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Four mid front vowels in Western Almería

The effect of /s/, /r/, and /θ/ deletion in Eastern Andalusian Spanish

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Abstract: Eastern Andalusian Spanish neutralises consonants in coda, although despite the neutralisation of most coda consonants, phonemic value has only been given to vowels preceding deleted /s/. The present paper expands on this traditional view and shows a more complex reality. This study will analyse differences between word-final /e/ and /e/ preceding deleted word-final /s/, /r/, and /θ/ in Western Almería (Eastern Andalusia) to determine if the deletion of each of these consonants causes consistent changes of quality to /e/, creating a system of four mid front vowels. A perception analysis will then determine if Western Almería speakers can distinguish between each of those vowels, which will confirm whether these realisations of /e/ have allophonic or phonemic value. An analysis shows consistent F1 and F2 values depending on whether /e/ is in coda or whether it precedes word-final /s/, /r/, or /θ/ deletion. Furthermore, perception tests show an ability to distinguish between some of those four mid front vowels.

Keywords: Eastern Andalusian Spanish, dialectology, consonant deletion, Eastern Andalusian vowel system, phonology, phonetics, vowel doubling

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1 Introduction

As documented by several scholars, such as Wulff (1889) and Navarro Tomás (1938; 1939), Eastern Andalusian Spanish (henceforth EAS), neutralises most consonants in coda position. However, there is no consensus on the effects that consonant deletion has on surrounding vowels. Researchers of EAS, such as Mondéjar Cumpián (1979), have distinguished between two types of vowels in this variety of Spanish: vowels in coda position and vowels followed by a deleted consonant. However, despite the neutralisation of most consonants in coda position in EAS, phonemic value has only been given to vowels preceding deleted /s/, as in Salvador (1957) and in Carlson (2012). This paper presents a more complex reality of vowel doubling in EAS, showing how /e/ splits into (at least) four different vowels as a result of consonant deletion.

As shown in Navarro Tomás (1938; 1939), and in Alvar (1973), /s/, /r/, and /θ/ are deleted in coda position in EAS; however, EAS speakers can still distinguish between words such as *ve*, *ves*, *ver* and *vez*. This paper will study the mechanism behind that distinction to determine if this is based on a difference of vowel quality. The present paper will analyse the differences between word-final /e/ and /e/ preceding deleted word-final /s/, /r/, and /θ/ (henceforth [e^{s}], [e^{r}], and [e^{θ}], respectively) in order to determine if the deletion of these consonants causes consistent changes of quality to /e/, thus creating a system of mid front vowels. Once it has been established whether the deletion of /s/, /r/, and /θ/ creates a set of vowels, a perception analysis will be carried out to determine if native speakers of EAS from Western Almería can distinguish between [e], [e^{s}], [e^{r}], and [e^{θ}], which will confirm whether those new vowels have allophonic or phonemic value. It is worth noting that consonants written in superscript, as [^{s}], [^{r}], and [^{Θ}], show deleted consonants.

Alarcos Llorach (1976, 122) explained that the evolution of a phonemic system means that some distinctions are lost, but that the system develops other ways of solving ambiguity. In this case, EAS vowel quality may be used to mark whether /s/, /r/, or /θ/ have been deleted after /e/, thus creating a set of mid front vowels in this variety of Spanish. If this vowel system derived from /e/ has acquired phonemic value, the 8–10 vowel phoneme system traditionally attributed to EAS will dramatically increase in complexity. This increase will be even more drastic if a similar situation has occurred to other vowels, which preliminary data seems to support.

Herrero de Haro (under review) offers a comprehensive review of literature on EAS studies published between 1881 and 2014 and it highlights the need to further study vowel phenomena. Authors such as Salvador (1977) and Sanders (1998) defend vowel doubling, whilst others, such as Alarcos Llorach (1983) and Cerdà

Massó (1992) defend doubling of the vowel system instead. We can support either of those theories; however, this set of binary options illustrates how EAS studies have only focused on the contrast /Vowel/ vs /Vowel + deleted /s// (/V/ vs /V^{s}/), thus, ignoring other consonants which are usually deleted in EAS, such as /r/ and /θ/.

Despite the focus on the contrast /V/ vs /V^{s}/, some scholars have already noticed differences on the effect that the deletion of different consonants has on vowels. Wulff (1889) found coda-final consonant deletion in words such as *luz, vos, voz*, and *dos*, with different vowel effects depending on the consonant that had been deleted in each case, which Wulff (1889) transcribed as: *toros* (toroh); *abrasador* (abrasao:); *soledad* (soleá); *cruz* (kruh); *espada* (empa:); *toril* (tori:); *pasar* (pasa·). Furthermore, Alvar (1973, maps 1613, 1620, and 1625) studied the Spanish words *zagal, mar*, and *más*. In most locations around Andalusia, /al/, /ar/, and /as/ are reduced to the same vowel following /l/, /r/, and /s/ deletion, although *mar* and *más* are distinguished in some towns due to aspiration, vowel lengthening, or vowel quality. However, /al/, /ar/, and /as/ all have different vowel quality following consonant deletion in some exceptional cases, as in Berja (represented by Alvar in his maps as *Al507*). Likewise, Alvar (1973, maps 1626 and 1629) studies the words *tos* and *voz* and shows that in some towns, such as in Algarinejo (Gr303 in Alvar's maps), Escúzar (Gr503), and Alboloduy (Al501), /os/ and /oθ/ are distinguished even when the consonant is deleted as /s/ and /θ/ deletion cause a different degree of opening on the preceding vowel. Furthermore, Jiménez/Lloret (2007) also noticed another degree of opening, previously identified in Navarro Tomás (1938), saying that /l/ and /r/ "do not systematically trigger opening of preceding vowels; if they do, they show a lesser degree of opening" (less opening than when a vowel precedes /s/ deletion). However, no further study was carried out to analyse if that lower opening was a phonetic or phonological phenomenon. To my knowledge, these are the only instances in EAS literature which analyse the role of vowel quality in marking the functional load of neutralised coda-final consonants other than /s/. As Gerfen/Hall (2001) said, "[a]lthough much attention has been paid to word-final s-aspiration because of its role in preserving semantic contrasts, there has been little focus on whether other contrasts are also maintained when coda aspiration is implemented".

With this in mind, this paper will study the effects of word-final /r/, /s/, and /θ/ deletion on the preceding vowel /e/ in order to determine the effects of consonant deletion on this mid front vowel. Firstly, an acoustic analysis of samples collected in Western Almería will determine if the deletion of those consonants causes any phonetic changes in the quality of a preceding /e/. Following that, a perception study carried out in the same locations will determine if any changes in /e/ have phonetic or phonological value.

2 Methodology

2.1 Data compilation

The researcher, a native speaker of EAS from El Ejido (Western Almería), undertook a research trip to this region of Spain in December 2013. Participants from this town were recorded and, whenever possible, the interview process had two parts: 1) an informal conversation about any topic (work, holidays, things to do in the local area, etc.) and 2) reading of a list of words and phrases which contained consonant clusters and sound combinations less likely to appear in spontaneous speech. At this stage, it is important to notice that the researcher's local EAS accent from the area helped participants feel comfortable using their normal EAS accent during the interview instead of using normative Spanish. Likewise, the topics of the conversations were also very informal, which helped maintain a relaxed atmosphere during the interviews.

The interviews were recorded using a Zoom H2n digital recorder and once the samples had been recorded a preliminary analysis of the data was carried out. This analysis was completed using Praat (Boersma/Weenink 2001). Likewise, it was also decided to reduce the number of participants to be analysed. As a result, the speech of four speakers from the town of El Ejido was analysed.

