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The Effect of Dialect Contact and Social Identity on Fricative Demerger

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The Effect of Dialect Contact and Social Identity on Fricative Demerger

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Dedication

Dedicated to my wife, my parents, my Nana, and my sister and brother. And also to all of the *buena gente* of Huelva and Lepe who were so gracious to share with me stories of their life, region, and culture.

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The Effect of Dialect Contact and Social Identity on Fricative Demerger

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This dissertation focuses on the phonetic demerger of the traditional dialectal feature of *ceceo,* [s$^\theta$], into the national prestige feature of *distinción,* [s] and [θ]. Based on 80 sociolinguistic interviews (40 male, 40 female; ages 18-87), the current endeavor analyzes the coronal fricative variation in the city of Huelva and the nearby rural town of Lepe. The aim of the research was four-fold: (i) to provide a sociophonetic assessment of the demerger of *ceceo* in connection to sociolinguistic theories of mergers and splits; (ii) to investigate which linguistic and extra-linguistic factors promote the demerger of *ceceo* to *distinción*; (iii) to compare a rural and an urban speech community in regards to the demerger; and finally, (iv) to determine the acoustic properties of these Andalusian coronal fricatives. The current analysis focuses on a reading passage and a word list from a larger four-part sociolinguistic interview averaging 60 minutes. The results indicate that significant predictors of demerged realizations are: orthography, gender, age, education, occupation and origin on the measures of center of gravity, variance, and mean intensity. The leaders of change are females, younger, those with more educational attainment, those with service and professionally oriented occupations, and those from Huelva. Those with *distinción* demonstrate a separation in phonemes with higher values for center of gravity and mean intensity for [s] and lower values for center of gravity and mean intensity for [θ], while those with *ceceo* demonstrate intermediate values for center of

gravity and mean intensity. The implications of this study are fourfold: (i) large scale-societal changes of increased dialect contact, increased education, changes in sectors of employment, and changes in population have created the social context that allows for the convergence from traditional dialectal *ceceo* to standard Castilian *distinción*; (ii) the motivation for this community-wide split is inherently social, suggesting that sociolinguistic theory should incorporate more non-English examples to investigate long-standing claims regarding mergers/splits such as Garde's and Herzog's Principles; (iii) both urban Huelva and rural Lepe are moving from merged *ceceo* to demerged *distinción* in similar processes of linguistic change, but differing in rate of change, indicating that even smaller towns perceived as timeless carriers of dialectal features are susceptible to convergence to regional or national standards; and, finally, (iv) the feature of *ceceo* undermines the phonological categorical approach between phonemes as it presents a gradient phonetic continuum between and overlapping with /s/ and /θ/. The present study contributes to the on-going research of coronal fricatives and dialect convergence in Andalucía, dialect contact induced change in modern social dialectology, and variationist analysis of mergers and splits.

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1. Mergers/Splits and Dialect Contact

Southern Andalusian Spanish is putatively distinct from all other varieties of

Spanish in demonstrating *ceceo*, where the four medieval Spanish sibilants historically

merged to /s$^\theta$/ (e.g., *gracioso*, 'funny' etymologically [gɾaθjoso]; in Southern Andalusian

Spanish: [gɾas$^\theta$jos$^\theta$o]). Other varieties in the Spanish-speaking world manifest either a

merger to /s/ (parts of Andalucía, the Canary Islands, and all of Latin America) or

distinción, the historic maintenance of /s/ and /θ/ as a result of the merger of the four

medieval sibilants. The current project seeks to document the on-going phonetic

demerger of *ceceo* in the Andalusian province of Huelva, Spain. Specifically, this work

aims to document the social diffusion of the *distinción* standard*,* as well as the degrees of

phonetic difference between the coronal fricatives in both speakers with the merger and

those with the split. This is important because the phonetic quality of the coronal fricative

produced in Southern Andalucía is quite variable and is often depicted by linguists and

dialectologists as /s$^\theta$/ or /θ^s/[1], designating the phonetically intermediate *ceceante*

production of the fricative. In this study, it is hypothesized that there is a continuum of

fricative productions among all speakers and that there is a demerger in progress

specifically in Huelva capital due to immigration from northern parts of the province of

Huelva and other parts of Spain (i.e. speakers who produce *distinción*) and a concomitant

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[1] While either is acceptable, I will adopt /s$^\theta$/ in this study as it is considered an allophone of /s̠/ from a historical perspective (Hualde 2005; Penny 2000). The symbol /s$^\theta$/ is meant to denote the intermediate phonetic realization and does not suggest dynamic changes throughout the fricative. That is, this is not meant to represent that the fricative starts with an /s/ and transitions into /θ/.

change in social norms toward a more cosmopolitan speaking norm. It is hypothesized, by contrast, that speakers from nearby, agro-rural Lepe (with tighter social networks and allegiance to local norms) will demonstrate less demerger and more maintenance of the stigmatized *ceceo.* This project examines the demerger of /s$^\theta$/ into the *distinción* phonemes of /s/ and /θ/. In coastal Andalucía, this type of distinción is *distinción meridional* 'southern distinction' as the /s/ realization is alveolar as opposed to the northern Castilian apico-alveolar /s/ realization. In this sense, coastal Andalusian Spanish never had the /s/-/θ/ contrast, but due to the stigmatization of the traditional *ceceo* merger in light of the prestigious Castilian *distinción* through dialect contact and educational norms, these communities are demerging from *ceceo* into *distinción*. Thus, this chapter will review theories and findings on mergers/splits (§1.1) and dialect convergence due to dialect contact (§1.2). This change concludes by briefly reviewing demerger and social change (§1.3) and the aims of the dissertation (§1.4).

1.1 PHONETIC MERGER AND SPLIT (DEMERGER)

The study of mergers, splits, and chain shifts, has been of great importance to historical linguistics, dialectology, and sociolinguistics. Fundamentally, these processes involve a change in the relationship between two sounds. While mergers and splits have been studied in great detail throughout historical linguistics, investigating these changes-in-progress with modern methodologies that were not available to neogrammarians permits novel insights into these mechanisms of change (Gordon 2013, 2015: 173; Labov 1994: 19). This section specifically reviews previous literature on mergers (§1.1.1), splits

(§1.1.2), the social correlates, or lack thereof, of mergers/splits and splits (§1.1.3). In §1.1.4 the two main theses on splits are presented; a split of a near-merger (§1.4.1.1), and a split induced by dialect contact (§1.4.1.2). An overview of the Andalusian case is provided in §1.1.5.

1.1.1 Mergers

A merger can be said to occur when the phonemic distinction between two sounds is lost. There are unconditioned mergers, in which the contrast is lost in all contexts, and conditioned mergers[2], in which the contrast is lost only in particular phonological contexts. An example of an unconditional merger is the vocalic merger of /ɑ/-/ɔ/ to /ɔ/ of the word class COT-CAUGHT, or DON-DAWN. In unconditioned mergers all words and phonological contexts are affected. On the other hand, an example of a conditioned merger is the pre-nasal merger of /I/ and /ɛ/ of the KIT-DRESS vowels before a nasal such as in *pin-pen*. In other phonological environments, the KIT-DRESS vowels remain phonemically distinct.

In addition to the identification of a merger itself, there has been a great deal of literature that has advanced our understanding on the processes that lead to mergers (Labov 1994, Herold 1990, 1997). Citing several previous studies, Labov (1994: 321) identifies three mechanisms of mergers: (i) merger by approximation (Trudgill & Foxcroft 1978); (ii) merger by transfer (Trudgill & Foxcroft 1978); and (iii) merger by expansion (Herold 1990, 1997). During these processes of merger there is the occasional

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[2] This distinction is also referred to as "context independent" and "context sensitive," referring to the phonetic context (Hickey 2004: 126).

case of *flip-flop* (Di Paolo 1992; Hall-Lew 2013; Labov et. al. 1972; Labov et al. 1991), where certain speakers maintain a slight contrast, but the contrast is flipped in that these speakers use "wrong" phoneme in a word.

While the focus on types of mergers and their causes sheds light onto situations in which future mergers may occur (Herold 1997: 165), there still exists debate as to whether or not mergers are reversible. The possibility of the split of a merger is disputed in the linguistics literature under the convention of *Garde's principle,* which holds that once a merger has occurred, it will persist (Labov 1994: 311). Specifically, Garde (1961: 38-9) states, "Innovations can create mergers, but cannot reverse them. If two words have become identical through a phonetic change, they can never be differentiated by phonetic means" (*Labov's translation* 1994: 311). Labov summarizes this as *Garde's Principle*: "Mergers are irreversible by linguistic means" (1994: 311). As Labov mentions (1994: 312), non-native speakers must learn a set of facts of word classes in order to produce a contrast, but native speakers on the other hand, must unlearn "the old facts acquired from their parents, and learn a new set." In this sense, Labov sees this as a difficult process:

> The *difficulty* of reversing mergers is then deduced from more general principles
> of linguistics. The *impossibility* of reversal established by Garde's Principle is not
> a deduction, but rests on empirical observations. Garde's Principle does not say
> that it is theoretically impossible for a person to reverse a merger accurately. It is
> based on the empirical observation that at no known time in the history of the

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language has such a reversal been accomplished by enough individual speakers to restore two original word classes for a given language as a whole (1994: 312). Thomas (2006: 490) posits that such claims of the irreversibility of mergers seems plausible particularly from an acquisition perspective in which children should not have any knowledge of which sound belongs to which words class. However, several scholars have recently presented evidence of splits indicating that Garde's Principle may not be exceptionless given the appropriate social context and dialect contact (Johnson 2010; Johnson & Nycz 2015; Maguire 2008; Maguire et al. 2013; Nycz 2011, 2013; Regan 2017; Villena 2001; Villena & Vida 2012).

Another major convention assumed in sociolinguistic theory is *Herzog's Principle,* which states, "mergers expand at the expense of distinctions," indicating that mergers are more common than splits (Herzog 1965; Labov 1994: 313). This receives empirical support through the *Atlas of North American English* (Labov, Ash, & Boberg 2006) in which many mergers such as COT-CAUGHT or PIN-PEN (among others) have expanded over vast territories of the United States.

1.1.2 Splits (demergers)

While phonetic mergers have been well studied in in the fields of historical linguistics and sociolinguistics, splits, the reversal of previously merged phones, remains a relatively underexplored topic (Johnson 2010; Johnson & Nycz 2015; Labov 1994; Maguire 2008; Maguire et al. 2013; Nycz 2011, 2013). Additionally, outside the literature

devoted to mergers in English, there has been little variationist work on mergers/splits in other languages[3] (Gordon 2013, 2015; Thomas 2006).

Most linguists agree that a full merger will not split due to language internal reasons alone unless accompanied by language external motivations such as dialect contact or social pressures such as education or mass media (Labov 1994: 343; Hickey 2004: 134; Thomas 2006: 490). Labov states,

> For social pressures to be brought to bear on the reversal of mergers, there must
> be an overt campaign to bring the problem to social attention and bestow prestige
> on the distinction. Yet this is not a normal development. As a rule, mergers and
> splits have no social affect associated with them (1994: 343).

While Labov acknowledges the possibility of a split due to such social pressures, he argues that there have never been enough speakers to achieve a reversal to restore word classes for a language (1994: 312-313). However, he reports anecdotes that /ʌ/~/u/ distinction of Received Pronunciation is acquired by in private boarding schools by students who did not grow up in a house with the distinction (1994: 347-8; Wyld 1936: 3-4). This leads him to acknowledge the possibility of the acquisition of a lexical split in a controlled education environment (1994: 348). In addition to education, he signals that mass media could also have a small role to play in the split of a merger (1994). Hickey (2004: 135) also suggests that only an external explication seems probable for the split of a merger, particularly in situations of dialect contact. In these situations, speakers are

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[3] However, as will be reviewed in §1.1.4.1, there has been a great deal of laboratory work on incomplete neutralizations in Polish, German, Catalan, and Russian.

exposed to dialects with the distinction and thus may acquire it for social purposes. Thomas also indicates that a split may occur in cases of social pressure from a more standard dialect and/or in cases of dialect contact due to a large immigration of speakers with the distinction into a region with the merger (2006: 490).

   With more recent examples of possible splits, Labov (2010) has opted for the terminology of "unidirectional"[4] instead of "irreversible" with regards to mergers. He states, "unidirectionality changes can reverse direction, if rarely, and these cases are of great interest in that they allow us to search for the special circumstances that permit things to go the other way" (2010: 120). He acknowledges that individuals, with the adequate dialect contact, may acquire a distinction later in life, but that it is not likely at a communal level. Specifically, he claims, "though it is clearly possible for individuals in close contact with the unmerged dialect to achieve this result by paying close attention to the speech of those around them, it does not seem likely that an entire speech community can do so" (2010: 121). A recent example of a split on an individual, but not communal level was found by Sankoff (2004). Sankoff found that only two British speakers out of a group of thirty-five were able to acquire the /ʌ/~/u/ distinction associated with Received Pronunciation. Such examples point to the possibility of an individual being able to learn a distinction, but perhaps not a community.

   Two other recent potential splits that challenge Garde's Principle are the reversal of the /ɑhɾ/-/ɔhɾ/ merger (*mourning-morning*, *card-cord*) in St. Louis and the reversal of

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[4] Labov proposes (2010: 126), "the main argument for the unidirectionality of mergers is that reversal requires a word-by-word relearning, in other words a change that proceeds by lexical diffusion rather than by regular sound change."

/ihr/-/ehr/ merger (*fear-fair, beer-bear*) merger in Charleston, SC. Both examples are conditioned mergers as they consist of a subset of vowels before /r/. Labov (2010) claims that as regional North American English dialects phonologically diverge, local dialects of small cities converge to a regional dialect (2010: 138). In this sense, Labov claims that the reversal of *card/cord* merger in St. Louis and the reversal of the *fear/fair* merger in Charleston are the effect of these two cities losing their traditional dialects in favor of a more regional dialect. That is to say, St. Louis is approximating to the Northern Cities Shift of the Inland North while the traditional dialect of Charleston is being replaced by the regional Southeastern dialect (Baranowksi 2007; Labov 2010: 138). Consequently, Labov (2010: 138) suggests that "the exceptions to Garde's Principle can therefore be characterized as mergers that are associated and identified with a dialect in the process of replacement." Consequently, although Garde's Principle is supported as an overwhelming tendency, it is not without exceptions.

1.1.3 (Lack of) Social affect of mergers/splits

It has been proposed that both splits and mergers lack socially meaningful status for speakers and listeners. Labov (1994: 343) states, "the evidence for the absence of social affect of splits and mergers is massive and overwhelming." An example is the well-studied case of the COT-CAUGHT merger of which no evidence of social awareness has been reported. Recent work by Baranowski (2006, 2007), based on a socially stratified sample of 100 subjects in Charleston, S.C., demonstrates that speakers are unaware of the change in progress of the low-back merger (COT-CAUGHT). In the same

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study, the on-going split of /ihr/-/ehr/ shows a clear break in speakers with the merger above the age of 50 and younger speakers showing a very clear distinction for /ihr/-/ehr/, only one speaker was aware of some *beer-bear* confusion, supporting Labov's claim of lack of social affect[5] (1994: 343-4; 2010: 129). However, given most studies have looked at English vowels, claims about lack of social awareness should be taken with caution.

1.1.4 The two main accounts of splits

In understanding the split of reported mergers, there are two main thesis: (i) that a reported merger was in fact only an apparent or near-merger, which allowed for the separation of phonemes as they were never fully merged (Labov and colleagues); or (i) that dialect contact of speakers with the distinction among those with the merger allowed for a split of a full merger (historical perspective). In line with Trudgill et al. (2003), I do not believe that one account should be privileged over the other, but that type of split may occur in one specific context while the other type of split in another context; these accounts are not exclusive, but rather dependent upon the variable and the context. Thus, neither account should be assumed a priori. Here both theses will be reviewed.

1.1.4.1 Apparent or near-mergers

Some mergers that had been previously reported as complete have been reanalyzed as apparent or near-mergers. A near-merger occurs when speakers produce subtle acoustic differences between two separate phonemes, but are not able to perceive

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[5] However, more recently Baranowski (2013) has suggested that the PIN-PEN merger may be above the level of conscious awareness as it received some overt comments from speakers.

these differences themselves (Labov et al. 1972; Di Paolo & Faber 1990; Faber & Di Paolo 1995; Labov et al. 1991; Labov 1994). The most commonly cited near-merger is the MEAT-MATE[6] problem. Historical phonologists had reported a merger of these two vowel classes, but contemporary British English presents two phonemes. Consequently, one could hypothesize that this is a case of phonemic split. However, Labov and colleagues (1975, 1994; Labov et al. 1972; Labov et al. 1991) suggest that the two sounds were never fully merged[7], but rather an apparent or near-merger. Labov proposes that this near-merger was maintained for generations, which allowed for the expansion of the vowel space between the sounds over time. Thus, this explanation is compatible with Garde's Principle, as there never was a complete phonetic neutralization of the two sounds.

Since the original proposal of near-mergers (Labov et al. 1972), others have reported similar findings with TOO-TOE and BEER-BEAR in Norwich (Trudgill (1974), with LINE-LOIN in Essex (Labov 1975; Nunberg 1980), POOL-PULL in Salt Lake City (Di Paolo & Faber 1990; Di Paolo & Faber 1995), and French schwa and [œ] in Frenchville, PA (Bullock & Nichols *in press*). Not all linguists, however, agree on the properties of near-mergers. Hickey (2004: 131), for example, believes that near-mergers cannot be passed across generations. In his view, they are the product of one generation on route to a full merger and cannot be separated. Hickey claims, "synchronic evidence for the existence of

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[6] See Maguire (2008) for a comprehensive review on this debate.

[7] In an alternative account (a dialect contact induced split), Milroy and Harris (1980) argue that there were two systems within the same community, speakers with the merger and others without the merger, which eventually lead the entire community to follow the unmerged norm.

near-mergers is slight and its assumption across generations is very speculative" (2004: 135).

Other studies have focused on non-primary acoustic correlates to examine if speakers utilize secondary acoustic correlates to separate phonemes. While the bulk of sociolinguistic near-merger literature has focused on vowels, there have been several experimental studies indicating incomplete neutralization in situations of obstruent final devoicing. This has been observed in Polish (Slowiaczek & Dinnsen 1985), German (Charles-Luce 1985; Port & Crawford 1989; Port & O'Dell 1985), Catalan (Charles-Luce & Dinnsen 1987; Dinnsen & Charles-Luce 1984; Mascaró 1987), and Russian (Burton & Robblee 1997) where cues such as duration of the previous vowel or stop consonant serve to distinguish the two sounds. Di Paolo and Faber (1990) found while speakers merged the spectral features of vowels (F1, F2) they differentiated these phonemes through secondary acoustic correlates, such as creak. Specifically they found a near-merger in which speakers produced differences in phonation between tense-lax pairs (/i-ɪ/,/e-ɛ/,/u-ʊ/) in Utah, even when the F1/F2 contrasts were lost.

In light of the findings on near-mergers, auditory analysis alone may not be sufficient to discover whether a contrast is or is not maintained. The seminal work of Labov et al. (1972) identifying near-mergers such as SOURCE-SAUCE in New York City and HAWK-HOCK in Western Pennsylvania provides evidence that what are traditionally perceived to be phonemes do not always fall into clearly discernible discrete phonetic categories. Labov et al. (1972) and Labov et al. (1991) indicate that near-mergers, with

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their asymmetry between production and perception, challenge the entrenched categorical view of phonology. The existence of near-mergers calls into question the very notion of discrete phonological categories as phonemic categories are suspended in perception, but yet small acoustic differences are maintained in production.

1.1.4.2 Dialect contact induced split

Several scholars (Johnson 2010; Johnson & Nycz 2015; Maguire 2008; Maguire et al. 2013; Nycz 2011, 2013; Trudgill et al. 2003) have recently provided evidence that challenges some variationist claims regarding mergers and splits. While acknowledging that Labov's arguments against the reversibility of a merger are supported by significant amounts of empirical data, Maguire et al. (2013) believe that parts of his argument are too "structural and abstract" (2013: 234). They posit that Labov's claim that no split has occurred at the level of a language is too strong and that instead of speaking about *languages*, one should speak about *individual* phonological systems. In this sense, if Labov's argument was rephrased to say that at no known time has a split occurred within an individual's phonology, it would not hold as much credibility. Additionally, Maguire et al. (2013: 234) suggest that irreversibility by "linguistic means" is a fuzzy notion as they note that intra- and inter-speaker variability impacts an individual's phonological knowledge. Following this line of thought, the irreversibility of mergers within a speech community becomes more susceptible to exceptions (2013: 234). In this sense, a speech community may be constituted by individuals who demonstrate a complete merger, others a putative split, and still others in between the two norms. Maguire et al. (2013:

234) argue that such is the case in the situation known as "swamping" (Thomas 2006) where a merged community is swamped (normally through immigration) by speakers who do not have the merger, resulting in speakers, especially those in acquisition, being exposed to both the merger and the distinction. While this may be an extreme situation, they suggest that what is much more common is the role of social meaning of the merger and the split. They state, "the applicability of Herzog's Principle (Labov 1994: 313)… may be compromised when the merger involved is, or becomes heavily stigmatized" (Maguire et al. 2013: 234-235). As evidence, they cite the current split of the long-standing NURSE-NORTH merger in Tyneside English. Due to large-scale immigration in the 1900s, Tyneside speakers are learning the distinction without hypercorrection. While a complete merger is typical for some speakers in Tyneside (Maguire 2008; Watt 1998a, 1998b; Watt & Milroy 1999), there are many speakers who have two separate phonemes. Maguire's (2008) analysis of speakers from the middle of the 19th century suggests that this variation existed even then. Given the competition between the merged and non-merged systems, it is likely that the stigmatization of the localized merger has led to its split (Maguire et al. 2013: 235).

Trudgill et al. (2003: 41), while recognizing the plausibility of Labov's near-merger in other cases, claim that the split of /w/-/v/ is a result of dialect contact. That is, /w/ and /v/ were merged as [β] through the 17th century. At that time of colonization, it was carried to other parts of the early colonies. However, in England, due to dialect contact, specifically with middle-class speakers in southeastern England without the

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merger, this merger began to split. This same merger has either been maintained or is only now beginning to split in lesser-known Englishes due to such varieties isolation and lack of dialect contact of mainstream varieties.

Nycz (2011, 2013) provides an example of immigration promoting a split among seventeen Canadian adults who immigrated to New York City (and surrounding New Jersey counties). These speakers' native dialect has a COT-CAUGHT merger while their new place of residence presents the separate phonemes of (o) and (oh) word classes. She found that many adults were able to acquire the contrast with some degree of variability. Many speakers distinguished these vowels by at least one phonetic measure (F1, F2, or both) but these distinctions were significantly smaller than those of the native New Yorkers. She contends that Herzog's Principle is a straw man argument, as there exists a middle ground in which speakers can learn a new sound for some of the word class as opposed to all or none (2013: 328).

In another example of a possible split, Johnson (2010) examined the low back COT-CAUGHT merger in New England, analyzing speakers who grew up in areas with the merger and moved to areas with the distinction and vice versa; speakers who grew up in areas with distinction and moved to areas with the merger. The eight adult speakers who grew up in an area with the merger (and had moved to an area with the distinction) were able to produce subtle distinctions in conversation, but less so in minimal pair production. Johnson also looked at three children (all from one family who moved from an area with the merger to an area with the distinction) and found a very subtle distinction in each of

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them. Johnson and Nycz (2015: 115) suggest that these findings, in tandem with Nycz (2011, 2013), indicate that adults accommodate towards a second-dialect in either the direction of loosing or acquiring the COT-CAUGHT distinction; children follow the same trends, but appear to be able to loose or acquire distinctions in shorter periods of time.

1.1.5 The Andalusian example

As noted from the examples above, the literature cited to inform theories on mergers and splits is heavily biased[8], not only towards English[9] but toward English vowels in particular. This emphasis has led variationists to overlook a particularly important example of a community-wide consonantal split in Andalusian Spanish.

The mergers of *ceceo* and *seseo* were cited as dominant throughout rural/urban and coastal/interior Andalucía as late as the mid 20th century (Navarro Tomás et al. 1933; Alvar 1996; Alvar et al. 1972). However, Andalusian sociolinguistic and dialectologist scholars in the last four decades have been analyzing the splits of *ceceo* and *seseo* into the standard Castilian norm of *distinción* (Ávila 1994; García Amaya 2008; Lasarte Cervantes 2010, 2012; Melguizo 2007, 2009ab; Martínez & Moya 2000; Moya & García-

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[8] Docherty and Mendoza-Denton (2012: 47) claim that an issue with the variationist project is that "the large volume of socially correlated phonological variation is heavily skewed towards the analysis of one language (English), and recurrently focuses on a subset of values," such as "-t/-d deletion, (ing), and certain vowel variables." Thus, we are a long way away from having a cross-language understanding of sociolinguistics (Docherty & Mendoza-Denton 2012: 47).

[9] For a recent non-English study see Bullock and Nichols (*in press*). In looking at legacy data of two French speakers in Frenchville, Pennsylvania, Bullock and Nichols demonstrate that schwa and [œ], while produced with some degree of overlap, were not fully neutralized. They claim that it is was actually a near-merger based on the F1 values as well as on the secondary cue of duration differences. The subsequent generation then separated these two phonemes further, suggesting that the reversal of a near-merger is in fact possible.

Wiedemann 1995; Moya & Sosiński 2015; Regan 2017; Salvador 1980; Santana 2016a; Villena 1994, 1996, 2001, 2005, 2007; Villena et al. 1995; Villena & Requena 1996). Previous scholars (Moya & Sosiński 2015: 35; Regan 2017: 152; Villena 2001: 126; Villena & Vida 2012: 117-118) suggest that the demerger of *ceceo* appears to challenge both *Garde's Principle* and *Herzog's Principle* as entire speech communities have shifted from a traditional dialect merger to the supralocal standard *distinción*. Villena (2001, 2008) indicates that the demerger likely began in the 1950s. The on-going demerger of *ceceo* provides an opportunity to investigate change-in-progress and to examine existing variationist claims and assumptions about mergers and splits.

While *ceceo* has been reported as a merger since the middle ages in Andalusian Spanish (Penny 2000, 2002; Alvar 1996), all previous work has been auditory analysis (with the exception of Lasarte Cervantes [2010] and Regan [2015]). To date, no study has investigated whether *ceceo* is a near-merger that is now demerging or whether *ceceante* speakers produce homophonous pairs, in which case the ensuing demerger constitutes a full phonemic split due to dialect contact and stigmatization. As this demerger is playing out in the context of dialect contact, the following section will consider effects of dialect convergence and divergence in situations of contact.

1.2 EUROPEAN SOCIAL DIALECTOLOGY: DIALECT CONVERGENCE & DIVERGENCE

In the 20th century large-scale societal changes throughout Europe have affected traditional dialects (Auer 1998; Auer & Hinskens 1996; Berruto 2005; Britain 2009; Hinskens 1998a, 1998b; Hinskens, Auer, & Kerswill 2005; Holmquist 1985; Kerswill

1994, 1996, 2003; Kerswill & Trudgill 2005; Villena 1996, 2005). Auer and Hinskens (1996: 1) indicate that throughout Europe, "social and cultural changes have affected the nature and position of the old dialects, thereby dissolving the traditional linguistic situation and giving way to complex sociolinguistic developments." These social changes often lead to either dialect convergence or divergence. Dialect convergence is defined here as the "linguistic unification… and homogenization of the linguistic repertoire," while dialect divergence is defined as the "linguistic diversification… and heterogenisation" of dialects (Hinskens et al. 2005: 1-2).

The term *dialect* is often thought of both in popular and scholarly discourse as "substandard" or associated with less prestigious groups (Chambers & Trudgill 1998: 3). For this reason, many scholars, such as Chambers and Trudgill (1998: 5) prefer to use the more neutral term of language *variety*, in order to avoid negative popular associations. However, given the continued use of *dialect* within social dialectology, the term will be use alongside *variety* in the current study. One of the most commonly accepted definitions of a dialect within social dialectology is "a language variety which is used in a geographically limited part of a language area in which it is 'roofed' by a structurally related standard variety," which may display grammatical lexical, and/or phonological differences from related varieties (Hinskens et al. 2005: 1). In modern social dialectology, much of the convergence and divergence is conceptualized between traditional dialects and the national standard variety. While I adopt the use of the term

"standard,"[10] I acknowledge the ideological baggage of the terminology due to its many popular and scholarly connotations. Standard language, or standard variety, will be defined here as the variety of overt prestige adopted by the centralist power of a nation-state. In Spain, the "standard" will be considered standard Castilian Spanish of central and northern Spain. Standard varieties are simply dialect varieties that have taken on social prestige due to their association with certain social and geographical groups. Similar to the terminology of a *language*[11] or a *dialect*, a *standard variety* is also an ideological construct. It should be acknowledged that there are linguistic differences between standard and dialect varieties, but just as important are the social differences involved in separating the people who speak such varieties.

The concept of a "standard-language" is relatively recent. Mass literacy, which has given standard varieties unprecedented momentum throughout the world, has only been around since the 20th century (Hinskens et al. 2005: 27). In the last century in particular, Auer (1988) indicates that the presence of standard varieties in European speech communities has increased significantly due to large-scale societal changes. Consequently, cross-dialectal leveling would have been the only type of convergence until relatively recently, where there is now standard-dialect convergence in place of

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[10] Coupland (2007: 44) indicates, "there is a dangerous circularity in pre-defining the social meanings of sociolinguistic variants in terms of 'standardness.'"

[11] Chambers and Trudgill state, "language is not a particular linguistic notion at all… we consider Norwegian, Swedish, Danish, and German to be single languages for reasons that are as much political, geographical, historical, sociological and cultural as linguistic" (1998: 4).

dialect-dialect convergence[12] (or divergence for that matter). We will now review the large-scale societal changes that have led dialect contact (§1.2.1) as well as the linguistic outcomes of dialect convergence (§1.2.2).

1.2.1 Large-scale societal changes

 Auer and Hinskens (1996: 1) take the position that convergence and divergence are primarily externally motivated due to increased dialectal contact, literacy, and mobility. Changes such as industrialization, urbanization, increased mobility, increased mass media, and improved education have brought about unprecedented dialect contact (1996: 4). More and more speakers are now exposed to the "standard variety", particularly through mass media and education (Auer & Hinskens 1996). Previous isolation began to disappear with the "demise of the economic role of agriculture" (Hinskens et al. 2005: 23). In fact,

> The transition from an agrarian to an industrial and, eventually, post-industrial society, triggers cultural changes which indirectly and gradually have tremendous effects on the position of the dialects. Among the cultural changes are increased literacy and improved means of transportation, leading to commuting and increased general mobility… Worldwide, the erosion of the relatively closed rural village community, the habitat of the traditional dialects, is manifested geographically in urbanization and the 'usurpation' of village communities by neighboring cities. Regular and intensive contact of a dialect with other varieties

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[12] In modern dialect contact, Auer and Hinskens (1996: 14) pose the question of whether dialect-dialect leveling can occur today without any influence from the standard.

often leads to short-term accommodation and, as some authors assume, in the long run to convergence (Hinskens et al. 2005: 23-24).

The transition from an agricultural, to industrial, and now to a post-industrial society has certainly increased mobility, contact, and education. In addition, migration (both emigration and immigration) has had a significant impact on dialect contact. Beginning in the mid 19th century with the rise of industrialization, migration increased steadily throughout Europe (Auer & Hinskens 1996: 19; Hinskens et al. 2005: 35). Thus, the present-day movement of people is a relatively new occurrence as much of the European population was previously immobile (Auer & Hinskens 1996: 18). Although the end of industrialization has led to a shift in population movements, in which there is now the sub-urbanization of city workers into the surrounding countryside, the industrial center continues to play a role in dialect change. However, instead of the rural dialects influencing the urban variety, the urban variety is now influencing the surrounding suburbs (Auer & Hinskens 1996: 19).

In addition to the labor changes seen throughout Europe from a primary, to a secondary and to a tertiary sector, there have also been changes in family structure throughout European and Western societies in general. Hinskens et al. (2005: 32) posit that the change from living in a multi-generational family to a nuclear family has had a significant impact on dialect acquisition. In previous (and some current) agricultural societies, it was more common to have three generations living in one home. However, in industrial or post-industrial societies, most now live with only the nuclear family and are

consequently exposed to less linguistic input from older generations. Hinskens et al.

(2005: 32) argue that a dialect may be "structurally reduced" in passing to the

grandchildren as the grandparents' input is not present in their dialect acquisition.

Kerswill and Trudgill (2005) suggest that where the third generation is not present,

koineised forms accelerate without the stable local vernacular of the grandparents.

Therefore, changes in mobility, economy, family structure, and education have led to

significant dialect convergence throughout Europe.

1.2.2 Dialect convergence and leveling

Although Auer and Hinskens (1996) propose that most dialect convergence and

divergence results from social factors, it is understood that there is always the possibility

of language-internal changes. Linguistic change in situation of contacts may include

processes of simplification, regularization, paradigmatic leveling, mixing, cross-dialectal

leveling, and koinesation (Auer & Hinskens 1996; Britain & Trudgill 2000; Chambers &

Trudgill 1998; Hinskens et al. 2005; Kerswill & Trudgill 2005; Sieguel 1985; Trudgill

1986, 2004; Villena 1996).

Here we will focus on dialect leveling. Dialect leveling is the reduction of

variation between two dialect varieties (Hinskens 1998). Two varieties become more

similar to one another. The motivation for such leveling is many times social. Features

that carry social stigma are likely to be eliminated in favor of more standard variants

(Kerswill & Trudgill 2005; Siegel 1985). This appears to be the case in Andalucía, where

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ceceo has taken on a social stigma and speakers eliminate this feature in favor of the prestigious Castilian *distinción*.

In this dissertation, I focus on the possible outcomes of standard–dialect convergence; this can lead to what Le Page and Tabouret-Keller (1985) referred to speech communities with either "diffused" norms or "focused" norms. Auer and Hinskens (1996: 8) indicate that a newly formed regional standard ("focused norms") may be the outcome of the partial acquisition of a standard form by speakers from traditional dialects. However, little is known about the formation of varieties that are intermediate between traditional and standard dialects. They suggest that a common pattern in the creation of a regional variety is that traditional dialects "trade in their more characteristic features" in favor of more standard features (Auer & Hinskens 1996: 9); see Figure 1.1 (a). Traditional dialects appear to disappear quicker in favor of regional standards in cities than in rural areas; thus, formation of regional standards can be strongly correlated with industrialization. Another pattern is one is which the convergence looks more like a continuum of realizations without a discernable regional standard; see Figure 1.1 (b).
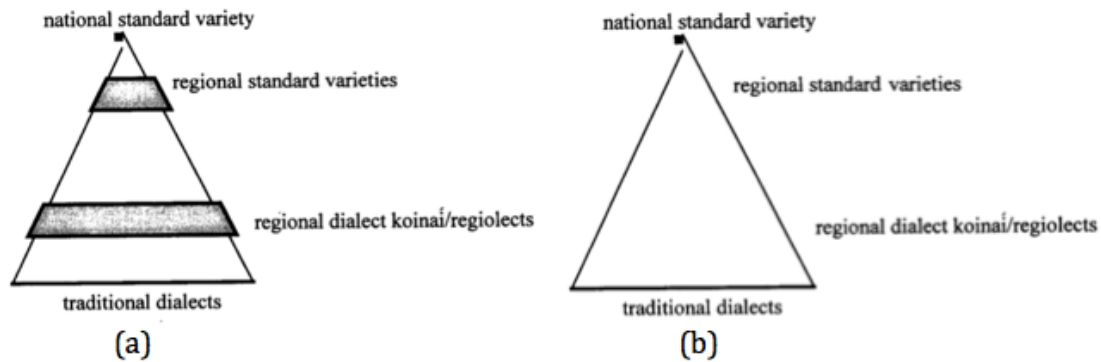
Figure 1.1: Two types of convergence: Convergence with the presence of a distinct regional standard (a) and convergence without a distinct regional standard (b) (Auer & Hinskens 1996: 7)

Villena (1996) argues that the situation in Andalucía is more complicated than the traditional sociolinguistic/dialectology model of standard-dialect continuum. He claims that there is a newly formed regional standard that differs mostly at the phonological level from the traditional dialects and from the national standard. This regional standard also differs from the standard Western Andalusian Spanish known as the "*norma sevillana*" 'Sevilla norm.' Based on the analysis of several phonological features, Villena (1996) argues for a tripolar continua (see Figure 1.2) in the city of Málaga, in which there is the national Castilian standard, the traditional dialect of Málaga, and a recently formed regional standard, in which speakers have leveled out stereotypical vernacular forms in favor of national prestige forms, while simultaneously retaining other local features that do not receive negative evaluation. I will argue that Huelva presents a situation similar to Málaga in which there is a recently formed regional standard that has leveled out *ceceo* in favor of *distinción*.

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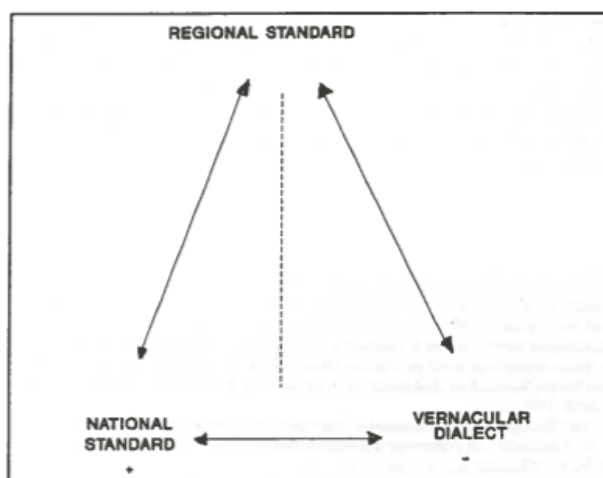
Figure 1.2: Tripolar continuum in Málaga, Spain (Villena 1996: 135)

1.3 DEMERGER AND SOCIETAL CHANGE

Western Andalucía presents the large-scale societal changes mentioned above. Huelva capital, while previously isolated, has been subject to increased dialect contact, increased educational attainment, and increased mass media exposure to standard Castilian since Franco industrialized the area in 1964. Previous work by the author (Regan 2014ab, 2015, 2017) indicates that Huelva capital appears to be undergoing dialect convergence, losing traditional dialect features in favor of national standard features. The nearby agricultural town of Lepe, however, with its own unique history of less dialect contact without industrialization presents an ideal situation for ceceo maintenance. Although Lepe has an independent economy and maintains a strong sense of "*lepero*" local identity, the community also appears to be subject to similar large-scale societal changes (perhaps at a slower rate). The two speech communities, in close

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proximity to each other, but with different demographic profiles, is an ideal context to

observe the effects of societal-changes on the loss/maintenance of *ceceo*.

1.4 THIS DISSERTATION

This dissertation project documents the coronal fricative variation in Western

Andalucía. Specifically, the study aims to investigate whether the traditional dialect

feature *ceceo* [s^θ], a reported merger since the 17th century has been maintained in

Western Andalucía, or if in fact, similar to Eastern Andalucía, it has begun to demerge

towards the national Castilian feature of *distinción*; [s] for <s> and [θ] for <z,ci,ce>.

While *ceceo* has been reported as a full merger, this study provides the first large-scale

sub-segmental analysis to investigate the status of *ceceo* as a full or near-merger.

The variation of Andalusian coronal fricatives provides the opportunity to

investigate theories of mergers and splits as this region historically has had only one

phoneme for what Castilian Spanish has had two phonemes. Additionally, as most

variationist work on mergers and splits has focused on vowels, this provides a nuanced

look of a consonant merger/split. As seen above, the two competing theses in dealing

with the explanation of splits is either dialect contact (historical perspective) or near-

merger (Labov and colleagues). The current acoustic analysis of apparent-time data could

shed light onto either the demerger of a near-merger or perhaps the influence of dialect

contact in separating an apparent merger. Western Andalucía, particularly the province of

Huelva, is an ideal location as it has historically been an isolated area with immigration

and dialect contact only beginning in the 1960s. Additionally, the decision to include two

speech communities, urban Huelva and rural Lepe, was in order to examine if this change-in-progress is occurring throughout Western Andalucía or only in urban centers as previous literature in Eastern Andalucía has indicated.

