony does not affect monosyllabic words). Thus, Experiment 2 confirms Hypothesis 2: vowel harmony is not essential for EAS speakers to identify underlying word-final /s/.

These experiments cannot demonstrate the phonological status of EAS laxed vowels, but they do demonstrate that EAS speakers can identify an underlying word-final /s/ without the aid of context or vowel harmony. This suggests that there is, indeed, a process of phonologisation in EAS. However, it is not possible to ascertain at this stage which feature has been phonologised (vowel opening, vowel length, an undetected suprasegmental feature, etc.). Finally, this phonologisation process indicates that Kiparsky's (1982: 27) *distinctiveness condition* is in operation in EAS: "there is a tendency for semantically relevant information to be retained in surface structure". However, how this information is retained in the surface structure is still unknown for EAS.

6. Conclusion

The present article has analysed the perception of words with and without underlying word-final /s/ in EAS. As explained in Herrero de Haro (2016, 2017a, 2017b), research on EAS has focused on production rather than perception. As such, claims on the effect of syllable-final consonant deletion on the EAS phonological system have been based on theoretical principles rather than on empirical evidence. The present article offers the first attempt to solve this, and studying EAS from a perceptual point of view can help establish whether some of the posited theories are correct.

In Experiment 1, the participants distinguished EAS singulars and plurals correctly in 72.92% of cases and the reported p-value for this result was below 0.0001, which

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according to conventional criteria is *extremely statistically significant*. Thus, it can be concluded that EAS speakers can identify underlying word-final /s/ without the help of context, numerals, or articles. This challenges what López Morales (1984) posited.

Zubizarreta (1979), Sanders (1998), Jiménez & Lloret (2007), and Lloret & Jiménez (2009), amongst many others, described how vowel harmony in EAS results in word-internal vowel opening following word-final /s/ deletion. Contreras Jurado (1975), Gómez Asensio (1977), Mondéjar Cumpián (1979), and Cerdà Massó (1992) claim that vowel harmony is essential for EAS speakers to identify an underlying word-final /s/; this is the strong basis of their arguments to reject word-final vowel opening as a phonemic feature. Experiment 2 was designed to test this. Words with word-internal syllable-final consonant deletion were chosen; thus only including examples with word-internal vowel opening even when no word-final /s/ had been deleted. EAS speakers distinguished words with and without word-final /s/ deletion in 82.07% of cases, and a p-value analysis showed that this degree of accuracy is *extremely statistically significant*. Tokens with and without an underlying word-final /s/ had vowel opening word-internally, which indicates that vowel harmony does not carry the semantic value of deleted word-final /s/. This contradicts the position defended by Contreras Jurado (1975), Gómez Asensio (1977), Mondéjar Cumpián (1979), and Cerdà Massó (1992). Likewise, the tokens used in both experiments belong to different grammatical categories and were cut from different parts of free conversations and reading samples. A limited analysis of the degree of accuracy identifying underlying /s/ in different grammatical categories does not allow for conclusive data on whether some categories are better identified than others; however, it can be asserted that underlying word-final /s/ identification is not limited to any grammatical category. Likewise, correct or incorrect identification of underlying /s/ is not based on lexical frequency.

In summary, it can be concluded that EAS speakers can identify underlying word-final /s/ without contextual help and that vowel harmony does not carry the semantic value of deleted word-final /s/. However, at this stage, it is not yet possible to ascertain whether it is word-final vowel opening which helps EAS speakers identify an underlying /s/, or if there are any undetected suprasegmental elements involved. Further research is required to investigate this.

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Appendix 1

Hoja de respuestas. Experimento 1

Datos personales: Hombre Mujer
Edad: _____
¿En qué pueblo vives? _____
Si no has vivido en ese pueblo **desde que tienes 4 años**, di en qué pueblo vivías antes y cuánto tiempo llevas en el pueblo en el que vives ahora:
_____
_____

Señala con un círculo la respuesta correcta. Si cometes un error, tacha la respuesta incorrecta y señala con un círculo la respuesta correcta.