These speakers represent a very homogeneous group: 29 years old female (henceforth F29E); 31 years old female (henceforth F31E); 31 years old male (henceforth M31E); and 34 years old male (henceforth M34E). The four speakers were born and raised in the town of El Ejido, they still live there, and their parents are also from this area. F29E and M31E attended secondary school until the age of 18, while F31E and M34E both completed a university degree (English and building engineering, respectively). With the exception of F31E, who studied English at university, none of the speakers are proficient in another language other than Spanish.

On a more informal basis, it is relevant to say that these four participants have a very clearly recognisable accent from Western Almería, although this is not as strong as the speech of speakers from lower socio-cultural backgrounds. For our purposes, we could refer to the accent of our participants as *General EAS Accent* (G-EAS), as opposed to the *Broad EAS Accent* (B-EAS) used, generally but not always, by speakers of lower socio-cultural backgrounds. Likewise, we could use the term *Normative EAS Accent* (N-EAS) to refer to the variety of EAS used by speakers who, due to family ties or to other reasons, speak a variety of EAS closer to normative Castilian Spanish. These terms are not based on a thorough sociolinguistic analysis of EAS, but are used here simply to contextualise our dialectical study. To clarify these distinctions we could adapt Trudgill's (1974, 41, Fig. 2) pyramid. On the top, we would have Normative Spanish, with features of Castilian

Spanish only; we would then have Normative EAS, a variety with few or no uses of stigmatised features of EAS and with less frequent coda-final consonant deletion than General EAS; below, we would have General EAS, the most common form of EAS; finally, at the bottom, we would have Broad EAS, a variety characterised by the use of several stigmatised features of EAS which do not necessarily appear in General EAS (or at least not to the same degree), such as *heheo* 'pronouncing intervocalic /s/ as [h]'.

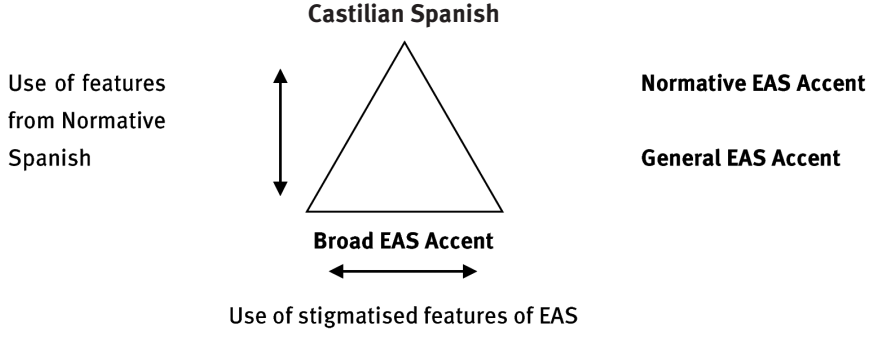

Fig. 1: Use of stigmatised EAS features and features from Normative Spanish in EAS. Figure adapted from Trudgill's (1974, 41, Fig. 2) pyramid.

Once again, these distinctions have not been devised using a methodological sociolinguistic study, but have been created to contextualise the features analysed in this paper. I recognise that these three categories might not be an accurate representation of the continuum found across different socio-linguistic levels of EAS speech, but they will serve the purpose of clarifying features of EAS speech to the reader.

2.2 Data analysis: Recordings

Once it had been decided whose speech was going to be studied, a perceptual preliminary analysis of the data was carried out to decide if the samples represented EAS accurately. The speech recorded during the informal interviews represented standard EAS accent from Western Almería (General EAS Accent), more specifically, from El Ejido. The participants read a list of words and phrases and they participated in an informal conversation with the researcher to ensure that these samples captured natural EAS speech. However, a perceptual and acoustic analysis of the reading extract showed that in many instances the pronunciation was somewhat unnatural and coda-final consonants which are

usually deleted in EAS were pronounced as in normative Spanish, for example, as in *los dos* (/los ðos/). As a result, a decision was made not to include the recordings obtained during the reading exercises, reducing the number of tokens to be analysed to 164 but working with data which represent natural EAS speech, trying to answer Sanders' (1998, 127) call for a need to analyse "naturally occurring forms in free conversation".

The data analysed for this study was the phoneme /e/ in word-final position and /e/ preceding deleted word-final /s/, /r/, and /θ/ ([e], [e^{s}], [e^{r}], and [e^{θ}], respectively) found in the informal spontaneous speech of four EAS speakers from El Ejido (Western Almería, Eastern Andalusia).

The phoneme /e/ was analysed using Praat (Boersma/Weenink 2001) and some steps were taken to ensure the accurate measurements of F1 and F2 in each case. F1 and F2 values were measured for each word-final /e/, /es/, /er/ and /eθ/ in each recording, however, some vowels were discarded in some cases: F1 and F2 formants were only taken of /es/, /er/ and /eθ/ when the final consonant had been deleted, which means that the measurements taken were of word-final [e], [e^{s}], [e^{r}], and [e^{θ}]. Furthermore, measurements were only taken of monophthongs, thus, discarding measurements of diphthongs such as *comer y* [ko^{ˈ}me^{r}i]. Finally, formants were analysed manually using Praat (Boersma/Weenink 2001), instead of using an automated system or a script. For each analysed vowel, the formants were measured only during their stable section, thus, avoiding analysing formants during transition. The stable section of the formants were selected and then the commands *Formant*/*Get first formant* and *Formant*/*Get second formant* were executed, giving a mean for the selected stable section, as in figure 2.

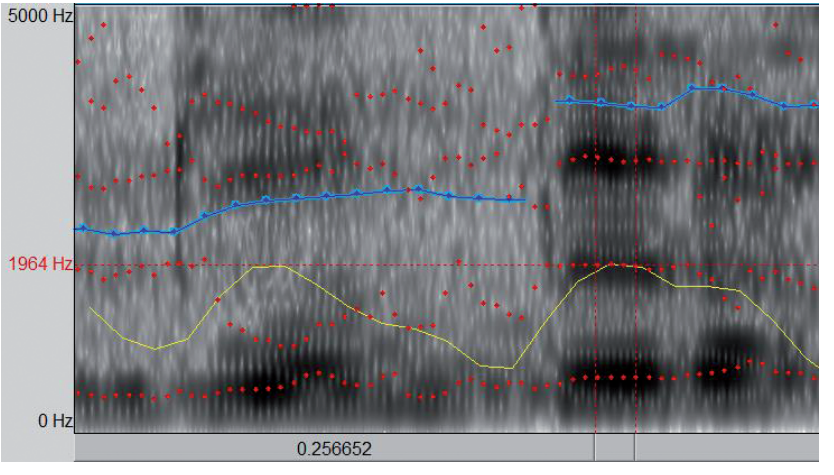

Fig. 2: Sample of selected portion of /e/ analysed in the word *antes* [^{ˈ}ãn̪te^{s}].

Once the formants had been analysed, these results were entered onto an Excel spreadsheet for each speaker, grouping the formants under each vowel [e], [e^{s}], [e^{r}], and [e$^{\theta}$]. Then the mean was calculated for the F1 and F2 of each vowel for these speakers. No decimals were annotated for the F1 and F2 of each vowel during the measurements on Praat (Boersma/Weenink 2001), or when working out the average F1 and F2 of each speaker; these values were rounded up or down (for example, *486.795* became *487*, and *1986.432* became *1986*). Once F1 and F2 values had been obtained for [e], [e^{s}], [e^{r}], and [e$^{\theta}$] for each speaker, these results were compared and a final overall mean was calculated and included in Table 8. This analysis highlighted phonetic differences between [e], [e^{s}], [e^{r}], and [e$^{\theta}$].