The aim of the study was four-fold: (i) to assess the status of the centuries old reported merger of *ceceo*; (ii) to investigate which linguistic and extra-linguistic factors promote the demerger of *ceceo* to *distinción*; (iii) to compare a neighboring urban and rural speech community to assess the extent of the change; and finally (iv) to determine the acoustic properties of these Andalusian coronal fricatives. This dissertation specifically focuses on the production of coronal fricatives by eighty Western Andalusian speakers. The production data come from passage readings and word lists that analyze linguistic abilities of speakers to separate phonemes. Future work will look at spontaneous speech to verify if the underlying phonological representation differs from this production data.

Chapter 2 reviews the previous studies of Andalusian coronal fricatives, focusing on the linguistic variable of study from a diachronic and synchronic perspective, with attention given to each speech community studied within Eastern and Western Andalucía, as well as differences that have resulted between these communities. A brief review of pilot studies in Huelva is also discussed. Chapter 3 describes the social context of the speech communities of Lepe and Huelva with a particular focus on the large-scale societal changes in population, economy, and education. The role of mass media is considered as well as the rural-urban dichotomy present in sociolinguistic studies.

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Chapter 4 introduces the research questions, methodologies, and statistical analysis. Chapter 5 presents the results of the study separated by macro-level acoustic analysis, macro-level auditory analysis, individual speaker analysis, family case studies, and the acoustic properties of the coronal fricative variation. Finally, Chapter 6 discusses the results in regards to the research questions. In conclusion, limitations of the study are presented as well as directions for future research.

2. Previous studies of Andalusian coronal fricatives

The following sections provide an overview of the previous research on *ceceo* on which the current project builds. Specifically, Section 2.1 provides a brief review of the general phonological features of Andalusian Spanish. Section 2.2 describes the linguistic variable of *ceceo* from both a diachronic and synchronic perspective. Section 2.3 reviews previous sociolinguistic studies of *ceceo* and *seseo* throughout Andalucía, separated into Eastern (§2.3.1) and Western (§2.3.2) Andalucía. Section 2.4 discusses current theories surrounding the Western divergence and Eastern convergence hypothesis. Section 2.5 reviews the author's pilot work. Finally, Section 2.6 summarizes previous findings.

2.1 ANDALUSIAN SPANISH

While popular and scholarly discourse use the terminology "*el andaluz*" 'Andalusian Spanish', it is important to note that there is a great amount of linguistic variation throughout the autonomous community of Andalucía. Consequently, Andalusian Spanish, while diverse geographically and socially (Morillo Velarde 2001, 2003), is seen as the dialect spoken within the eight provinces of the autonomous community of Andalucía (see Figure 2.1). Due to the variation found within the political borders of Andalucía, several scholars use the terminology "*las hablas andaluzas*" 'the Andalusian varieties' (Narbona et al. 1998: 150-1). Narbona et al. (1998: 150, *my tranlsation*) explains that within Andalucía, "there is not a homogeneous geographic nucleus in which we are able to localize 'Andalusian Spanish', in a way sharply separated from the rest." Narbona claims however, in spite of the large amount of linguistic

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variation throughout Andalucía, there is still a very real perception by Andalusians and non-Andalusians alike as to what constitutes *el andaluz*, even when speakers lack the most stereotypical Andalusian features of *ceceo* and *seseo*. Although many of these features are not uniquely Andalusian (Morillo Velarde 1997; Narbona et al. 1998), it appears to be the combination of these features that identifies an Andalusian speaker. As phonology is the most salient feature of Andalusian Spanish, as well as the most studied (Gerfen 2002; Villena 2008), here I will focus on the phonological properties that characterize contemporary Andalusian Spanish.

Figure 2.1: The eight provinces of the autonomous community of Andalucía (Villena 2008: 140)

Andalusian Spanish can trace its roots back to the thirteenth-century in which northern inhabitants resettled after the Reconquest of the south from Arabic rule (Penny 2000: 118; Villena 2008: 140). This period was marked by dialectal mixing and

koineization, which in large part led to simplification and the merger of several phonological distinctions. Modern Andalusian Spanish is characterized by open syllables (i.e. elimination of consonant codas) as well as reduced syllable onset (Villena 2001; 2008). Some of the most common features of Andalusian Spanish are the /s/-/θ/ merger (*seseo* or *ceceo*), aspiration of coda /s/, weakening of /x/ to aspirated [h], elision of intervocalic /d/, and weakening of affricate /t͡ʃ/ realized as [ʃ] (Hualde 2005: 21; Penny 2000: 118-127; Villena 2008: 139-142). Other dialectal features also found in parts of Andalucía, but more socially and geographically delimited, are *heheo* (also written *jejeo*), coda /l/-/r/ merger, as well as the eight vocalic system found in Eastern Andalucía. It has been shown that many of these "southern divergent features" are subject to convergence towards more standard features due to social pressures such as the case of the demerger of *ceceo*/*seseo* to *distinción* resulting in "less natural and more complex phonemic system" (Villena 2008:139).

Due to the phonological reduction in Andalusian Spanish, in comparison, Castilian Spanish is realized more closely to the underlying orthographic representation as compared to Andalusian Spanish. For this reason, Villena distinguishes between Castilian Spanish "conservative dialects" and Andalusian Spanish "innovative dialects." According to Villena (2008: 141-142) conservative (Castilian) dialects retain codas, preserve complex onsets, and generally maintain phonemic distinctions in contrast to innovative (Andalusian and Canary) dialects, which favor coda elision, reduce complex onsets, and may not preserve phonemic distinctions (Figure 2.2).

Feature	Conservative	Innovatory	Standard	Gloss
Coda	'taθas, a'tas·ko, ka'sar	'taθa, a'ta·k:o, ka'sa	*tazas, atasco, casar*	'cups', 'traffic jam', 'to marry'
Onset	'tʃaɾko, 'ka·tʃa	'ʃaɾko, 'ka·ʃa	*charco, cacha*	'puddle', 'butt'
/s/ : /θ/	'kasa / 'kaθa	'kaθˢa	*casa, caza*	'house', 'hunting'
/ʎ/ : /ʝ/	ra'ʎaɾ/ ra'ʝaɾ	ra'ʝa	*rallar, rayar*	'grate', 'scratch'
/x/	'kaxa, 'xulio	'kaha, 'hulio	*caja, julio*	'box', 'July'
[ʀ, ɹ, ř]	'roka 'karo	'ʀoka, 'kaʀo, 'ɹoka, 'kaɹo	*roca, carro*	'rock', 'car'

Figure 2.2: Phonological realizations in Conservative and Innovative Peninsular varieties (Villena 2008: 141)

It is the combination of these phonological mergers and reductions (with degrees of inter- and intra-personal variation) that makes Andalusian Spanish putatively different from Castilian Spanish. Moreover, these differences have led to small differences in phonological inventory between Castilian and Andalusian Spanish (Figure 2.3). These phonological innovations are not only allophonic, but also rather phonemic.

Although the conservative dialects reflect central and northern Spain and the innovative dialects are represented by Andalucía and the Canary Islands, this does not indicate that all Andalusian speakers follow the phonological inventory and trends mentioned above. Given that Castilian Spanish is the prestigious national standard, many urban and educated Andalusian speakers converge towards certain Castilian features (Villena 2008). However, rural and working class speakers tend to follow Andalusian phonological inventories (Villena 2008). Following Trudgill's (2002) three constraints on variation (geolinguistic, structural and social), Villena discusses how such variation occurs. In terms of geolinguistic factors, nearness to certain urban centers tend to

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promote convergence or divergence. Given the prestige of *la norma sevillana* 'the Seville norm', which follows a more divergent pattern, areas closer to Sevilla (such as Cádiz and Huelva) are thought to maintain divergent Andalusian patterns, while areas further away from Sevilla, such as Málaga, Granada, Jaén, Almería, tend to converge toward certain features of the national standard given its prestige.

Conservative (C)   Innovative (I)

Obstruents

Labial	Dental	Palatal	Velar			Labial	Dental	Palatal	Velar
p	t	tʃ	k	Tense		p	t	tʃ	k
b	d	ǰ	g	Lax		b	d	ǰ	g
f	θ	s	x	Fricative		f	θˢ		h

Sonorant

m	n	ɲ			m	n	ɲ
	l	ʎ				l	

ɾ		lax		ɾ
r		tense		r

Figure 2.3: Differences in phonological inventories of Conservative and Innovative
          Peninsular varieties (Villena 2008: 143)

The labels of innovative and conservative varieties do not represent monolithic speech communities, as there exists inter- and intra-personal variation within each of these dialects. Even within the innovative varieties, there are majority divergent patterns and minority divergent patterns (Villena 2008). One of the predominant patterns of the majority divergent patterns is *seseo* and *ceceo*. Villena (2008: 145) posits that *seseo* tends

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to be more common of urban speakers, while *ceceo* is more common of both rural and working class speakers. However, Andalusian innovative linguistic features generally lack overt prestige, which leads more upwardly mobile speakers to converge to certain conservative Castilian features (Hernández & Villena 2009: 191-2).

In terms of minority divergent patterns, there are two common patterns: sibilant fusion and sibilant backing (Villena 2008). Sibilant fusion refers to the fronting of palatal [ʃ] so that it merges with [s̠]. Sibilant backing, or lenition, refers to the backing of /θˢ/ to [h], which is commonly referred to as *heheo*, which occurs among "rural and 'rurban' (i.e., rural speakers living in the city and maintaining strong links with their rural acquaintances and kins) speakers" (Villena 2008: 146).

It is important to recognize which linguistic features are used by which speakers. Carbonero (2003) proposed that four groups of phonological features be separated based on their actual use as well as their social acceptance. Carbonero suggested the inclusion of the entire social landscape of Andalucía, in contrast to previous dialectal accounts of Andalucía following the traditional dialectology technique of interviewing only non-mobile older rural males (*NORMs*) (Trudgill 1986). Hernández and Villena (2009: 192) recently extended upon Carbonero's (2003) group distinction with concrete examples, separated by Western and Eastern Andalusian varieties. While useful, a social typology should be taken with caution as evaluations and uses vary per region and per speech community.

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2.2 THE LINGUISTIC VARIABLE: *CECEO*

In studies of Andalusian Spanish there has been significant attention given to the

dialectal variation in the pronunciation of the graphemes <s>, <z>, <ci>, and <ce>,

variously realized as [s] and [θ]. Standard Castilian Spanish follows that of *distinción*,

where speakers distinguish the voiceless interdental fricative [θ] from the voiceless

(apico-) alveolar[13] fricative [s] (Table 2.1) giving rise to minimal pairs such as *casar-*

cazar 'to marry-to hunt' and *coser-cocer* 'to sew-to boil'. Different from standard

Castilian Spanish, Andalusian presents *ceceo* and *seseo* speakers. *Ceceo* is defined as a

complete merger of the four medieval Spanish sibilants into a voiceless dental fricative,

variously represented as /θ/, /s^{θ}/, or /θ^{s}/ as it can vary from a post-dental realization all the

way to an interdental realization (Hualde 2005; Penny 2000). *Seseo*, in turn, is defined as

the complete merger of the four medieval sibilants into the realization of an alveolar /s/.

Table 2.1: Minimal pairs

	casa 'house'	*caza* 'hunt'
Distinción	[ká.sa]	[ká.θa]
Ceceo	[ká.s^{θ}a]	[ká.s^{θ}a]
Seseo	[ká.sa]	[ká.sa]

Speakers who follow the norm of *seseo* are labeled *seseante*, while speakers who

follow the norm of *ceceo* are commonly referred to as *ceceante*, and finally, those who

use *distinción* are referred to as *distinguidores* 'distinguishers.' It should be noted that

ceceo, *seseo*, and *distinción* are linguistic idealizations. While there are *ceceante* speakers

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[13] Andalusian speakers that follow *distinción* generally realize an alveolar /s/ as opposed to the apico-alveolar Castilian /s/. However, northern regions, especially in Eastern Andalucía realize a more Castilian apico-alveolar /s/ realization (see Narbona et al. [1998] for all allophonic variations). As the /s/ is alveolar, Villena (2001) refers to Andalusian *distinción* as *distinción meridional* 'southern distinction' as opposed to *distinción septentrional* 'northorn distinction'.

who canonically realized [s$^\theta$] for orthographic <s> and <z,ci,ce>, *seseante* speakers who canonically use [s] for <s> and <z,ci,ce>, and *distinción* speakers who canonically uses [s] for <s> and [θ] for <z,ci,ce>, there exists a great deal of intrapersonal variation that may not follow a norm. In fact, the term *ceseo*, or *seceo*, is used to identify speakers who do not canonically realize any of the three coronal fricative idealized norms of *ceceo*, *seseo*, or *distinción*. Instead, these speakers demonstrate a great deal of intrapersonal variation in which they may realize the same word with two different coronal fricatives such that they pronounce the word *casa* 'house' as [ká.sa] as well as [ká.θa] (Dalbor 1980; Morillo Velarde 1997; Sawoff 1980; Villena 2001). Some scholars (Morillo Velarde 1997; Regan 2017) propose that *seceo-ceseo* is the result of a *ceceante-seseante* speaker aspiring to achieve the norm of *distinción* and inadvertently hypercorrects. Another explanation, however, is that *ceseo* could also be free variation (Morillo Velarde 1997: 214). In brief, while there are three idealized norms that speakers in Andalucía follow –*seseo*, *ceceo*, or *distinción*– actual norms can and do vary greatly.

In order to understand the current competing coronal fricative norms present in Andalucía today, we will briefly review the diachronic[14] changes that have led to the current synchronic variation. From a historical perspective, both *ceceo* and *seseo* resulted from the reduction of four medieval sibilant phonemes: dental affricate /ts/ and /dz/ as well as alveolar fricative /s/ and /z/. In the XV century the pair of dental affricate phonemes underwent deaffrication to produce dental fricative /s̪/ and /z̪/ (Penny 2002:

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[14] For details on 13th century Spanish mergers see Mondéjar (1991), Penny (2000, 2002), Moreno-Fernández (2004), and Tuten (2003).

123). As Harris-Northall (1992: 266) indicates, this deaffrication process was a by-product of vowel final apocope. Thus, intervocalic affricates became word final affricates due to this apocope and consequently lost their affrication. At this point, Castilian and Andalusian Spanish began to differ in the processes that formed their respective modern day sibilants (Penny 2002: 123). In the case of Castilian Spanish (Figure 2.4), the voiced sibilants lost their voicing in syllable coda position reducing the four phonemes into voiceless dental /s̪/ and voiceless alveolar /s/ in the XVI century. This devoicing process is referred to as "*ensordecimiento castellano*" 'Castilian devoicing' (Pensado 1993: 195). Pensado (1993: 222) believes that the devoicing of the fricatives was the result of the strengthening of the articulation of the sibilants (as originally proposed by Alonso [1925: 335; 1953: 226-258]). As fricative amplitude increases, voicing decreases, and vice versa, which is common in other languages (Pensado 1993). As a large functional load was placed on such a small difference in place of articulation, it is hypothesized that in order to avoid confusion, the place of articulation difference between the two phonemes was increased; the dental /s̪/ moved forward giving rise to interdental /θ/, resulting in the phonemic contrast of modern *distinción*, that of apico-alveolar /s/ and interdental /θ/. In the case of Andalusian Spanish, however, in the XVI century alveolar fricative /s/ and /z/ changed into dental fricative /s̪/ and /z̪/ (Figure 2.5). Then in the XVII century the dental fricatives lost their voicing contrast and merged into dental /s̪/ (Penny 2002: 125). Today this phonemic merger is phonetically realized in two different ways: (1) the *seseo* norm of alveolar [s]; and (2) the *ceceo* norm of dental [s^θ] with "fronting of the tongue body so

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that the sound acquires some of the acoustic qualities of interdental /θ/" (Penny 2000: 118).

	Interdental	Dental		Alveolar	
	voiceless	voiceless	voiced	voiceless	voiced
1400		/ts/	/dz/	/s/	/z/
1500		/s̪/	/z̪/	/s/	/z/
XVI century		/s̪/		/s/	
1650	/θ/			/s/	
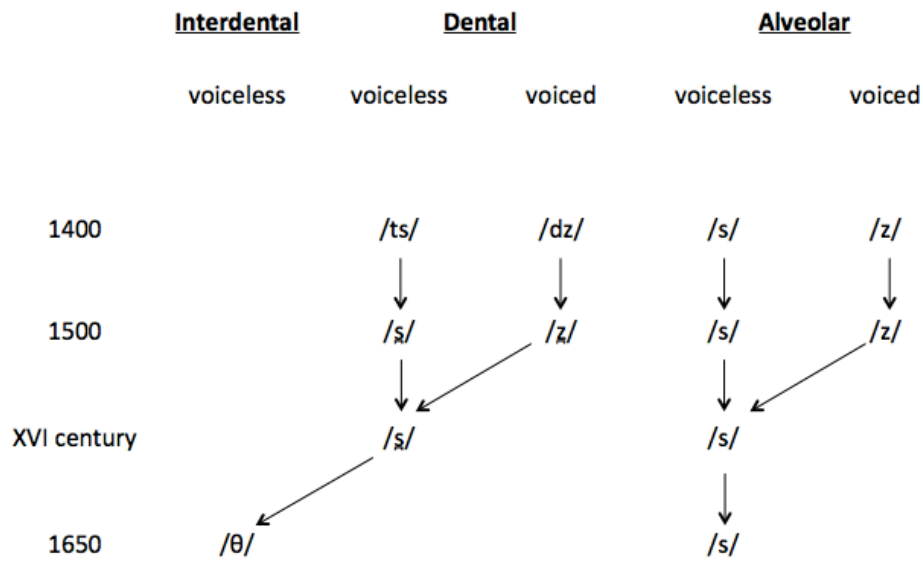
Figure 2.4: Readjustment of medieval sibilants to modern Castilian (Penny 2002: 124)

	Dental		Alveolar	
	voiceless	voiced	voiceless	voiced
1400	/ts/	/dz/	/s/	/z/
1500	/s̪/	/z̪/	/s/	/z/
XVI century	/s̪/	/z̪/		
XVII century	/s̪/			
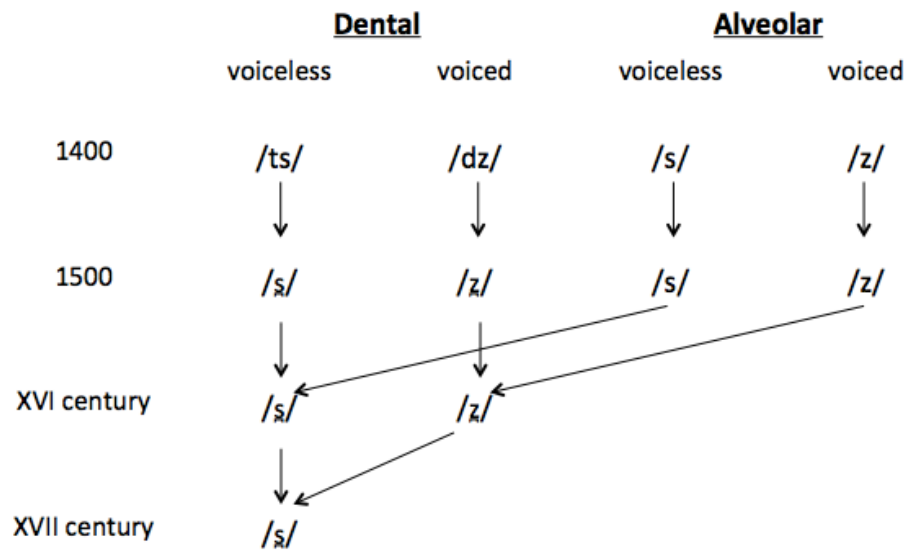
Figure 2.5: Readjustment of medieval sibilants to modern Andalusian (Penny 2002: 126)

Although popular stereotypes indicate a vast predominance of either *ceceo* or *seseo*, almost a third of Andalucía, if not more, follows the norm of *distinción* (Narbona et al. 1998: 156). According to Narbona et al. (1998: 155-160), *distinción* is not native to mid and southern Andalucía, but has been brought into existence by dialectal contact through rural emigration, northern Spaniards immigrating to Andalucía, and standardization due to both increased education and exposure to mass media. The most common geographical areas of *distinción* in Andalucía are northern regions bordering other autonomous communities. Recent sociolinguistic studies have demonstrated that in many urban areas all three different norms of *distinción*, *ceceo*, and *seseo* may coexist (Moya & García-Wiedemann 1995; Narbona et al. 1998; Stewart 1999; Villena 1994, 1996, 2001). However, these realizations are socially evaluated quite differently. Andalucía presents two different prestige norms in competition, that of *distinción* (the national standard) and that of *seseo* (*la norma sevillana* 'Sevilla local norm'). *Ceceo*, however, is socially stigmatized, as it is considered rural and less educated.

2.3 PREVIOUS *CECEO/SESEO* STUDIES IN ANDALUCÍA

Although *ceceo/seseo* is the most recognized and only original feature of Andalusian Spanish (Morillo Velarde 1997: 202), until recently, there has been a lack of quantitative studies[15] on *ceceo* and its speakers. The seminal works of Navarro Tomás et al. (1933) and Alvar et al. (1973) have provided a geographical vision of the phenomenon throughout Andalucía (Figure 2.6), but not until the 1980s have researchers begun to

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[15] There has, however, been a rich traditional in Andalusian dialectology (see Mondéjar 1991).

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empirically quantify the inter- and intra-personal coronal fricative variation in Andalucía.

In the following section, I will review the sociolinguistic studies by city, first in Eastern

Andalucía, then followed by Western Andalucía.
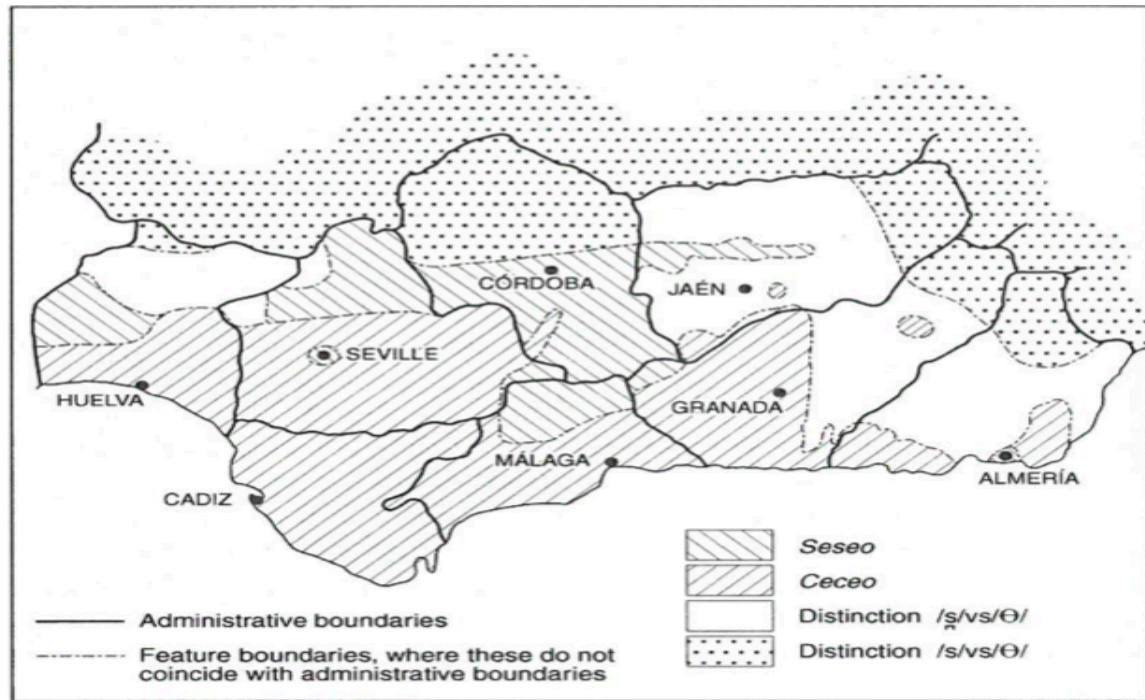
Figure 2.6 Dialectal map of *ceceo*, *seseo*, and *distinción* based on the *Atlas Lingüístico y Etnográfico de Andalucía* (Penny 2000: 120)

2.3.1 Eastern Andalucía

Eastern Andalucía (the provinces of Granada, Almería, Jaén, and Málaga) has

been studied in great depth in the last three decades, particularly the cities of Granada and

Málaga[16]. As Córdoba[17] is a transitional zone, both in the sense of being situated between

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[16] Geographically Málaga is considered central Andalucía. However, in line with previous coronal fricative studies, I consider Málaga as part of Eastern Andalucía.

[17] See Uruburu (1990) for an analysis of coronal fricative variation in Córdoba.

Eastern and Western Andalucía as well as between Andalucía and Castilla-La Mancha, it
will not be considered here.

2.3.1.1 Granada

Recent studies in Granada have demonstrated immense changes in coronal
fricative norms as compared to the results from the 1950s presented in the *Atlas
Lingüístico y Etnográfico de Andalucía* 'Linguistic and Ethnographic Atlas of
Andalucía,'*ALEA,* (Alvar et al. 1973), which previously labeled Granada *ceceante* among
the "*incultos*" 'uneducated' and *seseante* among the "*cultos y mujeres*" 'educated and
women'.

Salvador (1980) conducted one of the first sociolinguistic studies of Andalusian
coronal fricative variation to quantify the three norms of *seseo*, *ceceo*, and *distinción*
within the city limits of Granada. Based on a questionnaire and spontaneous speech,
Salvador gives the total percentages for the entire city: (i) *distinción* (46.71%) was no
longer an exception, but rather a norm; (ii) *seseo* (41.45%) remained a norm in certain
neighborhoods; and that (iii) *ceceo* (10.49%) was very delimited. While the overall Age
and Education results are not presented, the results from various neighborhoods suggest
that younger speakers follow *distinción*, adults follow *seseo*, and the oldest generation
follows presents *ceceo*.

In a much smaller scale study Dalbor (1980) aimed to quantify sibilants norms in
the cities of Granada and Sevilla, as he questioned earlier dialectology accounts of
Andalucía being mostly *ceceante* or *seseante*. Here I will only focus on his Granada data

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(see §2.3.2.1 for Sevilla data). His methodologies were quite exploratory in nature, thus many of his findings are anecdotes of either radio programs or as a third-party observer to conversations. Within Granada he notes that while no one apparently demonstrated canonical *distinción*, he claims there were more *distinción* attempts made by professionals than lower and middle class speakers, who also attempted *distinción*, but realized more *seseo* and *ceceo* (1980: 11). He argues that most speakers do not fall into a single one of three coronal fricative norms, but rather along a continuum with *ceceo* and *seseo* at either end, and consequently are more of *ceseo/seceo* due to "phonetic slippage"[18] (1980: 17). He suggests that many speakers attempt to use *distinción* due to the omnipresence of the national standard Castilian, which follows the norm of *distinción*.

Several years later, the seminal study of Moya and García-Wiedemann (1995) analyzed the norms of Granada to further Salvador's (1980) quantification of coronal fricative[19] variation. Data was collected from 103 speakers that were balanced between three generations (15-24, 25-54, >55 years), gender, neighborhood, and sociocultural level (low, middle, high). Each interview consisted of semi-spontaneous conversation and read speech. They found that only 5% of the total sample followed the norm of *ceceo* as compared to the other norms. However, they found a total of 40% *seseo* realizations. Using Gold-Varbrul's step-up/ step-down regression, they ran four different analyses: (i)

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[18] Dalbor uses "phonetic slippage" to label a grapheme to phoneme mismatch.
[19] In addition to coronal fricative variation, they also analyzed realizations of palatal [tʃ] or fricative [ʃ] for orthographic <ch>.

confusion vs. maintenance; (ii) *seseo*; (iii) *ceceo*; and finally, (iv) *distinción*. Thus, they ran the analysis for the three idealized norms, as well as what they refer to as "*confundidores*" 'those that confuse, those who do not follow systematically any one of the three norms (1995: 114-115). A multivariate analysis of *ceceo* found the following significant predictors: word environment (words with a second fricative like *solución* favored *ceceo,* while single fricative words like *casa* disfavored *ceceo*), neighborhood (speakers from *La Chana* neighborhood favored *ceceo* while those from more "heterogeneous" neighborhoods disfavored *ceceo*), socioeconomic status (those from low socioeconomic level favored *ceceo* while those from middle and higher socioeconomic level disfavored *ceceo*), and sex (men favored *ceceo* while women disfavored *ceceo*. A multivariate analysis of *seseo* found that the speaker most likely to realize *seseo* is 55 years or older, from a lower socioeconomic level living in Realejo or Albaicín. Their study and observations led them to theorize a three generational rule (Figure 2.7).
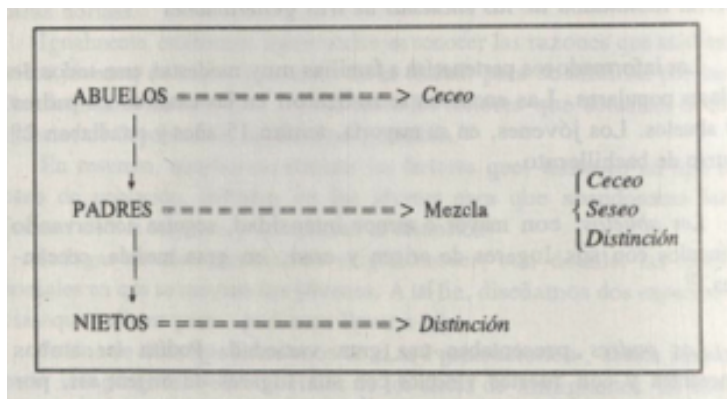
Figure 2.7: Three generation rule: *Ceceo* to mixture (hypercorrection) to *distinción*
(Moya & García-Wiedemann 1995: 238)

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The oldest generation, the *abuelos* 'grandparents', realize the merger of *ceceo* while the middle generation, the *padres* 'adults/parents', realize a *mezcla* 'mixture' (i.e. *ceseo*). Finally, the younger generation, *nietos* 'grand-children', realize the full *distinción*.

In order to understand the social evaluations of the different fricative norms, Moya and García-Wiedemann also used a matched-guise experiment (Lambert 1967) with an additional 103 participants (48 men; 55 women) balanced by age, neighborhood, and sociocultural level. One speaker was recorded reading one paragraph with four different pronunciations: (i) *seseo* and affricate [tʃ] for <ch>; (ii) *distinción* and affricate [tʃ] for <ch>; (iii) *ceceo* and affricate [tʃ] for <ch>; and finally, (iv) *seseo* and fricative [ʃ] for <ch>. Listeners were then asked to match the recordings with four different professions varying in prestige: (i) bank director; (ii) bank teller; (iii) taxista; and (iv) doorman of a building lobby. After matching the recording to the profession, they were also asked two open-ended questions: (1) "Which of these recordings is closest to your form of speaking?" and (2) "Which of these recordings do you consider to be the most correct" (1995: 254, *my translation*). The majority of speakers assigned the bank director *distinción* (83%), the bank teller *seseo* (65%), the taxi driver *seseo* with fricative [ʃ] for <ch> (51%), and finally, the doorman at a building lobby *ceceo* (52%) (1995: 254). Using profession as a proxy for this speech community, they suggest that these speakers clearly view *distinción* as the most prestigious, followed by *seseo*, and then *seseo* with fricative <ch> and *ceceo* evaluated as the least prestigious. These results indicate that speakers are conscious to the prestige differences in coronal fricative realizations in

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which *distinción* has the most overt prestige and *ceceo* has the least. These results were supported by García-Wiedemann's (1997) follow up matched-guise study, in which listeners consistently rated *distinción* as the most prestigious norm, with *seseo* as the second most prestigious and then either *ceceo* or *seseo* with [ʃ].

In a follow up study, Martínez and Moya (2000), sought to analyze the production and perception of local dialectal features in Granada. They analyzed 26 speakers divided by neighborhood: El Zaidín (a newer neighborhood composed of recent immigrant arrivals from the province) and El Albaicín (one of the older and more traditional neighborhoods of Granada). In the production stage of their study, they analyzed both coronal fricative realizations (*ceceo*, *seseo*, or *distinción*) as well as affricative [tʃ] or fricative [ʃ] realization of <ch>. They found only 18% demonstrated *ceceo*[20] realizations; favored by older men with less education. There were a total of 37% *seseo* realizations; correlated with women of all educational levels. Finally, *distinción* encompassed the final 45% of the realizations, and this was associated with the youth and those with more education.

They claim that there are very few canonical *ceceante* speakers (2000: 155), leading them to believe that *ceceo* speakers adopt *seseo* in an attempt to converge towards *distinción*. These findings lead Martínez and Moya (2000: 156) to postulate, from a dialectal acquisition perspective, that following Chambers' (1992) application of a simple rule, the acquisition of a new phonetic feature applied to all contexts is more

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[20] Additionally, those with *ceceo* and *seseo* favored [ʃ] for <ch> (particularly strong for *ceceo* speakers) while those with *distinción* favored [tʃ] (2000: 147).

feasible than acquiring two distinct phonemes. Thus, *seseo* is an alternative in which *ceceo* speakers can move from a stigmatized merger to a non-stigmatized merger, which may perhaps be more accessible to certain speakers than acquiring *distinción* (2000: 157).

More recently, Melguizo (2007, 2009a, 2009b) aimed to analyze the degree of linguistic accommodation of coronal fricatives of recent and long-term immigrants of the nearby rural town of Pinos Puente living in the city of Granada. According to Melguizo, *ceceo* still enjoys covert prestige in Pinos Puente, but younger more mobile speakers appear to follow the overt prestige norm of *distinción*. In this study, speakers from an area (Pinos Puente) with the merger have moved into an area (Granada) without the merger. This study is important for understanding the process of a demerger among individuals and the acquisition of second dialect features in line with recent variationist studies[21]. She conducted sociolinguistic interviews ranging 30-45 minutes with 144 speakers. Her sample was divided in two populations: (i) those born and raised, and still living in Pinos Puente ($N = 72$; 36 male, 36 female); and (ii) those born and raised in Pinos Punete, but now living in Granada ($N = 72$; 36 male, 36 female). The social variables she analyzed were age (15-24, 25-54, >54), education (0-6 years, 7-11 years, >11 years), gender, and length of residence in Granada. Using a statistical package in SPSS created by Villena et al. (1995) to analyze *seseo* versus *ceceo* versus *distinción* probabilities, she found that the rural speakers of Pinos Puente have a probability of 0.70 for *ceceo*, 0.17 for *distinción*, and 0.03 for *seseo*. The Pinos Puente immigrants living in

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[21] See chapter 1 for a discussion of recent studies on the COT-CAUGHT merger/split in second dialect acquisition (Johnson 2010; Johnson & Nycz 2015; Nycz 2011, 2013).

Granada, however, have a probability of 0.36 for *ceceo* and 0.66 for *distinción*.

Additionally, *ceceo* maintains prestige among all generations in Pinos Puente, but of the

immigrants in Granada, the youngest generations prefer *distinción*; the levels of *ceceo*

decrease as levels of education increase, this being more extreme for those in Granada

than in Pinos Puente; women favor *distinción* more than men in both populations,

although more women follow *ceceo* in Pinos Puente than those in Granada; in Granada,

women prefer *distinción* more than men, but *seseo* is also more favorable for both men

and women over *ceceo*. Consequently, her results show that rural immigrants who are

younger and with more educational attainment tend to shift from *ceceo* to *distinción*

much faster than immigrants who are older with less formal instruction.

Finally, in the most recent study of Granada, Moya and Sosiński (2015) analyzed

the coronal fricative variation of fifty-four speakers balanced for age (20-34, 35-54, >55),

gender (27 men, 27 women), and education. In overall percentages of this sample, they

found 79.4% *distinción*, 13.1% *seseo*, and only 5.7% *ceceo*, indicating a massive shift

from *seseo* toward *distinción* as compared to the results of Moya and García-Wiedmann

(1995) (55% *distinción*, 40% *seseo*, 5% *ceceo*). They argue that Granada has moved from

ceceo, to *seseo*, and now the dominant norm is that of *distinción*. Those with university or

secondary education as well as those of the youngest and middle generations are leading

the change, but even those with primary education and those of the oldest generation

demonstrate relatively high rates of *distinción*. While overall, women lead the change, the

principle variation in gender is found in those with primary education in which women

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significantly lead men in this change, but both genders are nearly equal among groups with more education. Moya and Sosiński (2015: 63-64) argue that this rapid change demonstrates a change from above based on the prestige of *distinción* in which the entire community has split (or is splitting) *seseo* into *distinción*.

2.3.1.2 Málaga

The Spanish of Málaga is the most studied among Andalusian cities due to the *Proyecto de Investigación sobre el Vernáculo Urbano de la ciudad de Málaga* (Proyecto V.U.M.). Several quantitative sociolinguistic studies (Ávila 1994; Lasarte Cervantes 2010, 2012; Villena 1994, 1996, 2001, 2005; 2007; Villena et al. 1995; Villena & Requena 1996; Villena & Ávila 2014; Villena & Vida 2012) have demonstrated that gender, age, education, social networks, and exposure to the media are the strongest predictors of a speaker's coronal fricative realizations. These studies reveal that the change from *ceceo* or *seseo* to *distinción* is recent, as *distinción* is a feature common to the youngest generations with the most education, particularly among females.

In one of the first quantitative studies of Málaga, Ávila (1994) analyzed the role of social networks in the neighborhood of Capuchinos in coronal fricative variation. The study consisted of 30 semi-led conversations (12 men, 18 women) with a total of 4,777 tokens. His participants were balanced by gender, age, education, *piñas reticulares* 'social-network clusters' (piña 1, piña 2, and piña 3), and socioeconomic class (variable based on education, income, and profession). *Piña* 1 ($n = 13$) included mostly working-class speakers. *Piña* 2 ($n = 7$) included mostly lower middle class speakers. Piña 3 ($n =$

10) included only working-class speakers. Based on methodological issues point out by

Sawoff (1980) and Caravedo (1992)[22], Ávila analyzed individual speaker realizations in

both orthographic environments and only then used the probabilistic model created by

Villena et al. (1995). Looking at the relative frequencies by *piñas*, Ávila noticed a

polarization of gender in linguistic behavior, which led him to separate the *piñas* by

gender. In *Piña* 1 men had a strong tendency to realize <s> as [θ], while women did not.

However, women had a strong tendency to realize <z,ci,ce> as [s], while men did not. In

Piña 2 almost all speakers favored *distinción*, while a few men favored *ceceo*. In *Piña* 3

men tended to favor *ceceo* while women favored both *seseo* and *distinción*. Using the

individual speaker probability values for *ceceo* and *seseo*, Ávila correlated variant and

social factors. Women tended towards *seseo* and men towards *ceceo*. That is to say, both

disfavored *distinción*, but their mergers are gendered: *seseo* as feminine and *ceceo* as

masculine. The probability of *distinción* increased as age decreased; younger speakers

favored *distinción*, while older speakers favored *ceceo* or *seseo* (depending upon gender).

Males with more education exhibited more *distinción*, but there was no education effect

for women as they varied between *seseo* and *distinción*. Given the findings, Ávila

concludes that *distinción* is a recent and overtly prestigious change as it is found among

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[22] This model takes into consideration the four possible outcomes in which orthographic <s> may be realized as [s] or [θ] and orthographic <z,ci,ce> may be realized as [s] or [θ]. In this manner, one cannot look exclusively at orthographic <s> because a [s] realization could be a speaker following the norm of either *distinción* or *seseo*, depending upon their realization for <z,ci.ce>. True coronal fricative behavior can only be known by observing the linguistic behavior for both etymological /s/ and /θ/ (Caravedo 1992; Sawoff 1980).

the youngest speakers with the most education. According to Ávila, education appears to be the fundamental predictor of coronal fricative realization.

Villena and Requena (1996) further analyzed the data of Ávila (1994) to better understand the gender polarization of coronal fricatives. They included the social factors of gender, age, education, income, occupational prestige, and social class. In addition they included the following social-network variables: size of network, network range, multiple links, and *Escala de Intesidad Reticular* 'Network strength scale' based on Milory's (1980) Belfast study. Given that Ávila (1994) noticed a polarization of gender, Villena and Requena (1996) ran separate analyses for men and women. Using the probabilistic model from Villena et al. (1995), they found that while *distinción* is preferred among younger, more mobile, and educated speakers, there exists a differentiation among the speakers with less formal instruction in which older male speakers favor *ceceo* while older female speakers favor *seseo*. In addition, *seseo* was common among male speakers of intermediate education as an alternative norm while *distinción* was the norm of speakers with the highest levels of education. Villena and Requena (1996: 27, my *translation*) summarize,

> *ceceo* constitutes a stigmatized norm whose use is practically non-existent (among women), or is casted aside in terms of one acquiring some type of formal instruction (for men). *Seseo* is a feminine norm relatively well accepted by women of all educational levels and by men with intermediate formal instruction. *Distinción* is defined as a prestigious norm tied to education.