1	Adquisitivo	Adquisitivos
2	Residencia allí	Redisencias allí
3	Casa	Casas
4	Más barata	Más baratas
5	Casa	Casas
6	Embarcadero	Embarcaderos
7	Sale	Sales
8	Pela	Pelas
9	Acento	Acentos
10	Muralla	Murallas
11	Mundo	Mundos
12	Catalana	Catalanas
13	Próximo	Próximos
14	Pela	Pelas
15	Político	Politicos
16	Parado	Parados
17	Tío	Tíos
18	Planeta	Planetas
19	Libro	Libros
20	Larga	Largas
21	Ejército	Ejércitos
22	Separado	Separados
23	Palabra	Palabras
24	E	Es
25	E	Es

Hoja de respuestas. Experimento 1

26	No	Nos
27	Habla	Hablas
28	Bebe	Bebes
29	Escribí	Escribís
30	*Pu*	Pus
31	Pulso	Pulsos
32	Curso	Cursos
33	Ante	Antes
34	Ente	Entes
35	Punto	Puntos
36	Ve	Ves
37	A	Has
38	Dinero	Dineros
39	O	Os
40	Mi	Mis
41	Lo	Los
42	Tu	Tus
43	Ve	Ves
44	Mi	Mis
45	Ente	Entes
46	O	Os
47	Nieto	Nietos
48	Choza	Chozas
49	Arco	Arcos
50	Bulto	Bultos

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Appendix 2

Hoja de respuestas. Experimento 2

Datos personales: Hombre Mujer
Edad: _____
¿En qué pueblo vives? _____
Si no has vivido en ese pueblo **desde que tienes 4 años**, di en qué pueblo vivías antes y cuánto tiempo llevas en el pueblo en el que vives ahora:

_____
_____

Señala con un círculo la respuesta correcta. Si cometes un error, tacha la respuesta incorrecta y señala con un círculo la respuesta correcta.

1	Australiano	Australianos
2	Ministro	Ministros
3	Independentista	Independentistas
4	Pesca	Pescas
5	Coste	Costes
6	Tenista	Tenistas
7	Esto	Estos
8	Casco	Cascos
9	Independentista	Independentistas
10	Acto	Actos
11	Espejo	Espejos
12	Bosque	Bosques
13	Texto	Textos
14	Esta	Estas
15	Pista	Pistas
16	Poste	Postes
17	Susto	Sustos
18	Susto	Sustos
19	Fabricarla	Fabricarlas
20	Acto	Actos
21	Asno	Asnos
22	Isla	Islas
23	Espejo	Espejos
24	Bebedlo	Bebedlos
25	Pacto	Pactos

Hoja de respuestas. Experimento 2

26	Texto	Textos
27	Picnic	Picnics
28	Desvela	Desvelas
29	Apta	Aptas
30	Etnografía	Etnografías
31	Bosque	Bosques
32	Susto	Sustos
33	Texto	Textos
34	Comerlo	Comerlos
35	Moleste	Molestes
36	Esta	Estas
37	Escribirlos	Escribidlos
38	Cumplidlo	Cumplidlos
39	Óptimo	Óptimos
40	Casta	Castas
41	Susto	Sustos
42	Pista	Pistas
43	Pista	Pistas
44	Carne	Carnes
45	Texto	Textos
46	Acta	Actas
47	Esta	Estas
48	Esto	Estos
49	Gasta	Gastas
50	Chasco	Chascos

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Appendix 3

Experiment 1				
Grammatical category	**Tokens used in the experiment**	**Correct identifications**	**Total amount of tokens**	**Percentage of correct identifications**
Adjective	5	169	405	41.72%
Adverb	3	115	243	47.3%
Conjunction	3	229	243	94.24%
Direct object pronoun	1	69	81	85.19%
Noun	26	1422	2106	67.52%
Possessive pronoun	3	140	243	57.61%
Preposition	2	136	162	83.95%
Verb	7	411	567	72.49
Total	50	2691	4050	68.75%

Table 3. Breakdown of tokens used and of percentage of correct identification of underlying word-final /s/ by grammatical category

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Appendix 4

Differences regarding the percentage of accurate identification of deleted word-final /s/ are easier to appreciate in the following graph