2.3 Data Analysis: Perception experiments

The researcher visited Western Almería again in June 2014 and this time the objective was to perform a series of perception experiments to establish if the identified phonetic differences between [e], [e^{s}], [e^{r}], and [e$^{\theta}$] had phonological value in EAS.

For Perception experiment one, the researcher read *e, es, er*, and *ez* several times in his normal EAS accent, pronouncing those tokens [e], [e^{s}], [e^{r}], and [e$^{\theta}$]. One example of each was chosen, looking for an item that sounded natural, clear, and not extremely short or long. A track was then created using Audacity (<http://audacityteam.org/>), and the numbers one to eight were read out in Spanish by the researcher using Normative Castilian Spanish (*dos* [dos], *seis* [seis], etc). Each item of [e], [e^{s}], [e^{r}], and [e$^{\theta}$] was introduced twice in the recording in randomised order, meaning that each participant heard eight instances of /e/: two of [e], two of [e^{s}], two of [e^{r}], and two of [e$^{\theta}$]. This was also done for the vowels, /a/, /i/, /o/, and /u/, although the results for those items will be discussed in a different article. In the final version of the audio used for this experiment, /a/ was covered in items 1–8, /e/ in items 9–16, /i/ in items 17–24, /o/ in items 25–32, and /u/ in items 33–40.

The perception experiment consisted of a classification perception test (Appendix 1) in which the participants had to decide which category each of the tokens presented in the audio belonged to. An answer sheet was created where participants had to disclose their gender, age, town where they lived, and supply additional information if they had not lived in that town since they were four years of age. Answers from participants who had not lived in Western Almería since the age of four were discarded.

The participants were four groups of primary and secondary school children from the towns of El Ejido, Balerma and Adra who volunteered to help, following

ethical clearance from the University of Wollongong, Office of Education in Almería, and the participating primary and secondary schools.

One group was from a secondary school in El Ejido, another group from a secondary school in Balerma, and the third secondary school was in Adra. Each student completed the perception test using an individual MP3 player in class with individual headphones. The fourth group was from a primary school in El Ejido and the students completed the perceptual test listening to the stimuli from the interactive board's speakers.

Perception experiment two was designed to compare accuracy of perception of [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] with that of standard Spanish phonemes. The researcher recorded a list of 20 words and these were edited into one audio file. After this, an answer sheet was prepared (Appendix 2) and a group of students listened to it out of loud speakers, circling the item they heard in each case. The results of the perception tests will be analysed further down.

3 Analysis of /e/ in previous studies

3.1 Formants of /e/ in Castilian Spanish and in EAS

To identify formant variation in /e/ as a result of /s/, /r/, and /Θ/ deletion, it is necessary to show first typical values for Castilian Spanish and for EAS. This will allow for a more accurate comparison between the formants of /e/ in Castilian Spanish and of [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] in EAS. The following table presents formant values for Castilian Spanish /e/.

Table 1: Formant values for Castilian [e]

Study	Type of /e/	F1	F2
Alarcos Llorach (1976)	Castilian /e/	500	1800
Quilis Morales (1981)	Castilian /e/	410	2300
Quilis/Esgueva (1983)	Castilian /e/ in open syllable. Male	449	2052
Quilis/Esqueva (1983)	Castilian /e/	454 (male)	1995 (male)
		492 (female)	2252 (female)
Martínez Celdrán (1984)	Castilian /e/	461	1884
Martínez Celdrán (1995)	Castilian /e/ in 20–30 years old speakers	457 (male)	1926 (male)
		576 (female)	2367 (female)
Mean value		**475**	**2072**

These values for Castilian Spanish [e] can be compared with reported F1 and F2 values for EAS [e] included in the table below.

Table 2: Formant values for EAS [e]

Study	Type of /e/	F1	F2
Martínez Melgar (1986)	EAS /e/	506	1725
Martínez Melgar (1994)	EAS /e/	494	1828
Sanders (1994)	EAS /e/	485	1879
Sanders (1998)	Pretonic EAS /e/	480	1830
Sanders (1998)	Tonic EAS /e/	476	1938
Sanders (1998)	Word-final EAS /e/	489	1867
Corbin (2006)	EAS /e/	544	2010
Mean value		**496**	**1868**

The tables above show how /e/ presents a higher F1 and a lower F2 in EAS than in Castilian Spanish. The average formant values from the studies above are F1 475 and F2 2072 for Castilian /e/, and F1 496 and F2 1868 for EAS, which justifies Contreras Jurado's (1975) *word not affected by prosodeme of openness* vs *affected word* and Martínez Melgar's (1986) *open* vs *non-open* vowel distinction.

3.2 Formants of EAS /e/ in other contexts

Having looked at F1 and F2 values for Castilian Spanish and for EAS /e/, it will be useful to compare now those values with other reported measurements for EAS. The following table presents F1 and F2 values for EAS /e/ in various contexts.

Table 3: Formant values for EAS [e^{s}]

Study	Type of /e/	F1	F2
Martínez Melgar (1986)	EAS /e/ preceding deleted /s/	520	1611
Martínez Melgar (1994)	EAS /e/ preceding deleted /s/	565	1657
Sanders (1994)	EAS /e/ preceding deleted /s/	579	1744
Sanders (1998)	Pre-tonic EAS /e/ preceding deleted /s/	589	1665
Sanders (1998)	Tonic EAS /e/ preceding deleted /s/	579	1792

Study	Type of /e/	F1	F2
Sanders (1998)	Word-final EAS /e/ preceding deleted /s/	568	1774
Corbin (2006)	EAS /e/ preceding deleted /s/	597	2020
Mean value		**588**	**1866**

The values reported by Martínez Melgar (1986; 1994), Sanders (1994; 1998), and Corbin (2006) show no real difference in EAS between F2 values for [e] or for [e^{s}]; however, they show a clear opening of /e/ preceding deleted /s/.

Interestingly, a comparison between the formant values that Corbin (2006) reported for EAS [e^{s}] (F1 616, F2 2080), for EAS [e^{h}] (F1 601, F2 2020), and for EAS [es] (F1 552, F2 2040), shows that in EAS /e/ is more open when /s/ is deleted than when it is preserved, and that [e^{h}] presents a middle stage.

4 Analysis of /e/

4.1 Analysis of word-final /e/ in EAS

The first F1 and F2 values analysed belong to word-final /e/ in informal interviews held between the researcher and participants from El Ejido, Western Almería.

Table 4: F1 and F2 values for word-final /e/ in EAS

Word-final /e/ in EAS		
Participant	**F1**	**F2**
F29E	456	2091
F31E	473	2117
M31E	484	2064
M34E	481	1919
Mean	**473.5**	**2047.75**
Standard Deviation	**12.55**	**88.51**

The measurements obtained for word-final /e/ in El Ejido show consistent values in the F1 and F2 across the four participants. These values are consistent with the measurements reported by other scholars for /e/, although these match better the measurements reported for Castilian Spanish than those of EAS. However, it is worth pointing out that none of the previously mentioned studies analysed participants from Almería, but from other areas where EAS is spoken.

4.2 Analysis of /e/ preceding deleted /s/ in EAS

Once again, F1 and F2 measurements were taken from free speech recorded during informal interviews in order to analyse a more realistic form of speech.