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This study suggests that it is women of intermediate education that push the linguistic change towards *distinción*. They posit that the universalization of obligatory education has eliminated illiterates from the youngest generation, making them different from the oldest generations, where there still exist a percentage of (semi)-illiterate speakers. Therefore they conclude that education is the primary factor changing the two systems of neutralization (*seseo* for women and *ceceo* for men) towards the prestigious *distinción*. Given the difference in educational levels between generations, age is also seen as a strong main effect. Only speakers without much formal instruction show any effect for social networks in which those with strong community integration demonstrate more *ceceo* for men and more *seseo* for women. Villena and Requena (1996) propose that there is a move from *ceceo* to *seseo* to *distinción* as educational attainment increases.

In a larger follow up study, Villena (1996) quantified dialect convergence and divergence of several phonological features in Málaga as compared to standard Castilian. The study consisted of 176 speakers (64 men, 112 women) from ten different social networks, and three socioeconomic classes. Sociolinguistic interviews included both spontaneous speech in interaction as well as some more formal elicited speech. However, for the statistical analysis only 119 speakers were included. The five phonological variables were: (1) /s/:/θ/ maintenance or merger; (2) weakening of [x] to [h] or [Ø]; (3) deletion or maintenance of intervocalic /d/; (4) [tʃ] to [ʃ] lenition[23]; and (5) /r/ lenition and assibilation or velarization. For *distinción-seseo-ceceo* realizations, they utilized two

[23] As Villena (1996: 116) mentions, /tʃ/ is quite studied in American Spanish (Cedegren 1972; López Morales 1983), but is barely mentioned for European Spanish except in Moya and García-Wiedemann (1995).

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related multinomial models (Villena et al. 1995). All other variables were analyzed using Pearson correlation between linguistic and social variables. In terms of coronal fricative norms, middle class speakers (especially women) and younger speakers favored *distinción*. Older men favored *ceceo*, while older women favored *seseo*. In general, correlations between social and linguistic variables were stronger in female speakers than in male speakers. However, it appears that working class women differed from middle class women. For all variables, age 35 demonstrated a very strong divide between traditional dialectal features (for those over 35) and more standard features (for those under 35). More education negatively correlated with vernacular features. A higher score on social class (middle class) negatively correlated with vernacular features (nearly identical to Education). The 'Network Strength Scale' (Milroy 1980) demonstrates that density and multiplexity showed correlations for those with lower amounts of education, that is to say, those with lower education and stronger, closed and dense social networks favored the more vernacular variables for all five phonological variables. These findings lead Villena (1996: 130) to propose three poles with corresponding variables: standard variants (*distinción*), regional variants (*seseo*, /x/→ [h] reduction), and vernacular variants (*ceceo*, /x/ → Ø, /tʃ/ → [ʃ], /ð/ → Ø). Once this was established a stepwise regression analysis was run for the vernacular-standard dimension in which media exposure, gender, and local loyalty were the most significant predictors; less media exposure, male, and more local loyalty favor vernacular (1996: 134).

While Villena (1996) briefly looked at social networks, Villena (2005) synthesizes several previous studies in Málaga (Ávila 1994; Cuevas 2001; Villena & Requena 1996) in order to analyze the effect of social networks on traditional dialectal features within the city of Málaga. Throughout each prior study, it appears that Education and Social Network strongly interact. Speakers that have higher educational attainment generally do not show effects of social networks (even if they have a strong social network score). However, speakers with lower educational attainment strongly correlate with social network scores; those with strong network ties are more likely to maintain traditional dialectal features such as *ceceo* or *seseo*.

In a follow up study, Villena (2007) analyzed the coronal fricative variation based on both linguistic and extra-linguistic factors looking at 124 speakers (44 men, 80 women) of seven different social networks in the city of Málaga taken from previous studies (Ávila 1994; Villena 1994). Different from previous studies of Málaga, Villena used a multivariate logistic regression analysis using *Varbrul's Goldvarb* 2.0 (Robinson et al. 2001) with the dependent realization as the binomial realization of either [s] or [θ] for all syllable initial orthographic <s> environments, for a total of 11,102 <s> tokens. The first regression included both men and women and found main effects in the following hierarchical order: education/gender interaction > media exposures > style > phonological environment > loyalty. Given the strong effect of gender, Villena created a gender-education factor interaction in which more education among men reduced *ceceo*, but there was no effect for women. Those without any media exposure favored *ceceo*

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while those with slight or significant media exposure disfavored *ceceo*. *Ceceo* was less

favored in paragraph readings and word lists as compared to spontaneous speech. The

presence of a prior [θ] in the world such as *cesar*, (*[θ]esar*), favored a [θ] realization for

the following orthographic <s>. Those with more local integration and local ties slightly

favored [θ] as compared to those with more loose integration. Given the gender

polarization of the community, Villena ran two follow-up regressions for men only and

women only. For men, the *ceceo* probability was 0.43 and the hierarchy order of

significance of the predictors was education > age[24] > style > loyalty > media exposure >

phonological environment. The regression with the women demonstrated much less

ceceo with a total probability of 0.17. Only women with high level of linguistic loyalty

and over 35 years of age with low levels of education demonstrated any favoring of

ceceo. Villena (2007: 95, *my translation*) states, "Based on these results in this study, we

can affirm that the non-sibilant pattern (*ceceo*) is a masculine sociolinguistic stereotype

that is currently in clear regression."

In the first subsegmental study[25] of *ceceo*, Lasarte Cervantes (2010) sought to

analyze the acoustic correlates and parameters of the demerger of /s$^\theta$/ into the two

separate phonemes of /s/ and /θ/ (*distinción*) in Málaga. She analyzed the production of

intervocalic syllable initial <s> and <z,ci,ce> from paragraph readings, short phrases, and

minimal pairs by four male speakers (24-31 years of age; all with university education).

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[24] One noteworthy difference is that younger men with primary education demonstrated a tendency to return to *ceceo* realizations.

[25] With the exception of Regan (2015), this is the only study on Andalusian coronal fricative variation that uses an acoustic analysis to examine the gradient nature of each realization as all other work has been auditory analysis.

Two speakers are from the rural town of Cártama Pueblo, 17km outside of Málaga, and the other two are from the city of Málaga. She analyzed the data first auditory and then acoustically. The auditory analysis reveals that the two urban speakers demonstrate 100% [s] for orthographic <s> and 98.8% [θ] for orthographic <z,ci,ce> while the rural speakers demonstrated 42.1% [s] for orthographic <s> and 96.5% [θ] for orthographic <z,ci,ce>. In terms of style differences, the urban speakers demonstrated a near 100% [s] realization for all orthographic <s> regardless of style (paragraph reading vs. word list) while the rural speakers demonstrated an increased self-awareness as the formality increased with 55% [θ] for <s> in paragraph reading, 32.9% [θ] for <s> in phrase reading, and 0% [θ] for <s> for minimal pairs.

For the acoustic analysis she used six separate dependent measures: duration (ms), average intensity (dB), maximum intensity (dB), frequency of beginning of frication (Hz), frequency of maximum intensity (Hz), and, center of gravity (Hz). One limitation is that the statistical analysis of the acoustic analysis were based on the auditory coding of [s] and [θ] as opposed to orthographic environment (<s> vs. <z,ci,ce>). Her analysis found that the urban speakers had a significant difference of mean intensity between coded [s] and [θ] realizations while rural speakers did not reveal a significant difference between coded [s], [θ], or *dudosa* 'doubtful' realizations. She found that both urban and rural speakers realized significant differences between coded [s] and [θ] realizations based on maximum intensity (dB). Lasarte Cervantes correlates these two dependent measures (mean and maximum intensity) for urban speakers and rural speakers (see

Figure 2.8). In these figures one observes a separation between the two auditorily coded phonemes in the urban speakers' realizations in both mean and maximum intensity as compared to the overlap between phonemes of the rural speakers, who are at the beginning stages of demerger.

(a)   (b)
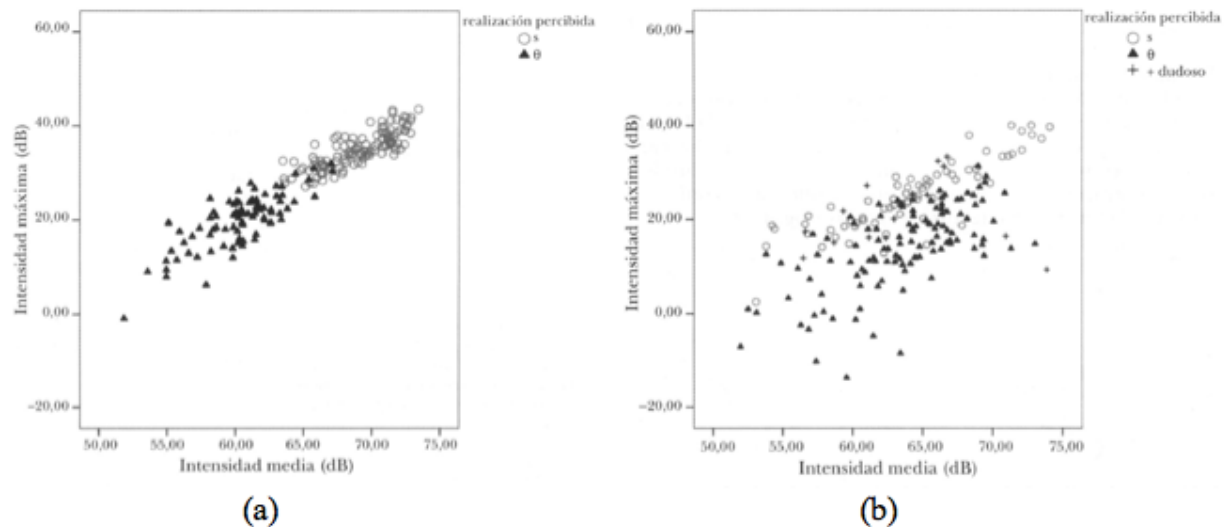
Figure 2.8: Scatterplots of urban speakers' (a) and rural speaker's (b) auditory coded /s/
vs. /θ/ plotted by mean intensity (x-axis) by maximum intensity (y-axis)
(Lasarte Cervantes 2010: 506-507)

Other dependent measures (frequency of beginning of frication (Hz), the frequency of the maximum frication (Hz), and center of gravity (Hz)) were not statistically significant. Based on the findings of intensity differences, she builds on the intensity continuum[26] proposed by Martínez Celdrán and Fernández Planas (2007: 107) by adding *ceceo* (/θˢ/ and /sᶿ/) to this continuum as an intermediate realization between alveolar /s/ and /θ/; see Figure 2.9.

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[26] Lasarte Cervantes added to the intensity continuum of Martínez Celdrán and Fernández Planas by adding *ceceo* (/θˢ/ and /sᶿ/) in-between interdental /θ/ and alveolar /s/.
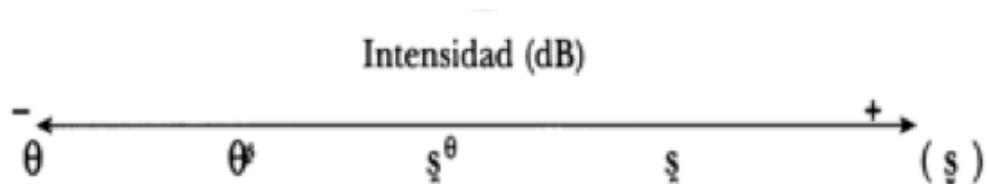
Figure 2.9: Modified Intensity Continuum (Lasarte Cervantes 2010: 489)

In a follow up study, Lasarte Cervantes (2012) ran a perception experiment with two objectives: (i) to support the acoustic correlates findings in differences between mean/maximum intensity between [s] and [θ] found in Lasarte-Cervantes (2010); and (ii) to analyze the social variation in perception of these sounds. The recordings consisted of several urban *distinción* speakers saying 26 words containing [s] and [θ]. She took these minimal pairs such as *rasa* 'level/flat' and *raza* 'race' and modified only the /s/ section of the sound using *Soundforge*. The /s/ token was reduced by 75%, 50%, and 25% of the original intensity. Consequently, there were four tokens for each minimal pair selected, varying in intensity. There were a total of 18 listeners (8 men, 10 females) ranging in age, education, and origin (urban, rural). For overall perception, tokens with higher intensity were more likely rated as [s] as compared to those with reduced intensity, which were more likely rated as [θ]. Those with university education were better attuned at labeling /s/ tokens as [s] even with modified intensity whereas those with primary and secondary education were more likely to label any modified stimuli as [θ]. Rural speakers were more likely to label modified /s/ tokens as [θ] as compared to urban speakers. The oldest group was significantly more likely to label a modified /s/ token as [θ]. Given the

apparent-time age effect, she suggests this supports the notion that this change began 50-60 years ago as hypothesized by other scholars (Morillo Velarde 2001; Villena 2001). These results indicate that intensity (dB) serves as an acoustic correlate for perceptually distinguishing the phonemes /s/ and /θ/, but that the categorical difference between phonemes varies based on educational level, age, and origin of the listener.

Taken together, the studies in Granada and Málaga suggest large changes in coronal fricative norms in Eastern Andalucía since the original work of Navarro Tomás et al. (1933) and Alvar et al. (1973). These studies indicate a demerger of the traditional dialectal features of *ceceo* and *seseo* towards the national standard of *distinción*.

2.3.2 Western Andalucía

Western Andalucía (the provinces of Sevilla, Cádiz, Huelva) has been studied in much less depth than Eastern Andalucía. The few quantitative studies that do exist have focused on Sevilla or Jerez de la Frontera (in the province of Cádiz).

2.3.2.1 Sevilla

Sawoff (1980) analyzed the intra- and inter-personal variation of sibilants in the city of Sevilla in order to appraise previous claims of Sevilla as the *seseante* stronghold. Using a brief questionnaire and soliciting certain words, he went to three places of employment: "*drogerías*" 'shops selling household cleaning agents, paints and cosmetics', grocery stores, and banks. He grouped *drogerías* and grocery stores together to represent lower middle class with 82 speakers and then banks represented the upper

lower class with 97 speakers. He elicited works with etymological[27] /θ/ from standard

Castilian Spanish. Overall there was a total of 66% [s] and 34% [θ] for orthographic

<z,ci,ce>. Of the 97 speakers in the banks, 54% realized [s], 41% [θ], and 4% [s^θ].

However, he noticed bank employees among themselves would use *seseo*, but would

switch to *distinción* to attend customer needs. In both locales, the youngest and oldest

speakers used more *seseo* while middle age speakers in the prime of their career used

more *distinción*. He concludes that *distinción* has become a "viable alternative of

pronunciation alongside *seseo*," while *ceceo* is delimited (1980: 249).

As mentioned previously in §2.3.1.1, Dalbor (1980) investigated the coronal

fricative norms in Sevilla. Different from Granada, *sevillanos* who made "phonemic

slips" would do so in the direction of *seseo*, instead of *ceceo*. In terms of the quantitative

evaluation, Dalbor analyzed the reading passage of one university student as well as radio

broadcaster and callers on the various shows. He included both syllable initial and

syllable final, which he admits was problematic given the high amount of aspiration in

syllable final. He found a range of variation among these speakers leading him to

conclude that there is a confusion that has existed and will continue to exist. He suggests

that there is no lexical or phonetic context that favor or disfavor [s] or [θ] realizations.

However, González-Bueno (1993), a native linguist of Sevilla, explains that there

are several issues with Dalbor's claims, particularly in Sevilla. She cites the importance

of recognizing three different types of speakers within Sevilla: those that are *seseante*,

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[27] As Sawoff (1980: 242-3) acknowledges, this methodology is not with limitations as only looking at the realizations for etymological /θ/ cannot fully tell whether a [s] realization is truly *seseo*, or perhaps a mixture of *seceo*. In addition, a [θ] realization cannot be fully distinguished between *ceceo* or *distinción*.

those who have immigrated from surrounding *ceceante* regions, and finally, those,

whether they are *seseante* or *ceceante* who, for social pressure, have begun to learn the

national norm of *distinción* (1993: 393). Given his lack of social information of his

speakers, we have no way of knowing if all informants were of Sevilla capital or of

ceceante towns. She argues against Dalbor's claims that [s] and [θ] are simply in free

variation with one another. As she argues, *seseo* and *ceceo* do not mix with one another,

but rather there is a mixture between *ceceo* and *distinción* or between *seseo* and

distinción[28] (1993: 393). Thus, a *seseante* speaker would realize most contexts with [s],

but will also demonstrate some [θ] realizations for <z,ci,ce> . She proposes that the cases

in which *seseante* speakers do produce a [θ] in a <s> context is simply a sign of a

hypercorrection particularly in artificial reading contexts.

In an attempt to define the contemporary urban speech of Sevilla of the

"*hablantes cultos*" 'educated speakers,' Carbonero (1982) examined three phonological

features of aspiration or elision of coda /s/, the /s/-/θ/ neutralization (i.e. here *seseo*), and

/r/-/l/ neutralization in coda position (as well as elision in coda final position) (1982:

144). Carbonero (1982: 148-149) found that *seseo* and aspiration/elision of /s/ form part

of the educated norm that represent "*fenómenos sevillanos*," while other features such as

the /r/-/l/ neutralization do not form part of the educated norm and that these speakers

instead follow the "leveling of the Castilian norm" (1982: 148). He believes the reason

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[28] Interestingly, González-Bueno concludes by stating "I don't believe in absolute that there exists a
tendency, neither in Sevilla nor do I hope in any other place in Andalucía, towards the Castilian *distinción*"
(González-Bueno 1993: 397, my *translation*). It appears that she underestimated the social pressures (and
prestige) to adopt *distinción*.

for interspeaker variation in terms of *seseo* (with certain speakers realizing *distinción*) is due to the social pressures of these speakers in contact with the Castilian norm. He claims the educated speakers are "the most representative of the conscious of the leveling of a language variety" (1982: 149, *my translation*). He therefore sees the speech of Sevilla in a "*doble tensión*" 'double tension', between a certain dependency on the Castilian norm as well as a strong use of certain features of Sevilla (149). Carbonero suggests, while features like the /r/-/l/ neutralization are leveled out of the educated speech of Sevilla, other dialectal features of Sevilla such as *seseo* remain due to their linguistic status within Sevilla and the educated speakers.

In a follow up study, Carbonero (1985) more broadly quantified the norms of Sevilla looking at the variation of eight phonological features by socioeconomic level: educated, intermediate, and popular (based on level of education). In terms of *seseo* he found that there was an overall rate of 0.87 (0.74 educated, 0.86 intermediate, and 1.0 popular) (1985: 79). The overall rate of *ceceo* in Sevilla was 0.06 with only the popular level (0.19) demonstrating *ceceo* realizations. He claims, "*ceceo*, as one can see, remains as an apart feature, given its scarce extension into the urban environment" (1985: 81, *my translation*). In looking more specifically at this data, Lamíquiz and Carbonero (1987) analyzed twenty-four "educated" speakers balanced for gender and age. While the overall "acceptance index" of *seseo* was 0.74, there were differences between generations: youngest (0.82), middle (0.87), and oldest (0.53). There was no difference between men and women as both groups had 0.74. Therefore, these Sevilla studies taken together

(Carbonero 1982, 1985; Dalbor 1980; Lamíquiz & Carbonero 1987; Sawoff 1980),

demonstrate a predominance of the *seseo* merger.

However, recent work has analyzed the current situation of coronal fricatives in

Sevilla. Santana (2016a) conducted semi-directed interviews with twenty-four university

educated speakers balanced by gender (12 men, 12 women) and age (18-34, 35-54, >55).

In contrast to earlier findings, this sample only demonstrated an overall distribution of

25.54% *seseo* and 74.46% *distinción*. Interestingly there was no main effect for age, all

three generations produced similar rates of *distinción*. While men and women produced

high rates of *distinción*, women were more advanced in *distinción* than men. As Santana

(2016a: 278) argues, the strong preference of the "*sociolecto alto*" 'educated sociolect' is

that of *distinción*. However, even among younger men, there appears to be a small

perseverance of *seseo*. In a follow up study, Santana (2016b) conducted semi-directed

interviews with twenty-four speakers with primary (or less) education balanced by gender

(12 men, 12 women) and age (18-34, 35-54, >55). Overall she found much higher rates of

seseo (77.09%) than *distinción* (21.54%) (and *jejeo* [1.36%]). In terms of the age by

gender interaction, Santana found that as age decreases women produce less *seseo* (and

more *distinción*), while for the men, there is actually an increase in *seseo* as age

decreases. These two studies taken together (Santana 2016ab), indicate that university

educated speakers produce *distinción*, while among speakers with primary (or less)

education, younger women are leading a change to the national prestige feature of

distinción while younger men appear to be returning to the local prestige feature of *seseo*.

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Similarly, on-going work by Gylfadottir (2017), based on twenty-six speakers in Sevilla, demonstrates a range of variation between *seseo* and *distinción*.

2.3.2.2 *Jerez de la Frontera*

In the historically *ceceante* city of Jerez de la Frontera, Carbonero et al. (1992) sought to produce a contemporary sociolinguistic profile of the city analyzing several phonological features. The study consisted of 54 speakers, which varied by gender, age (18-30, 30-45, > 45), and sociocultural status (popular, middle, cultured/educated). Each interview contained three sections: (i) a 20 minute semi-directed conversation; (ii) a questionnaire with specific questions about grammar; and (iii) a questionnaire about 60 vocabulary entries taken from the *ALEA*. Carbonero et al. auditorily analzed each interview for various phonetic features (*ceceo-seseo-distinción*, /-s/, j>h, elision of coda /r/, elision of coda /l/, /l/-/r/ neutralization, *yeísmo*, elision of intervocalic /d/, fricativization of <ch>). The results are presented in overall ratios, with *one* being a canonical realization of the feature under study and *zero* indicating no appearance of the phenomenon. They refer to *seseo* and *ceceo* as two aspects of the same phonological process, that of "*desfonologización*" 'de-phonologization' (1992: 23). They found that *ceceo* had an index of 0.47, *seseo* 0.44, and *distinción* 0.09 (1992: 24). The majority of the variation is found within their variable of sociocultural level in which educated level had 0.76 *seseo*, 0.12 *ceceo*, and 0.12 *distinción*, the middle level had 0.46 *seseo*, 0.39 *ceceo*, and 0.15 *distinción*, and the popular level had 0.11 *seseo*, 0.89 *ceceo*, and 0.0 *distinción*. Curiously, there were no major differences between males and females or

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between the three generations. The results indicate that in Jerez de la Frontera, *distinción* is almost non-existent, and that *seseo* is a marker of educated/cultured speakers while *ceceo* is a marker of working class speakers. According to this study, both the mergers of *ceceo* and *seseo* appear to enjoy social acceptance, even over *distinción*.

Several years later, however, García Amaya (2008) re-evaluated the coronal fricative variation of Jerez de la Frontera and found contrasting trends based on 21 sociolinguistic interviews. He analyzed the first 100 tokens of syllable-initial target /θ/ for a total of 2,100 tokens. Of the 2,100 tokens, there were 563 (26.8%) [s] realizations and 1537 (73.1%) [θ] realizations. A GoldVarb X multivariate analysis found the extra-linguistic predictors of the realization of [s] to be: social network (those with external contacts favored [s] over those with only group internal contacts), sex-age-education (young males and females with university education, young females with high school education, and older females with elementary education favored [s]), and socioeconomic status (those with higher income favored [s]). The linguistic predictors of the realization of [s] were: orthographic representation (<s> favored [s], whereas <z> and <c> disfavored [s]), preceding segment (phrase initial and preceding consonant favored [s] while preceding vowel barely disfavored [s]), and following vowel (/a/ and /e/ favored [s] while /i/, /o/, and /u/ slightly disfavored [s]). Consequently, different from Carbonero et al. (1992), García Amaya's (2008) results support the trends found in the cities of Málaga and Granada where traditional *ceceo* is yielding to standard Castilian *distinción* among younger speakers and those with more education.

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2.3.2.3 Huelva

The only previous linguistic records of the city of Huelva are the seminal dialectal studies of Navarro Tomás et al. (1933) and the *Atlas Lingüístico y Etnográfico de Andalucía* (Alvar et al. 1973). Navarro Tomás et al. (1933: 233) observed the three idealized trends of the province of Huelva (Figure 2.10) with *distinción* in the northern region, known as *la sierra* 'mountain range', *seseo* in the central part of the province known as the Andévalo, and finally, *ceceo* in the southern coastal area. While *seseo* was common among all socioeconomic groups of the Andévalo, Navarro Tomás et al. (1993: 234, *my translation*) indicated that "In the [zone] of *ceceo*, the *ceceante* pronunciation is common in the vast majority of the population, but not as much among the educated people, who tend to adopt *seseo* as the less crude form." Consequently, it appears even as early as the 1930s there was some stigmatization associated with *ceceo* among those with higher education. Narvarro Tomás et al. also observed, however, "in the capital city of Huelva it is the *ceceo* that constitutes the predominant use" (1993: 325, *my translation*). Consequently, in the 1930s the dominant norm in the city of Huelva was *ceceo*.

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Pronunciación de *s* y *z* en la provincia de Huelva.

Figure 2.10: Areas of *distinción*, *seseo*, and *ceceo* in the province of Huelva (Navarro Tomás et al. 1933: 233)

Several decades later, Alvar et al. (1973) in the *ALEA* map of "areas of

maintenance or neutralization of the opposition /s/:/θ/" (Vol. VI, Print 1580, Map 1705)

labeled the city of Huelva (H 503) as fully *ceceante*. In the *ALEA* map of "types of /θ/" (Vol. VI, Print 1580, Map 1706), Huelva capital is also labeled as having a "dento-interdental" or "post-interdental" voiceless fricative /θ/ realization, as compared to a fully "interdental" /θ/ realization found in the northern parts of the province that displayed *distinción*. From these two *ALEA* maps, in conjunction with Navarro Tomás et al. (1933), we can assume that even as late as the 1950s, the predominant norm of the city of Huelva was the *ceceo* merger with a dento-interdental or post-interdental realization of all orthographic <s> and <z,ci,ce>.

In addition to the dialectal work listed above, the only previous sociolinguistic study of *ceceo* in the province of Huelva is that of de las Heras et al. (1996) that looked at several phonological features, including *ceceo*, of three periphery towns around Huelva capital (but not within the capital city) in an attempt to identify an "*andaluz culto*" 'educated norm' of Western Andalusian Spanish. There were twenty-four speakers (eight from each town), balanced for gender, age (18-35, >56), and sociocultural level (cultured, popular). Tokens were taken from 25-minute interviews and were presented in *ceceo* percentages per town: Aljaraque (27%), San Juan del Puerto (23%), and Trigueros (21%). Percentages of eight speakers per town should be taken with caution, but nevertheless serves to indicate that *ceceo* is perhaps no longer as predominant as it was several decades earlier.

2.3.2.4 Lepe

While the town of Lepe lacks any quantitative sociolinguistic study of *ceceo*, it

has been the cite of several traditional dialectology works. Navarro-Tomás et al. (1933),

placed Lepe in the southern third of the province of Huelva as one of the places of *ceceo*

(Navarro Tomás et al. 1933: 234, *my translation*),

> The zone of *ceceo* is found even more to the South, understood as the towns of
>
> Sanlúcar de Gudiana, San Silvestre de Guzmán, Villablanca, Ayamonte, Isla
>
> Cristina, Lepe, Cartaya, Gibraleón, Huelva and all the towns of the Southeast of
>
> the province, from Moguer, Trigueros and Valverde del Camino until the limits of
>
> the province of Sevilla…

This aforementioned area can be seen in Figure 2.10.

In a Lepe-specific study, Mendoza Abreu (1985), with the aim of reduplicating

Alvar and his colleagues' work on the *ALEA*, used similar questionnaires in order to

examine the phonetics/phonology, morphology, syntax, and lexicon particular to her

native Lepe. In line with the *ALEA*, the work was descriptive, not quantitative. She based

her study on 10 participants (8 men, 2 females) ranging from 42-68 years (the majority in

their 60s). In defining the consonant /s/, Mendoza Abreu (1985: 59, *my translation*)

states, "this sound, in our locality, has disappeared in any position of the phonetic chain,

and depending upon the place in which it should occupy, sometimes in favor of [θ],

others for the weakening of aspiration." In syllable initial position, she states that <s> is

always realized as [θ], such as *sí señor* [ˈθí.ˈθe.ŋó] (1985: 60). Additionally she mentions

this may be realized with a type of interdental aspiration, which she writes as [θʰ].

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Mendoza Abreu manifests that while this allophonic variation exists, the phonemic difference between s/θ has disappeared completely, leaving only the phoneme /θ/, i.e. *ceceo*. Both <s> and <z,ci,ce> in syllable final is reported here as either an aspiration or a complete elision, with some amount of consonantly variation.

With the recent exceptions of García Amaya (2008) and Santana (2016a), the studies of Sevilla (Carbonero 1982, 1985; Dalbor 1980; Lamíquiz & Carbonero 1987; Santana 2016b; Sawoff 1980), Jerez de la Frontera (Carbonero et al. 1992), Huelva province (Alvar et al. 1973; de las Heras et al. 1996; Navarro-Tomás et al. 1993), and Lepe (Mendoza Abreu 1985) all indicate that the merger of *ceceo* (and *seseo* in Sevilla) have been maintained in contrast to the convergence towards *distinción* in Eastern Andalucía. These findings indicate that Western Andalucía maintains traditional dialectal features more than Eastern Andalucía.

2.4 EASTERN VS. WESTERN ANDALUCÍA

The differences found between Eastern and Western Andalucía have led several scholars (Hernández & Villena 2009; Villena 1996, 2000, 2001, 2008; Villena & Ávila 2014; Villena & Vida 2012) to posit that the Spanish of Eastern Andalucía, such as the cities of Granada and Málaga, are structurally closer to the national Castilian standard than Western Andalucía based primarily on the re-strengthening of syllabic coda and the demerger of *seseo* and *ceceo* towards *distinción*. Such disparities between Eastern and Western Andalusia would support the *ALEA* findings from the 1950s (Morillo Velarde 2001b: 42) in which Western Andalusian Spanish was found to be more divergent as

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compared to Eastern Andalusian Spanish, perhaps due to the earlier repopulation in Western Andalusia during the XIII and XIV centuries as compared to Eastern Andalucía during the XV and XVI centuries (Morillo Velarde 2001a: 84). Villena (2008: 147) hypothesizes that the prestige of the *norma sevillana* 'Sevilla norm' and distance between Sevilla and Eastern Andalucía has led to such differences in Eastern and Western varieties. Villena and Ávila (2014: 212) cite the "centuries-old effect of the regional prestige emanated from the urban dialect of Sevilla (i.e., the so-called *norma sevillana*)" as the reason for such divergence between Eastern and Western Andalucía. They argue that the *norma sevillana* has not, however, diffused into Eastern Andalucía. Villena (2008: 158) summarizes the general consensus of these scholars,

> What characterizes Andalusian speech behavior today is a fairly discernible
> division between eastern and western varieties resulting from historical, social,
> and structural conditions. Convergence and divergence from the national standard
> underlie recent developments. On the one hand, western divergence and social
> acceptance of southern features is distancing these varieties from the national
> standard of Spain and bringing them closer to the innovatory dialects of America.
> On the other hand, eastern convergence is contributing to the formation of a
> regional *koiné*, where separated varieties are hardly recognized.

Villena (2008) cites previous studies to provide empirical evidence for such East-West claims as seen in Figure 2.11. Using the data from Sevilla (Carbonero 2003 [1982, 1985])

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and Jerez de la Frontera (Carbonero et al. 1992), an East-West differentiation appears

quite warranted.

	University graduates				General			
	Seville	Jerez	Malaga	Granada	Seville	Jerez	Malaga	Granada
Systems								
C	0.26	0.00	0.91	0.76	0.07	0.09	0.62	0.55
I	0.74	0.88	0.10	0.13	0.97	0.91	0.42	0.45
Patterns								
SR *seseo*	0.74	0.76	0.06	0.24	0.87	0.44	0.11	0.40
NSR *ceceo*	0.00	0.12	0.04	0.00	0.06	0.47	0.27	0.05
/tʃ/ → ʃ		0.73	0.03	0.06		0.83	0.25	0.18

Source: Seville (Carbonero 2003); Jerez (Carbonero et al. 1992); Granada (Moya and García Wiedemann 1995); Malaga (Villena 1996)

Figure 2.11: Eastern (Málaga, Granada) vs. Western (Sevilla, Jerez) Andalucía linguistic variation by education levels (Villena 2008: 147)

Villena (2008) and Hernández and Villena (2009) suggest that the dialect convergence

trends in Granada and Málaga have led to a regional koine in Eastern Andalucía where

speakers are converging towards the national standard in certain prestige features, such as

distinción, while maintaining other traditional features, forming a variety they call

español común 'common Spanish'.[29] Hernández and Villena (2009: 193-194) propose

that Western Andalusian varieties have at least two varieties between the local traditional

dialects and the national Castilian dialects such as a regional standard and a tertiary

dialect. Eastern Andalucía, on the other hand, is a "'convergent continuum,' where it is

---

[29] Accordingly, Villena (1996, 2000, 2001, 2008) has proposed a tri-polar continuum between Castilian Spanish, traditional Andalusian Spanish, and Regional Standard Andalusian Spanish.

difficult to differentiate discrete varieties from the tertiary dialect and the vernacular ones" (2009: 194).

Villena and Ávila (2014) have expanded on this East-West model recently, also taking into account social variation as well. They distinguish between the Vernacular Dialects (VD) spoken in Western Andalucía as well as urban/rurban speakers in both areas (maintained by strong community ties and low external contact) as compared to the regional standard (RS) of the *norma sevillana* that only exists in Western Andalucía. This is different from what they label as a southern tertiary dialect (TD), which refers to the transitional zones between Andalucía and bordering communities, also known as *español común* (Figure 2.12). This tertiary dialect is closer to the national standard. Villena and Ávila claim (2014: 212-213),

> urban middle-class speakers from eastern Andalucía (Granada, Málaga, Jaén, Almería) have adopted and enhance conservative speech features from the national standard while their western counterparts go on using regional prestige innovative features… this gradual separation reveals that both areas have different ways of perceiving the same set of features reflecting the traditional contrast between Sevilla and Madrid (Menéndez Pidal 1962).
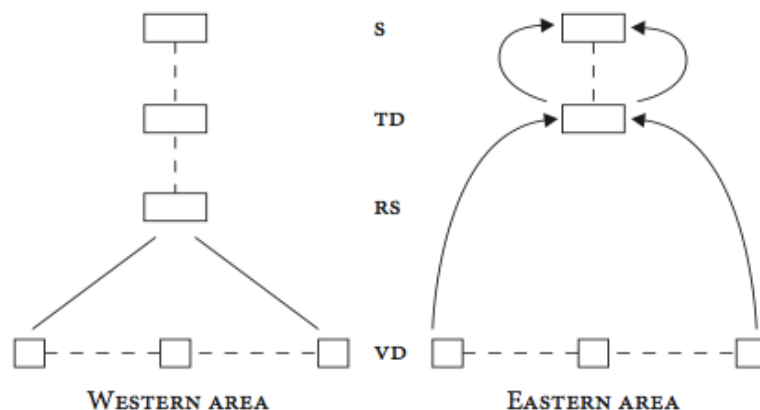
s: National Standard; TD: Tertiary Dialect; RS: Regional Standard; VD: Vernacular Dialects

Figure 2.12: Western divergence vs. Eastern Convergence (Villena & Ávila 2014: 212)

However, after a review of the more recent studies, including García Amaya (2008),

Villena and Ávila (2014: 215) acknowledge there may have been recent changes,

> García-Amaya's results point out the need for more detailed analyses able to
>
> confirm his major hypothesis, i.e., that reversal of CASA and CAÇA merger cannot
>
> be restricted to the eastern area of urban Andalucía, and that if his results would
>
> be replicated in Jerez and other western towns and confirmed by up-to-date data
>
> from urban Sevilla, the real centre of the innovative way of the spoken Spanish
>
> (*norma sevillana*) would be endangered.

García Amaya is the only recent quantitative study of Western Andalucía, with the

exception of Regan (2017), to challenge such divergent patterns of Western Andalucía. In

addition to such a geographic variation between dialect convergence or divergence,

Villena and Ávila also claim that throughout Andalucía, the other greatest difference lies

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in the social axis in terms of dialect convergence or divergence, that is the "[social] progressive divergence between urban middle-class and both rural vernacular and urban working-class varieties" (2014: 218). Previous literature suggests that Andalusian middle class urban speakers converge toward national or regional standards, while rural or *rurban*[30] speakers tend to maintain traditional dialectal features of the reduced Andalusian phonemic system (Hernández & Villena 2009; Villena 2008; Villena & Ávila 2014). Villena and Ávila cite the studies of Melguizo Moreno (2008) and Lasarte Cervantes (2010) as evidence that rural and rurban varieties strongly maintain dialectal features that are forming highly stigmatized phonological reductions non-standard varieties. They claim that local loyalty, less external-contact, low media exposure, and close-knit social networks and allow rural and rurban varieties to resist convergence.

These two large differences in geographic variation (Eastern vs. Western) and social variation (rural/*rurban*/working-class vs. middle-class), lead Villena and Ávila (2014: 227) to see this as a type of community polarization in which

> urban middle-class speakers who either converge towards the national standard (particularly in eastern Andalucía), or enhance use of the regional-prestige variety (specially in western Andalucía); on the other hand, rural or urban lower-class speakers who maintain vernacular features despite their low or non-existent overt prestige.

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[30] Rural speakers who have moved to urban centers (Villena 1996).

It should be noted, however, that these claims appear to be based on previous research in Western Andalucía (Carbonero 1982, 1985, 2003; Carbonero et al. 1992; Lamíquiz & Carbonero 1987; Sawoff 1980). While these claims may be the case with certain phonological features, it cannot be taken for granted given the lack of studies in Western Andalucía. The following section addresses pilot and previous studies carried out by the author (Regan 2014ab, 2015, 2017) that have not yet reached the discussion[31] surrounding the thesis of Eastern convergence vs. Western divergence.

2.5 PILOT STUDIES IN HUELVA

Pilot research on *ceceo* from a variety of sociolinguistic perspectives has provided the framework for the current project. These studies are reviewed in the next sections.

2.5.1 Segmental study of *ceceo* in Huelva

Regan (2017) examined the coronal fricatives norms of contemporary Huelvan speech with the goals of in verifying to what degree *ceceo* exists in Huelva as compared to earlier dialectology reports and understanding what social and linguistic factors govern the realization of [s] vs. [θ] phonemes. The study included 38 participants (23 men, 15 women), ranging in age from 18 to 55. The dependent variable was a binary realization of [s] or [θ] for syllable initial orthographic <s> and <z,ci,ce>. 75 <s> tokens were coded per speaker for a total of 2,850 <s> tokens. <z,ci,ce> tokens were also coded, but as these tokens occurr less frequently, a minimum of 25 <z,ci,ce> tokens per speaker were coded

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[31] In the final stages of revisions of this dissertation, it was brought to my attention that Regan (2017) has begun to be incorporated into this on-going discussion on Eastern and Western differences (see Villena and Vida [*in press*]).

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for a total of 1,544 tokens. Between the two orthographic environments there was a total of 4,394 tokens. A mixed effects logistic regression model was fitted using Rbrul (Johnson 2009) in the statistical package R (R Development Core Team 2015) to analyze the most predictive factors of coronal fricative realizations. The seven linguistic and four extra-linguistic factor groups were considered in Rbrul's multivariate logistic regression in addition to 'speaker' as a random factor. In terms of the extra-linguistic factors, Neighborhood (those living in *El Centro* (middle class) and *Isla Chica* (lower middle class) favor [s] while those living in *La Orden* (working class) disfavor [s]) and Gender (females favor [s] whereas males disfavor [s]) were significant predictors. In terms of linguistic predictors, Orthography (<s> favors [s] whereas <z,ci,ce> disfavors [s]), Following Segment (/u/ favors [s], /o/ has a neutral effect, while central and front vowels /a/, /e/, and /i/ disfavor [s]), and Regressive assimilation (words with an additional following [s] favor [s], while words with an additional following [θ], or without an additional coronal fricative, disfavor [s]) were significant predictors.