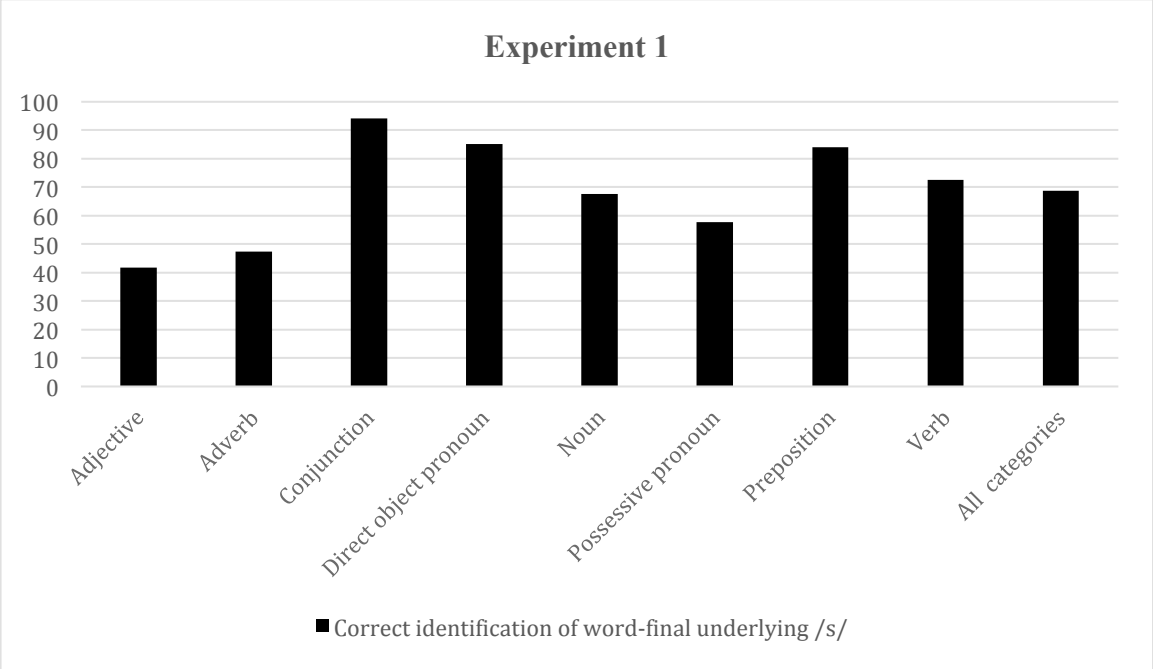


Figure 7. Correct identification of underlying /s/ by grammatical category

Appendix 5

Experiment 2				
Grammatical category	**Tokens used in the experiment**	**Correct identifications**	**Total amount of tokens**	**Percentage of correct identifications**
Adjective	2	107	144	74.3%
Demonstrative pronoun	5	315	360	87.5%
Noun	35	1979	2520	78.53%
Verb	8	419	576	72.24%
Total	50	2820	3600	78.33%

Table 4. Breakdown of tokens used and of percentage of correct identification of underlying word-final /s/ by grammatical category in words with word-medial consonant deletion

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Appendix 6

Correct identification of underlying word-final /s/ in words with word-medial deleted consonant for different grammatical categories