Table 5: F1 and F2 values for /e/ preceding deleted /s/ in EAS

/e/ preceding deleted /s/ in EAS		
Participant	**F1**	**F2**
F29E	611	1959
F31E	580	1867
M31E	597	1736
M34E	601	1649
Mean	**597.25**	**1802.75**
Standard Deviation	**12.91**	**137.04**

The results obtained for F1 and F2 are consistent within the four participants, although F1 is considerably much more consistent than F2, which shows greater variability. The results obtained from our four participants also match the results reported in Table 3. Both sets of results show a clear opening and backing of /e/ when it precedes deleted /s/, thus proving that in EAS there is a consistent difference between the quality of [e] and [e^{s}] (e.g. between singular and plural /e/).

These results proving vowel opening are in line with those obtained by Navarro Tomás (1938; 1939), Alonso et al. (1950), Alvar (1955; 1973), Salvador (1957; 1977), Gómez Asensio (1977), Zubizarreta (1979), López Morales (1984), Martínez Melgar (1986; 1994), Sanders (1998) and Peñalver Castillo (2006). Likewise, the results obtained in this analysis contradict the opinions posited by Alarcos Llorach (1958; 1983), Contreras Jurado (1975), Mondéjar Cumpián (1979), Cerdà Massó (1992) and Carlson (2012). Some of these scholars, such as López Morales (1984) and Martínez Melgar (1986), defend vowel opening preceding /s/ deletion, although they believe that this is a phonetic feature, not a phonological one.

The analysis presented in the perception section will prove whether vowel opening in EAS has phonological value or not.

4.3 Analysis of /e/ preceding deleted /r/ in EAS

The F1 and F2 values reported below were also obtained from informal interviews and the instances included in the analysis are those in which /r/ had been completely deleted.

Table 6: F1 and F2 values for /e/ preceding deleted /r/ in EAS

/e/ preceding deleted /r/ in EAS		
Participant	**F1**	**F2**
F29E	652	1847
F31E	630	1937
M31E	603	1800
M34E	677	1734
Mean	**640.5**	**1829.5**
Standard Deviation	**31.52**	**85.34**

Herrero de Haro (under review) offers a comprehensive review of literature on EAS research published between 1881 and 2014. This study shows that there is no previous analysis of vowels preceding /r/ deletion, so it will not be possible to compare this data to vowel measurements reported by other scholars.

The results obtained for [e^{r}] are consistent within each speaker and between the participants. All participants present a higher F1 for [e^{r}] than for [e^{s}] and, with the exception of F29E, all speakers also present a higher F2 in [e^{r}] than in [e^{s}]. These results are different to those obtained for [e] and for [e^{s}], which shows that /r/ deletion causes a change of quality in the preceding /e/ different to that caused by /s/ deletion.

Once again, it will be the perception experiment which will confirm whether the difference in vowel quality between [e^{s}] and [e^{r}] in EAS, at least in Western Almería, is of a phonetic or of a phonological nature.

4.4 Analysis of /e/ preceding deleted /θ/ in EAS

As in the previous cases, the values reported below were also obtained from samples recorded during an informal interview.

Table 7: F1 and F2 values for /e/ preceding deleted /θ/ in EAS

/e/ preceding deleted /θ/ in EAS		
Participant	**F1**	**F2**
F29E	616	2054
F31E	582	1658
M31E	632	1675
M34E	579	1535
Mean	**602.25**	**1730.5**
Standard Deviation	**25.97**	**224.50**

The results obtained for [e$^{\Theta}$] are not as consistent as the ones obtained in the other three cases. For F29E and for F31E, F1 values for [e$^{\Theta}$] are between the ones obtained for [e^{s}] and for [e^{r}]. For M31E, F1 values for [e$^{\Theta}$] are higher than for [e], [e^{s}] or [e^{r}], and for M34E [e$^{\Theta}$] has a lower F1 value than [e], [e^{s}] or [e^{r}]. Regarding F2, all speakers have a lower value for [e$^{\Theta}$] than for [e], [e^{s}], or [e^{r}], except F29E, who presents a higher F2 than for [e^{s}] and [e^{r}] but lower than for [e]. When we look at the average values obtained for the four speakers, F1 for [e$^{\Theta}$] is between the values reported for [e^{s}] and [e^{r}] and F2 is lower than for those two vowels.

This analysis of /e/ preceding deleted /θ/ shows that /θ/ deletion causes a change in the quality of /e/ different to the ones caused by /s/ or /r/ deletion. The resulting vowel [e$^{\theta}$] shows that F1 and F2 formants are different to those found for [e], [e^{s}], and [e^{r}]. Once again, F1 values are consistent within the four speakers, while there is more variability in F2.

The data obtained from these measurements show that [e$^{\theta}$] is consistently different to [e], [e^{s}], and [e^{r}], thus it should be considered, for the time being, an allophone of /e/. However, a perception study will confirm whether [e$^{\theta}$] has phonetic or phonemic value in EAS, or at least in Western Almería.

Alvar (1973, map 1613, 1620 and 1625) studied the words *zagal, mar* and *más* and found that the three word-final vowels had different quality following consonant deletion in some particular towns, as in Berja (Al507). Alvar (1973, maps 1626 and 1629) also studied the words *tos* and *voz* and found that in some towns, such as Algarinejo (Gr303), Escúzar (Gr503), and Alboloduy (Al501), /s/ and /θ/ deletion cause a different degree of opening on the preceding vowel. Furthermore, Jiménez/Lloret (2007) and Navarro Tomás (1938) also noticed a lower degree of opening preceding /l/ or /r/ deletion than preceding /s/ deletion. However, no further study has been carried out to analyse if that lower opening has phonetic or phonological value. According to Herrero de Haro (under review), these are the only instances in EAS literature which analyse the role of vowel quality in marking the functional

load of deleted coda-final consonants other than /s/. As explained above, this was done for the vowels /a/ and /o/, but there is no analysis for /e/, which means that there is no previous analysis to compare with the data reported here.

4.5 F1 and F2 values for [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] in EAS

As explained in Herrero de Haro (under review), EAS scholars have mainly studied the effect of /s/ deletion on preceding vowels, without giving due attention to the deletion of other consonants. Having analysed the effect of /s/, /r/, and /Θ/ deletion on preceding /e/, it is now necessary to compare all the data obtained.

Table 8: F1 and F2 values for word-final /e/ and for /e/ preceding deleted /s/, /r/, and /θ/ in EAS.

Participant	[e]		[e^{s}]		[e^{r}]		[e$^{\Theta}$]	
	F1	F2	F1	F2	F1	F2	F1	F2
F29E	456	2091	611	1959	652	1847	616	2054
F31E	473	2117	580	1867	630	1937	582	1658
M31E	484	2064	597	1736	603	1800	632	1675
M34E	481	1919	601	1649	677	1734	579	1535
Mean	**473.5**	**2047.75**	**597.25**	**1802.75**	**640.5**	**1829.5**	**602.25**	**1730.5**
Standard Dev.	**12.55**	**88.51**	**12.91**	**137.04**	**31.52**	**85.34**	**25.97**	**224.50**

F1 and F2 values for [e] are distinguished from those of [e^{s}], [e^{r}], and [e$^{\Theta}$]. In EAS, /e/ has a higher F1 and lower F2 when it precedes deleted /s/, /r/, or /θ/, which marks a primary distinction between /e/ and /e/ preceding consonant deletion. Furthermore, /s/, /r/, and /θ/ deletion have different effects on the preceding vowel /e/, which results in a further secondary distinction based on different degrees of opening and frontness for [e^{s}], [e^{r}], and [e$^{\Theta}$]. The degrees of opening and backness are consistent within the four participants studied, which allows to posit that EAS, at least in Western Almería, has four mid front vowel phonemes; [e], [e^{s}], [e^{r}], and [e$^{\Theta}$]. A perception experiment with speakers from the area will show whether the difference between those four vowels is phonetic or phonological.