Given there were only 3 [θ] realizations for <s> among all women, Regan ran a separate analysis for the men, focusing only on orthographic <s>, in order to show that men do not behave monolithically as one would gather from the prior analysis (such a separation of gender[32] in a multivariate analysis is not uncommon). In men only analysis, those living in *El Centro* favored [s], while those living in *Isla Chica* and *La Orden*

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[32] While variationist research has found significant trends based on gender, several scholars (Eckert 1989; Labov 1990, 2001) warn that there are inherent limitations to the multivariate analysis in which "the hidden interactions of sex and other social factors are irretrievably lost" (Labov 1990: 221). Both Labov (1990) and Eckert (1990) recommend creating an interaction category or running a separate analysis.

disfavored [s]. Additionally, those with a university or secondary education favored [s], while those with a primary education (or less) disfavored [s]. The extra-linguistic factors were quite similar to the first analysis.

Regan concludes by suggesting that there is a change from above in the city of Huelva from *ceceo* to *distinción*. This change is being led by males from middle class neighborhoods or those with more formal education as well as females from all neighborhoods and educational levels. Men with less education living in working class neighborhoods are the most likely to maintain traditional *ceceo* realizations. In this sense, *ceceo* can be considering a *linguistic marker* (Labov 1972: 179) associated with working class males in the city of Huelva.

2.5.2 Discourse analysis & ethnographic observations of *ceceo*

Regan (2014a) demonstrated how the concepts of stylistic variation and indexicality (Ochs 1992; Silverstein 2003) can shed light onto the social meaning of traditional dialectal merger and recent split, contrary to previous variationist claims of mergers/splits having no social value (Labov 1994, 2010). Based on conversational data and ethnographic observations in Huelva, Spain, following the framework of Bucholtz and Hall (2005) of identity in interactional discourse, Regan analyzed the social meaning of the traditional dialectal feature of *ceceo* through the various interactional stances that speakers are able to use in discourse as part of the indexical field (Eckert 2008). In particular, this microanalysis examines eight speakers of Huelva capital who follow the norm of *distinción*. These speakers utilize *ceceo* in stylistic variation for a multiplicity of

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indexical values such as inherent localness, masculinity, and working class values. Following third-wave sociolinguistics, these speakers, whether or not they belong to particular sociodemographic categories, are able to use the semiotic social associations of *ceceo* with certain groups through social stances. The current data suggest that mergers and splits are used as a social practice for interactional purposes and do in fact enjoy a rich social life that is observable through emergent stances in discourse.

In a follow-up study using detailed discourse analysis (Sacks et al. 1974; Gumperz 1982, 2001) and ethnographic observations, Regan (2014b) focused on the relationship between the local and global (Erickson 2004), connecting micro-level language practices to macro-level processes (Eckert 2000), analyzing the interactions of three couples. The interactions demonstrated "spousal coaching" in Huelva capital whereby Huelvan women were attempting to rid their husband's speech of *ceceo*, qualitatively supporting Principle 3 of the *Gender Pattern* (Labov 1990: 213; 2001: 274). Here, however, not only are the women avoiding *ceceo*, they are explicitly trying to rid it from their husband's speech.

2.5.3 Sociophonetic study of *ceceo* and social mobility

Finally, Regan (2015), building on the only previous acoustic analysis of *ceceo* (Lasarte Cervantes 2010), sought to (i) analyze the acoustic properties of *ceceo*; and, (ii) investigate differences between urban, rural, and rural-mobile speakers. There were a total of 15 males (5 urban, 5 rural, and 5 rural-mobile) between 18-41 years of age. The

statistical analysis was a 3x2 ANOVA, that is Network[33] (Urban, Rural-Mobile, Rural) by Orthography (<s>, <z,ci,ce>). Following Lasarte Cervanets (2010), only intervocalic tokens were considered. There were a total of 20 tokens per speaker (10 <s> tokens, 10 <z,ci,ce> tokens). While several dependent measures demonstrated significant differences between phonemes, the most robust of these were spectral peak frequency (Hz) (Jongman et al. 2000), dynamic amplitude (Jesus & Shadle 2002), normalized amplitude (dB) (Forrest et al. 1988), and mean and maximum amplitude (dB) (Behrens & Blumstein 1988). Each of these measures revealed a clear separation of phonemes for urban as well as rural-mobile speakers, while there was a full merger of phonemes for the rural speakers. This demonstrates that rural-mobile participants with significant urban social networks exhibited a demerger of *ceceo*, while those without such contacts continue to realize the merger. Specifically, for normalized amplitude (following mean vowel amplitude minus mean fricative amplitude), rural speakers (R) merged realization was at an intermediate value between the separated phonemes of the urban (U) and rural mobile (RM) speakers. As seen by the boxplots in Figure 2.13, both rural mobile and urban speakers demonstrate a significant difference between orthographic <s> and <z,ci,ce> in normalized amplitude while rural speakers, on the other hand, do not demonstrate a difference in normalized amplitude between orthographic environments. In terms of spectral peak (Hz), however, the merged values of the rural speakers were

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[33] Urban speakers were defined as speakers growing up and living in Huelva capital. Rural speakers were speakers that had grown up in small towns outside of Huelva and had remained in the same place without living in other places. Finally, rural-mobile speakers were defined as speakers who grew up in rural towns in coastal Huelva, but had either lived previously or currently in urban centers of Andalucía.

equivalent to the interdental [θ] realizations for <z,ci,ce> of the urban and rural mobile speakers. In regards to dynamic amplitude, the merged values of the rural speakers were equal to the interdental [θ] realizations for <z,ci,ce> of the urban and rural mobile speakers. Finally, in terms of variance, the rural speaker merged values are also equal to the interdental [θ] realizations for <z,ci,ce> of the urban and rural mobile speakers. Consequently, the merged *ceceante* values appear quite similar to a fully interdental [θ] realization with the exception of the acoustic measure of normalized amplitude.
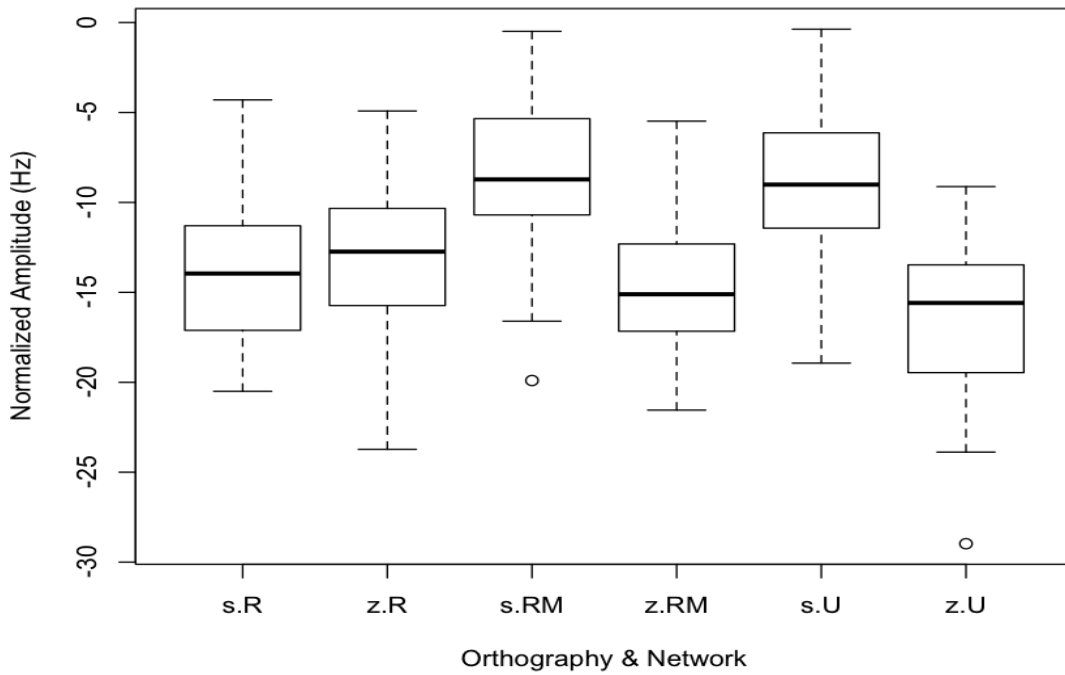
Figure 2.13: Box plot of Orthography by Social Network interaction for Normalized Amplitude (dB) (s = <s>, z = <z,ci,ce>; R = rural, RM = rural mobile, U = urban)

While very preliminary, Regan's (2015) findings indicate that the *ceceo* realization [s$^{\theta}$] intensity lies between canonical interdental [θ] and alveolar [s] realizations of *distinción*,

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which supports Lasarte Cervantes's (2010) modification of the intensity continuum

proposed by Martínez Celdrán and Fernández Planas (2007:107); see Figure 2.9.

2.6 SUMMARY

Although there have been significant number of studies surrounding the well-

documented phenomenon of *ceceo*, there are still many questions left unanswered. While

Lasarte Cervantes (2010) and Regan (2015) provide preliminary work towards

understanding the acoustic properties of *ceceo* [s$^{\theta}$] realizations in comparison with the

distinción meridional of fully interdental [θ] and alveolvar [s], these studies only looked

at men of a particular age range and provided relatively few tokens. Significantly more

data is needed to observe the gradient properties of *ceceo* in order to assess the acoustic

properties of the merger (*ceceo*), the demerger-in-progress, as well as the full split

(*distinción*). Although the extra-linguistic factors have been analyzed throughout

Andalucía in depth, each speech community varies greatly in norms and language

ideologies. In this sense, the current study aims to verify the extra-linguistic factors in

Huelva and Lepe that most favor a split. In addition, while previous comparative studies

provide convincing evidence of dialect convergence in Eastern Andalucía and dialect

divergence in Western Andalucía (excluding the most recent studies of García Amaya

2008 and Regan 2017), more data is needed to confront such claims in order to

demonstrate that dialect convergence is in fact a phenomenon occurring throughout

Andalucía. Finally, as seen through the review of the previous studies, there is an

implicit, or even explicit, assertion that rural speakers are fundamentally different from

urban speakers. As Britain (2009, 2010, 2012) notes, this rural-urban variationist idealization is perhaps a false dichotomy. Given the large-scale societal changes occurring throughout Andalucía with increased education and mobility, that affect both rural and urban speakers alike, such assumptions must be investigated. By observing the norms in rural Lepe in comparison to urban Huelva, the current study will shed some light onto the urban-rural similarities and differences in dialect convergence and divergence.

3. The Speech Communities

Historically, Andalucía has been known as one of the poorest and least educated autonomous communities of Spain. For this reason an Andalusian stereotype is continually depicted in national news stories and in popular television sitcoms. However, Andalucía, similar to other parts of Spain, has experienced large-scale societal changes, especially since the mid 20th century. These changes have affected both urban and rural communities throughout Andalucía to various degrees. One of the objectives of the present work is to quantitatively examine two different Andalusian speech communities- Huelva and Lepe- in order to challenge the notion that certain areas are isolated and timeless carriers of dialects.

The motivation to study Huelva and Lepe was brought about by my own participant observation during the 2008-2009 academic year.[34] During this period I was exposed to a large array of sociolinguistic variation. My ethnographic observations contrasted sharply with the traditional dialectal descriptions of the region. Consequently, beginning in the summer of 2013[35] I returned to Huelva to continue ethnographic observations as well as to begin conducting sociolinguistic interviews. I returned again in the summer of 2014 to continue to collect data not only within the city of Huelva, but also in surrounding towns. This pilot data motivated me to compare Huelva capital to

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[34] I lived in Huelva, Spain and taught in Cartaya at *Instituto de Educación Secundaria Rafael Reyes* 'high school' as an *auxiliar de conversación* 'conversation assistant'. Cartaya in an agricultural town about a 30-minute drive from Huelva and 5km from Lepe.

[35] This initial 2013 research was supported by a NeMLA Summer 2013 Fellowship award and a Summer 2013 Research Award from the Department of Spanish and Portuguese at The University of Texas at Austin.

another speech community. I wanted to build on the work I had already done in Huelva capital, so as to compare my findings to other work that had been done in urban Andalucía (particularly within the cities of Málaga, Granada, Sevilla, and Jerez de la Frontera). However, given the absolute dearth of rural (or small town) quantitative studies throughout Andalucía, I decided I would compare urban Huelva to a more rural speech community.

I chose Lepe for several reasons. First, I had personal contacts in Lepe and this afforded me entrance into the community. More importantly however, Lepe appeared to be economically independent from Huelva capital and different from many *pueblos dormitorios* 'bedroom commuter towns' that were close to Huelva capital such as Gibraleón, Moguer, Palos de la Frontera, or Juan del Puerto. While a few residents of Lepe commute to Huelva capital for employment, the majority is locally employed. Thus, Lepe is just far enough from Huelva capital that it is not considered a *pueblo dormitorio*. In this sense, unlike other towns where younger generations grow up and move away and/or commute to Huelva capital each day, Lepe appears to be holding its population and even growing. In line with Woolard's (1985) call to look for *alternative markets*, instead of simply focusing on Bourdieu's standard *linguistic market*, Lepe presents the social and economic environment to allow for such an alternative market. Additionally, in terms of identity, *los leperos* 'those from Lepe' are proud to be from Lepe. As sociolinguistic literature has demonstrated, strong local integration can provide the

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adequate environment for preserving traditional dialectal features, even if they are overtly stigmatized.

For the above reasons I conducted sociolinguistic interviews in Huelva and Lepe during the summers of 2015 and 2016[36]. Historically this area has been relatively isolated as it is between Portugal to the west, which serves as a linguistic boundary, and the *Parque Nacional de Doñana* to the east, which serves as a geographic barrier with no connection further east to Cádiz. It was only within the last two decades that a highway was built between Sevilla and Huelva. As one can appreciate from Figure 3.1, Huelva and Lepe are only communicated with Sevilla.

Figure 3.1: Map of the province of Huelva (googlemaps)

3.1 HUELVA CAPITAL

The city of Huelva presents the social and demographic environment that proves opportune for linguistic change. As major sociocultural shifts have affected older traditional dialects throughout postmodern Europe (Auer & Hinskens 1996), Huelva appears to be no exception. The transition from an agrarian to an industrial and, finally, to a post-industrial society (Hinskens et al. 2005: 23) has led to convergence of traditional dialects through leveling, 'fudging', and koineization (Auer et al. 2005; Chambers & Trudgill 1998; Chambers et al. 2002; Docherty & Foulkes 1999; Holmquist 1985; Kerswill 1994, 2002, 2004; Trudgill 1986; Villena 1994, 1996, 2001, 2005). Since the 1950s, when Alvar et al. (1973) collected their data, Huelva has experienced large-scale societal changes in terms of increased population and immigration, increased education, as well as changes in sectors of employment. In comparison to other Andalusian capitals, Huelva historically has not been a major urban area. In fact Huelva, has only been the capital of the province of Huelva since 1833 (Martínez-Chacón 1992: 307). Only later in the 20th century did Huelva become urban-like.

3.1.1 Changes in population

In 1950, according to the Census (*Instituto Nacional de Estadística* [INE] 1950), Huelva was a relatively small fishing town with a population of 83,648 people. Then, in 1964, Dictator Francisco Franco's regime made Huelva a home to one of Spain's largest *Polo Industrial* 'industry plants', which still operates today. This decision expanded the city overnight as immigrants came from all over the province, especially from *la sierra de Aracena* (mountains of the northern third of the province where *distinción* is the

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norm), as well as from other parts of Spain, for employment in the factories (Feria-Toribio 1994; Martínez-Chacón 1992; Ruiz García 2001). In fact, Feria-Toribio (1994: 189) claims that the *Polo Desarrollo de Huelva*, also known as the *Polo de Promoción Industrial*, created immense population growth in Huelva capital, while simultaneously depopulating many small towns from the rest of the province, particularly the towns of *la sierra* 'the north of the province'. However, Lepe, along with other coastal towns (Ayamonte, Isla Cristina, Bollullos, and Almonte), were able to maintain their populations, thanks to fishing and agriculture (Feria-Toribio 1994: 190).

Rural immigration from *la sierra* brought *distinción* to the city of Huelva. Morillo Velarde (1997: 209) posits that this immigration brought *distinción* speakers into the capital. Morillo Velarde (1997) and Narbona et al. (1998) claim that this rural immigration from geographical areas of *distinción* to *ceceante/seseante* cities has been common in other Andalusian cities as well. In the case of Huelva, this movement was magnified due to the creation of the industrial plant. Consequently, the population has increased significantly since the addition of the industrial plant in 1964 both in number of native-born individuals as well as in number of people from the province of Huelva and other parts of Spain. As one can see in Figure 3.2, the largest increase (nearly double) in population is between 1960 and 1991 due to the development of the industrial plant. As of the 2011 Census, Huelva is now home to a population of 147,808 inhabitants (INE 2011).

Population of Huelva by Year
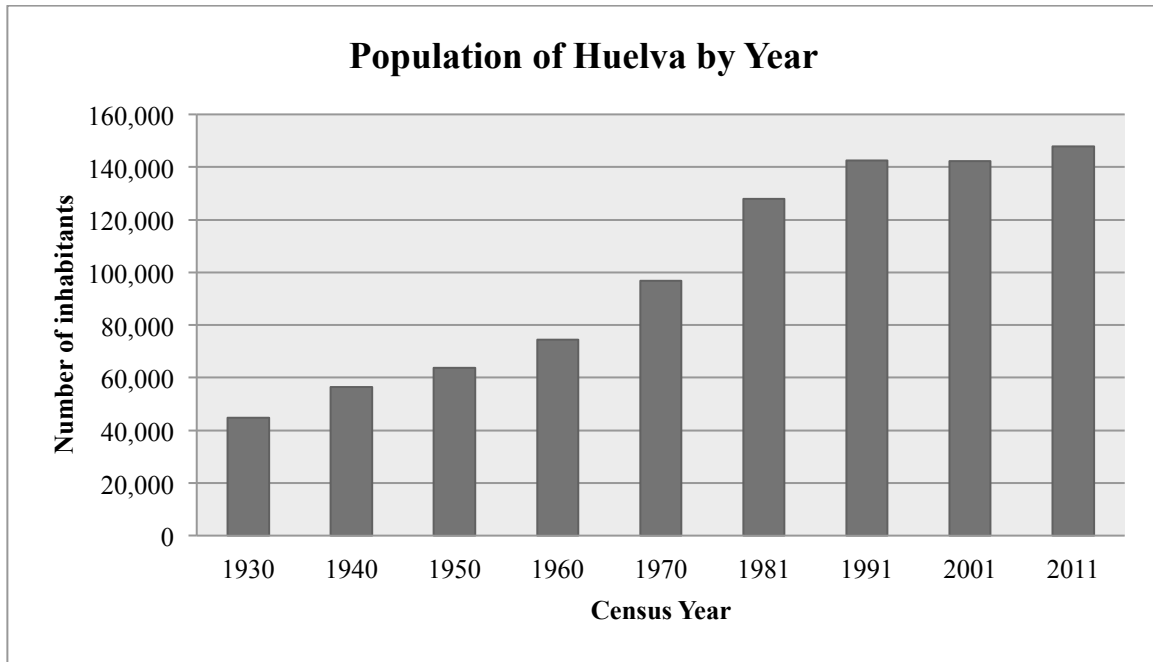
Figure 3.2: Population changes in Huelva (*Instituto Nacional de Estadística*)

3.1.2 Economic changes

The role of the industrial plant in the development of Huelva is one of the most

influential moments in the city's history (Martínez-Chacón 1994). Prior to the 1960's,

Huelva was primarily an agrarian and fishing economy. The insertion of the industrial

plant led to the industrialization of the economy. However, since the 1990s, the economy

has become increasingly service-oriented, as many of the original industrial plants have

recently been shutting down (Figure 3.3). In this regard, Huelva's economy follows the

prototypical European sequence pattern of agrarian (primary sector) to industrial

(secondary) to post-industrial (tertiary) economy (Hinskens et al. 2005: 23).

Huelva Population Employment by Sector
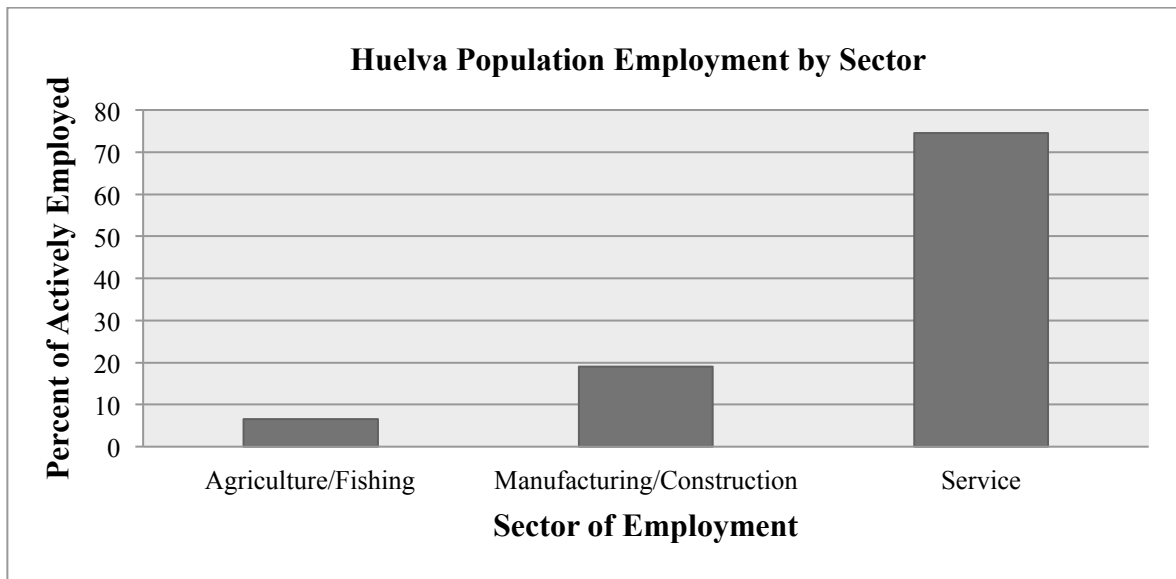
Figure 3.3: Percent of actively employed population by sector (INE 2011)

3.1.3 Educational changes

In addition to the population and economic changes in Huelva, there have been major educational changes since the 1950s in which more Huelvans are attaining higher levels of education as compared to previous generations (Figure 3.4). In comparing the levels of education from 1950 to 2011 Census data, one can see that the population of Huelva in 1950 consisted of people mostly with either no formal education or only primary education. In contrast, the majority of the population today has at least a secondary education and an increasing number of people are receiving a university education.

Educational Levels of Population
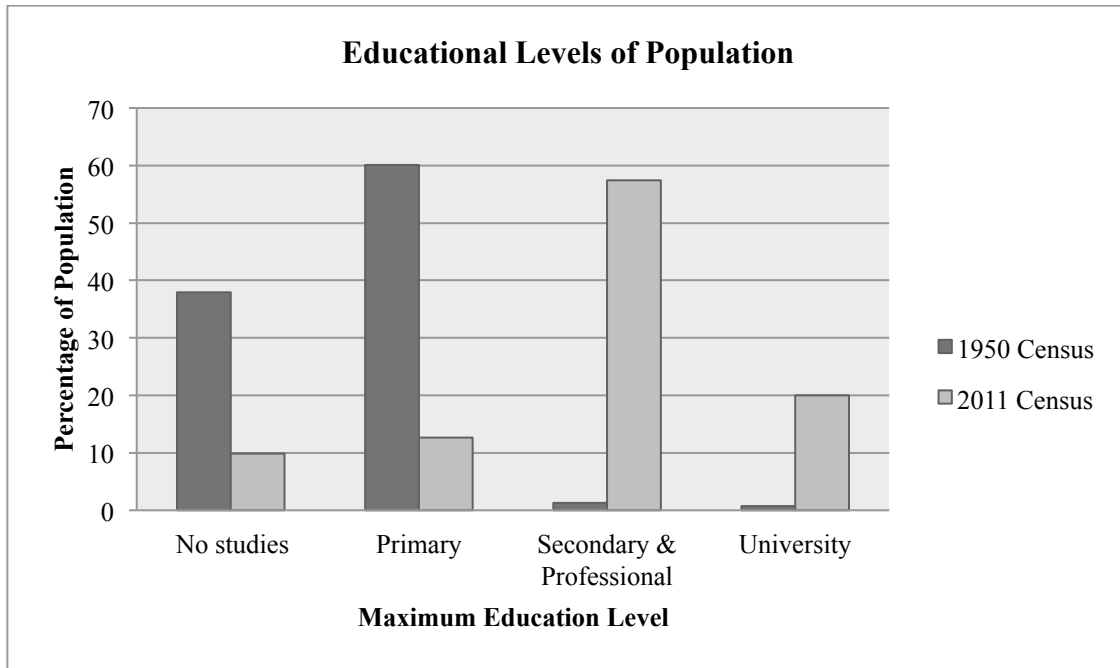
Figure 3.4: Percent of population by maximum educational level (1950 vs. 2011) [37]

This change in advances in educational attainment is fundamental to language change, particularly in the current study, as the direct role of orthography can allow for newer generations to separate one phoneme into two phonemes based on orthography given the one to one mapping of grapheme to phoneme of prescriptive *distinción*. Consequently, although *ceceo* has existed in the region for centuries, the aforementioned societal changes in population, economy, and education have led to increased contact with *distinción* within the city of Huelva. A slightly different situation holds in Lepe.

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[37] Census information is author's own elaboration of information from INE (2011). Percentages were created by taking the number of people from each educational level divided by the total number of speakers with available educational information. This was a total of 121,510 persons (not the total population of 147,255) as there were 25,757 speakers whose educational information was not listed.

3.2 LEPE

 Lepe, situated 33km west of Huelva capital, is an important agricultural and economic center in the province. It is important to mention that Lepe is known in the national discourse primarily through the jokes about stereotyped *leperos brutos* 'backwards Leperos' or those who *hablan bruto* 'speak rustically.' Locally, however, Leperos are also known for their rich agricultural production. Unlike Huelva capital, Lepe has not developed into a modern city, due to a lack of industrialization and tourism. However, the increase in tourism in the last two decades has brought Spaniards from all over the country to the beaches of Lepe during the summer months. Therefore, while Lepe is a rural speech community, there have been significant changes in population, economy and education that provide an opportune environment for language change.

3.2.1 Changes in population

 Lepe currently has a population of 26,538 people (INE 2011 Census), making it the second most populated municipality in the province, second only to Huelva capital. This population has significantly increased since 1950, when the population was 9,285 people (*Instituto de Estadística y Cartografía de Andalucía* 2015); see Figure 3.5. However, different from Huelva capital, there has not been as much immigration from other parts of the province or other parts of Spain. Instead, within the last ten to fifteen years there has been a significant increase in immigration from outside of Spain due to the agricultural boom. In fact, in 2015, of the total population of 27,675 people, 6,207 of these residents are of foreign origin (*Instituto de Estadística y Cartografía de Andalucía*

2015). These immigrants, proceeding principally from Eastern Europe and northern and

central Africa, have come to Lepe to work in agriculture.

Population of Lepe by Year
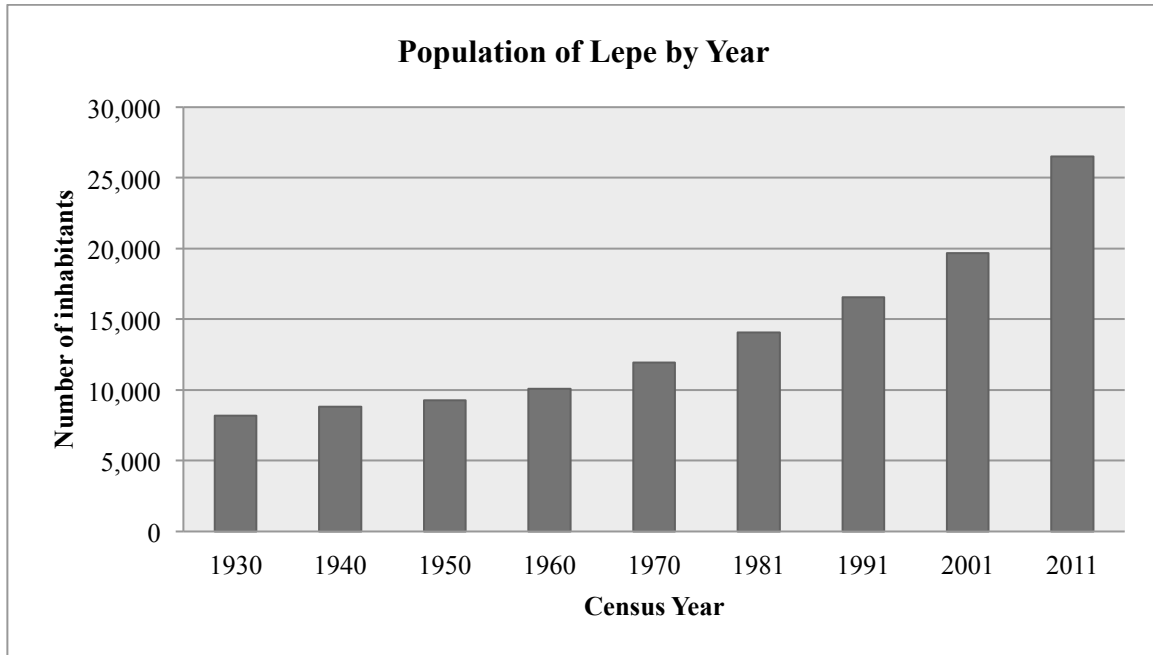
Figure 3.5: Population changes in Lepe (Instituto de Estadística y Cartografía de
Andalucía; Instituto Nacional de Estadística)

3.2.2 Economic changes

While Lepe is know today more so for its agriculture, historically it has been a

fishing and agricultural hub of the province. However, *El Puerto de El Terrón*, the local

port, serves more so for recreational purposes than it does for commercial fishing. This

generational difference was strongly reflected in the participants interviewed in the

current study. The majority of the men of the oldest generation are retired fisherman.

There are very few fishermen under the age of sixty, as younger generations abandoned

the fishing tradition of their ancestors. The modern economy is comprised mainly of

agriculture and service (Figure 3.6). Prior to 2008, a significant portion of the economy

was based on construction, but since the world economic crisis of 2008, construction[38] in

this area is almost non-existent. Therefore, in contrast to Huelva capital, where there was

a change from agriculture to industry to now post-industry, it appears that Lepe maintains

its original agricultural sector, but is increasingly relying on the tertiary sector (service

and professional occupations).

Lepe Population Employment by Sector
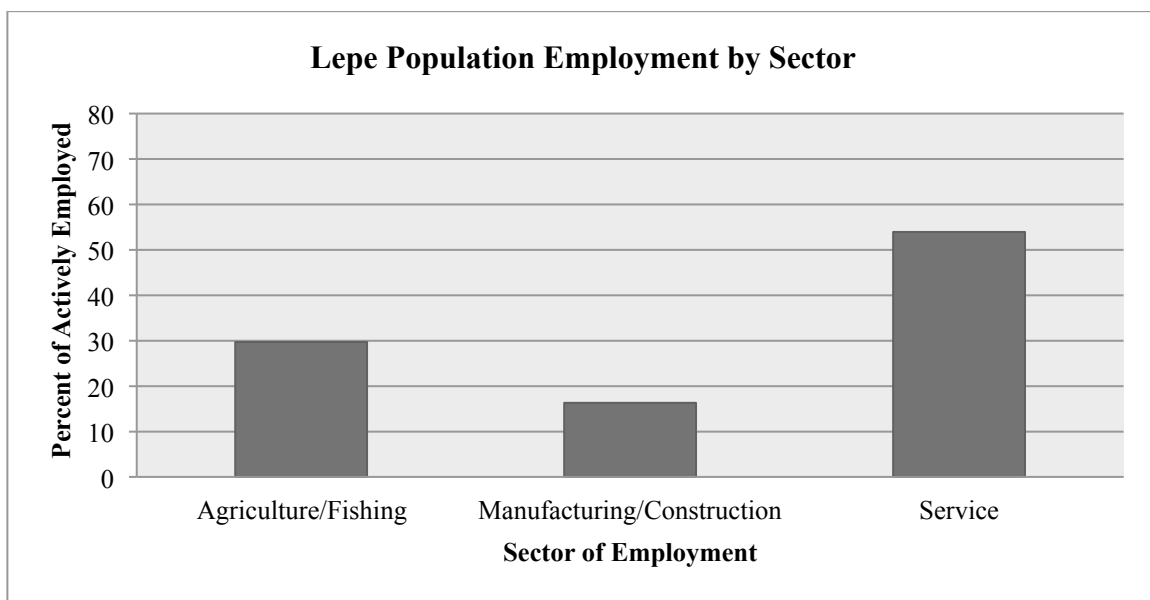
Figure 3.6: Percent of actively employed by sector (INE 2011)

3.2.3 Educational changes

Similar to Huelva capital, there have also been significant changes in terms of the

educational levels of the population in Lepe. In 1950, the Census data (*Instituto Nacional*

de Estadística) only obtained specifics for municipalities with a population of over

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[38] Figure 3.6 indicates nearly 18% of Lepe was employed in construction in the 2011 Census. However, I
hypothesize that a more updated census would demonstrate a significant reduction in this sector of
employment almost a decade after the world economic housing crisis.

10,000 inhabitants. Given that the population of Lepe was just under this number with 9,285 inhabitants in 1950, there is no reported data of education levels in Lepe for 1950. Thus, while we have this information for the 2011 Census data of Lepe, we are not privileged to know the exact figures for educational attainment in Lepe in 1950. However, for a qualitative comparison, I incorporate the educational information from Cartaya, a similar agricultural town located only 5km from Lepe, which in 1950 had a population of 10,562 (INE 1950). While the numbers may have varied, this gives us a relatively accurate comparison of the changes in this rural area from 1950 to 2011, as seen in Figure 3.7. Similar to the stark change in educational levels seen in Huelva in Figure 3.4, we can also observe that the majority of the *leperos* had either no formal education or only primary studies in 1950. However, in 2011, over 60% of the total population had a secondary education with a small percentage of university degrees. One qualitative difference we can note here between speech communities is that there are more Huelvans per capita with university education than Leperos.

Educational Levels of the Population
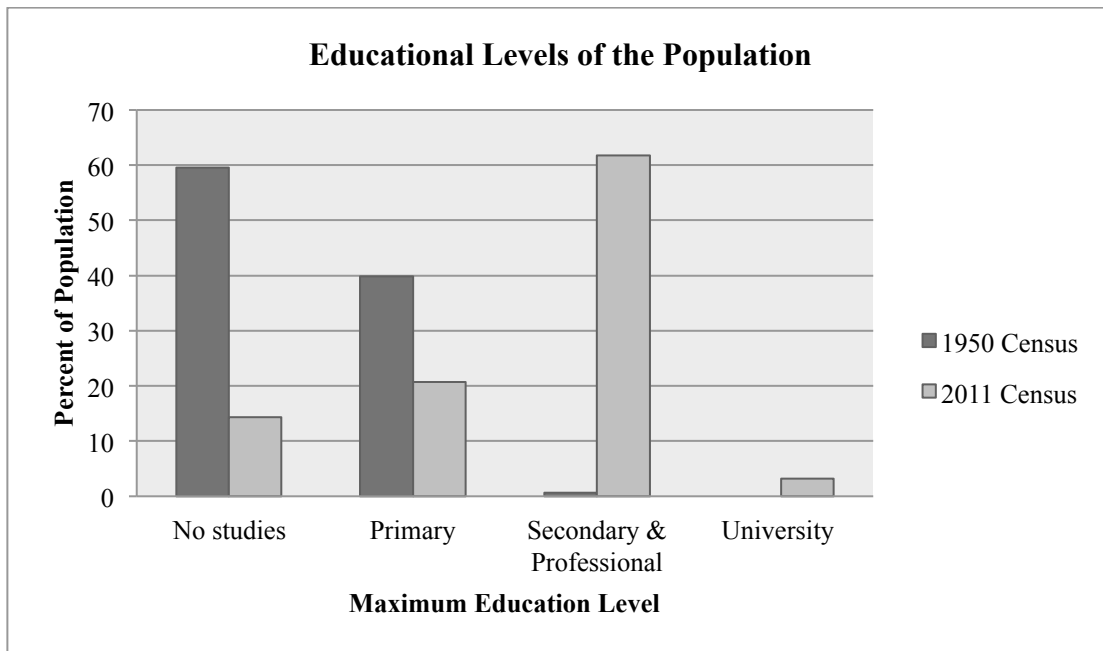
Figure 3.7: Percent of population by maximum education level (1950 vs. 2011)

3.3 ROLE OF MASS MEDIA

Another large-scale societal change that has effected in both speech communities,

much more difficult to quantify, is the role of the mass media through television in the

20th century. In 1956 television broadcasting began throughout Spain (Díaz Nosty 2002;

Gutiérrez 2010: 53; Palacio 2001; Rueda & Chicarro 2006). This timeline is important

when we consider that the dialectal studies of the 1930s and 1950s in Huelva and Lepe

would have involved subjects who had little to no exposure to television. During this time

Televisión Española (TVE) "had a centralist, monopolistic and propagandistic character"

(Gutiérrez 2010: 53). In this regard we can reasonably assume that those watching

television were exposed to more standard varieties of Castilian Spanish.

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Beginning in 1989 the first Andalusian regional station appeared: Canal Sur

Televisión (Fernández 1999; Gutiérrez 2004, 2010: 54). As Stewart notes (1999: 25), the

national television broadcasting company, Radio Televisión Española (RTVE), had

official style guides beginning in 1985 that were written by the prescriptive language

keepers at the *Real Academia Española* 'Royal Spanish Academy.' Following these

guides, national programs such as *TeleMadrid* banned *seseo* and *ceceo* "with justification

that anyone who engages in public speaking should be able to use both pronunciations[39]

correctly" (Stewart 1999: 26). *Canal Sur Televisión*, while not as prescriptive as

TeleMadrid, encourages broadcasters to avoid "*andalucismos*" 'Andalusianisms', but

simultaneously not to imitate the more standard speech of Valladolid (Stewart 1999: 26).

Although more local norms may be represented on Canal Sur, it is more popular among

older and rural Andalusian speakers while younger speakers prefer other national stations

(Gutiérrez 2010: 56).[40] It is apparent then, that *distinción* is heard throughout most

broadcasting in Andalucía. Consequently, the mass media, in addition to the educational

system, give social value to *distinción* as linguistic capital (Bourdieu 1991). Thus,

speakers may come to associate *ceceo* with "uneducated" or "provincial," even if their

own parents or grandparents are *ceceante* speakers.

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[39] Here "both pronunciations" refers to the prescribed phonemes of *distinción*: /s/ and /θ/.

[40] Anecdotally, this was confirmed frequently by participants from Huelva and Lepe, with more elderly participants (as well as younger participants more routed in local traditions) claiming to enjoy *Canal Sur Televisión*, while younger more mobile speakers thought it played on outdated Andalusian stereotypes.

3.4 THE RURAL-URBAN DICHOTOMY

The aim of comparing "urban" Huelva to "rural" Lepe with regards to *ceceo* demerger is three-fold: (i) to provide a quantitative account of linguistic change in rural Andalucía as it is assumed that rural areas maintain the traditional merger; (ii) to employ variationist methodologies in a rural area as such areas have been almost exclusively analyzed through the lens of traditional dialectology; and, finally (iii) to provide a nuanced comparison of a *rural* and an *urban* speech community undergoing similar large-scale societal changes in order to challenge notions of the rural-urban dichotomy.

While there is nothing particularly linguistic, or scientific, about the terms *urban* and *rural*[41], they continue to pervade scholarly and popular notions of language change and variation. By and large, it is assumed that urban areas are sites of dialect/language contact and linguistic change, while rural areas are timeless carriers of traditional dialects. Recently, Britain (2009ab, 2010, 2012ab, 2013) has thoroughly examined the rural-urban dichotomy within variationist sociolinguistics. Britain claims, "while urban and rural areas certainly trigger very distinct images and attitudes in our minds, there are in fact no absolute differences between them- *there are not causal social processes which affect urban areas but not rural or vice versa*" (2009a: 224). While dialect contact may occur more frequently in large cities and lead to dialect leveling, similar processes may occur in rural areas as well, resulting in similar changes that differ in rate of change, but nonetheless changes. However, there is no reason to assume that urban communities

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[41] I acknowledge that even using the terms *urban* and *rural* to distinguish Huelva and Lepe is an ideological decision.