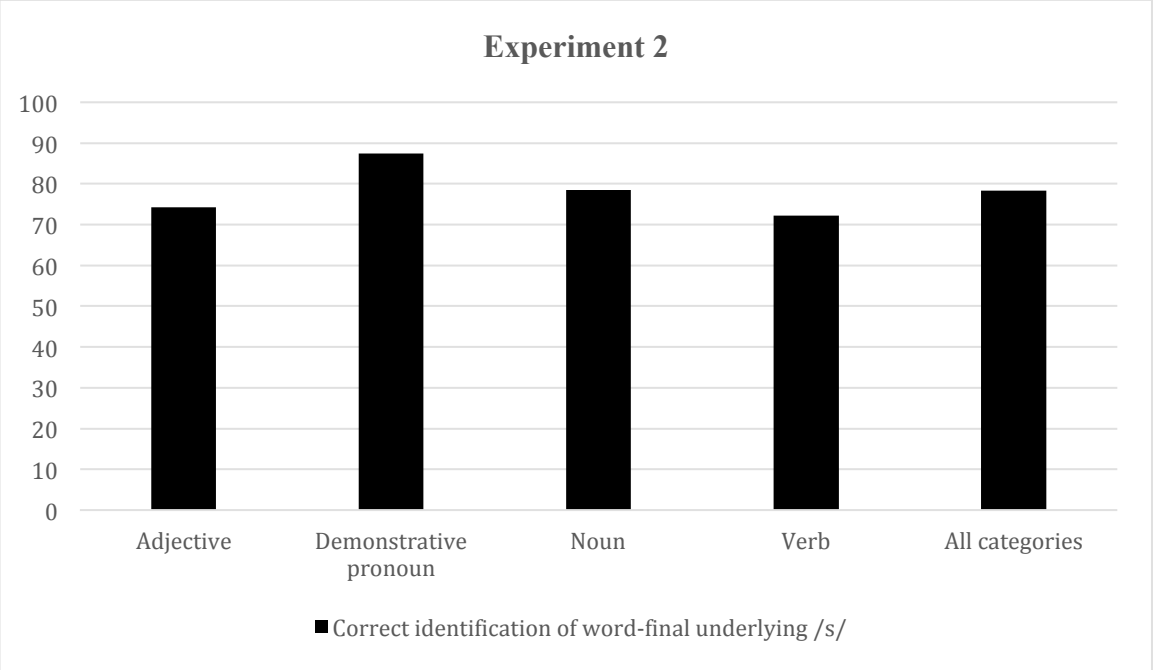


Figure 8. Correct identification of underlying /s/ by grammatical category in words word-medial consonant deletion

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Appendix 7

		EAS singular		EAS plural			
Question	**Correct answer**	**Frequency order**	**Absolute frequency**	**Frequency order**	**Absolute frequency**	**>90% Correct answer more common?**	**<50% Correct answer less common?**
4	37%	10148	1,160	19163	492		no
5	26%	122	85,064	1048	13,203		yes
7	98%	1223	11,346	7132	1,814	no	
12	35%	3480	4,046	13432	802		no
20	16%	976	13,908	2906	4,926		no
21	17%	705	18,900	7362	1,743		no
22	44%	4830	2,856	6844	1,909		yes
25	100%	75	123,729	19	1,019,669	no	
26	17%	15	1,465,503	62	154,412		no
27	21%	812	16,597	11085	1,035		no
30	28%	Pseudo-word	N/A	29738	260		
34	96%	6281	2,117	12158	917	yes	
35	90%	201	56,259	463	27,488	no	
36	95%	697	19,059	2977	4,823	yes	
38	36%	394	30,386	11394	996		no
43	90%	697	19,059	2977	4,823	no	
44	26%	51	186,360	256	43,564		yes
45	0%	6281	2,117	12158	917		no
46	96%	24	542,284	1598	9,037	yes	
47	96%	5270	2,624	9288	1,298	no	
49	28%	3415	4,132	8146	1,530		yes
50	91%	10005	1,180	16639	597	yes	
						Yes= 4 No=5	Yes = 4 No = 8

Table 5. Analysis of the relationship between lexical frequency and tokens identified correctly at a rate of 90% or higher or identified incorrectly at a rate of 50% or lower in Experiment 1

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Appendix 8

		EAS singular		EAS plural			
Question	**Correct answer**	**Frequency order**	**Absolute frequency**	**Frequency order**	**Absolute frequency**	**>90% Correct answer more common?**	**<50% Correct answer less common?**
1	21%	12215	911	21345	421		yes
2	28%	311	36,337	1566	9,183		no
10	93%	682	19,520	1340	10,547	yes	
11	99%	2091	7,039	6991	1,858	yes	
12	93%	2934	4,876	3668	3,850	yes	
13	90%	754	17,714	2037	7,210	no	
14	96%	38	238,841	162	69,071	yes	
17	93%	7885	1,597	33694	214	yes	
18	43%	7885	1,597	33694	214		no
19	22%	142538	15	115932	23		yes
23	94%	2091	7,039	6991	1,858	no	
24	100%	459209	1	***Bebedlos*** **Not available**		yes	
27	94%	49474	114	154386	13	yes	
30	96%	47177	123	164902	11	yes	
31	70%	2934	4,876	3668	3,850	yes	
32	96%	7885	1,597	33694	214	yes	
33	90%	754	17,714	2037	7,210	yes	
36	99%	38	238,841	162	69,071	yes	
38	94%	***Cumplidlo*** **Not available**		***Cumplidlos*** **Not available**			
40	42%	11130	1,030	22962	379		no
44	96%	923	14,905	4865	2,834	yes	
45	96%	754	17,714	2037	7,210	yes	
47	90%	38	238,841	162	69,071	yes	
						Yes=15 No=2	Yes=2 No=3

Table 6. Analysis of the relationship between lexical frequency and tokens identified correctly at a rate of 90% or higher or identified incorrectly at a rate of 50% or lower in Experiment 1

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