It is important to notice that F1 presented more stable values than F2. This was the case in normal conversation and also when vowels were lengthened in spontaneous speech to gain thinking time. This might be an indication that openness is a more reliable measure to distinguish between [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] than frontness or backness. The graph below illustrates the mean values obtained for [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] for each of our four speakers.

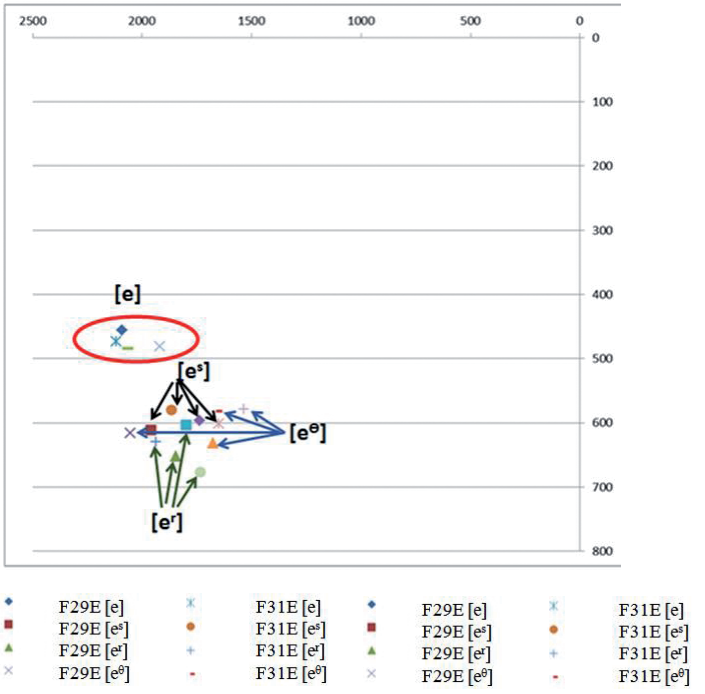

Fig. 3: F1 and F2 mean values obtained for [e], [eˢ], [eʳ], and [eᵉ] for each speaker.

Likewise, we can represent the overall mean values obtained for [e], [eˢ], [eʳ], and [eᵉ] for our four speakers in the following graph.

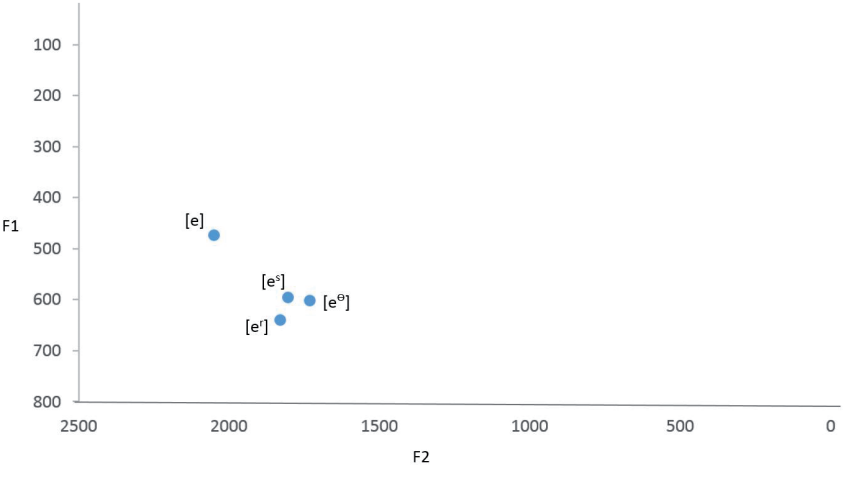

Fig. 4: Mean values obtained for [e], [eˢ], [eʳ], and [eᵉ].

As highlighted in Herrero de Haro (under review), various researchers, such as Martínez Melgar (1986; 1994) and Sanders (1998), have focused only on the difference between [e] and [e^{s}], which show different F1 and F2 values. However, [e^{r}] and [e$^{\Theta}$] also have different values to those reported for [e] and for [e^{s}], which shows that there are, at least, four realisations for the medial phoneme /e/ in Western Almería. These realisations are also consistent in different word categories; for example, [e^{s}] present similar values in plural nouns and in verbs in the second person singular. Furthermore, previous works studying contrasts between [e] and [e^{s}] have presented different views regarding the phonetic or phonemic nature of that difference, yet, EAS scholars have focused exclusively on production rather than on perception by native speakers of EAS, which is why Gerfen/Hall (2001) and Bishop (2007) call for more perception studies.

It was with this in mind that the second part of the study was designed. This was in order to analyse whether EAS speakers from Western Almería can distinguish between those four mid front vowels, which could give [e^{s}], [e^{r}], and [e$^{\Theta}$] phonemic value.

5 Perception experiments

As explained in the review of literature included in Herrero de Haro (under review), EAS researchers have almost exclusively studied EAS accent from the point of view of the speaker, ignoring the perceptual element in EAS native speakers. This part of the study aims to solve this, using a perception experiment to decide whether vowel quality differences between [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] are of a phonetic or phonological nature.

5.1 Perception experiment one: [e] vs [e^{s}] vs [e^{r}] vs [e$^{\theta}$]

This experiment focuses on the contrast between [e], [e^{s}], [e^{r}], and [e$^{\Theta}$]. The researcher, a native speaker of El Ejido, recorded himself pronouncing /a/, /e/, /i/, /o/ and /u/ in 4 different contexts: isolated vowel, vowel preceding deleted /s/, vowel preceding deleted /r/, and vowel preceding deleted /θ/.

The researcher pronounced all of these sounds various times in his vernacular accent and the best two examples of each were selected. The main features looked for in each of the items were clarity of the sound, normal length, and complete deletion of the final consonant, that is, that the final consonant was totally deleted in those items, as it is the norm in EAS accent.

The experiment was divided in five sections: /a/, /e/, /i/, /o/ and /u/. In each section there were two items of each vowel pronounced in each of the aforementioned contexts (isolated vowel, vowel preceding deleted /s/, vowel preceding deleted /r/, and vowel preceding deleted /θ/), and each item appeared mixed with other items of the same vowel.

Three of the four groups of participants were given an individual MP3 player each with a track containing the audio for the experiment. Together with this MP3 player, they were also given an individual answer sheet (Appendix 1), where they had to write down their age, gender, and town of origin, having to give further details if they had not lived in the same town since they were four years of age. This was to ensure that all participants taking part in the experiment were native speakers of EAS, thus answers were discarded for those respondents who had not lived in Western Almería since the age of four. The fourth group completed the same experiment but an interactive board's speakers were used to play the audio.

The participants then listened to the track and marked the option they heard in each case: [e], [e^{s}], [e^{r}], or [e$^{\Theta}$]. Once all the answers had been collected, they were analysed. The data for the perception of [e], [e^{s}], [e^{r}], and [e$^{\Theta}$] is summarised below; however, perception data for /a/, /i/, /o/, and /u/ will be reported in future articles.