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experience more linguistic change than rural areas. For example, *counterubanization* may produce an urban environment with a more conservative linguistic speech community while *rural gentrification* may bring many dialects into contact, which leads to koinés or leveled forms of speaking (Britain 2009, 2012a).

Contemporary variationist studies focus almost exclusively on urban communities. Since Labov's (1996) New York City study, there has been an "urban turn" in dialectology and sociolinguistics (Britain 2009a). This move from rural to urban communities is due in large part to outdated methodologies of traditional dialectology. The focus of traditional dialectology was rural areas as it was assumed one could find more vernacular and historical forms in such places, particularly among *NORMS*, non-mobile rural males (Chambers & Trudgill 1998; Trudgill 1986). Traditional dialectology typically comprised of rigid questions, either isolated words or short phrases and at times would only include one older male speaker from a speech community. Thus, the move to urban variationist studies was in large part a reaction to the limitations of dialectology methodologies (Britain 2009a, 2013). Additionally, during the 1960s the social sciences experienced the "quantitative revolution" in which large-scale statistical analysis became possible and incorporated into variationist sociolinguistics (Britain 2009a, 2013). In brief, the combination of outdated dialectology methods in tandem with the 1960s statistical revolution, motivated variationists to turn to cities to analyze language variation.

While there are very few variationist, laboratory phonology, or experimental phonetic studies that concern rural areas, these same methodologies can (and should) be

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used in more rural communities. What should be more important to scholars of language variation and change is focusing on *dialect contact*[42] (or isolation) and *mobility* as opposed to idealized terminology of urban versus rural (Britain 2009a, 2012a). In this manner, it is more important to "identify the causal processes"[43] and analyze how this is realized in both urban and rural contexts. While traditional dialectology assumed non-mobility, or at least exclusively focused on speakers that were non-mobile, the contemporary speech community is far from non-mobile. The mobility[44] and contact in the last half century is unprecedented due to increased urbanization, increased counterurbanization, increased migration, increased higher education leading students away from home, and increased transportation (Britain 2009b: 197-199). Geographic mobility in large part has been promoted through economic changes with a large increase in the tertiary service sector of the economy (Britain 2012b). It is important to note that although there is increased mobility, that mobility in itself is socially stratified (Britain 2012b, 2013). In turn, increased mobility has led to an increase of weak ties in Western society (Urry 2007: 211-229). As previous studies (Milroy & Milroy 1985, 1992) of social networks indicate, weak ties generally lead to more susceptibility to language change. Milroy (2002ab) argues that when members of a previously close-knit community become more mobile, then linguistic leveling and simplification are likely to

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[42] Britain (2009a: 224) claims, "contact is blind to urban or rural location- it may happen more often and more intensively in urban areas but is not restricted to such areas."

[43] Britain states, "the very same cultural, economic, social and political processes and conflicts can affect rural areas as affect urban- less routinely, less visibly, less intensively (or of course, more routinely, visibly, intensively…) perhaps, but affect them nevertheless" (2009a: 238).

[44] This mobility does not have to include large-scale migrations, but rather mundane mobility, or "unexceptional everyday movement" that can lead to language change (Britain 2012b).

occur causing localized features to disappear. Chambers (2002) also claims that mobility is the strongest catalyst of dialect leveling. Consequently, in analyzing Huelva and Lepe, we can specifically look at the causal process (contact and mobility) occurring in both speech communities in order to confront the urban-rural dichotomy.

3.5 SUMMARY

While Huelva and Lepe present two distinct speech communities, with separate economies, populations, and histories, there is a shared isolation and there are similar large-scale societal changes that have affected both communities including an increase in educational attainment levels, an economic shift towards the tertiary sector, an increase in the amount of mobility (for particular individuals and social groups), and finally, an increase to radio and television access where *distinción* is always present. For these reasons, Huelva and Lepe provide an excellent opportunity to analyze the rural-urban dichotomy from a sociolinguistic perspective. Although this particular Andalusian Spanish variety, especially that of Lepe, is well known, there are no published quantitative studies (with the exception of Regan 2017) of this variety. However, given the rich tradition of dialectology in Andalucía, we will be able to compare current findings to older accounts (Alvar et al. 1973; Mendoza Abreu 1985; Navarro Tomás et al. 1933). In view of the aforementioned large-scale societal changes in Huelva and Lepe, it is hypothesized that the results of the current study will contrast sharply with previous dialectal accounts.

4. The Study

The present investigation is an apparent time study (Labov 1994) in which all traditional sociolinguistic interviews (Labov 1972) were conducted during the summers of 2015 and 2016 in two speech communities, Huelva capital and Lepe. As mentioned previously, only the passage reading and word lists will be analyzed.

4.1 RESEARCH QUESTIONS

In order to document and analyze the coronal fricative variation in the region of Huelva, this work pursues five broad research questions with hypothesis listed below.

RQ1: *Demerger*: Is there a demerger underway in Huelva and/or Lepe, such that the putatively merged *ceceo* realization for orthographic <s> and <z,ci,ce> is splitting into two separate categories?

Hypothesis: Based on the pilot work in Huelva capital (Regan 2014ab, 2017) and surrounding towns (Regan 2015), it is hypothesized that there is currently a demerger from the traditional dialect feature of *ceceo* towards *distinción*, that is, two the separate phonemes of /s/ and /θ/.

RQ2: *Near-merger vs. complete merger*: If there is a demerger, is there evidence within either community that there was a near-merger or a complete merger?

Hypothesis: While dialectology studies in Huelva and Lepe (Alvar et al. 1973; Mendoza Abreu 1985; Navarro Tomás et al. 1933) have reported a full merger in the 20th

century of *ceceo*, there has been little acoustic analysis to support such claims. In this light, there is no reason to assume a priori that *ceceo* is a near-merger or a complete merger. Given the lack of acoustic studies, there is no formal hypothesis.

RQ3: *Factors leading to demerger*: What social and linguistic factors contribute most to the probability that a speaker will manifest a split (i.e., *distinción*) rather than *ceceo*?

Hypothesis for social factors: Based on previous sociolinguistic studies of *ceceo* in the cities of Málaga (Ávila 1994; Lasarte Cervantes 2010, 2012; Villena 1994, 1996, 2001, 2005, 2007; Villena et al. 1995; Villena & Requena 1996), Granada (Martínez & Moya 2000; Melguizo 2007, 2009ab; Moya & García-Wiedeman 1995; Moya & Sosiński 2015; Salvador 1980), Jerez de la Frontera (García Amaya 2008), and Huelva (Regan 2017), it is hypothesized that social factors of gender, age, and education will be strong predictors of whether a speaker realizes *ceceo* or *distinción*. Following the overwhelming trend found in these studies of women leading this change, it is hypothesized that women will demonstrate a difference that is more closely aligned to *distinción* in producing [s] and [θ] than men. Based on the findings of these studies, it is also hypothesized that younger speakers will demonstrate a larger acoustic difference in producing [s] and [θ] than older generations, indicating an apparent-time change in progress. Based on the results from these studies, it is hypothesized that speakers with more formal education will demonstrate a larger acoustic difference in producing [s] and [θ] than those with less education. In line with theories of the linguistic market (Bourdieu 1991; Bourdieu and

Boltanski; 1975; Sankoff and Laberge 1978), it is hypothesized that those in professional and service-oriented occupations where linguistic capital is highly valued will demonstrate a larger acoustic difference in producing [s] and [θ] than those with manual occupations. Following general sociolinguistic trends on the influence of mobility on dialect leveling (Britain 2012b; Chambers 2002; Milroy 2002), it is hypothesized that those speakers who have spent more years away from home and consequently have been exposed to more dialect contact, will demonstrate a larger acoustic difference in producing [s] and [θ] than those who have not lived away from the area. Following Villena (2007), it is hypothesized that those with more exposure to mass media will demonstrate a larger acoustic difference in producing [s] and [θ] than those without connection to mass media. Following Villena (2007), it is hypothesized that those with less local integration will demonstrate a larger acoustic difference in producing [s] and [θ] than those with higher local integration. Finally, following the overwhelming trends in variationist sociolinguistics of stigmatized features that are under a change-from-above (Labov 1972, 2001), it is hypothesized that the word list will demonstrate a larger acoustic difference in producing [s] and [θ] than the reading passage.

Hypothesis for linguistic factors: Following previous studies (García Amaya 2008; Regan 2017), it is hypothesized that Orthography will be a strong main effect with acoustic differences found between orthographic environments in producing [s] and [θ]. If Huelva and Lepe were still *ceceante* communities as predicted by earlier dialectal accounts, there should be no acoustic difference based on orthography. While previous

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studies (García Amaya 2008; Regan 2017) have not found a significant main effect for Syllabic Stress, the current study seeks to find from an acoustic analysis if tonic syllables favor or disfavor a more *ceceante* realization. It is hypothesized that syllable initial fricatives in tonic syllables will demonstrate a greater difference in dependent measures based on orthography than fricatives in atonic syllables. In terms of Functionality, Wedel (2006) and Wedel et al. (2013) demonstrate in languages with potential mergers, that phonological maintenance is increased when such phonemes serve a functional load. However, this has yet to be tested in the reverse direction, that of a demerger. Based on Villena's (2007: 84) small, but significant effect for functional <s> tokens favoring [s] over non-functional <s> tokens, it is hypothesized that <s> in *masa* 'mass' and <z> in *maza* 'hunting club' would be more likely to be produced acoustically different than would non-functional <s> in *cosa* 'thing' and <z> in *andaluza* 'Andalusian (fem)'. In terms of the presence of an additional fricative, previous studies (Moya & García-Wiedemann 1995; Villena 2007; Regan 2017) found that the presence of an additional coronal fricative in the same word predicted the realization of the following coronal fricative: the presence of [s] would favor an additional [s], while the presence of [θ] would favor an additional [θ]. In light of these findings, it is hypothesized that words with two different coronal fricative environments would produce a smaller acoustic difference between [s] and [θ] due to assimilation effects.

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RQ4: *Rural vs. Urban*: Does *rural* Lepe demonstrate differences in the linguistic change as compared to *urban* Huelva?

   Hypothesis: In line with Britain's (2009a, 2009b, 2012a, 2012b) findings, it is hypothesized that there will not be a main effect for origin in terms of a larger acoustic difference in producing [s] and [θ] in one community or another, but rather an interaction between Origin and other fixed factors.

RQ5: *Acoustic properties of the coronal fricatives*: What are the acoustic properties of fricative tokens that are auditorily coded as [θ] vs. [s] by the author?

   Hypothesis: Based on previous studies (Lasarte Cervantes 2010; Regan 2015), it is hypothesized that tokens that correspond to the prescribed orthographic *distinción* (alveolar /s/ for <s> and interdental /θ/ for <z,ci,ce>) that <s> will have a higher center of gravity (Hz), a lower variance, and a higher mean intensity (dB) than <z,ci,ce>. As *ceceo* is considered an allophone of alveolar /s/ with a more dental realization (Penny 2000; Hualde 2005), it is hypothesized that [s$^\theta$] (*ceceo*) realizations will fall between the values of [s] and [θ] values. Similar to Lasarte Cervantes' (2010) proposed intermediate intensity value for [s$^\theta$] realizations between [s] and [θ] (see Figure 4.1), I hypothesize that *ceceante* speakers' merged realizations will also fall on similar continuum for other dependent measures in between fully distinguished [s] and [θ]. That is to say, there will be a continuum of gradient realizations with alveolar [s] and interdental [θ] at the far

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extremes for each dependent measure while full-fledge *ceceo* realizations will fall in the middle of these continuums with inter- and intra-personal variation.
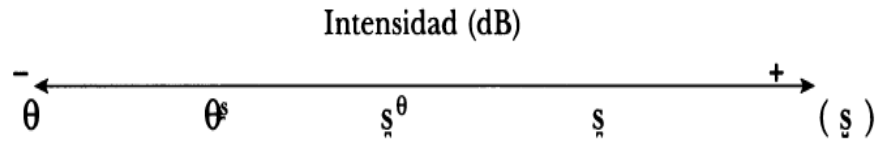
Figure 4.1: Intensity continuum (Lasarte Cervantes [2010: 489]; modified from Martínez Celdrán & Fernández Planas [2007])

The above research questions were addressed through the analysis of data collected via reading passage and word lists. The interview data was coded using quantitative variationist techniques with statistical models fit to the data using R (R Development Core Team 2015). A phonetic analysis of the data examined the spectral, amplitudinal, and temporal parameters of the fricatives by orthography (<s> vs. <z,ci,ce>) as well as by impressionistic coding ([θ] vs. [s]).

4.2 METHODOLOGIES

4.2.1 Participants

Participants were recruited through the author's social networks in both Huelva and Lepe. These social contacts were then followed by snowball sampling of "friends of friends" (Milroy 1980: 453), or in the case of the current study, relatives of relatives. A total of 118 sociolinguistic interviews were conducted by the author during the summers of 2015 and 2016 between the two speech communities. Of these, 80 participants were selected in order to balance populations based on socioeconomic background, origin (40

Huelva, 40 Lepe), gender (40 men, 40 women), and age, ranging from 18 to 87 ($M =$ 43.7, $SD = 17.2$). The two speech community sample populations were similar in age. Huelva ranged in age from 18-70 ($M = 43.03$, $SD = 16.03$), while Lepe ranged from 18-87 ($M = 44.4$, $SD = 18.48$); see Appendix A for demographic information of speakers from Huelva and Appendix B for demographic information of speakers from Lepe. Although age is used as a continuous factor in the analysis, Table 4.1 and Table 4.2 show the traditional sociolinguistic-binned categories of age by gender.

Table 4.1: Speakers of Huelva ($N = 40$) by age and gender

Age by Gender	Men ($n = 20$)	Women ($n = 20$)
18-35	7	8
36-60	9	8
>60	4	4

Table 4.2: Speakers of Lepe ($N = 40$) by age and gender

Age by Gender	Men ($n = 20$)	Women ($n = 20$)
18-35	10	7
36-60	5	8
>60	5	5

4.2.2 Materials & Procedure

Data collection consisted of a traditional three-part sociolinguistic interview followed by metalinguistic and demographic questions. The investigator initially told participants that he was conducting a holistic study on "*Las voces de Huelva*" 'The voices

of Huelva' documenting the culture, history, and peoples of Huelva and its surrounding area. Thus, participants were not made aware until the end of the study that the investigator was also explicitly interested in local language variation and practices. Interviews averaged around sixty minutes, although several lasted up to ninety minutes. Recordings were carried out in quiet places such as the interviewee's living room or office, rooms at the Universidad de Huelva, offices at *el Centro de Mayores* 'senior center' in Lepe, and rooms at *el teatro municipal* 'municipal theater' of Lepe. Participants were recorded with a solid-state digital recorder Marantz PMD660 wearing a Shure WH20XLR Headworn Dynamic Microphone.

The author, although a non-native speaker of Spanish, has previously lived in the city of Huelva and can briefly pass for a local Huelvan speaker. The author's Spanish therefore represents a non-native Huelvan accent following the norm of *distinción*. Using *distinción* is clearly a limitation because interlocutors might accommodate to the author's norm. While accommodation may have been present due to the "Observer's Paradox" (Labov 1972), the author did not notice any significant changes in conversations during or after recording. The author was able to use his Andalusian linguistic competence and sociocultural knowledge of the region to create a familiar conversation space for speakers and encourage them to speak as if they were at their kitchen table with family.

4.2.2.1 Advantages and limitations of each task

In analyzing mergers and splits, several scholars have pointed to the advantages and disadvantages of difference tasks. For example, Thomas (2006: 492) indicates that

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while conversational speech is ideal for having more relaxed speech patterns, it has the two main disadvantages in which particular conditioned mergers may be rare enough where they do not occur in natural speech or that they occur frequently but in limited phonetic contexts, which skews the distribution. Additionally he cites potential accommodation to the interviewers' speech as yet another disadvantage.

In contrast to conversation style, word lists allow for the explicit testing of contexts and words that may not occur in spontaneous speech. Of course, this presents the disadvantage of self-monitoring speech and the influence of spelling (Gordon 2013: 207; Gordon 2015: 184). In order to account for these limitations, Thomas (2006: 492) suggests that the construction of specific passages balances the advantages and disadvantages of both the semi-led conversation and the word list. Additionally, Gordon (2015: 184) believes that a comparison of the minimal pair data to less formal production allows for a fuller picture of the linguistic change. Consequently, any differences between more formal contexts and informal contexts may demonstrate the sociolinguistic status of a merger (Gordon 2013: 206; Labov 1994: 354-355; Milroy 1992: 74). Here I analyze two distinct levels of style[45], the reading passage and the word list results.

4.2.2.2 Reading passage

For the reading portion, participants read a full one-page passage of 575 words constructed by the author with target tokens placed throughout the text (see Appendix D).

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[45] The semi-structured conversation, not analyzed here, consisted of open-ended questions about local themes such as religious holidays (*el Rocío*, *Semana Santa, la Romería de la Bella)*, local gastronomy, Sevilla-Huelva or Lepe-Cartaya rivalries, soccer, changes in Huelva/Lepe since childhood, and city-province differences, among other themes (see Appendix C).

Here is an example of the first few sentences from the reading task with target tokens

underlined for the convenience of the reader:

> *Yo pien<u>s</u>o que Huelva capital tiene mucho para ofre<u>c</u>er a cualquier per<u>s</u>ona. A*
>
> *pe<u>s</u>ar de <u>s</u>er una <u>c</u>iudad chica, tiene muchas co<u>s</u>as para ha<u>c</u>er, ver y comer.*
>
> *Además, es una <u>c</u>iudad muy cómoda, no ha<u>c</u>e falta condu<u>c</u>ir. La gente es muy*
>
> *acogedora, maja, <u>s</u>o<u>c</u>ial, andalu<u>z</u>a, o <u>s</u>ea, gente muy <u>s</u>alada. Ha cre<u>c</u>ido mucho*
>
> *desde los años <u>s</u>e<u>s</u>enta…*

The passage focused on local rivalries, local customs, foods, and lifestyles. The passage

was designed to be relatively informal, interesting, and relatable. The reason for this was

two-fold: first, so that it would be enjoyable for the participants; and second, so that it

speakers would pay less attention to speech and more attention to the passage theme as

opposed to the word list. There were a total of 170 target tokens (<s> = 97 tokens;

<z,ci,ce> = 73 tokens) within the reading passage.[46] There were two speakers that were

not able to read the passage, one due to limited literacy and the other due to lack of

glasses during the time of the interview. However, these same speakers were able to read

the word pairs.

4.2.2.3 Word list

The word list of 82 words consisted of both minimal pair and non-minimal pair

tokens that contained syllable initial <s> and <z,ci,ce> tokens as well as distractors (i.e.

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[46] Although the passage was designed to analyze syllable initial orthographic <s> and <z,ci,ce>, I included many other orthographic environments to analyze other phonological features (<ch>, <-r> vs. <-l>, <y> vs. <ll>, <rr>) for future studies.

words without syllable initial coronal fricatives) (see Appendix E). There were a total of

86 target tokens[47] within the word list, balanced for orthographic environment (<s> = 44

tokens; <z,ci,ce> = 42 tokens). The investigator never asked participants to produce

distinción nor asked if they were capable of producing *distinción*, but rather handed them

the word lists and asked if they would be able to read it. All speakers were able to read

the minimal pair list.

4.2.2.4 Metalinguistic questions

After the read speech, I asked the participants metalinguistic questions[48] about the

local forms of speaking as compared to other varieties such as those of Sevilla and

Madrid (see Appendix F). The interview was conducted in this order (semi-directed

conversation, reading passage, word list, metalinguistic questions) to avoid any

confounding effects of speakers being made explicitly aware of language practices.

4.2.2.5 Demographic questions

Finally, the interviewees orally responded to a short list of demographic questions

to obtain information for social factors such as age, education, occupation, social

networks, and family history (see Appendix G). Several sections (3,4,5,6) of the appendix

were taken from Villena et al. (2003), while other sections (1,2,7,8,9) were created by the

author specifically for Huelva and Lepe.

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[47] Several words contained more than one token such as *gracioso* 'funny'.
[48] While this section will be not be analyzed in the current study, it will provide a rich future analysis of language ideologies and identity as seen through variation in discourse. Future work will analyze both the content and the phonetic variation following Bucholtz & Hall's (2005) framework of identity in interaction.

4.2.3 Preprocessing of data

Of the tokens collected, several observations had to be eliminated due to speakers' misreading a word (saying a different word instead of the prompt), speakers' skipping over the target word, or an occasional overlap of external noise (phone ringing, dog barking, baby crying), resulting in a total of 12,651 for the passage reading and a total of 6,769 for the word list. Overall, there were a total of 19,420 tokens for analysis.

The data from the reading passage and the word lists were forced aligned using FASE (Wilbanks 2015). An example of the minimal pairs *casa-caza* 'house-hunt' can be seen in Figure 4.2. Tier two displays the words, while tier one presents the phonemic categories. One limitation of FASE is that it does not include the phoneme /θ/. For this reason, all orthographic <s> and <z,ci,ce>[49] are automatically labeled as /s/ in tier one. However, the measurements were stored in relation to its actual orthographic environment in spreadsheets, not the automated /s/ label given by FASE. Thus, for the word *caza*, the orthographic environment is coded as <z,ci,ce>.

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[49] As a reminder for non-Spanish speakers, orthographic <s> and <z,ci,ce>, regardless of their realization as an alveolar [s], interdental [θ] or a dental [s$^\theta$], do not demonstrate any type of voice bar in this Andalusian variety. These are voiceless fricatives; <z> does not indicate [z]."
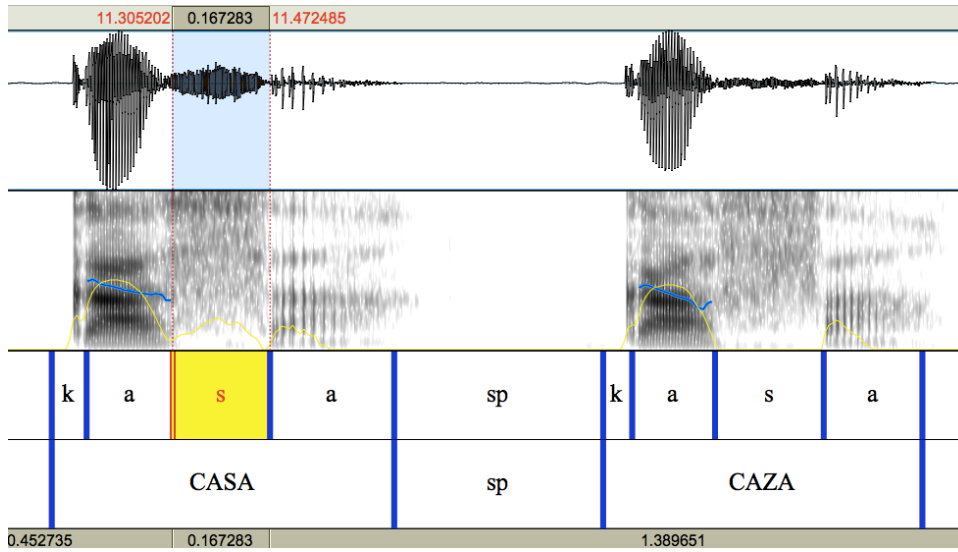
Figure 4.2: Example of a forced-aligned textgrid of minimal pairs (word list) using FASE (Wilbanks 2015)

Once the alignments were made, I hand corrected each textgrid fricative boundary in Praat (Boersma & Weeknik 2015) to assure that the fricatives were properly segmented following the guidelines of Jongman et al. (2000: 1255). Specifically, the start point of the frication noise was marked at the point in which high frequency energy appears on the spectrogram and where the aperiodic zero crossings increases dramatically. The end point of the frication noise was marked prior to the end of the aperiodic noise end before the rise of the periodicity of the following vowel (see Figure 4.3). Additionally, given that Jongman et al. (2000: 1256) found no difference in results between Bark versus linear data, the current analysis did not convert the linear[50] data into Bark scale.

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[50] Similarly, Flipsen et al. (1999: 675) found linear scale data to be more useful.
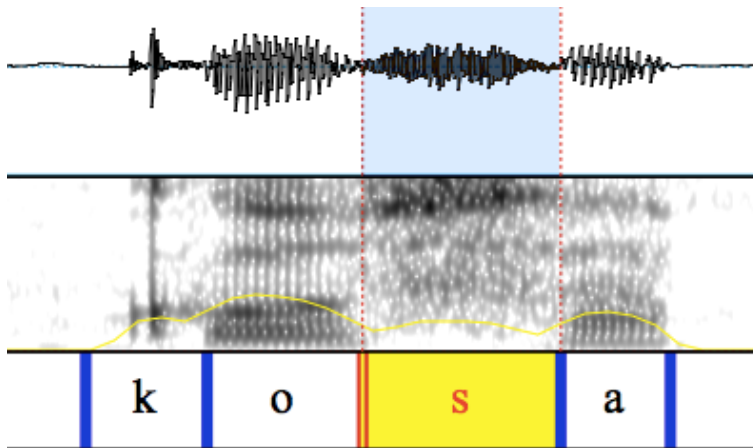
Figure 4.3: Fricative segmentation

The investigator also auditorily coded each segment as either [s] or [θ] during the manual alignment correction phase. While the acoustic analysis demonstrated a continuum of realizations, I followed all previous auditory coding (see Chapter 2) in a forced choice coding of [s] or [θ]. An automated Praat script written by Elvira-García (2014) was used to measure all tokens from the recordings. Using this automated Praat script ensured consistency and reliability in measurements. The measurements taken from the Praat script served as the raw data for the acoustic analyses.

4.2.4 Independent factors

Each token from the reading passage and word list was auditorily coded for dependent variable realizations as well as linguistic and extra-linguistic independent variables. In addition to linguistic and social fixed factors, word and speaker were considered as random factors.

Nine social factors were coded as relevant to coronal fricative variation: Gender[51], Age, Education[52], Occupation, Mobility (years lived away), Origin, Contact with mass media, Local integration, and Speech style (reading passage, word list) (see Table 4.3). For Occupation, speakers were divided into three categories based: manual, service, and professional. Manual occupations included fishermen, construction workers, factory workers, and field workers. Service occupations included bar tenders, cashiers, small store workers, etc. Professional occupations included teachers, professors, lawyers, civil servants, and nurses. For Mobility, years lived away from Huelva or Lepe will serve as a quantitative proxy. The Contact with mass media consisted of a questionnaire taken from Villena et al. (2003) with a range in scores from 0 (the least exposure) to 24 (the most exposure) (see Appendix G, Part 3). The Local Integration relates to attachments inside the community. The Local Integration score was based on nine yes/no questions written by the author. Answering yes to questions 1-7 produced resulted in one point per question, while answering no to questions 8 and 9 resulting in one point per question. Thus, speakers ranged from 0-9 on the local integration score (see Appendix G, Part 2). Lower scores pertain to those who have limited connections inside their community, and higher scores identify those who have extensive networks within their community. The

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[51] *Gender* is used here instead of *sex*, as "sex is not directly related to linguistic behavior but reflects complex social practice. The correlations of sex with linguistic variables are only a reflection of the effects on linguistic behavior of gender" (Eckert 1989: 245). Thus, speakers are seen as *doing* and *performing* gender within societal norms (Eckert and McConnell-Ginet 2003: 10).

[52] For Education, participants were placed in the highest degree earned, with the exception of those who were actively pursuing/completing such a degree, who were placed into those respective categories (i.e. 'university' or 'secondary').

Local Integration score was obtained during the socio-demographic questions at the end

of the interview.

Table 4.3: Social factors and coding

Social factors	Coding
1) Gender	Male; Female
2) Age	Continuous (18-87)
3) Education	Primary; Secondary; University
4) Occupation	Manual; Service; Professional
5) Mobility (years lived away)	Continuous (0+)
6) Origin	Huelva; Lepe
7) Contact with mass media	Continuous (0-24)
8) Local Integration index	Continuous (0-7)
9) Speech style	Reading Passage; Word list

Four linguistic factors[53] were coded as relevant to coronal fricative variation:

Orthography, Syllable Stress, Functionality, and Assimilation (see Table 4.4). While

Orthography is undeniably related to the social factor of Education, I place it with the

linguistic factors following previous studies. Functionality refers to whether the fricative

token serves as the contrast between minimal pairs. For example, the <s> in *casa* 'house'

(vs. *caza* 'hunt') is functional while the <s> token in *cosa* 'thing' is non-functional.

Assimilation refers to whether or not there is an additional fricative in the same word.

The tokens in the word *cereza* 'cherry' would be labeled as having the same orthographic

environment, while the word *precioso* 'precious', would be labeled as having different

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[53] Originally preceding phonetic context and following vowel were considered. The only interactions found were with following back vowels. However, given the lack Spanish words of <z> + /u,o/, this has since been removed from the analysis.

orthographic environments in the same word. Finally, the token in *Mazagón* (a town near Huelva), would be labeled as having no additional coronal fricative.

Table 4.4: Linguistic factors and coding

Linguistic factors	Coding
1) Orthography	<s>; <z,ci,ce>
2) Syllable stress	Tonic; Atonic
3) Functionality	Functional; Non-functional
4) Assimilation	Same; Different; None

4.2.5 Dependent measures

      Only syllable initial tokens were considered as syllable final consonants are highly aspirated among most speakers of Huelva and Lepe. For the auditory analysis, the author labeled each segment as [s] or [θ].

      Studies have sought to determine which spectral, temporal, and amplitudinal parameters distinguish fricatives based on place of articulation. In terms of *spectral* parameters, scholars have looked at the four spectral moments (Forrest et al. 1988): center of gravity (M1), variance (M2), skewness (M3), and kurtosis (M4) (Flipsen et al. 1999; Fox & Nissen 2005; Haley et al. 2010; Iskarous et al. 2011; Jongman et al. 2000; Li et al. 2008; Maniwa et al. 2009; Munson 2001, 2004; Nittrouer 1995; Shadle & Mair 1996), the spectral peak frequency (Hz) (Fox & Nissen 2005; Iskarous et al. 2011; Jesus & Shadle 2002; Jongman et al. 2000; Koenig et al. 2013; Lasarte Cervantes 2010; Maniwa et al. 2009), spectral slope (Fox & Nissen 2005; Jesus & Shadle 2002; Maniwa et al. 2009; Shadle & Mair 1996), and F2 onset (Jongman et al. 2000; Li et al. 2008;

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Maniwa et al. 2009). For *amplitudinal* parameters, scholars have analyzed root-mean-squared amplitude (Behrens & Blumstein 1988b; Fox & Nissen 2005; Jongman et al. 2000; Maniwa et al. 2009), normalized amplitude (Fox & Nissen 2005; Jongman et al. 2000; Maniwa et al. 2009), raw mean and maximum amplitude (Behrens & Blumstein 1988a; Jongman et al. 2000; Lasarte Cervantes 2010), and dynamic amplitude (Jesus & Shadle 2002; Shadle & Mair 1996). For *temporal* parameters, scholars have analyzed fricative duration (Fox & Nissen 2005; Jongman et al. 2000; Lasarte Cervantes 2010; Maniwa et al. 2009). Finally, other scholars have also analyzed locus equations (Jongman et al. 2000; Sussman & Shore 1996).

Only a few of these studies specifically compared alveolar /s/ to interdental /θ/, among other fricative comparisons (Behrens & Blumstein 1988; Fox & Nissen 2005; Hendrick & Ohde 1993; Jongman et al. 2000; Lasarte Cervantes 2010, 2012; Maniwa et al. 2009; Nissen & Fox 2005; Regan 2015; Shadle & Mair 1996). These studies have found that the spectral peak location (Hz) differentiates dental and alveolar fricatives with a higher spectral peak for /θ/ than /s/ (Fox & Nissen 2005; Jongman et al. 2000; Martínez-Celdrán & Fernández-Planas 2007; Regan 2015). In terms of the spectral moments, these studies have found that /s/ has a higher *center of gravity* (Hz)[54] (M1) than /θ/ (Jongman et al. 2000; Nissen & Fox 2005); non-sibilants such as /θ/ have a higher *variance* (M2) than sibilants such as /s/ (Jongman et al. 2000; Nissen & Fox 2005; Regan

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[54] Center of gravity is defined as "the first spectral moment or centroid, the center of gravity of the shape defined by the curve and its boundaries. This is equivalent to the point on which a piece of cardboard with the shape of the curve would balance on a pin." (Ladefoged 2003: 156).

2015); /s/ has a greater negative *skewness* (M3) than /θ/ (Jongman et al. 2000);[55] and, sibilants such as /s/ have a larger *kurtosis* (M4) than non-sibilants such as /θ/ (Jongman et al. 2000)[56]. In terms of amplitudinal parameters, sibilants such as /s/ have higher *mean intensity* (dB) than non-sibilants such as /θ/ (Behrens & Blumstein 1988ab; Lasarte Cervantes 2010; Strevens 1960). However, other scholars (Fox & Nissen 2005; Hendrick & Ohde 1993; Jongman et al. 2000; Martínez-Celdrán & Fernández-Planas 2007; Lasarte Cervantes 2012; Nissen and Fox 2005; Regan 2015; Shadle & Mair 1996; Stevens 1985) found that normalized (or relative or dynamic) intensity (dB) (needed in order to account for inter- and intra-speaker differences) better separated sibilant and non-sibilant so that /s/ had significantly higher intensity than non-sibilant /θ/. The temporal parameter of duration (ms) has been shown to distinguish sibilants from non-sibilants such that sibilant /s/ has a longer duration than non-sibilant /θ/ (Behrens & Blumstein 1988a; Fox & Nissen 2005; Jongman et al. 2000). A summary of these previous findings can be seen in Table 4.5.

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[55] Fox and Nissen (2005) and Nissen and Fox (2005), however, found that /θ/ had greater negative skewness than /s/.

[56] Fox and Nissen (2005), however, found that /θ/ had greater kurtosis than /s/.

Table 4.5: Summary of previous studies comparing (inter-)dental to alveolar fricatives

Measure	Findings	Study
Spectral peak location (Hz)	/θ/ > /s/	Fox and Nissen (2005)
		Jongman et al. (2000)
		Martínez-Celdrán & Fernández-Planas (2007)
		Regan (2015)
Center of gravity (Hz) (M1)	/s/ > /θ/	Jongman et al. (2000)
		Nissen and Fox (2005)
Variance (Hz) (M2)	/θ/ > /s/	Jongman et al. (2000)
		Nissen and Fox (2005)
		Regan (2015)
Skewness (M3)	/s/ > /θ/	Jongman et al. (2000)
Kurtosis (M4)	/s/ > /θ/	Jongman et al. (2000)
Absolute Mean intensity (dB)	/s/ > /θ/	Behrens and Blumstein (1988a)
		Behrens and Blumstein (1988b)*
		Lasarte Cervantes (2010)
		Strevens (1960)
Normalized (or relative/ dynamic) intensity (dB)	/s/ > /θ/	Fox and Nissen (2005)
		Hendrick and Ohde (1993)*
		Jongman et al. (2000)
		Martínez-Celdrán & Fernández-Planas (2007)
		Lasarte Cervantes (2012)*
		Nissen and Fox (2005)
		Regan (2015)
		Shadle and Mair (1996)
		Stevens (1985)
Absolute (and normalized) Duration (ms)	/s/ > /θ/	Behrens and Blumstein (1988a)
		Jongman et al. (2000)
		Fox and Nissen (2005)

Note: * denotes a perception study

Given the sociolinguistic aims of this study, particularly the inclusion of the social factor of gender, it is worth pointing out several biological sex-related acoustic differences for three of the main dependent variables. It is important to acknowledge that there have been differences found based on biological sex between men and women, particularly for center of gravity and variance. For center of gravity (Hz) it has been

found that women have a higher center of gravity than men (Jongman et al. 2000; Fox & Nissen 2005). Specifically for the phoneme /s/, females have been shown to have a higher center of gravity than males (Flipsen et al. 1999; Fox & Nissen 2005; Haley et al. 2010; Jongman et al. 2000; Maniwa et al. 2009). Also, females also have a higher variance (Hz) than males (Jongman et al. 2000). In contrast to these spectral moments, previous studies have not found significant sex effects between fricatives for intensity (dB) (Fox & Nissen 2005; Jongman et al. 2000; Koenig et al. 2013).

For the acoustic analysis, the current study followed recent phonetic work on fricatives, pursuing the analysis of spectral, amplitude, and temporal parameters (Behrens & Blumstein 1988a, 1988b; Forrest et al. 1988; Fox & Nissen 2005; Jesus & Shadle 2002; Jongman et al. 2000; Lasarte Cervantes 2010; Maniwa et al. 2009; Martínez Celdrán & Fernández Planas 2007; Stuart-Smith 2007). Using the spectrogram and waveforms, a Praat script (Elvira-García 2014) took the following measures: duration of the segment (ms), maximum spectral peak (Hz), minimum intensity (dB), maximum intensity (dB), mean intensity (dB), and the first four spectral moments[57] (center of gravity, variance, skewness, kurtosis) (see Table 4.6 for a summary). Elvira-García's script uses a Filter pass Hand band (1,000, 11,000, 100). For the spectral moments, the Praat script creates an averaged power spectrum using the "to Ltas" function, in which

[57] I recognize that several scholars argue against the use of spectral moments in discrimination fricatives (Jesus & Shadle 2002; Koenig et al. 2013; Shalde & Mair 1996). However, I follow previous studies that have found spectral moments useful in distinguishing voiceless interdental /θ/ from alveolar /s/ (Fox & Nissen 2005; Jongman et al. 2000; Lasarte Cervantes 2010; Maniwa et al. 2009; Nissen & Fox 2005).

spectral slices are subject to cepstral smoothing for FFT (Fast Fourier Transform)

analysis, in line with previous studies and recommendations (Forrest et al. 1998; Fox &

Nissen 2005; Jongman et al. 2000; Ladefoged 2003: 154; Jesus & Shadle 2002).

Additionally, the spectral peak location, the frequency (Hz) of the highest amplitude peak

of the spectrum (Jongman et al. 2000: 1255), was measured from the FFT window.

Table 4.6: Dependent measures

Type of parameter	Measures
Spectral Parameters	Spectral peak frequency (Hz)
	Center of gravity (Hz) (M1)
	Variance (Hz) (M2)
	Skewness (M3)
	Kurtosis (M4)
Amplitudinal Parameters	Mean intensity (dB)
	Maximum intensity (dB)
Temporal Parameters	Duration (ms)

4.3 STATISTICAL ANALYSIS

For the acoustic analysis, a linear mixed effects regression model was fitted to the

data using the *lme4* (Bates et al. 2015) and *lmerTest* (Kuznetsova et al. 2014) packages of

R (R Development Core Team 2015) with Speaker and Word as random factors. The

phonetic variation from the acoustic analysis was analyzed using linear regression models

for all dependent measures: spectral peak location, center of gravity, variance, skewness,

kurtosis, mean intensity, and duration. For the auditory analysis, logistic mixed effects

regression was run for the auditorily coded dependent binomial measure of [θ] vs. [s]

with Speaker and Word as random factors. Case family studies (two to four family

members) were analyzed in one-way ANOVAs looking at speaker and orthography.

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Finally, paired t-tests with Bonferroni correction were used to analyzed individual

speaker differences based on orthography (<s> vs. <z,ci,ce>).

5. Results

In order to find the best model to account for the variation of the linguistic and extra-linguistic factors, I looked at a few individual speakers who demonstrated *distinción*. I compared their <s> and <z,ci,ce> realizations for each dependent measure. From this analysis, it was determined that the most robust measures for showing the differentiation between the alveolar and dental realizations were center of gravity (Hz), variance (Hz), and mean intensity (dB). The following sections look specifically at those three acoustic parameters. The rationale for using more than one acoustic parameter is due to the fact that previous work on near-mergers, have found that speakers are able to utilize one acoustic parameter (which may not be the primary acoustic parameter) to maintain a subtle phonetic difference in phonemes (Bullock & Nichols *in press*; Di Paolo & Faber 1990; Faber & Di Paolo 1995). In this sense, using only one acoustic parameter may obscure the fact that a speaker, who is merged in center of gravity, may actually use mean intensity to separate the phonemes (or vice versa). Originally all nine extra-linguistic factors and all four linguistic factors were incorporated into each model. However, the factors of *contact with mass media* and *local integration scale* were taken out of all analyses, as none of these were found to contribute to variation in any model. This is not to say that neither of these plays a role in the demerger of *ceceo*, but rather that these particular scales did not seem to accurately[58] measure mass media contact or

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[58] The mass media contact scale came from a questionnaire developed nearly 15 years ago (Villena et al. 2003), which perhaps does not best reflect the highly changing digital media access that speakers now

local integration for these communities. All the data from Lepe and Huelva (from all eighty participants) were incorporated into these models, for a total of 19,420 tokens.

5.1.1 Center of Gravity (Hz): Linear regression

In order to investigate the main effects and interactions of the linguistic and extra-linguistic factors on the center of gravity (Hz), a linear mixed effects model was run with orthography, style, assimilation, gender, age, education, occupation, mobility and origin as fixed factors and speaker and word as random factors. *Functionality* and *stress* were originally run in this model, but as neither was significant they were taken out of the model. Given the importance of the prescribed phoneme to grapheme, orthography was run additionally in interaction with all other fixed factors.

The linear mixed effects regression model produced significant main effects for orthography, style, assimilation, gender, age, education as well as significant interactions of orthography with assimilation, gender, age, education, occupation, and origin (see Table 5.1). While main effects are reported as they are part of the model, it should be noted that main effects only demonstrate a difference based on the reference group, which is orthographic <s>. For example, a significant main effect of Gender only indicates that men and women are different based on the <s> realizations. For this reason the interactions will be covered in more depth. While the lsmeans[59] will be provided for

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have, that were not available at the time. Additionally, the local integration scale, invented by the author, did not fully capture differences in speakers who were more rooted than those who were less rooted.

[59] A lsmeans post-hoc analysis of the main effects are comparisons of the fixed factors across orthographic environment (as opposed to the main effect which is only a comparison based on the reference group of <s>) Thus, it is possible that in the case where there is a significant main effect that the lsmeans post-hoc

all comparisons, given the importance of the one-to-one grapheme-to-phoneme, emphasis will be given to the main effect of orthography as well as the significant interaction of orthography with other fixed factors (linguistic and extra-linguistic) as the purpose is to understand the status of merger versus separation of phonemes.

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comparison is not significant, or vice-versa. For these reasons, the interactions are much more revealing of actual trends.

Table 5.1: Summary of the linear mixed effects regression model, with Center of gravity (Hz) as the dependent measure, speaker and word as random factors, for all the data combined; Intercept = <s>, reading passages (B), Different fricative, female, Primary education, Manual occupation, origin of Huelva; total n = 19,420.

Predictor	Estimate	Std. Error	t-value	p-value
(Intercept)	5994.797	478.463	12.530	**<.0001**
Orthography	-3365.401	112.080	-30.030	**<.0001**
Style	505.040	49.897	10.120	**<.0001**
Assimilation				
None	334.933	73.752	4.540	**<.0001**
Same	450.285	111.596	4.030	**<.0001**
Gender	-1987.736	190.098	-10.460	**<.0001**
Age	-20.577	6.795	-3.030	**<.01**
Education				
Secondary	680.133	302.617	2.250	**<.05**
University	454.088	450.775	1.010	0.290
Occupation				
Professional	370.218	353.899	1.050	0.274
Service	130.140	154.504	0.840	0.395
Mobility	-27.759	31.579	-0.880	0.355
Origin	209.283	197.854	1.060	0.266
Orthography*Style	-64.041	64.955	-0.990	0.320
Orthography*Assimilation				
<z>:None	-416.677	74.155	-5.620	**<.0001**
<z>:Same	-783.749	163.636	-4.790	**<.0001**
Orthography*Gender	2197.745	39.412	55.760	**<.0001**
Orthography*Age	33.171	1.414	23.470	**<.0001**
Orthography*Education				
<z>:Secondary	-764.753	67.237	-11.370	**<.0001**
<z>:University	-500.800	97.316	-5.150	**<.0001**
Orthography*Occupation				
<z>:Professional	-201.266	84.239	-2.390	**<.05**
<z>:Service	-450.832	60.860	-7.410	**<.0001**
Orthography*Mobility	-10.157	6.393	-1.590	0.112
Orthography*Origin	103.674	40.688	2.550	**<.05**

Note: The p-values were calculated using 'lmerTest' package. Statistically significant values are in bold.

Orthography. There was a significant main effect of Orthography for center of

gravity (Hz). A lsmeans[60] post-hoc comparison found that overall orthographic <s> (*M* =

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[60] Images were created in Rstudio using the raw means and standard deviations for each factor. Lsmeans, however, calculates means and standard error taking into account all of the other factors (fixed and random) to produce a more conservative statistical comparison. For this reason, certain lsmeans may be slightly

5,205.36, *SE* = 109.56) has a significantly higher center of gravity (Hz) than orthographic

<z,ci,e> (*M* = 3,323.97, *SE* = 110.60); see Figure 5.1.

Main effect of Orthography
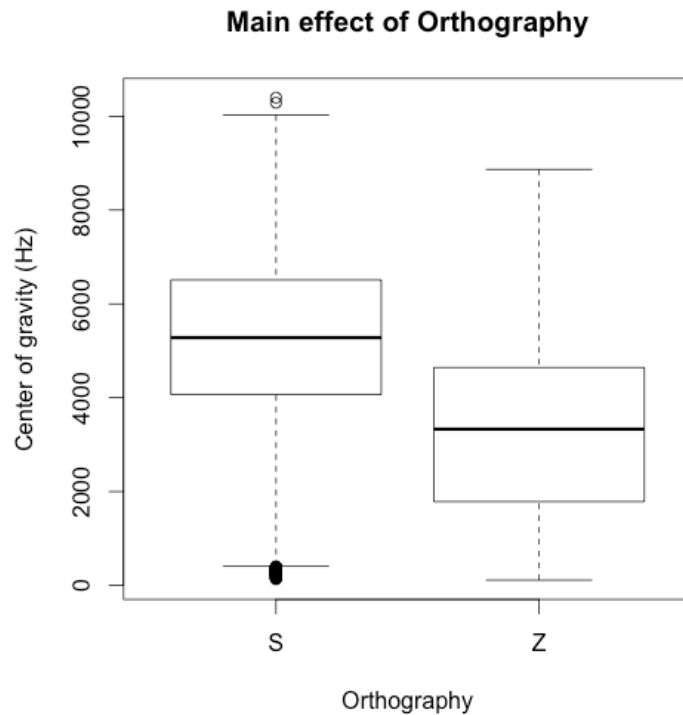
Figure 5.1: Boxplot of the main effect of Orthography (S = <s>, Z = <z,ci,ce>) for center
of gravity (Hz)

Style. There was a significant main effect of Style for center of gravity (Hz). A

lsmeans post-hoc comparison found that the Passage Reading (Style B) (*M* = 4,028.15,

SE = 107.01) has a significantly lower center of gravity (Hz) than the Word List (Style C)

(*M* = 4501.17, *SE* = 108.78) (*p* < .0001).

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different than the "true" factors means displayed in the boxplots and line graphs. The lsmeans post-hoc
comparison is a type of *Tukey post hoc* analysis.

Orthography by Style. There was no significant interaction between Orthography and Style. A lsmeans post-hoc comparison found that for the Passage Reading (Style B), <s> (M = 4,952.84, SE = 110.81) had significantly higher center of gravity than <z,ci,ce> (M = 3,103.47, SE = 113.39) (p < .0001); for the Word List (Style C), <s> (M = 5,457.88, SE = 113.90) had significantly higher center of gravity than <z,ci,ce> (M = 3,544.47, SE = 114.91) (p < .0001). For orthographic <s>, the Passage Reading (Style B) had significantly lower center of gravity than the Word List (Style C) (p < .0001). For orthographic <z,ci,ce>, the Passage Reading (Style B) had significantly lower center of gravity than the Word List (Style C) (p < .0001).

Assimilation. There was a significant main effect of Assimilation for center of gravity (Hz). However, a lsmeans post-hoc comparison found no significant differences in center of gravity (Hz) between an additional Different orthographic fricative environment (M = 4,203.00, SE = 116.05) and No additional orthographic fricative environment (M = 4,329.59, SE = 103.62) (p = 0.12), nor between Different orthographic fricative environment and additional Same orthographic environment (M = 4,261.41, SE = 126.83) (p = 0.81). Similarly, there was no significant difference in center of gravity between words with No additional orthographic fricative and words with an additional Same orthographic fricative (p = 0.69).

Orthography by Assimilation Interaction. There was a significant interaction between Orthography and Assimilation for center of gravity (Hz). A lsmeans post-hoc comparison found that for words with two Different orthographic coronal fricatives, <s>

(M = 4943.62, SE = 118.38) had a significantly higher century of gravity than <z,ci,ce> (M = 3,462.37, SE = 118.14) (p < .0001); for words with No additional fricative, <s> (M = 5,278.55, SE = 106.81) had significantly higher century of gravity than <z,ci,ce> (M = 3,380.63, SE = 109.32) (p < .0001); and finally, for words with two of the Same orthographic environments, <s> (M = 5,393.90, SE = 142.02) had significantly higher century of gravity than <z,ci,ce> (M = 3,128.91, SE = 157.06) (p < .0001). For orthographic <s>, words with two Different orthographic fricative environments had significantly lower center of gravity (Hz) than words with No other coronal fricatives (p < .0001) and words with the Same fricative environment (p < .001). There was no significant difference between words with No additional coronal fricative and those with an additional Same coronal fricative (p = 0.51). For orthographic <z,ci,ce>, words with an additional Different coronal fricative had significantly higher center of gravity (Hz) than words with an additional Same fricative (p < .05). There was no significant difference between words with No additional coronal fricative and those with an additional Different coronal fricative (p = 0.52) nor between words with No additional coronal fricative and those with an additional Same coronal fricative (p = 0.13). The interaction indicates that words with two Different coronal fricative orthographic environments have a smaller difference in phonemes as compared to words with No other fricatives or words with the Same fricative environment; see Figure 5.2.
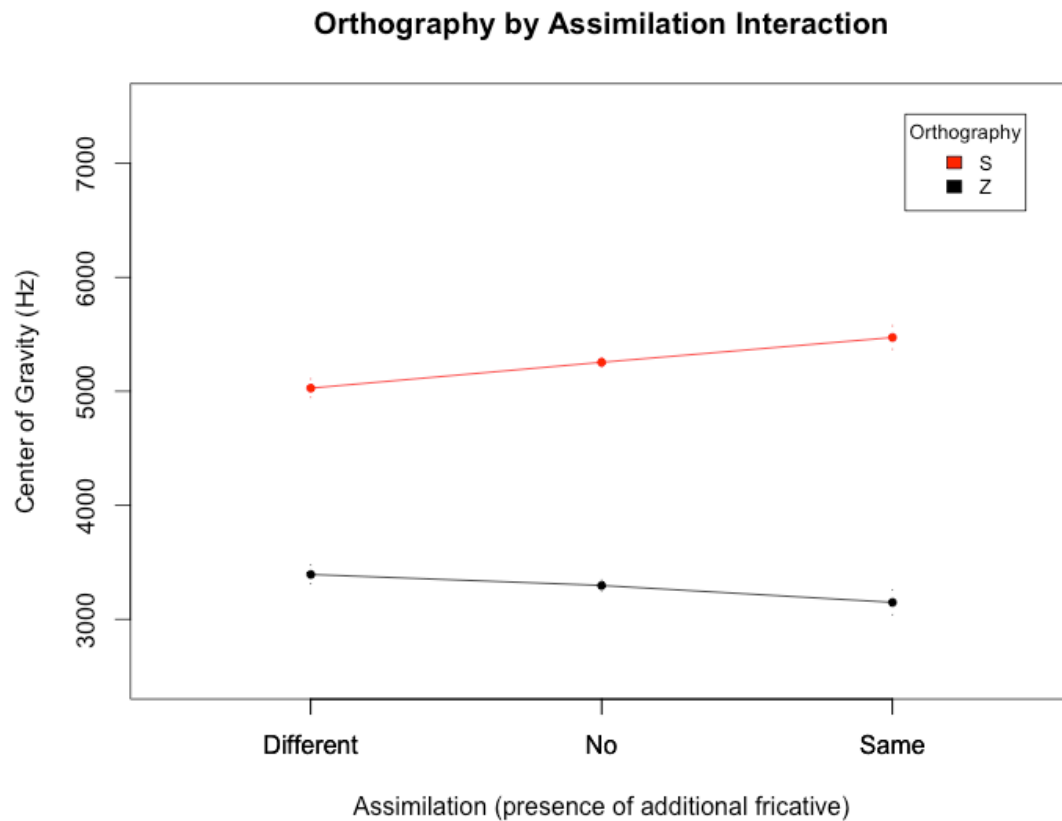
Figure 5.2: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Assimilation
(Different additional orthographic fricative; No additional orthographic
fricative; Same additional orthographic fricative) interaction for center of
gravity (Hz)

Gender. There was a significant main effect of Gender for center of gravity (Hz).

A lsmeans post-hoc comparison found that the women (M = 4,709.10, SE = 145.55) have

a significantly higher center of gravity (Hz) than the men (M = 3,820.23, SE = 138.28) (p

< .0001).

Orthography by Gender Interaction. There was a significant interaction between

Orthography and Gender for center of gravity (Hz). A lsmeans post-hoc comparison

demonstrated that for men, the center of gravity for <s> (M = 4,211.49, SE = 141.42) was

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significantly higher than <z,ci,ce> (M = 3,428.97, SD = 142.35) (p < .0001) and that for

women, the center of gravity for <s> (M = 6,199.23, SD = 148.58) was significantly

higher than <z,ci,ce> (M = 3,218.97, SD = 149.51) (p < .0001). For orthographic <s>,

women had a significantly higher center of gravity than men <s> (p < .0001), while there

was no significant difference for orthographic <z> between women and men (p = 0.27).

The significant interaction indicates there is a significantly larger separation in phonemes

for women than for men in which women have a much higher center of gravity for

orthographic <s>; see Figure 5.3. As mentioned in §4.2.5, women have a higher center of

gravity than men. Thus, while the demerger among women is more than men, it is

slightly exaggerated here due to a biological sex difference in vocal tract differences.

Orthography by Gender Interaction
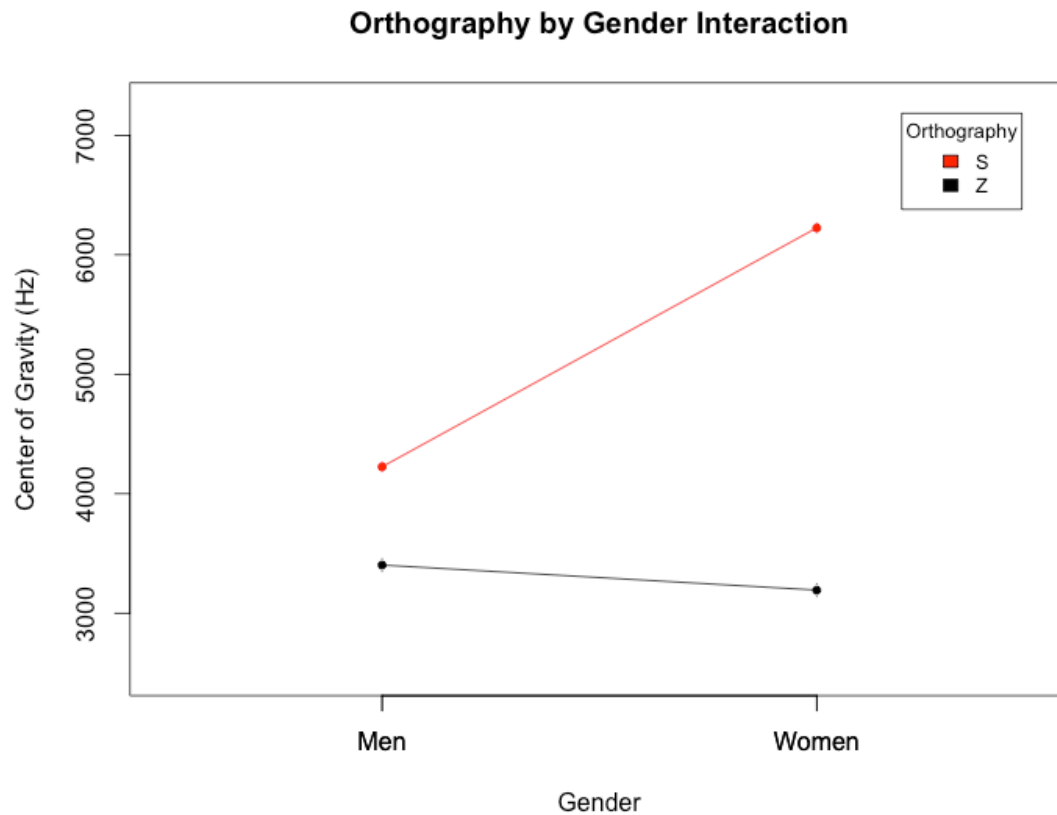
Figure 5.3: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Gender (Men; Women) interaction for center of gravity (Hz)

Age. There was a main effect for Age, but this is only the main effect of the intercept <s>. Thus, we will look at the interaction to see the age effects for <s> and <z,ci,ce>.

Orthography by Age Interaction. The interaction of Orthography and Age in the linear regression demonstrates that for a one-year increase in age, the center of gravity (Hz) for <s> decreases by -20.577Hz. In contrast, for a one-year increase in age, the center of gravity (Hz) for <z,ci,ce> increases by 12.5941Hz. This means that the difference in center of gravity between orthographic environments is smallest among the

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older speakers and the phonetic difference between orthographic environments increases as age decreases; see Figure 5.4[61].

Figure 5.4: Scatterplot of Orthography (red = <s>, blue = <z,ci,ce>) by Age (18-87) interaction for center of gravity (Hz)

Education. There was a significant main effect of Education for center of gravity (Hz). However, a lsmeans post-hoc comparison did not find any significant differences

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[61] This scatterplot (as well as subsequent similar color scatterplots) was created using the package *ggplot2* (Wickham 2013); all other images were created in RStudio.

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between those with Primary Education (M = 4,097.52, SE = 262.89) and Secondary Education (M = 4,395.27, SE = 166.39) (p = 0.58), or Primary Education and University Education (M = 4,301.20, SE = 260.27) (p = 0.89). Additionally, there was not a significant difference in center of gravity (Hz) between those with Secondary and University Education (p = 0.95).

Orthography by Education Interaction. There was a significant interaction between Orthography and Education for center of gravity (Hz). A lsmeans post-hoc comparison demonstrated than for those with Primary education, the center of gravity for <s> (M = 4,827.29, SD = 265.47) was significantly higher than <z,ci,ce> (M = 3,367.75, SD = 266.47) (p < .0001); for those with Secondary education, the center of gravity for <s> (M = 5,507.42, SD = 169.20) was significantly higher than <z,ci,ce> (M = 3,283.13, SD = 170.14) (p < .0001); and finally, for those with University education, the center of gravity for <s> (M = 5,281.37, SD = 262.76) was significantly higher than <z,ci,ce> (M = 3,321.04, SD = 263.72) (p < .0001). For orthographic <s>, there were no significant comparisons between educational levels. For orthographic <z>, there were no significant differences between educational levels. The significant interaction indicates that those with primary education have a significantly smaller difference in center of gravity between orthographic <s> and <z,ci,ce> as compared to those with secondary and university education; see Figure 5.5

Orthography by Education Interaction
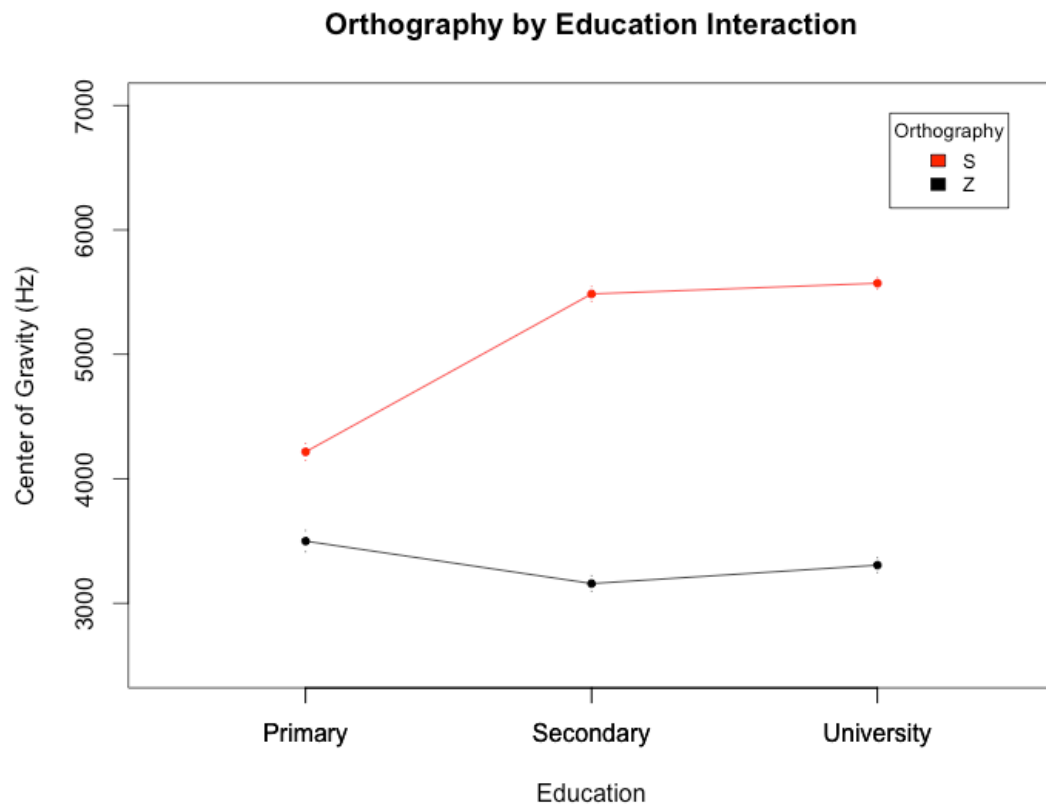
Figure 5.5: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Education
(Primary, Secondary, University) interaction for center of gravity (Hz)

Occupation. There was no significant main effect of Occupation. A lsmeans post-
hoc comparison did not find any significant differences in center of gravity between those
with Manual occupations (M = 4,206.56, SE = 192.28), Service Occupations (M =
4,111.29, SE = 175.69), or Professional occupations (M = 4,476.15, SE = 225.51).

Orthography by Occupation Interaction. There was a significant interaction
between Orthography and Occupation for center of gravity (Hz). A lsmeans post-hoc
comparison found that for those with Manual occupations, <s> (M = 5,038.57, SE =
195.44) had a significantly higher century of gravity than <z,ci,ce> (M = 3,374.55, SE =

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196.71) (*p* < .0001); for those with Service occupations, <s> (*M* = 5,168.71, *SE* = 178.64) had significantly higher century of gravity than <z,ci,ce> (*M* = 3,053.86, *SE* = 179.61) (*p* < .0001); and finally, for those with Professional occupations, <s> (*M* = 5,408.79, *SE* = 228.06) had significantly higher century of gravity than <z,ci,ce> (*M* = 3,543.50, *SE* = 228.96). There were no significant difference for orthographic <s> or <z,ci,ce> between groups. The significant interaction between orthography and occupation indicates that those with manual occupations have a significantly smaller difference in center of gravity between orthographic <s> and <z,ci,ce> as compared to those with professional or service occupations; see Figure 5.6.
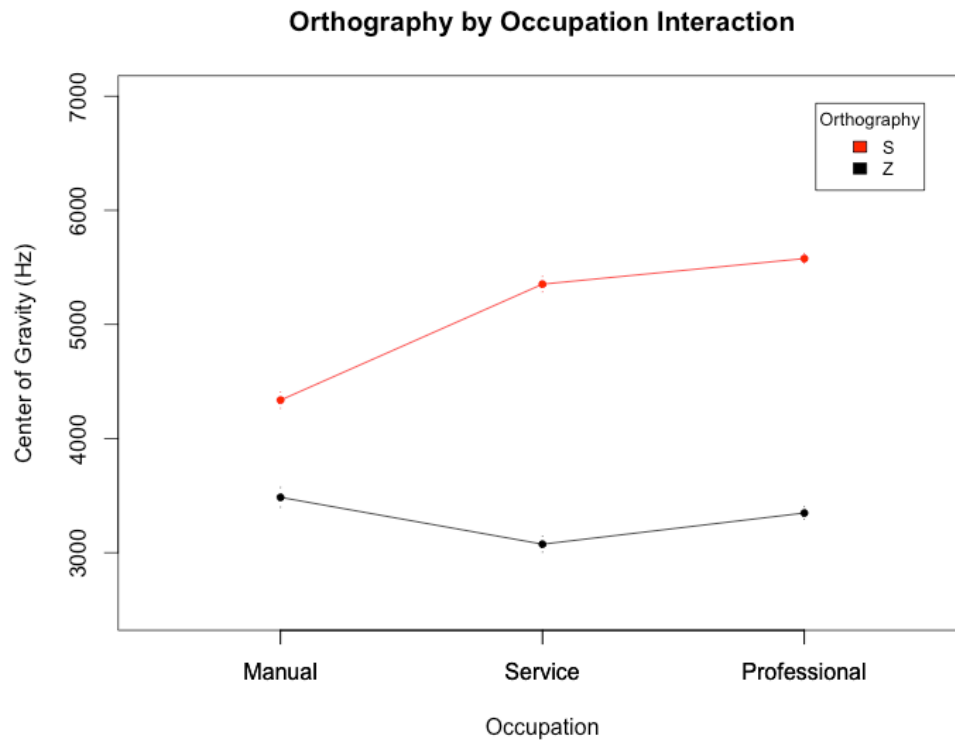
Figure 5.6: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Occupation (Manual, Service, Professional) interaction for center of gravity (Hz)

Mobility. There was no main effect for Mobility.

Orthography by Mobility. There was no significant interaction between Orthography and Mobility for center of gravity.

Origin. There was no significant main effect of Origin for center of gravity. A lsmeans post-hoc comparison did not find any significant differences between Huelva (M = 4,134.10, SE = 148.75) and Lepe (M = 4,395.22, SE = 140.25) (p = 0.19).

Orthography by Origin. There was a significant interaction between Orthography and Origin for center of gravity (Hz). A lsmeans post-hoc comparison demonstrated that for those from Huelva, the center of gravity for <s> (M = 5,100.72, SE = 151.74) was significantly higher than <z,ci,ce> (M = 3,167.49, SD = 152.64) (p < .0001); and for those from Lepe, the center of gravity for <s> (M = 5,310.00, SD = 143.37) was significantly higher than <z,ci,ce> (M = 3,480.45, SD = 144.29) (p < .0001). There were no significant differences between Huelva and Lepe for orthographic <s> (p = 0.29) or for orthographic <z> (p = 0.11). The interaction between orthography and origin indicate that those from Huelva have a larger difference in center of gravity (Hz) between orthographic <s> and orthographic <z> as compared to those from Lepe. That is, the community of Huelva has a greater phonetic separation of phonemes than the community of Lepe; see Figure 5.7.

Orthography by Origin Interaction
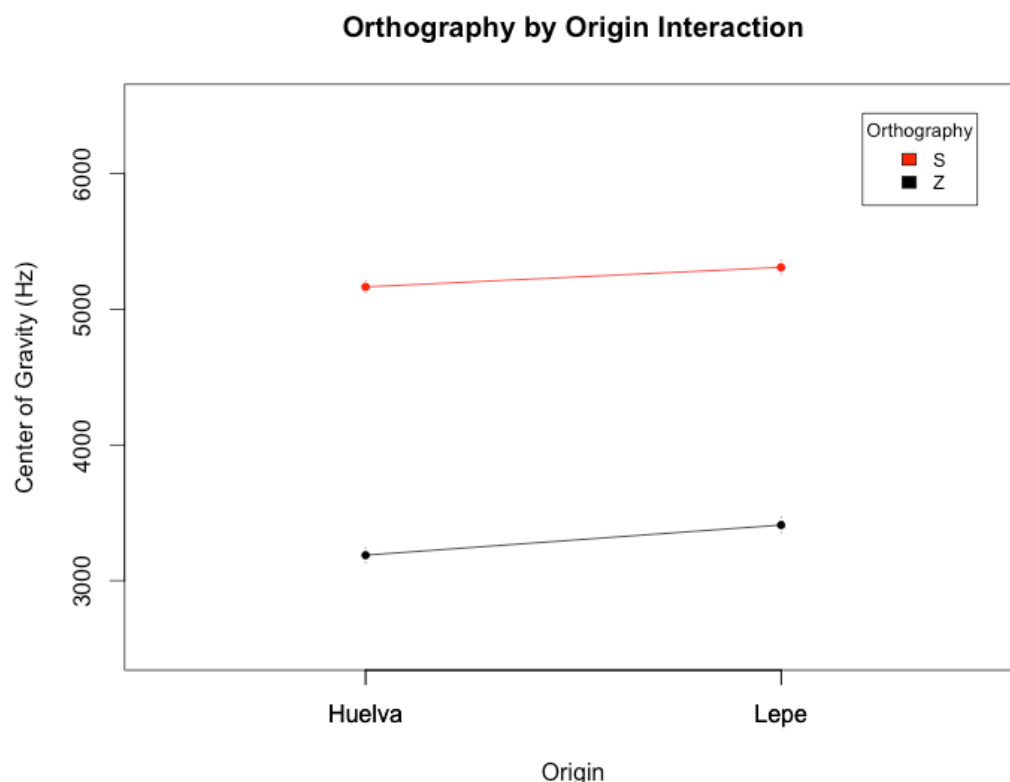
Figure 5.7: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Origin (Huelva, Lepe) interaction for center of gravity (Hz)

5.1.1.1 Summary of Center of Gravity (Hz) linear regression

The main effect of orthography suggests that speakers, as a community, are separating phonemes based on orthography with a significantly higher center of gravity (Hz) for <s> than <z,ci,ce> in line with expected acoustic parameters for alveolar /s/ and interdental /θ/. The analysis of the fixed linguistic factors in interaction with orthography demonstrates that the environment with the largest difference in center of gravity between orthographic <s> and <z,ci,ce> is in words with an additional Same fricative environment (i.e. *sesenta*, *cerveza*). Conversely, the environment with the smallest difference in center of gravity between orthographic <s> and <z,ci,ce> is in words with an additional, but

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Different fricative environment (i.e. *socio*, *gracioso*). The orthography by assimilation interaction could indicate that when there are two separate orthographic environments in one word such as *gracioso* 'funny' that speakers are either assimilating one sound to the other or that the first token triggers a type of progressive assimilation in which both tokens are realized as [θ] or [s]. These findings indicate that the difference in center of gravity between orthographic <s> and <z,ci,ce> is not random, but rather partially subject to language-internal constraints. The orthography main effect supports previous research (García Amaya 2008; Regan 2017). The orthography by assimilation interaction supports previous findings (Moya & García-Wiedemann 1995; Regan 2017; Villena 2007).

In terms of the extra-linguistic factors in interaction with orthography, the results indicate that the speaker most likely to have the largest difference in center of gravity between orthographic <s> and <z,ci,ce> is female, younger, has a Secondary or University education, works in a Professional or Service-oriented occupation, and is from Huelva. Conversely, the environment with the smallest difference in center of gravity between orthographic <s> and <z,ci,ce> is male, older, has a primary education, works in a manual occupation, and is from Lepe. These findings with regards to gender, age, and education support previous segmental research in the influence of social factors in the realization of *distinción* versus *ceceo* (Ávila 1994; García Amaya 2008; Lasarte Cervantes 2010, 2012; Melguizo 2007, 2009a, 2009b; Moya & García-Wiedemann 1995; Regan 2017; Villena 1996, 2001, 2005, 2007; Villena & Requena 1996; Villena & Vida 2012; Villena et al. 1995). The interaction of orthography and occupation has yet to be

studied in great detail, but it appears that different sectors of employment may exhibit various degrees of pressure to adhere to the linguistic market. The interaction of orthography and origin appears to support Melguizo's (2007, 2009ab) and Lasarte Cervante's (2010) findings in which rural speakers are more likely to maintain the merger as compared to urban speakers.

5.1.2 Variance (Hz): Linear regression

In order to investigate the main effects and interactions of the linguistic and extra-linguistic factors on variance (Hz), a linear mixed effects model was run with orthography, style, stress, functionality, assimilation, gender, age, education, occupation, mobility and origin as fixed factors and speaker and word as random factors. Given the importance of the prescribed phoneme to grapheme, orthography was run additionally in interaction with all other fixed factors.

The linear mixed effects regression model produced significant main effects for orthography, style, gender, origin, as well as the interaction of orthography with style, stress, gender, age, education, occupation, mobility, and origin (see Table 5.2). While main effects are reported as they are part of the model, it should be noted that main effects only demonstrate a difference based on the reference group, which is orthographic <s>. For example, a significant main effect of Gender only indicates that men and women are different based on the <s> realizations. While the lsmeans will be provided for all comparisons, given the importance of the one-to-one grapheme-to-phoneme, emphasis will be given to the main effect of orthography as well as the significant interaction of

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orthography with other fixed factors (linguistic and extra-linguistic) as the purpose is to

understand the status of merger versus separation of phonemes.

Table 5.2: Summary of the linear mixed effects regression model, with Variance (Hz) (i.e. the 2nd spectral moment [M2]) as the dependent measure, speaker and word as random factors, for all the data combined; Intercept = <s>, reading passage (B), Different fricative, atonic, functional, female, Primary education, Manual occupation, origin of Huelva; total n = 19,420.

Predictor		Estimate	Std. Error	t-value	p-value
(Intercept)		2799.164	206.382	13.563	**<.0001**
Orthography		434.821	78.757	5.521	**<.0001**
Style		-162.300	22.67	-7.160	**<.0001**
Assimilation					
	None	-8.048	30.182	-0.267	0.800
	Same	-63.932	45.159	-1.416	0.154
Stress		-38.209	22.346	-1.710	0.085
Functionality		-4.527	30.044	-0.151	0.876
Gender		-203.747	81.180	-2.510	**<.01**
Age		-3.870	2.900	-1.334	0.159
Education					
	Secondary	-48.192	129.908	-0.371	0.672
	University	-145.585	193.090	-0.754	0.413
Occupation					
	Professional	-261.464	152.877	-1.710	0.081
	Service	-48.008	71.835	-0.668	0.580
Mobility		8.808	13.474	0.654	0.491
Origin		189.617	84.430	2.246	**<.05**
Orthography*Style		290.185	31.388	9.245	**<.0001**
Orthography*Assimilation					
	<z>:None	24.972	35.453	0.704	0.483
	<z>:Same	-6.163	61.587	-0.100	0.907
Orthography*Stress		136.473	34.171	3.994	**<.0001**
Orthography*Functionality		-175.198	50.090	-3.498	**<.0001**
Orthography*Gender		147.369	18.946	7.779	**<.0001**
Orthography*Age		-2.056	0.680	-3.026	**<.01**
Orthography*Education					
	Secondary	245.206	32.321	7.587	**<.0001**
	University	313.774	46.780	6.707	**<.0001**
Orthography*Occupation					
	Professional	282.479	40.494	6.976	**<.0001**
	Service	-179.533	29.256	-6.137	**<.0001**
Orthography*Mobility		-26.735	3.073	-8.699	**<.0001**
Orthography*Origin		-48.402	19.559	-2.475	**<.05**

Note: The p-values were calculated using 'lmerTest' package. Statistically significant values are in bold.

Orthography. There was a significant main effect of Orthography for variance (Hz). A lsmeans post-hoc comparison found that overall orthographic <s> (*M* = 2,353.65, *SE* = 46.61) had significantly lower variance (Hz) than orthographic <z,ci,e> (*M* = 3,032.87, *SE* = 47.98) (*p* < .0001); see Figure 5.8.

Main effect of Orthography

Figure 5.8: Boxplot of main effect of Orthography (S = <s>, Z = <z,ci,ce>) for variance (Hz)

Style. There was a significant main effect of Style for variance (Hz). However, a lsmeans post-hoc comparison did not find any significant difference in variance (Hz) between the Passage Reading (Style B) (*M* = 2,701.86, *SE* = 46.74) and the Word List (Style C) (*M* = 2,684.66, *SE* = 45.34) (*p* = 0.382).

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Orthography by Style Interaction. There was a significant interaction between Orthography and Style for variance (Hz). A lsmeans post-hoc comparison demonstrated that for the Passage reading (Style B), the variance for <s> ($M = 2437.09$, $SE = 46.81$) was significantly less than <z,ci,ce> ($M = 2952.79$, $SD = 50.51$) ($p < .0001$); and for the Word list (Style C), the variance for <s> ($M =$, 2297.81 $SD = 48.68$) was significantly less than <z,ci,ce> ($M = 3142.44$, $SD = 50.53$) ($p < .0001$). For orthographic <s>, the Passage Reading had significantly higher variance than the Word List ($p < .0001$). For orthographic <z,ci,ce,>, the Passage Reading had significantly lower variance than the Word List ($p < .0001$). The interaction indicates that there is a larger separation of variance between orthographic environments for the Word list than the Passage reading; see Figure 5.9.
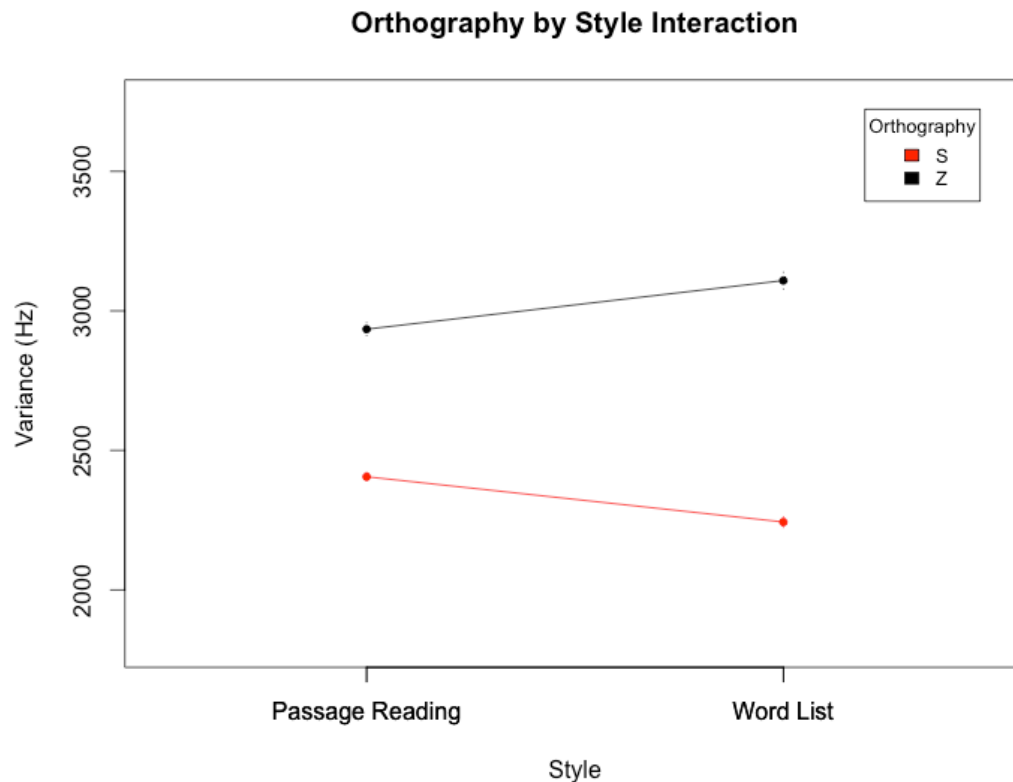
Figure 5.9: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Style (Passage Reading [Style B]; Word List [Style C]) interaction for variance (Hz)

Stress. There was no significant main effect of Stress for variance (Hz). A lsmeans post-hoc comparison found no significant difference between atonic (M = 2,678.25, SE = 45.15) and tonic tokens (M = 2,708.27, SE = 46.09) (p = 0.05).