5.2 Analysis of Perception experiment one: [e] vs [e^{s}] vs [e^{r}] vs [e$^{\theta}$]

The perception experiment consisted of a classification perception test in which the respondents had to decide which category each of the tokens presented in the audio belonged to. The respondents were primary and secondary school children from the towns of El Ejido, Balerma and Adra, the three groups from secondary schools completed the perception test using individual MP3 players, while the group from a primary school completed it listening to the stimuli from the interactive board's speakers. All groups were asked to mark an answer only if they were sure of it and to leave a question blank if they were unsure of the right answer or if they had not heard an item clearly enough to make a decision.

The following tables summarise the results. The number in the left column refers to the question number in the original perception test answer sheet (numbers 1 to 8 dealt with /a/). The number under each realization of /e/ ([e], [e^{s}], [e^{r}], and [e$^{\theta}$]) is the amount of answers received for that category, and the percentage is the percentage of correct identification in each case. The percentage has only been calculated for correct answers.

The table below presents perception data from El Ejido:

Table 11: Perception experiment answers by 14- and 15-year olds from El Ejido; task completed using an individual MP3 player

	[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
9	2	8	**6 (33.3%)**	1	1	18
10	2	**11 (61.1%)**	2	2	1	18
11	1	7	2	**7 (38.8%)**	1	18
12	**18 (100%)**					18
13	1	10	**4 (22.2%)**	1	2	18
14		**10 (55.5%)**	5	2	1	18
15	1	7	4	**5 (27.7%)**	1	18
16	**18 (100%)**					
Correct answers / total right answers	**36/36 (100%)**	**21/36 (58.33%)**	**10/36 (27.6%)**	**12/36 (33.3%)**	**7/144 (4.86%)**	144
Correct answers / (total right answers – blank answers)	**No blank answers**	**21/34 (61.76%)**	**10/33 (30.30%)**	**12/34 (35.29%)**	**7/144 (4.86%)**	144

The table below presents perception data from Adra:

Table 12: Perception experiment answers by 15- and 16-year olds from Adra; task completed using an individual MP3 player

	[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
9	1	3	**3 (30%)**	2	1	10
10	1	**3 (30%)**	3	3		10
11	1	2	4	**2 (20%)**	1	10
12	**10 (100%)**					10
13		4	**4 (40%)**	2		10
14		**2 (20%)**	3	5		10
15	1	3	1	**4 (40%)**	1	10
16	**10 (100%)**					10

	[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
Correct answers / total right answers	**20/20 (100%)**	**5/20 (25%)**	**7/20 (35%)**	**6/20(30%)**	**3/80 (3.75%)**	80
Correct answers / (total right answers – blank answers)	**No blank answers**	**No blank answers**	**7/19 of answers (36.84%)**	**6/18 of answers (33.3%)**	**3/80 (3.75%)**	80

The table below presents perception data from Balerma:

Table 13: Perception experiment answers by 15- and 16-year olds from Balerma; task completed using an individual MP3 player

	[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
9	1	3	**6 (46.15%)**	3		13
10	1	**9 (69.23%)**	1	2		13
11	1	6	4	**2 (15.38%)**		13
12	**13 (100%)**					13
13		7	**6 (46.15%)**			13
14		**8 (61.53%)**	2	3		13
15		6	4	**3 (23.07%)**		13
16	**13 (100%)**					13
Correct answers / total right answers	**26/26 100%**	**21/26 (65.38%)**	**12/26 (46.15%)**	**5/26 1 (9.23%)**	**0/104 (0%)**	104
Correct answers / (total right answers – blank answers)	**No blank answers**	**No blank answers**	**No blank answers**	**No blank answers**	**0/104 (0%)**	104

Finally, the table below presents perception data from primary school participants from El Ejido. Unlike the other cases, these participants listened to the audio from speakers at the front of the class as this experiment was carried out before the MP3 players were available.

Table 14: Perception experiment answers by 11- and 12-year olds from El Ejido; task completed listening to the stimuli from the interactive board's speakers

	[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
9		8	**12 (50%)**	3	1	24
10		**11 (45.83%)**	7	6		24
11	1	6	8	**3 (12.5%)**	6	24
12	**24 (100%)**					24
13		6	**13 (54.16%)**	2	3	24
14		**10 (41.66%)**	5	6	3	24
15		7	3	**7 (29.16%)**	7	24
16	**23 (95.83%)**				1	24
Correct answers / total possible right answers	**47/48 (97.91%)**	**21/48 (43.75%)**	**25/48 (52.08%)**	**10/48 (30.83%)**	**21/192 (10.93%)**	192
Correct answers / (total possible right answers – blank answers)	**47/47 (100%)**	**21/45 (46.66%)**	**25/44 (56.81%)**	**10/35 (28.57%)**	**21/192 (10.93%)**	192

The following table summarises perception results for the four groups of participants, grouping them according to how they listened to the stimuli and then offering a combined percentage for the four groups.

Table 15: Perception experiment answers by all groups

Listening mode		[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
Indiviual MP3	Correct answers / total right answers	82/82 (100%)	47/82 (57.31%)	29/82 (35.36%)	23/82 (28.04%)	10/328 (3.04%)	328
	Correct answers / (total right answers – blank answers)	No blank answers	47/80 (58.75%)	29/78 (37.17%)	23/78 (29.48%)		

Listening mode		[e]	[e^{s}]	[e^{r}]	[e$^{\theta}$]	Blank answers	Total answers
Interactive board's Speakers	Correct answers / total right answers	47/48 (97.91%)	21/48 (43.75%)	25/48 (52.08%)	10/48 (30.83%)	21/192 (10.93%)	192
	Correct answers / (total right answers – blank answers)	47/47 (100%)	21/45 (46.66%)	25/44 (56.81%)	10/35 (28.57%)		
Final total	Correct answers / total right answers	129/130 (99.23%)	68/130 (52.30%)	54/130 (41.53%)	33/130 (25.38%)	31/520 (5.96%)	520
	Correct answers / (total right answers – blank answers)	129/129 (100%)	68/125 (54.4%)	54/122 (44.26%)	33/113 (29.20%)		

It can be seen from tables 11–15 that the groups who completed the perception experiment using individual MP3 players present more accurate results for [e^{s}] and for [e$^{\theta}$], the latter with only a difference of 0.91%, while the group who listened to the audio from the interactive board's speakers obtained better results for [e^{r}]. Furthermore, this latter group also submitted 10.93% of blank responses, 7.89% more than the other group. However, both groups present similar results. The final overall results of 100% accuracy for [e], 54.4% for [e^{s}], 44.26% for [e^{r}] and 29.20% for [e$^{\theta}$] present some interesting data.

Firstly, 100% accuracy for [e] shows the ability of EAS speakers, at least the ones from Western Almería, to distinguish between what Contreras Jurado (1975) referred to as *word not affected by prosodeme of openness* vs *affected word* distinction and what Martínez Melgar (1986) referred to as *non-open* and *open* vowels. This is backed by the fact that any errors of perception did not cross over between an *unaltered* /e/ ([e]) and an *altered* /e/ ([e^{s}], [e^{r}], or [e$^{\theta}$]). In principle, this supports Contreras Jurado's (1975) and Martínez Melgar's (1986) distinctions; however, a closer analysis of the perception results for [e^{s}], [e^{r}], or [e$^{\theta}$] shows that EAS speaker's phonological division goes even further, with the ability to distinguish between altered vowels. These findings show that, as Alarcos Llorach (1976, 122) explained, the evolution of a system means that some distinctions are lost, but the system develops other ways of solving ambiguity.