Orthography by Stress Interaction. There was a significant interaction between Orthography and Stress for variance (Hz). A lsmeans post-hoc comparison found that for atonic tokens, <s> (M = 2380.47, SE = 47.33) had a significantly lower variance than <z,ci,ce> (M = 3014.52, SE = 50.68) (p < .0001); and for tonic tokens, <s> (M = 2354.43, SE = 48.63) had significantly lower variance than <z,ci,ce> (M = 3080.71, SE = 51.04) (p

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< .0001). For orthographic <s>, there was no significant difference between atonic and tonic tokens ($p = 0.233$). For orthographic <z,ci,ce>, atonic tokens had significantly lower variance than tonic tokens ($p < .05$). The interaction indicates that there is a greater difference in variance between orthographic environments for tonic tokens than atonic tokens; see Figure 5.10.
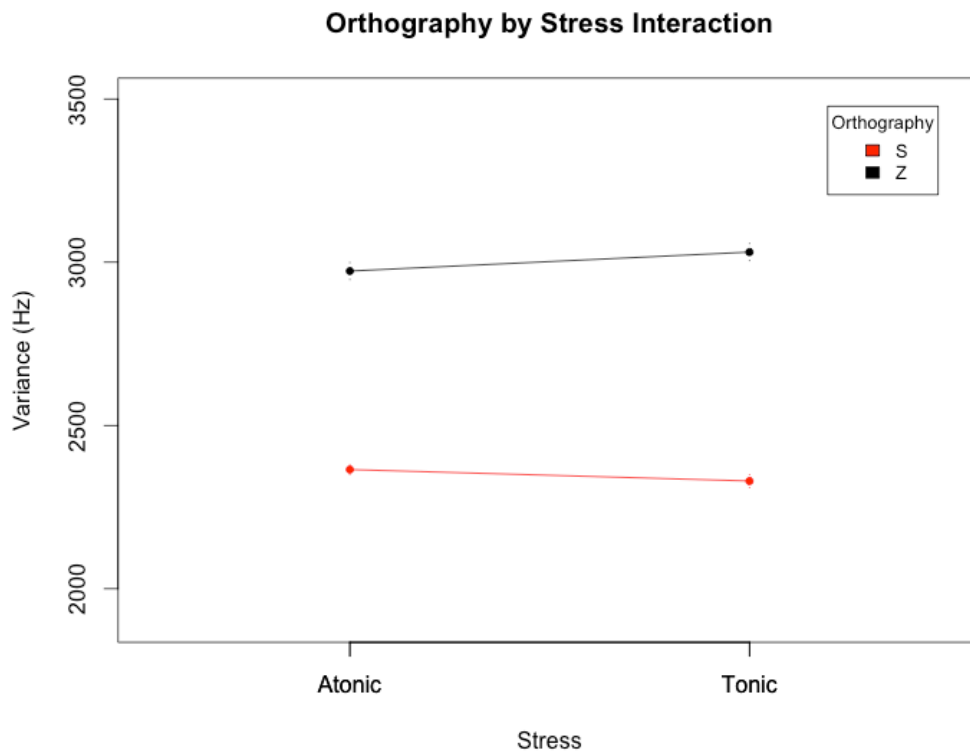
Figure 5.10: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Stress (Atonic, Tonic) interaction for variance (Hz)

Assimilation. There was no significant main effect for Assimilation for variance (Hz). Thus, there were no differences between words with an additional Different orthographic fricative environment ($M = 2,714.12$, $SE = 49.01$), words with No additional

orthographic fricative environment (*M* = 2,718.56, *SE* = 43.67), or words with an additional Same orthographic environment (*M* = 2,647.11, *SE* = 52.17).

Orthography by Assimilation Interaction. There was no significant interaction between Orthography and Assimilation for variance (Hz). A lsmeans post-hoc comparison found that for words with two Different orthographic fricatives, <s> (*M* = 2,377.65, *SE* = 51.34) had a significantly lower variance than <z,ci,ce> (*M* = 3,050.59, *SE* = 52.44) (*p* < .0001); for words with No additional fricatives, <s> (*M* = 2,369.60, *SE* = 44.87) had significantly lower variance than <z,ci,ce> (*M* = 3,067.51, *SE* = 45.62) (*p* < .001); and finally, for words with two of the Same orthographic environments, <s> (*M* = 2,313.72, *SE* =58.51) had significantly lower variance than <z,ci,ce> (*M* = 2,980.50, *SE* = 62.71) (*p* < .0001). For orthographic <s>, there were no significant differences between groups. For orthographic <z>, there were no significant differences between groups.

Functionality. There was no significant main effect of Functionality for variance (Hz). A lsmeans post-hoc comparison did not find any significant differences between Functional tokens (*M* = 2,739.32, *SE* = 49.21) and non-functional tokens (*M* = 2,647.20, *SE* = 44.38).

Orthography by Functionality. There was a significant interaction between Orthography and Functionality for variance (Hz). A lsmeans post-hoc comparison demonstrated that for Functional tokens, the variance for <s> (*M* = 2,355.92, *SE* = 51.67) was significantly lower than <z,ci,ce> (*M* = 3,122.73, *SE* = 58.08) (*p* < .0001); and that for non-functional tokens, the variance for <s> (*M* = 2,351.39, *SE* = 46.11) was

significantly lower than <z,ci,ce> (M = 2,943.00, SE = 45.77) (p < .0001). For

orthographic <s>, functional tokens were not significantly different than non-functional

tokens for variance (p = 0.88). For orthographic <z,ci,ce>, functional tokens were

significantly higher in variance than non-functional tokens (p < .0001). The interaction

indicates that there is a greater difference in variance between the two orthographic

environments for functional tokens than for non-functional tokens; see Figure 5.11.
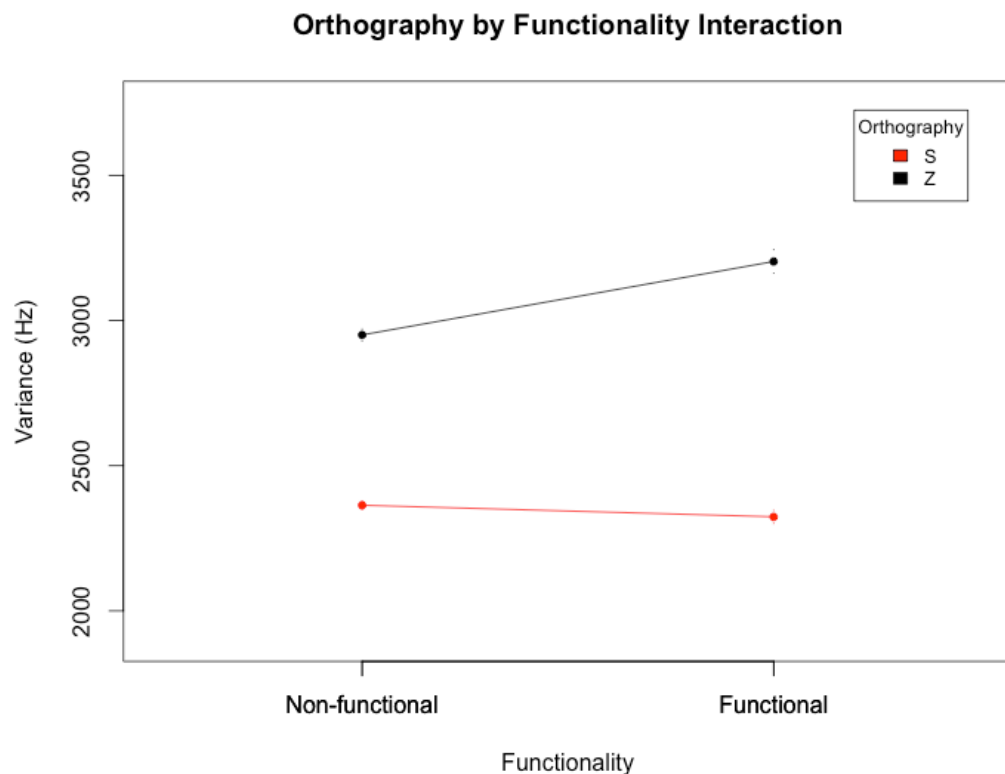
Figure 5.11: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Functionality
(Non-functional, Functional) interaction for variance (Hz)

Gender. There was significant main effect of Gender for variance (Hz). However,

a lsmeans post-hoc comparison did not find an overall difference in variance (Hz)

between women ($M = 2{,}758.29$, $SE = 61.99$) and men ($M = 2{,}628.23$, $SE = 58.86$) ($p = 0.107$).

Orthography by Gender Interaction. There was a significant interaction between Orthography and Gender for variance (Hz). A lsmeans post-hoc comparison demonstrated that for men, the variance for <s> ($M = 2{,}251.78$, $SE = 60.24$) was significantly lower than <z,ci,ce> ($M = 3{,}004.68$, $SE = 61.37$) ($p < .0001$); and that for women, the variance for <s> ($M = 2{,}455.53$, $SE = 63.33$) was significantly lower than <z,ci,ce> ($M = 3{,}061.06$, $SE = 64.43$) ($p < .0001$). For orthographic <s>, women had significantly higher variance than men ($p < .05$). For orthographic <z,ci,ce>, there was no significant difference between men and women for ($p = 0.49$). The interaction indicates that men have a greater difference in variance between orthographic environments than women, particularly that men have less variance for <s>; see Figure 5.12. As mentioned in §4.2.5, women have higher variance (Hz) than men. In this sense, the higher variance for orthographic <s> could very well be attributed to a biological sex effect of vocal tract differences as opposed to indicating that men demonstrate a larger separation of phonemes for variance (Hz).

Orthography by Gender Interaction
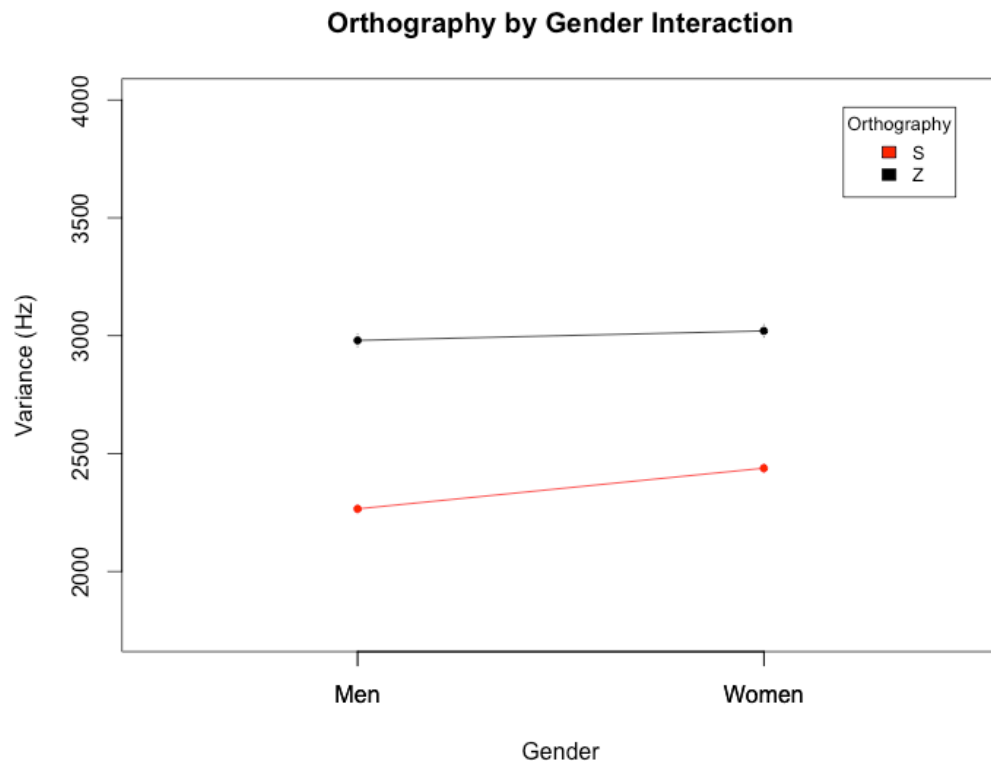
Figure 5.12: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Gender (Men; Women) interaction for variance (Hz)

Age. There was a main effect for Age, but this is only the main effect of the intercept <s>. Thus, we'll look at the interaction to see the age effects for <s> and <z,ci,ce>.

Orthography by Age Interaction. The interaction of Orthography and Age in the linear regression demonstrates that for a one-year increase in age, the variance (Hz) for <s> decreases by 3.87Hz. In contract, for a one-year increase in age, the variance (Hz) for <z,ci,ce> decreases by 5.926Hz. This indicates that the youngest speakers have the lowest <s> variance and highest <z,ci,ce> variance of all the speakers and as the years

increase the difference in variance between the two orthographic environments decreases;
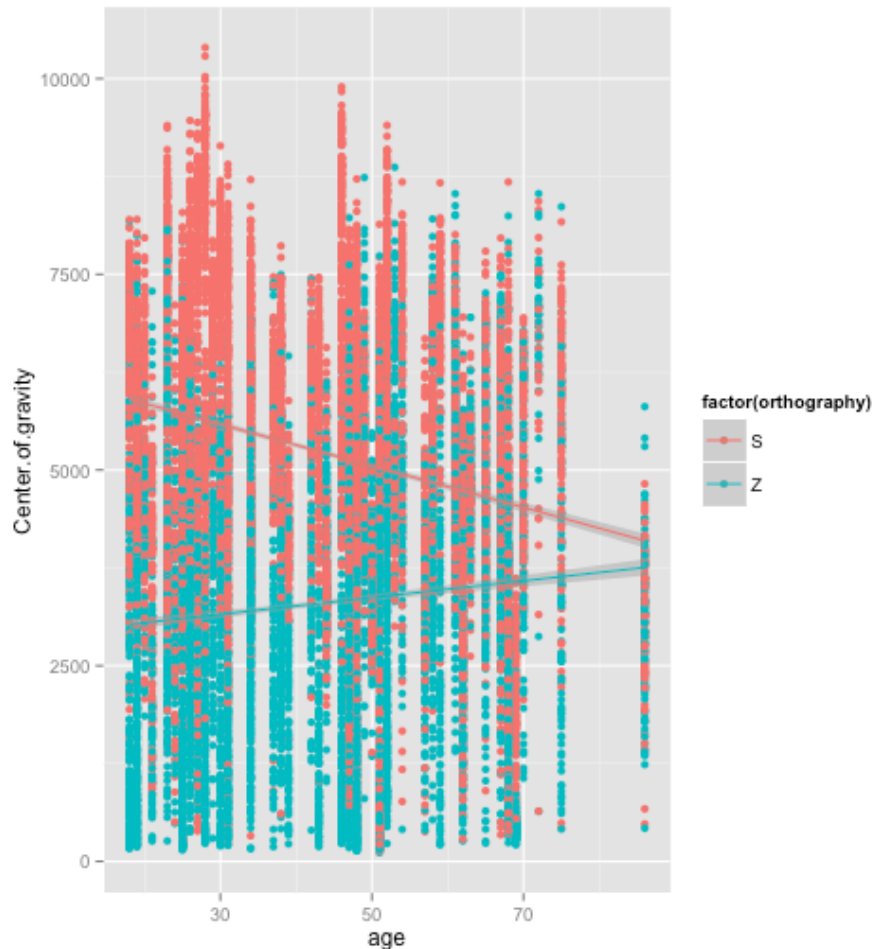
see Figure 5.13.
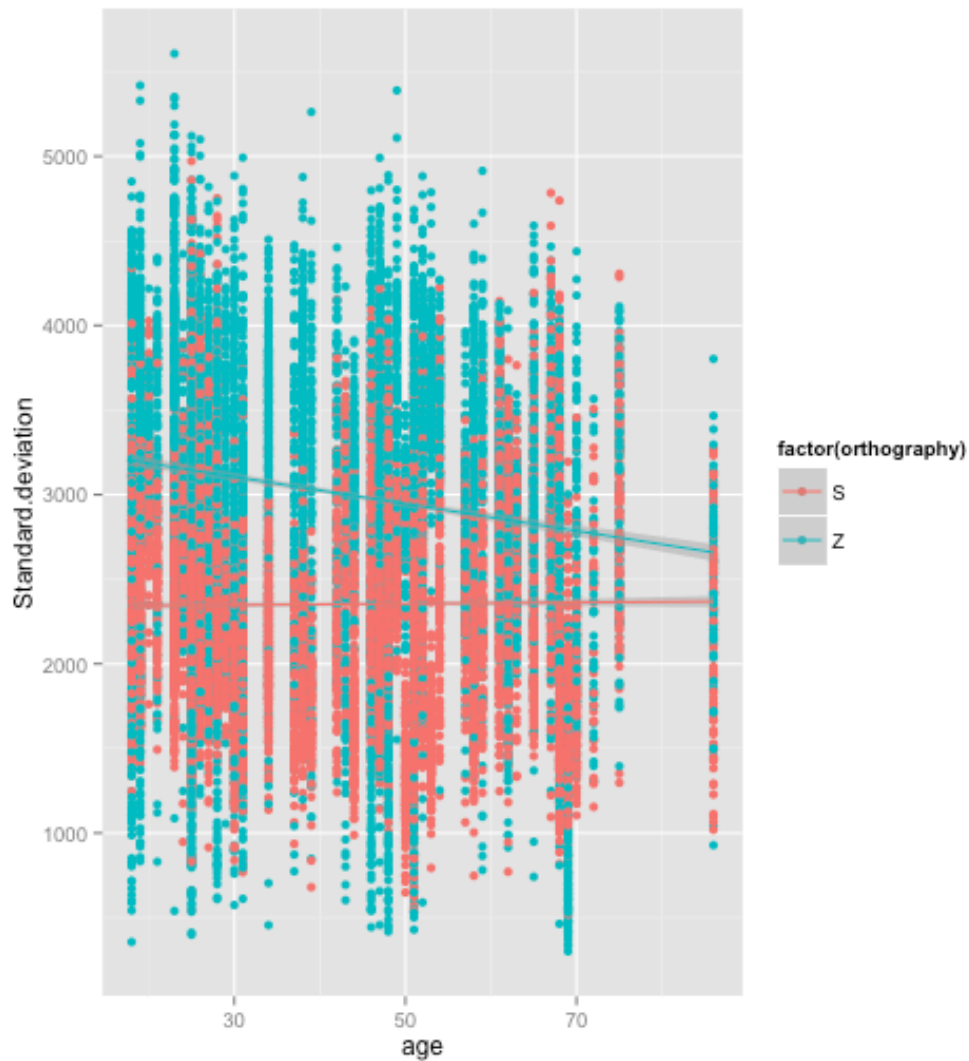
Figure 5.13: Scatterplot of Orthography (red = <s>, blue = <z,ci,ce>) by Age (18-87) interaction for variance (Hz)

Education. There was no significant main effect of Education for variance (Hz).

Additionally, a lsmeans post-hoc comparison found no differences in variance between

those with Primary education ($M = 2,664.69$, $SE = 112.43$), Secondary education ($M = 2,739.10$, $SE = 70.97$), or University education ($M = 2,675.99$, $SE = 111.10$).

Orthography by Education Interaction. There was a significant interaction between Orthography and Education for variance (Hz). A lsmeans post-hoc comparison demonstrated than for those with Primary education, the variance for <s> ($M = 2,418.25$, $SE = 113.65$) was significantly lower than <z,ci,ce> ($M = 2,911.13$, $SE = 114.53$) ($p < .0001$); for those with Secondary education, the variance for <s> ($M = 2,370.05$, $SE = 72.23$) was significantly lower than <z,ci,ce> ($M = 3,108.15$, $SE = 73.26$) ($p < .0001$); and finally, for those with University education the variance for <s> ($M = 2,272.66$, $SE = 112.28$) was significantly lower than <z,ci,ce> ($M = 3,079.32$, $SE = 113.13$) ($p < .0001$). For orthographic <s>, there were no significant differences in variance between educational groups. For orthographic <z,ci,ce>, there were no significant differences in variance between educational groups. The interaction indicates that those with University and Secondary education have a significantly larger difference between orthographic environments for variance as compared to those with Primary education; see Figure 5.14.

Orthography by Education Interaction
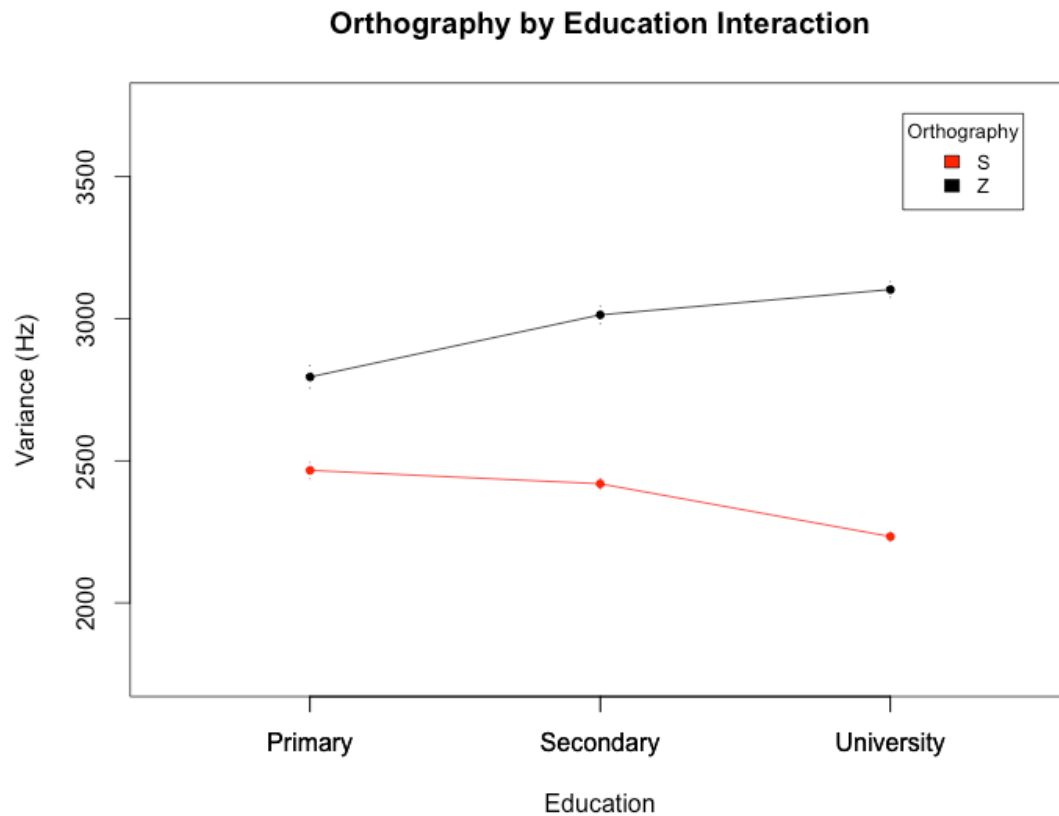
Figure 5.14: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Education
    (Primary, Secondary, University) interaction for variance (Hz)

Occupation. There was no significant main effect for Occupation. Additionally, a

lsmeans post-hoc comparison found no significant differences between those with

Manual occupations (M = 2,779.26, SE = 83.79), Service occupations (M = 2,641.49, SE

= 75.52), or Professional Occupations (M = 2,659.04, SE = 96.23).

Orthography by Occupation Interaction. There was a significant interaction

between Orthography and Occupation for variance (Hz). A lsmeans post-hoc comparison

found that for those with Manual occupations, <s> (M = 2,456.81, SE = 85.24) had a

significantly lower variance than <z,ci,ce> (M = 3,101.71, SE = 86.36) (p < .0001); for

those with Service occupations, <s> (*M* = 2,408.80, *SE* = 76.86) had significantly lower

variance than <z,ci,ce> (*M* = 2,874.17, *SE* = 77.86) (*p* < .0001); and finally, for those

with Professional occupations, <s> (*M* = 2,195.35, *SE* = 97.41) had significantly lower

variance than <z,ci,ce> (*M* = 3,122.72, *SE* = 98.29) (*p* < .0001). For orthographic <s>,

there were no significant comparisons between Occupational groups. For orthographic

<z,ci,ce>, those with Manual occupations had significantly higher variance than those

with service occupations (*p* < . 01). No other comparisons for orthographic <z,ci,ce>

were significant. The interaction between Orthography and Occupation indicates that

those with Professional occupations have a significantly larger difference in variance

between orthographic environments as compared to those with Service or Manual

occupations. Additionally, those with Manual occupations have a significantly larger

difference between orthographic environments in variance as compared to those with

Service occupations; see Figure 5.15.

Orthography by Occupation Interaction
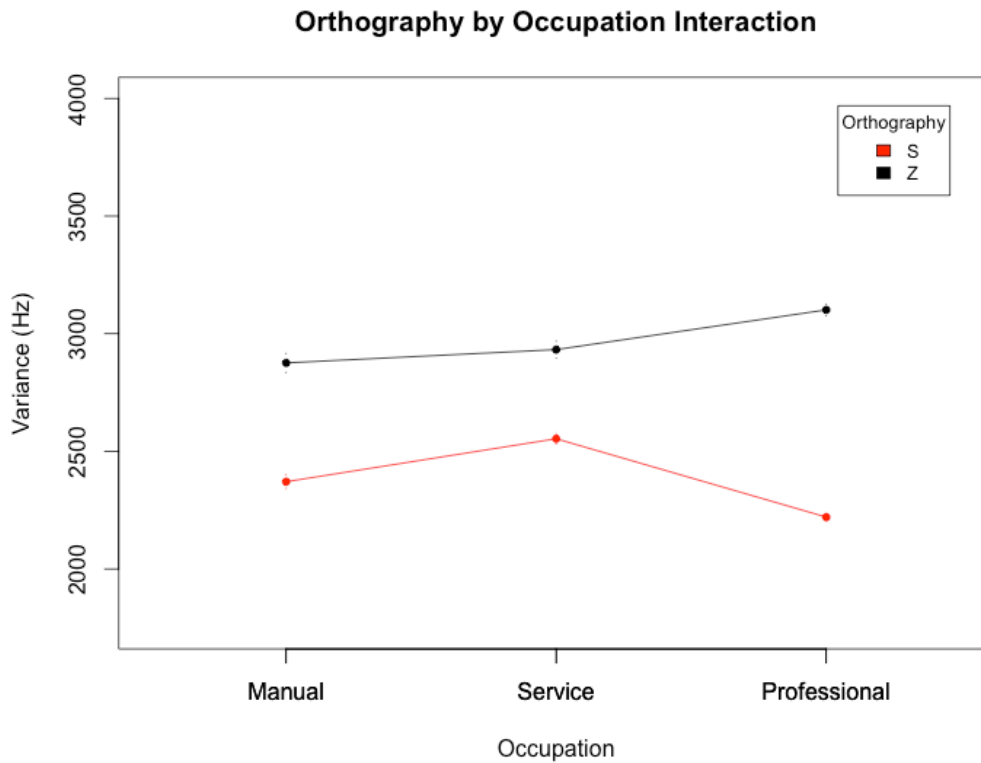
Figure 5.15: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Occupation (Manual, Service, Professional) interaction for variance (Hz)

Mobility. There was no significant main effect for mobility.

Orthography by Mobility Interaction. The interaction of Orthography and Mobility (years lived away) in the linear regression demonstrates that for a one-year increase in years lived away, the variance (Hz) for <s> increases by 8.808Hz. In contract, for a one-year increase in mobility, the variance (Hz) for <z,ci,ce> decreases by 17.927Hz. This indicates that speakers that have lived the most years away from Huelva or Lepe demonstrate a larger phonetic difference in variance between the two orthographic environments; see Figure 5.16.

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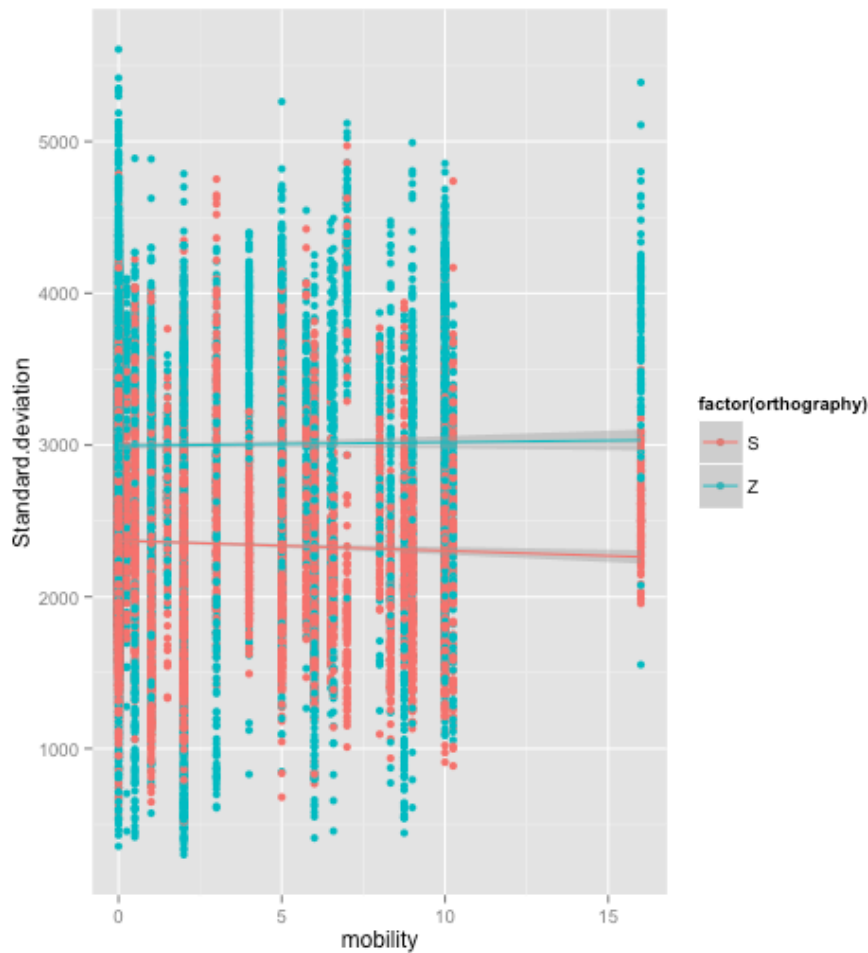
Figure 5.16: Scatterplot of Orthography (red = <s>, blue = <z,ci,ce>) by Mobility (0+)
interaction for variance (Hz)

Origin. There was a significant main effect of Origin for variance. Additionally, a

lsmeans post-hoc comparison found that those from Lepe ($M = 2,775.97$, $SE = 59.69$)

have significantly higher variance (Hz) than those from Huelva ($M = 2,610.55$, $SE =$

63.32) ($p < .05$).

Orthography by Origin Interaction. There was a significant interaction between

Orthography and Origin for variance (Hz). A lsmeans post-hoc comparison demonstrated

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that for those from Huelva, the variance for <s> (*M* = 2,258.84, *SE* = 64.64) was

significantly lower than <z,ci,ce> (*M* = 2,962.26, *SE* = 65.72) (*p* < .0001); and for those

from Lepe, the variance for <s> (*M* = 2,448.46, *SE* = 61.07) was significantly lower than

<z,ci,ce> (*M* = 3,103.47, *SE* = 62.19) (*p* < .0001). For orthographic <s>, Huelva had a

significantly lower variance than Lepe (*p* < .05). For orthographic <z,ci,ce>, there was no

significant difference in variance between Huelva and Lepe (*p* = 0.095). The interaction

between Orthography and Origin indicates that those from Huelva have a larger

difference in variance between orthographic environments as compared to those from

Lepe. That is to say, those from Lepe demonstrate greater variance for orthographic <s>

than those from Huelva; see Figure 5.17.
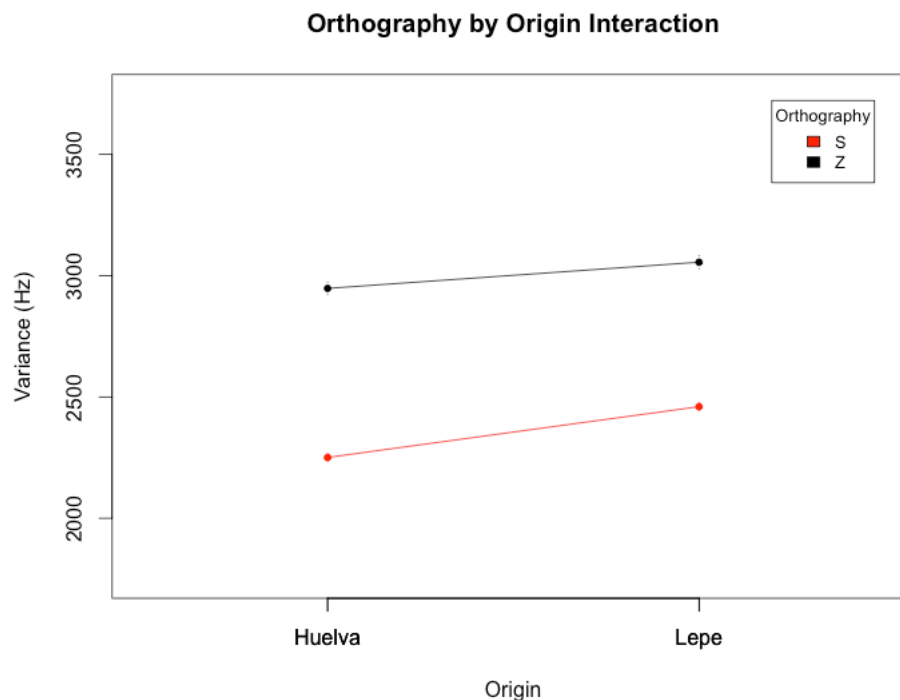
Figure 5.17: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Origin (Huelva, Lepe) interaction for variance (Hz)

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5.1.2.1 Summary of Variance (Hz) linear regression

The main effect of orthography suggests that speakers, as a community, are separating phonemes based on orthography with a significantly higher variance (Hz) for <z,ci,ce> than <s> in line with expected acoustic parameters for alveolar /s/ and interdental /θ/. The analysis of the fixed linguistic factors in interaction with orthography demonstrates that the environment with the largest difference in variance between orthographic <s> and <z,ci,ce> is among tonic and functional tokens. Conversely, the environment with the smallest difference in variance between orthographic <s> and <z,ci,ce> is atonic and non-functional tokens. These findings indicate that the difference in variance between orthographic <s> and <z,ci,ce> is not random, but rather partially subject to language-internal constraints. The interaction of Orthography and Functionality suggests that, at least in very formal tasks, speakers produce a larger difference in variance based on orthographic environment for functional words as opposed to non-functional words. This would support previous research (Villena 2007; Wedel 2004, 2006; Wedel et al. 2013) in which that phonological maintenance is increased when such phonemes serve a functional load.

The extra-linguistic factors in interaction with Orthography demonstrate that the speaker most likely to have the largest difference in variance between orthographic <s> and <z,ci,ce> is a male, younger, has a Secondary or University education, works a Professional-oriented occupation, has higher Mobility (more years lived away), and is from Huelva. Additionally, the more formal task of the Word list (Style C), with more attention paid to speech, also increases phonetic differences based on orthography.

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Conversely, the environment with the smallest difference in variance between orthographic <s> and <z,ci,ce> is female, older, has a Primary education, works a Service-oriented occupation, has no Mobility (has not lived any time away from home), and is from Lepe. Additionally, the less formal task (although still relatively formal) of the Passage Reading (Style B), with slightly less attention paid to speech, demonstrates less phonetic difference in variance based on orthography. The finding of gender appears to be more of a biological sex-related effect of women having higher variance (Hz) than men particularly for /s/ (see §4.2.5), as opposed to men leading the demerger in this acoustic measure. The findings of Age and Education support previous segmental research in the influence of social factors in the realization of *distinción* versus *ceceo*. The interaction of Orthography and Occupation again demonstrates pressure to adhere to the linguistic market. The interaction of Orthography and Mobility has yet to be studied, but it appears that those with more years lived away from home, and consequently are exposed to more dialect contact, have a larger separation in variance based on orthography. The interaction of Orthography and Origin appears to support the findings of Melguizo (2007, 2009ab) and Lasarte Cervantes (2010) in which rural speakers are more likely to maintain the merger as compared to urban speakers. Worth noting in the Orthography by Origin interaction is that Huelva had significantly lower variance (Hz) for <s> than did Lepe. As higher variance is more associated with /θ/ than /s/, this indicates that Lepe, as a community, is still producing <s> in a more *ceceo*-like manner than Huelva. Munson (2001, 2004) suggests that center of gravity variability (i.e.

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variance) indicates a lack of motor control. In this sense, Huelva, as a community, may have more motor control in producing [s] (i.e. are more advanced in acquiring the split) whereas Lepe, as a community, may demonstrate greater variability as the community may be lagging behind Huelva in this change. The interaction of Orthography and Style indicates that with more attention paid to speech, speakers are more able to produce a larger difference in variance based on orthography.

5.1.3 Mean Intensity (dB): Linear regression

In order to investigate the main effects and interactions of the linguistic and extra-linguistic factors on the mean intensity (dB), a linear mixed effects model was run with orthography, style, stress, assimilation, gender, age, education, occupation, mobility and origin as fixed factors and speaker and word as random factors. *Functionality* was originally run in the model, but as it did not contribute to the variation, it was taken out. Given the importance of the prescribed phoneme to grapheme, orthography was run additionally in interaction with all other fixed factors.

The linear mixed effects regression model produced significant main effects for orthography, style, stress, assimilation, gender, education, and occupation, as well as the interaction of orthography with stress, assimilation, gender, age, education, occupation, and origin (see Table 5.3). While main effects are reported as they are part of the model, it should be noted that main effects only demonstrate a difference based on the reference group, which is orthographic <s>. For example, a significant main effect of Gender only indicates that men and women are different based on the <s> realizations. While the

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lsmeans will be provided for all comparisons, given the importance of the one-to-one grapheme-to-phoneme, emphasis will be given to the main effect of orthography as well as the significant interaction of orthography with other fixed factors (linguistic and extra-linguistic) as the purpose is to understand the status of merger versus separation of phonemes.

Table 5.3: Summary of the linear mixed effects regression model, with Mean Intensity (dB) as the dependent measure, speaker and word as random factors, for all the data combined; Intercept = <s>, Reading passages (B), atonic, Different coronal fricative, female, Primary education, Manual occupation, origin of Huelva; total *n* = 19,420.

Predictor		Estimate	Std. Error	t-value	p-vale
(Intercept)		49.719	2.055	24.1987	**<.0001**
Orthography		-5.801	0.361	-16.058	**<.0001**
Style		0.844	0.162	5.192	**<.0001**
Stress		1.091	0.182	5.985	**<.0001**
Assimilation					
	None	0.983	0.272	3.610	**<.0001**
	Same	1.208	0.373	3.235	**<.01**
Gender		1.754	0.818	2.144	**<.05**
Age		0.055	0.029	1.871	0.051
Education					
	Secondary	2.717	1.284	2.116	**<.05**
	University	2.266	1.924	1.178	0.215
Occupation					
	Professional	2.667	1.476	1.807	0.061
	Service	1.815	0.477	3.808	**<.0001**
Mobility		-0.100	0.136	-0.731	0.442
Origin		0.827	0.853	0.970	0.308
Orthography*Style		-0.047	0.202	-0.232	0.802
Orthography*Stress		-1.948	0.297	-6.559	**<.0001**
Orthography*Assimilation					
	None	-0.705	0.280	-2.520	**<.05**
	Same	-2.014	0.672	-2.995	**<.01**
Orthography*Gender		2.711	0.113	24.102	**<.0001**
Orthography*Age		0.047	0.004	11.593	**<.0001**
Orthography*Education					
	Secondary	-1.920	0.192	-10.003	**<.0001**
	University	-1.293	0.278	-4.654	**<.0001**
Orthography*Occupation					
	Professional	-3.019	0.240	-12.554	**<.0001**
	Service	-0.782	0.173	-4.504	**<.0001**
Orthography*Mobility		0.009	0.018	0.486	0.627
Orthography*Origin		2.190	0.116	18.854	**<.0001**

Note: The p-values were calculated using 'lmerTest' package. Statistically significant values are in bold.