A statistical analysis of the accuracy rate for the perception of [e], [e^{s}], [e^{r}] and [e$^{\theta}$] was carried out using Graphpad Software and the results provide some reveal-

ing information: 100% accuracy rate for [e] is extremely statistically significant and shows that EAS speakers from Western Almería can distinguish [e] from [e^{s}], [e^{r}] and [e^{θ}]. Both accuracy rates of 54.4% for [e^{s}] and of 44.26% for [e^{r}] present a p-value < 0.0001. That p-value is also extremely statistically significant, indicating that those answers are not due to chance. Thus EAS speakers from Western Almería can distinguish [e^{s}] from [e^{r}] and each of those two vowels from [e] and [e^{θ}]. On the other hand, an accuracy rate of 29.20% for [e^{θ}] presents a p-value of 0.3021; this is not statistically significant and shows that EAS speakers from Western Almería cannot distinguish [e^{θ}] from [e^{r}] or from [e^{θ}]. However, according to Graphpad Software, a test like ours with four different options to choose from needs 34% of correct answers to show statistical significance, and with 33% of accuracy the results are "not quite statistically significant"; the secondary school group from El Ejido and the one from Adra reached an accuracy rate of 35.29% and of 33.3%, respectively. This shows that the distinction between [e^{θ}] and [e], [e^{s}], and [e^{r}] was statistically significant for the group from El Ejido but not quite statistically significant for the group from Adra. This still does not prove that EAS speakers from Western Almería can distinguish [e^{θ}], but it could mean that that distinctions is either being lost or being consolidated in this geolect.

It is interesting to notice two facts about these results: 1) [e] is never mistaken by [e^{s}], [e^{r}], or [e^{θ}], and likewise, errors in the perception of [e^{s}], [e^{r}], or [e^{θ}] almost exclusively only happen between these vowels (out of the 390 possible answers for [e^{s}], [e^{r}], or [e^{θ}], only 15 were entered as [e], which represents a 3.84%); 2) perceptual accuracy for [e^{s}], [e^{r}] and for [e^{θ}] coincides with the occurrence/functional load of those consonants in Spanish: [e^{s}] > more frequent/higher functional load than [e^{r}] > more frequent/higher functional load than [e^{θ}]. This is backed by the data presented in Alarcos Llorach (1976, 198), who said that /s/ is the most common consonant phoneme in Spanish, with an occurrence rate of 8%; the rate of occurrence for the archiphoneme [R] is of 4.5%; and the occurrence rate of /Θ/ is 1.7%. As Ohala (2008, 32) explained regarding first language acquisition, "[i]n every given language, more frequent sounds are mastered earlier". This would explain the correlation between the ability to distinguish between [e], [e^{s}], [e^{r}], or [e^{θ}] by EAS speakers in Western Almería and the frequency of occurrence of each vowel. This issue of phonologisation of more frequent contrasts has already been applied to Spanish dialectology: Vásquez (1953) used it to explain why in Uruguayan Spanish there is doubling of /a/, /e/, and /o/ following /s/ deletion but not of /i/ or /u/; Salvador (1977) applied the same concept to EAS.

Despite the strong p-values reported in this study, some scholars might still believe that a successful discrimination of 54.4% for [e^{s}] and of 44.26% for [e^{r}] does not prove that those vowels are distinguished by these speakers; however, these results can be compared with the ones obtained in experiment two.

5.3 Perception experiment two: Phonemes

Another experiment was designed to see the percentage of correct discrimination between standard Spanish phonemes. The researcher recorded himself reading a list of 20 words and then he edited them into one track. Once this had been done, an answer sheet was prepared and a class of students were asked to listen to it out of the loud speakers and to circle the word they heard in each case.

5.4 Analysis of Perception experiment two: Phonemes

The answers for perception experiment two are presented in the table below. The number under each word is the amount of answers received for that word, and the percentage is the percentage of correct answers in each case. The percentage has only been calculated for correct answers.

Table 16: Perception experiment answers by students in a 3 ESO class (15- and 16-year olds) from Adra

					Blank answers	**Correct answers/ (total right answers – blank answers)**
1	**Pata 18/19 (94.7%)**	Pato	Gata	Bata	1	18/18 (100%)
2	A	**E19/19 (100%)**	I			**19/19 (100%)**
3	**Seda 11/19 (57.9%)**	Ceta	Sera 8	Seta		**11/19 (57.9%)**
4	A	O	**U19/19 (100%)**			**19/19 (100%)**
5	**A 19/19 (100%)**	E	O			**19/19 (100%)**
6	Pata	Pato	Gata 2	**Bata 17/19 (89.5%)**		**17/19 (89.5%)**
7	Pasto	Gasta1	**Gasto 17/19 (89.5%)**	Pasta	1	**17/18, 94.4%**
8	E 1	**I16/19 (84.2%)**	A		2	**16/17 (94.1%)**
9	Seda	Ceta	**Cera 19/19 (100%)**	Seta		**19/19 (100%)**
10	Seda	Ceta	Sera	**Seta 19/19 (100%)**		**19/19 (100%)**

					Blank answers	Correct answers/ (total right answers – blank answers)
11	A	**O 19/19 (100%)**	U			**19/19 (100%)**
12	Perro	Cero 2	**Cerro 17/19 (89.5%)**	Cepo		**17,/19 (89.5%)**
13	Pata	Pato	**Gata 18/19 (94.7%)**	Bata 1		**18/19 (94.7%)**
14	Pata	**Gato 19/19 (100%)**	Gata	Bata		**19/19 (100%)**
15	Pesa	Besa	**Mesa 19/19 (100%)**	Peso		**19/19 (100%)**
16	**Te 19/19 (100%)**	Ti	De	Fe		**19/19 (100%)**
17	Apilar	**Afilar 19/19 (100%)**	Afilad	Apilad		**19/19 (100%)**
18	**Pesa 13/19 (68.4%)**	Besa 6	Mesa	Peso		**13/19 (68.4%)**
19	Te	Ti	**De 19/19 (100%)**	Se		**19/19 (100%)**
20	Pesa	**Besa 19/19 (100%)**	Mesa	Peso		**19/19 (100%)**

Out of the 20 words included in this experiment, only 12 of them were distinguished correctly by all participants, showing that only 60% of these words are distinguished with a 100% accuracy. Furthermore, some contrasts between minimal pairs did not present 100% accuracy: seda/sera (57.9%); bata/gata (89.5%); gasto/gasta (89.5%); i/e (84.2%); cerro/cero (89.5%); gata/bata (94.7%); and pesa/besa (68.4%).

The respondents in our experiments were more successful at distinguishing [e] from [e^{s}], [e^{r}], and [e$^{\Theta}$] (100% [99.23% counting blank answers as errors]) than at distinguishing /i/ from /e/ and /a/ (94.1% [84.2% counting blank answers as errors]). Furthermore, other pairs of phonemes such as /d/ and /ɾ/, /ɾ/ and /r/, and /p/ and /b/ were accurately distinguished at a rate of 57.9%, 89.5% and 68.5%, respectively, despite these contrasts being played as part of full words as opposed to as isolated vowels as in our first experiment. Contreras Jurado (1975) believes that EAS speakers need the context to distinguish between singular and plural words; however, the data from experiment one shows that this is not the case.

5.5 Findings from perception experiments

The results from Perception experiment one show that native speakers of EAS, at least in Western Almería, can differentiate between an *unaltered*/*non-open* /e/ and an *altered*/*open* /e/ (/e/ becomes *altered*/*open* as a result of /s/, /r/, or /θ/ deletion). Furthermore, the results of perception experiment one also show that two EAS mid front vowels derived from /e/ ([e^{s}] and [e^{r}]) are distinguished by our participants, which I consider evidence that they have undergone phonologisation.

The accuracy percentage for [e], [e^{s}] and [e^{r}] in experiment one is 100%, 54.4%, and 44.26%, respectively, and p-values show that these results are not due to chance. Thus, I believe that the results from experiment one show that EAS speakers, at least in Western Almería, can distinguish between three types of mid front vowels: [e], [e^{s}], and [e^{r}].

5.6 Limitations of the present study and future lines of research

Despite the results of the acoustic analysis and of the perception experiments, it is necessary to highlight a series of limitations of this study as a way of identifying future lines of research.

I am aware of the limitations when analysing the speech of only four participants, although it is important to highlight that F1 and F2 values are consistent between these four participants and that these values are consistent with data previously reported by other scholars. It will be important to increase the amount of participants in a future study, but it is also necessary to remember that, despite the limitations that working with four participants might have, the results from the perception experiment back the differences found in the acoustic analysis between [e], [e^{s}], [e^{r}], and [e^{θ}].

The only difference found between [e], [e^{s}], [e^{r}], and [e^{θ}] during the acoustic analysis was regarding F1 and F2 values. Out of these two, the most salient difference was in F1, which supports that vowel opening has phonological value in EAS. However, there is also the possibility that despite differences in vowel quality this might not be what helps EAS speakers distinguish between [e], [e^{s}] and [e^{r}]; openness or backness could be a secondary feature and EAS speakers could distinguish these vowels due to suprasegmental features undetected in our analysis. Further study of EAS vowels is needed to clarify this.

Some linguists might consider that [e^{s}] and [e^{r}] cannot be phonemes as they only distinguish meaning word-finally; I am convinced that this distinction also operates word-internally, although this needs to be investigated further. How-

ever, the vowels in the English words *lot* and *strut* are only distinguished word-medially before a consonant and no linguist seems to hesitate to consider them phonemes. Further phonological analysis of EAS vowels is needed.

Likewise, it is also possible to argue that when EAS speakers hear [e^{s}] or [e^{r}] they will perceive that [s] or [r] has been deleted in each case and then deconstruct meaning from /es/ and /er/. A perception experiment should be carried out with illiterate adults or with children who have not learnt to read or write yet in order to prove that EAS speakers can convey and deconstruct meaning from [e^{s}] or [e^{r}] independently from any mental representation of letters.

6 Conclusion

This article has focused on two different types of analyses to study the vowel phoneme /e/ in Western Almería, a region where EAS is spoken.

Firstly, an acoustic analysis of the speech of speakers from this area was conducted to study whether /e/ is pronounced differently when it appears word-finally and when it is made word-final following /s/, /r/, or /Θ/ deletion. The acoustic analysis of the samples show that the vowel quality varies between [e], [e^{s}], [e^{r}], and [e^{θ}], which means that /s/, /r/, and /Θ/ deletion alter the quality of a preceding /e/ in different ways; previous studies had only analysed how /s/ deletion changed the quality of /e/. I suspect that this also applies to /a/, /i/, /o/, and /u/, although I do not think that this will be as developed in the other vowels as in /e/; this would explain the fact that three participants from different schools only completed the perception questions on /e/, having left the answers for the other four vowels blank.

This shows the existence of, at least, four different allophones of /e/ in EAS. Alvar (1973) distinguished between different types of /a/ and /o/ preceding the deletion of different consonants; however, no studies had analysed /e/ or offered formant measurements of the effects of consonant deletion on preceding vowels, other than for deleted /s/.

Secondly, a perceptual study was carried out in order to establish whether the difference in quality between those four different types of /e/ is phonetic or phonological. Sixty five speakers from Western Almería completed a test in which they had to listen to an audio file and distinguish between [e], [e^{s}], [e^{r}], or [e^{θ}]. The percentage of accurate distinction of each of those vowels was: [e] 100%; [e^{s}] 54.4%; [e^{r}] 44.26%; and [e^{Θ}] 29.2%. An analysis of p-values shows that, in fact, speakers from this area can distinguish, at least, three different types of medial front vowels; word-final /e/ and /e/ preceding deleted word-final /s/ and /r/ ([e], [e^{s}] and [e^{r}]).

Taking these results into account, I can conclude that EAS speakers, at least in the towns of El Ejido, Adra, and Balerma, can distinguish at least three types of mid front vowels in word-final position: /e/ ([e]); /e/ preceding deleted /s/ ([e^{s}]); and /e/ preceding deleted /r/ ([e^{r}]). Additionally, /e/ preceding deleted /θ/ ([e^{θ}]) might be either becoming phonologised or dephonologised word-finally. Furthermore, I believe that the distinction of these vowels is not limited to word-final position, but that it also operates word-internally, although this still needs to be investigated.

All this would mean that the EAS vowel system would increase from the 8–10 phonemes traditionally attributed to this geolect; however, this might just be a stage in the neutralisation of word-final /s/, /r/, and /Θ/. Some scholars, such as Alarcos Llorach (1983), considers a vowel system with five or six degrees of height to be too complex to be efficient and maintained. However, García Marcos (1987) and O'Neill (2010) consider EAS to be a geolect in evolution; EAS might be currently readjusting its vowel system as a result of consonant deletion and it might not have started simplifying its vowel system yet.

Regardless of whether we consider [e], [e^{s}], and [e^{r}] as (full) phonemes, the fact is that EAS speakers differentiate between them and contrast each of those vowels to convey and to understand meaning.

7 References

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Appendix 1: Answer sheet for Perception test one

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	a	as	ar	az
2	a	as	ar	az
3	a	as	ar	az
4	a	as	ar	az
5	a	as	ar	az
6	a	as	ar	az
7	a	as	ar	az
8	a	as	ar	az
9	e	es	er	ez
10	e	es	er	ez
11	e	es	er	ez
12	e	es	er	ez
13	e	es	er	ez

14	e	es	er	ez
15	e	es	er	ez
16	e	es	er	ez
17	i	is	ir	iz
18	i	is	ir	iz
19	i	is	ir	iz
20	i	is	ir	iz
21	i	is	ir	iz
22	i	is	ir	iz
23	i	is	ir	iz
24	i	is	ir	iz
25	o	os	or	oz
26	o	os	or	oz
27	o	os	or	oz
28	o	os	or	oz
29	o	os	or	oz
30	o	os	or	oz
31	o	os	or	oz
32	o	os	or	oz
33	u	us	ur	uz
34	u	us	ur	uz
35	u	us	ur	uz
36	u	us	ur	uz
37	u	us	ur	uz
38	u	us	ur	uz
39	u	us	ur	uz
40	u	us	ur	uz

Appendix 2: Answer sheet for Perception test two

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	Pata	Pato	Gata	Bata
2	A	E	I	
3	Seda	Ceta	Sera	Seta
4	A	O	U	
5	A	E	O	
6	Pata	Pato	Gata	Bata
7	Pasto	Gasta	Gasto	Pasta
8	E	I	A	
9	Seda	Ceta	Cera	Seta
10	Seda	Ceta	Sera	Seta
11	A	O	U	
12	Perro	Cero	Cerro	Cepo
13	Pata	Pato	Gata	Bata
14	Pata	Gato	Gata	Bata
15	Pesa	Besa	Mesa	Peso
16	Te	Ti	De	Fe
17	Apilar	Afilar	Afilad	Apilad
18	Pesa	Besa	Mesa	Peso
19	Te	Ti	De	Se
20	Pesa	Besa	Mesa	Peso