Orthography. There was a significant main effect of Orthography for mean

intensity (dB). A lsmeans post-hoc comparison found that overall orthographic <s> (*M* =

57.97, *SE* = 0.47) has a significantly higher mean intensity (dB) than orthographic

<z,ci,e> (*M* = 52.42, *SE* =0.48) (*p* < .0001); see Figure 5.18.
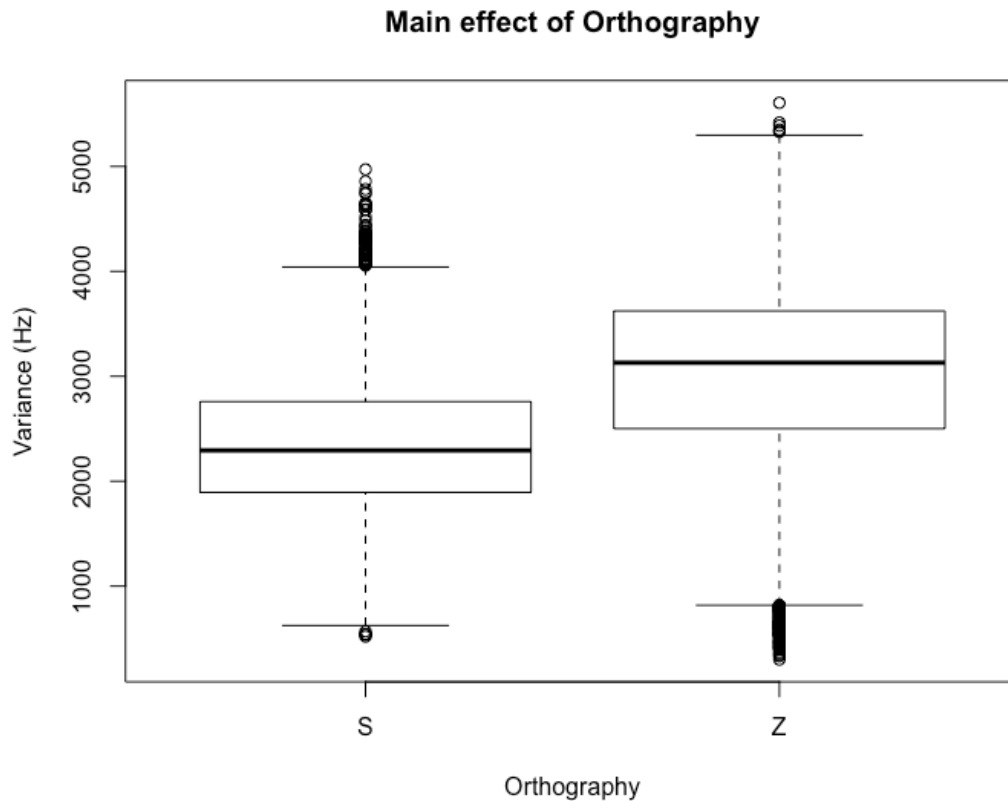
Main effect of Orthography
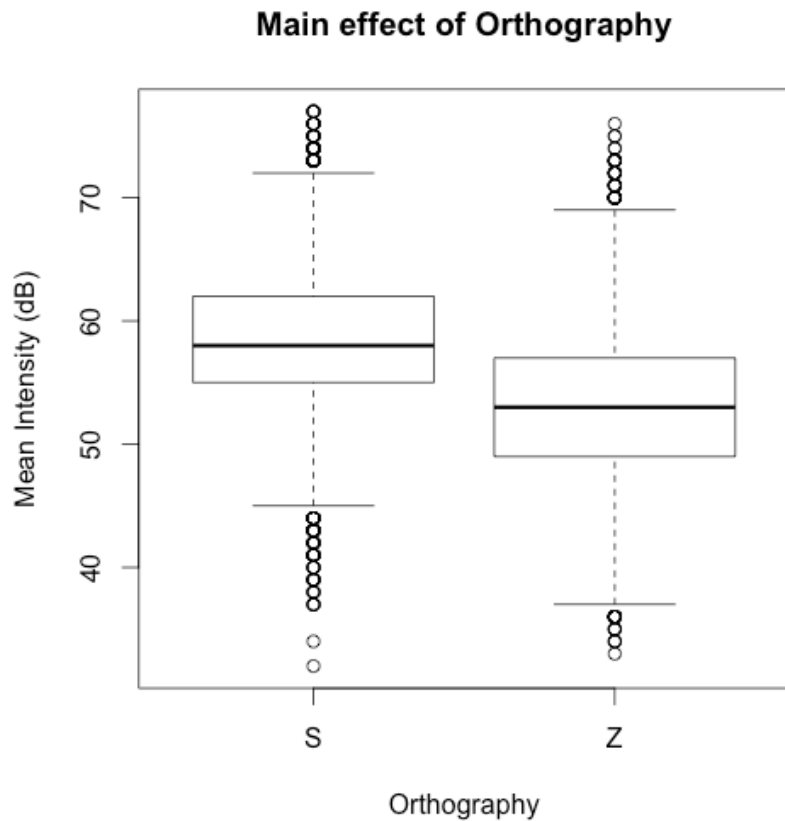
Figure 5.18: Boxplot of main effect of Orthography (<s> vs. <z,ci,e>) for mean intensity
(dB)

Style. There was a significant main effect of style for mean intensity (dB).

Additionally, a lsmeans post-hoc comparison found a significant difference in which the

Passage Reading (*M* = 54.78, *SE* = 0.46) had significantly lower mean intensity (dB) than

the Word List (*M* = 55.60, *SE* = 0.467) (*p* < .0001).

Orthography by Style. There was not a significant interaction between Orthography and Style for mean intensity (dB). A lsmeans post-hoc analysis indicated that for the Passage Reading, orthographic <s> ($M = 57.55$, $SE = 0.47$) had significantly higher mean intensity than <z,ci,ce> ($M = 52.02$, $SE = 0.49$) ($p < .0001$). Similarly, for the Word list, orthographic <s> ($M = 58.39$, $SE = 0.48$), had significantly higher mean intensity than <z,ci,ce> ($M = 52.82$, $SE = 0.49$) ($p < .0001$). For orthographic <s>, the Passage Reading had significantly lower mean intensity than the Word List ($p < .0001$). For orthographic <z,ci,ce>, the Passage Reading had significantly lower mean intensity than the Word List ($p < .0001$).

Stress. There was a significant main effect of Stress for mean intensity (dB). A lsmeans post-hoc comparison, however, did not find a significant difference between atonic ($M = 55.13$, $SE = 0.46$) and tonic tokens ($M = 55.25$, $SE = 0.46$) ($p = 0.31$).

Orthography by Stress Interaction. There was a significant interaction between Orthography and Stress for mean intensity (dB). A lsmeans post-hoc comparison found that for atonic tokens, <s> ($M = 57.42$, $SE = 0.47$) had a significantly higher mean intensity than <z,ci,ce> ($M = 52.84$, $SE = 0.49$) ($p < .0001$); and for tonic tokens, <s> ($M = 58.51$, $SE = 0.48$) had significantly higher mean intensity than <z,ci,ce> ($M = 51.99$, $SE = 0.49$) ($p < .0001$). For orthographic <s>, atonic tokens had significantly lower mean intensity than tonic tokens ($p < .0001$). For orthographic <z,ci,ce>, atonic tokens had significantly higher mean intensity than tonic tokens ($p < 0.001$). The interaction

indicates that there is a larger difference in mean intensity between orthographic

environments for tonic tokens than atonic tokens; see Figure 5.19.
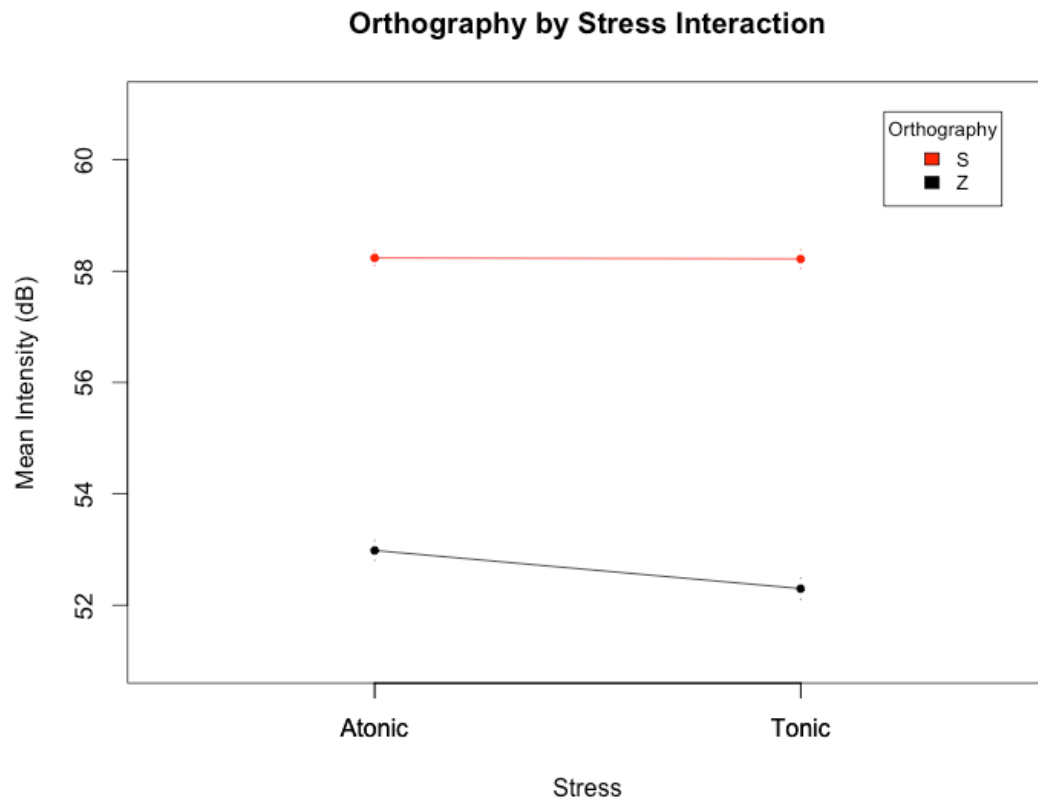
Figure 5.19: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Stress (Atonic, Tonic) interaction for mean intensity (dB)

Assimilation. There was a significant main effect for Assimilation. Additionally,

lsmeans post-hoc comparison found that words with an additional Different orthographic

coronal fricative ($M = 54.92$, $SE = 0.49$) had significantly lower mean intensity than

words with No additional fricatives ($M = 55.55$, $SE = 0.45$) (p < .05), but not significantly

different from words with an additional Same orthographic environment ($M = 55.12$, SE

$= 0.54$) ($p = 0.86$). No other comparisons were significant.

Orthography by Assimilation Interaction. There was a significant interaction between Orthography and Assimilation for mean intensity (dB). A lsmeans post-hoc comparison found that for words with an additional Different orthographic coronal fricatives, <s> ($M = 57.24$, $SE = 0.50$) had a significantly higher mean intensity than <z,ci,ce> ($M = 52.59$, $SE = 0.49$) ($p < .0001$); for words with No additional fricatives, <s> ($M = 58.22$, $SE = 0.46$) had significantly higher mean intensity than <z,ci,ce> ($M = 52.87$, $SE = 0.47$) ($p < .0001$); and finally, for words with an additional Same orthographic environment, <s> ($M = 58.45$, $SE = 0.56$) had significantly higher mean intensity than <z,ci,ce> ($M = 51.78$, $SE = 0.70$) ($p < .0001$). For orthographic <s>, words with an additional Different orthographic coronal fricatives had significantly lower mean intensity than words with No additional fricative ($p < .001$) and words with an additional Same orthographic environments ($p < .01$). There were no significant differences in mean intensity between words with No additional fricative and words with an additional Same orthographic environment ($p = 0.29$). For orthographic <z,ci,ce>, there were no significant differences between groups. The significant interaction indicates that for words with two Different orthographic environments (i.e. *cesar* 'to cease') difference in mean intensity between the two orthographic environments was less than the difference found in words with No additional coronal fricatives or words with two of the Same orthographic environments; see Figure 5.20.
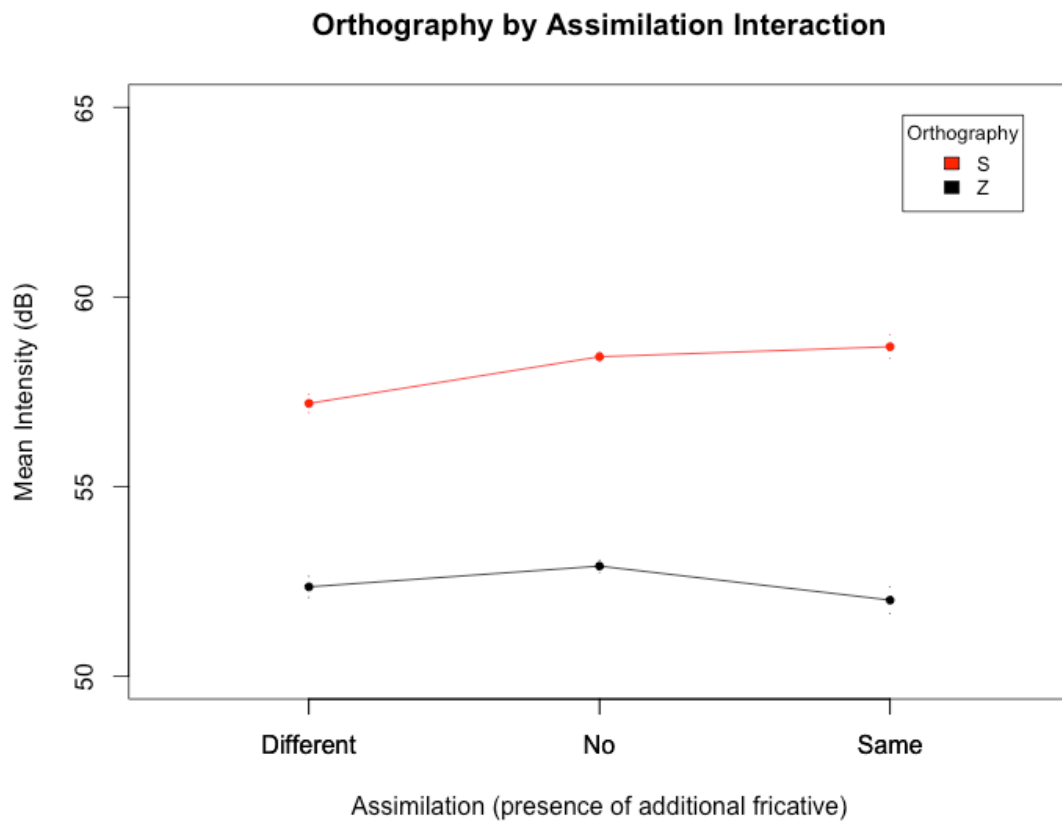
Figure 5.20: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Assimilation (Different additional orthographic fricative; No additional orthographic fricative; Same additional orthographic fricative) interaction for mean intensity (dB)

Gender. There was a significant main effect of Gender for mean intensity. Additionally, a lsmeans post-hoc comparison demonstrated that men ($M = 56.75$, $SE = 0.60$) had significantly higher mean intensity than women ($M = 53.64$, $SE = 0.63$) ($p < .0001$).

Orthography by Gender Interaction. There was a significant interaction between Orthography and Gender for mean intensity (dB). A lsmeans post-hoc comparison demonstrated that for men, the mean intensity for <s> ($M = 57.09$, $SE = 0.64$) was

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significantly higher than <z,ci,ce> ($M = 50.18$, $SE = 0.65$) ($p < .0001$); and that for

women, the mean intensity for <s> ($M = 58.84$, $SE = 0.61$) was significantly higher than

<z,ci,ce> ($M = 54.78$, $SE = 0.69$) ($p < .0001$). For orthographic <s>, women had

significantly less mean intensity than men <s> ($p < .05$). For orthographic <z,ci,ce>,

women had significantly less mean intensity than men ($p < .0001$). The interaction

indicates that there is a larger difference in mean intensity between in orthographic

environments for women than for men; see Figure 5.21. As mentioned in §4.2.5, there is

no biological sex difference in mean intensity between men and women for mean

intensity. Thus, mean intensity gives a non-confounding view of the demerger being

greater among women than men.

Orthography by Gender Interaction
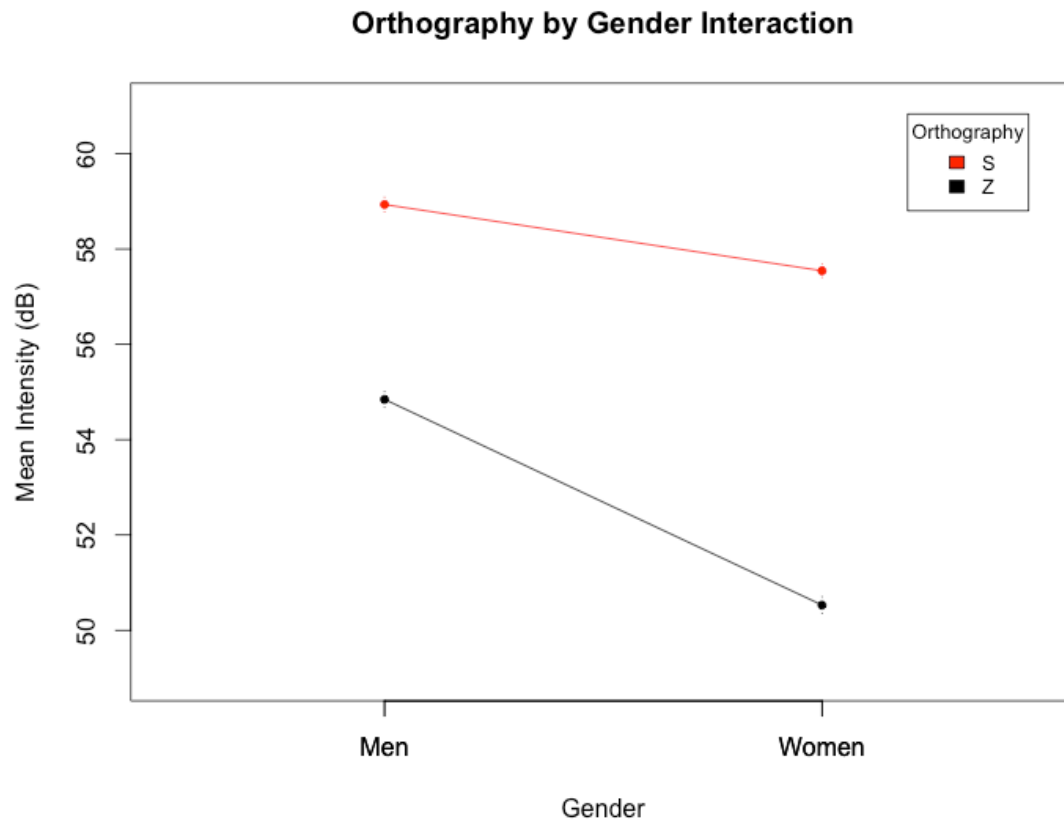
Figure 5.21: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Gender (Men; Women) interaction for mean intensity (dB)

Age. There was a main effect for Age, but this is only the main effect of the intercept <s>. Thus, we'll look at the interaction to see the age effects for <s> and <z,ci,ce>.

Orthography by Age Interaction. The interaction of Orthography and Age in the linear regression demonstrates that, that for each one-year increase in age there is an increase of 0.055 decibels for <s> and an increase of 0.102 decibels for <z,ci,ce>. This indicates that the difference in mean intensity between orthographic environments is the least among the oldest speakers and with each decrease in age (moving on x-axis from

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right to left) there difference in mean intensity between orthographic environments increases; see Figure 5.22.
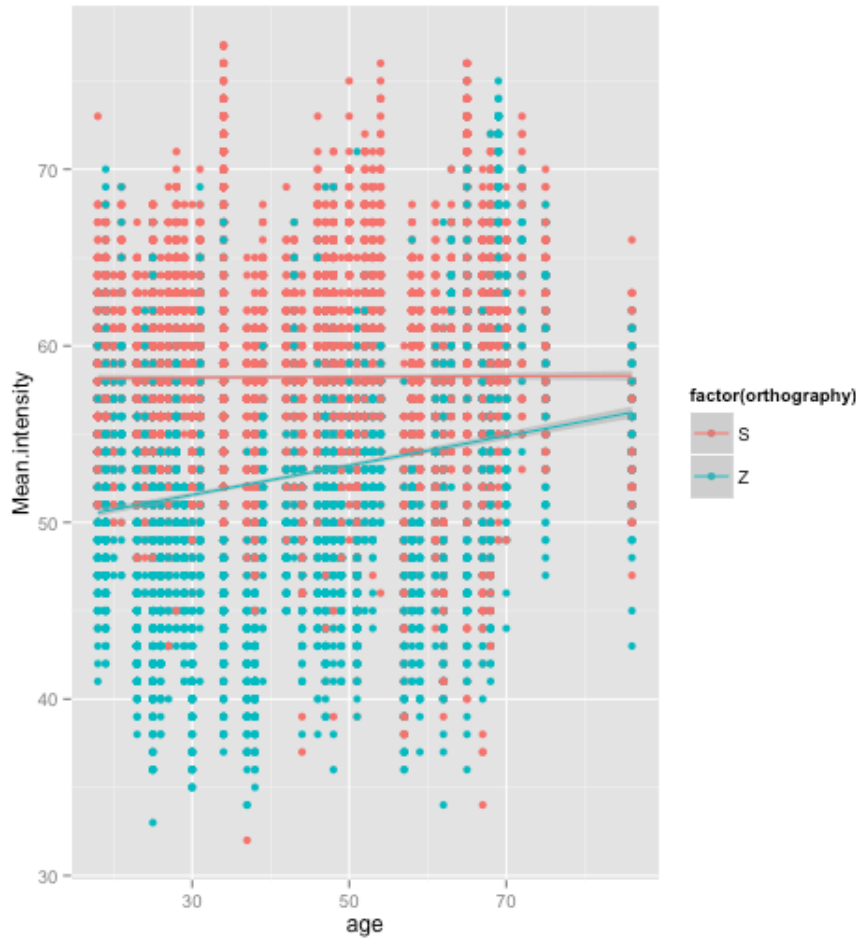
Figure 5.22: Scatterplot of Orthography (red = <s>, blue = <z,ci,ce>) by Age (18-87) interaction for mean intensity (dB)

Education. There was a significant main effect for Education. However, a lsmeans post-hoc demonstrated that there is no significant difference in mean intensity between those with Primary education ($M = 54.07$, $SE = 1.13$), Secondary education ($M = 55.82$, $SE = 0.72$), or University education ($M = 55.69$, $SE = 1.12$).

Orthography by Education Interaction. There was a significant interaction between Orthography by Education for mean intensity (dB). A lsmeans post-hoc comparison demonstrated than for those with Primary education, the mean intensity for <s> (*M* = 56.31, *SE* = 1.13) was significantly higher than <z,ci,ce> (*M* = 51.83, *SE* = 1.14) (*p* < .0001); for those with Secondary education, the mean intensity for <s> (*M* = 59.02, *SE* = 0.72) was significantly higher than <z,ci,ce> (*M* = 52.62, *SE* = 0.72) (*p* < .0001); and finally, for those with University education, the mean intensity for <s> (*M* = 58.57, *SE* = 1.13) was significantly higher than <z,ci,ce> (*M* = 52.79, *SE* = 1.13) (*p* < .0001). For orthographic <s>, there were no significant differences in mean intensity between educational levels. For orthographic <z,ci,ce>, there were no significant differences in mean intensity between educational levels. The interaction indicates that those with Primary education have a significantly smaller difference in mean intensity between the orthographic environments as compared to those with Secondary and University education; see Figure 5.23.

Orthography by Education Interaction
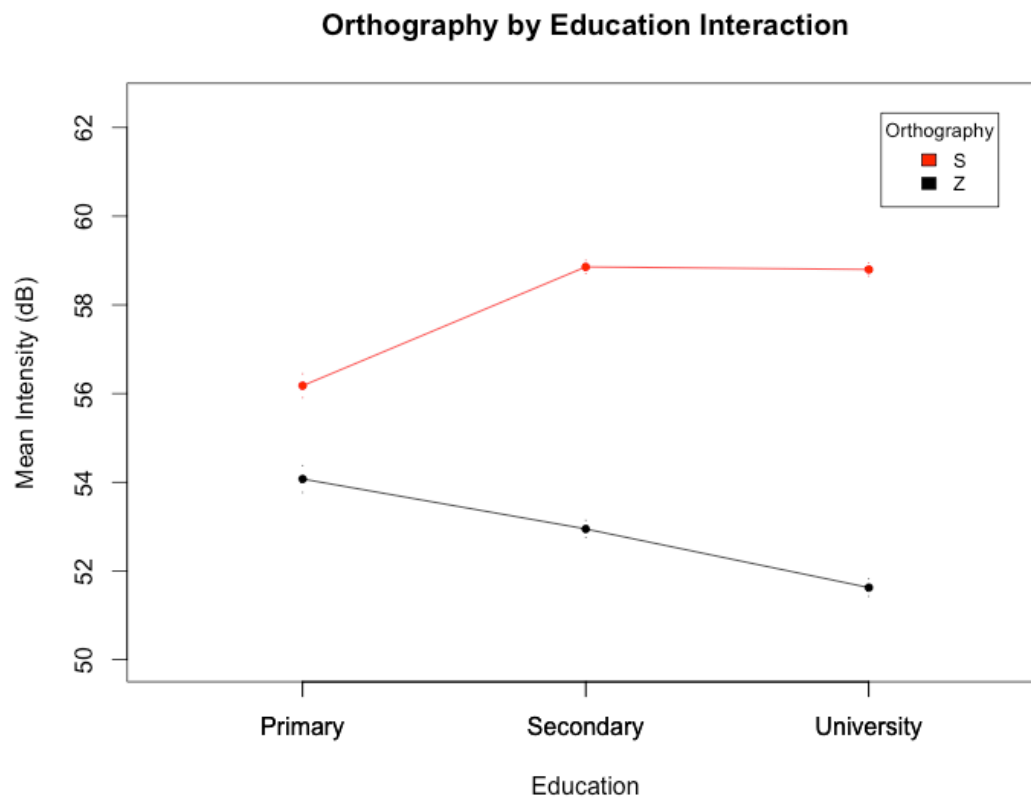
Figure 5.23: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Education
(Primary, Secondary, University) interaction for mean intensity (dB)

Occupation. There was a significant main effect of Occupation for mean intensity (dB). Additionally, a lsmeans post-hoc comparisons found that those with Manual occupations ($M = 54.33$, $SE = 0.78$) have significantly less mean intensity than those with Service occupations ($M = 55.76$, $SE = 0.74$) ($p < .01$), but no significant difference in mean intensity in comparison to those with Professional occupations ($M = 55.49$, $SE = 0.97$) ($p = 0.71$). There was no significant difference in mean intensity between those with Service and Professional occupations ($p = 0.98$).

Orthography by Occupation Interaction. There was a significant interaction between Orthography and Occupation for mean intensity (dB). A lsmeans post-hoc comparison found that for those with a Manual occupation, <s> (*M* = 56.47, *SE* = 0.79) had a significantly higher mean intensity than <z,ci,ce> (*M* = 52.20, *SE* = 0.80) (*p* < .0001); for those with Service occupations, <s> (*M* = 58.29, *SE* = 0.78) had significantly higher mean intensity than <z,ci,ce> (*M* = 53.22, *SE* = 0.76) (*p* < .0001); and finally, for those with Professional occupations, <s> (*M* = 59.14, *SE* = 0.98) had significantly higher mean intensity than <z,ci,ce> (*M* = 51.84, *SE* = 0.98) (*p* < .0001). For orthographic <s>, those with Manual occupations had significantly lower mean intensity than those with Service occupations (*p* < .001). There was no difference between Manual and Professional occupations. For orthographic <z,ci,ce>, there was no significant difference in mean intensity between groups. The interaction between Orthography and Occupation indicates that those with Manual occupations have a significantly smaller difference in mean intensity between orthographic <s> and <z,ci,ce> as compared to those with Service or Professional occupations; see Figure 5.24.

Orthography by Occupation Interaction
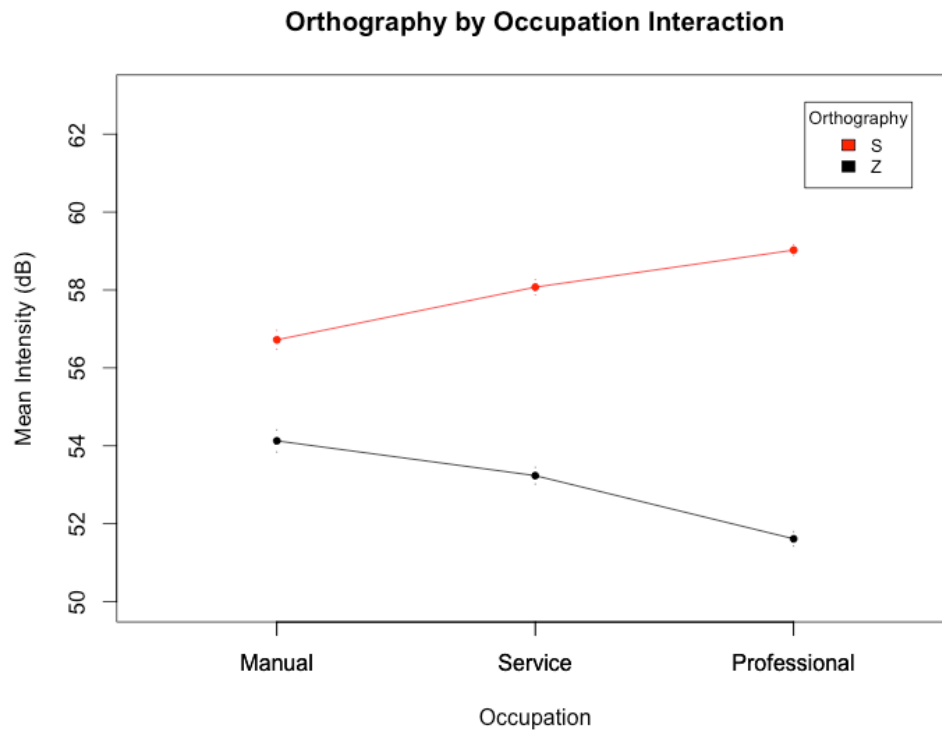
Figure 5.24: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Occupation (Manual, Service, Professional) interaction for mean intensity (dB)

Mobility. There was no significant main effect of mobility for mean intensity.

Orthography by Mobility. There was no significant interaction between Orthography and Mobility for mean intensity.

Origin. There was no significant main effect of Origin. A lsmeans post-hoc comparison found no significant difference between Huelva ($M = 54.23$, $SE = 0.64$) and Lepe ($M = 56.15$, $SE = 0.61$).

Orthography by Origin Interaction. There was a significant interaction between Orthography and Origin for mean intensity (dB). A lsmeans post-hoc comparison demonstrated that for those from Huelva, the mean intensity for <s> ($M = 57.55$, $SE =$

0.65) was significantly higher than <z,ci,ce> ($M = 50.91$, $SE = 0.66$) ($p < .0001$); and for those from Lepe, the mean intensity for <s> ($M = 58.38$, $SE = 0.61$) was significantly higher than <z,ci,ce> ($M = 53.92$, $SE = 0.62$) ($p < .0001$). For orthographic <s>, there were no significant differences in mean intensity between Huelva and Lepe ($p = 0.33$). For orthographic <z,ci,ce>, Huelva had significantly lower mean intensity than Lepe ($p < .001$). The interaction between orthography and origin indicates that those from Huelva have a significantly larger difference in mean intensity between orthographic <s> and orthographic <z> as compared to those from Lepe. That is, while speakers from both communities realize orthographic <s> with similar mean intensity, as a community, Huelva has a much lower mean intensity than Lepe for orthographic <z,ci,ce>, demonstrating a larger phonetic separation of phonemes; see Figure 5.25.

Orthography by Origin Interaction
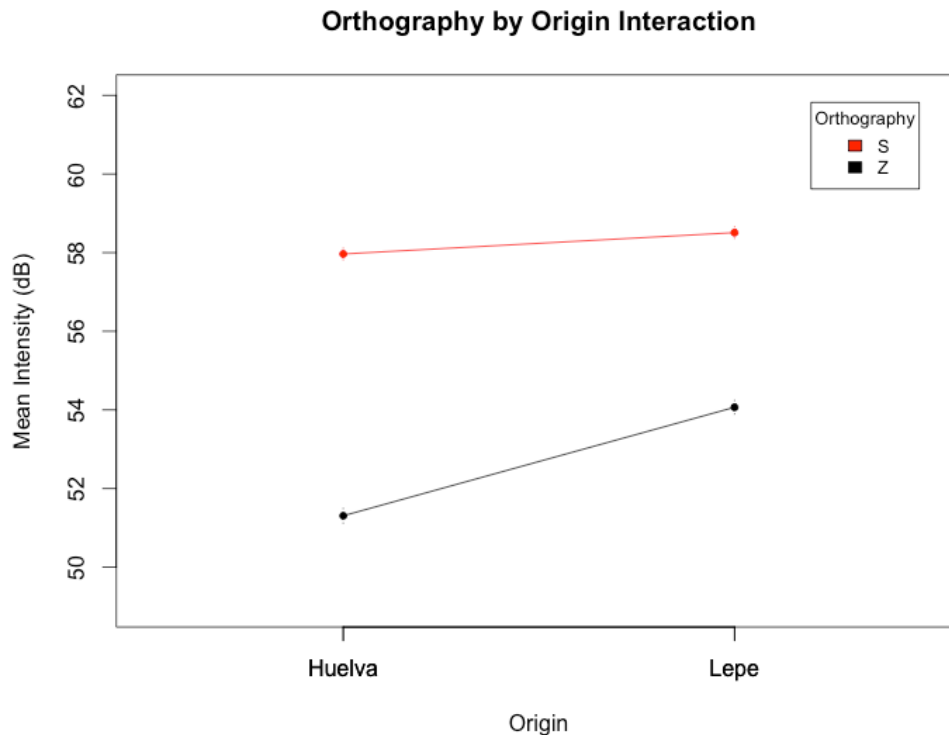
Figure 5.25: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Origin (Huelva, Lepe) interaction for mean intensity (dB)

5.1.3.1 Summary of Mean Intensity (dB) linear regression

The main effect of orthography suggests that speakers, as a community, are separating phonemes based on orthography with significantly higher mean intensity (dB) for <s> than <z,ci,ce> in line with expected acoustic parameters for alveolar /s/ and interdental /θ/. The analysis of the fixed linguistic factors in interaction with orthography demonstrates that the environment with the largest difference in mean intensity between orthographic <s> and <z,ci,ce> is tonic tokens and words with the an additional Same fricative (i.e. *sesenta*) as well as words with No additional fricative (i.e. *cosa*). Conversely, the environment with the smallest difference in mean intensity between

orthographic <s> and <z,ci,ce> is atonic tokens and words with an additional Different orthographic coronal fricative (i.e. *gracioso*). These findings indicate that the difference in mean intensity between orthographic <s> and <z,ci,ce> is not random, but rather partially subject to language-internal constraints. The orthography main effect supports previous research (García Amaya 2008; Regan 2017). The interaction of Orthography and Stress indicates that tokens that receive the syllabic stress are more likely to demonstrate a larger difference in meant intensity based on orthography. The Orthography by Assimilation interaction supports previous findings (Moya & García-Wiedemann 1995; Regan 2017; Villena 2007). Again, as speakers are grouped together this could indicate that when there are two separate orthographic environments in one word such as *gracioso* 'funny' that speakers are either assimilating one sound to the other or that the first triggers a type of progressive assimilation in which both tokens are realized as [θ].

The extra-linguistic factors in interaction with orthography demonstrate that the speaker most likely to have the largest separation of mean intensity between orthographic <s> and <z,ci,ce> is a female, younger, has a Secondary or University education, works a Professional or Service-oriented occupation, and is from Huelva. Conversely, the environment with the smallest separation in mean intensity between orthographic <s> and <z,ci,ce> is male, older, has a Primary education, works a Manual occupation, and is from Lepe. These findings with regards to Gender, Age, and Education support previous segmental research in the influence of social factors in the realization of *distinción* versus

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ceceo. The interaction of orthography and occupation again demonstrates pressure to adhere to the linguistic market. The interaction of orthography and origin supports Melguizo's (2007, 2009ab) segmental findings in which rural speakers are more likely to maintain the merger as compared to urban speakers. Additionally, these results directly support Lasarte Cervantes (2010) acoustic findings that urban speakers had a larger difference in mean intensity between orthographic environments as compared to rural speakers.

5.1.4 Summary of linear regressions

The findings from the macro-level acoustic analysis demonstrate a separation of phonemes based on orthography with differing degrees of separation based on the interaction of orthography with linguistic and extra-linguistic factors. These analyses indicate that the speech communities as a whole utilize the dependent measures of center of gravity (Hz), variance (Hz), and mean intensity (dB) to separate phonemes based on their prescribed orthographic environment in line with standard *distinción*.

For the fixed linguistic factors in interaction with orthography, there was not any one linguistic factor that patterned the same between three dependent measures; see Table 5.4. For both the measures of variance (Hz) and mean intensity (dB), tonic tokens demonstrated the greatest separation in phonetic space between orthographic environments compared to atonic tokens. For both the measures of center of gravity (Hz) and mean intensity (dB), words with No additional fricative (*cosa*, *pozo*) as well as words with an additional Same orthographic environment (*sesenta*, *cerveza*) demonstrated

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greater separation in phonetic space between orthographic environments compared to words with an additional Different orthographic environment (*gracioso*).

Table 5.4: Largest phonetic difference in dependent measures between orthographic environments (<s> vs. <z,ci,ce>) for linguistic factors

	Syllabic stress	Functionality	Assimilation
Center of gravity	n.s.	n.s.	Same fricative No add. fricative
Variance	Tonic	Functional	n.s.
Mean intensity	Tonic	n.s.	Same fricative No add. fricative

For the extra-linguistic factors in interaction with orthography, there appear to be similar patterns in which those with the largest separation of the dependent measures between orthographic <s> and <z,ci,ce> are among speakers who are female, younger, have Secondary or University education, work a Professional or Service-oriented occupation, and are from Huelva; see Table 5.5. The dependent measure of variance (Hz) demonstrated some differences from center of gravity and mean intensity in that men demonstrated a great difference in variance (again this is most likely due to biological sex related acoustic differences), mobility was significant, and the more formal Word list was also more significant. These findings suggest, that although linguistic factors do play a role, that it is overwhelmingly the extra-linguistic factors that are motivating the increase in difference in each dependent measure between orthographic environments. Consequently, the separation of the merger for some speakers, and the increase in phonetic space between orthographic speakers for others, is socially motivated.

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Table 5.5: Largest phonetic difference in dependent measures between orthographic environments (<s> vs. <z,ci,ce>) for extra-linguistic factors

	Gender	Age	Education	Occupation	Mobility	Origin	Style
Center of gravity	Female	Younger	Secondary, University	Service, Professional	n.s.	Huelva	n.s.
Variance	Male	Younger	Secondary, University	Professional	> years	Huelva	Word list
Mean intensity	Female	Younger	Secondary, University	Service, Professional	n.s.	Huelva	n.s.

5.2 MARCO-LEVEL AUDITORY ANALYSIS (LOGISTIC REGRESSION ([S] VS. [Ɵ]))

In order to investigate the main effects and interactions of the acoustic correlates, a logistic mixed effects regression was run with the binary dependent measure of [s] vs. [θ]. The same linguistic and extra-linguistic factors (as well as interactions) were run in the model with the inclusion of word and speaker as random variables. Given the lack of variance in [s] and [θ] outside of the predictor of orthography, the model crashed. Several other logistic regressions were run without interactions and or linguistic factors and only with extra-linguistic factors and speaker as a random effect. Even with the reduction in fixed factors the model still crashed. As a preliminary analysis of spontaneous speech (Style A) reveals much more variability in the binary realization of [s] and [θ] than the Passage Reading (Style B) and Word List (Style C), a future logistic regression will be run once all spontaneous speech is coded.

A separate logistic mixed effects regression was run in order to examine the perceptual cues of two dependent measures of center of gravity (Hz) and mean intensity (dB) (variance here is not considered as it did not prove to be as reliable for

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distinguishing these Andalusian coronal fricatives). The dependent measure was the

binary perception of [s] vs. [θ] as perceived by the author[62]. Fixed effects included center

of gravity, mean intensity, the interaction of these two measures and with speaker as a

random factor. The logistic mixed effects regression model produced significant main

effects for center of gravity, mean intensity, and the interaction of center of gravity by

mean intensity (see Table 5.6).

Table 5.6: Summary of the logistic mixed effects regression model, with the dependent
measure of the binary realization of [s] vs. [θ] as coded by the author,
speaker as random factor, and center of gravity (Hz) and mean intensity
(dB) as fixed factors; total n = 19,420.

Predictor	Estimate	Std. Error	z-value	p-vale
(Intercept)	1.230e+01	6.625e-01	18.56	**<.0001**
Center of gravity (Hz)	2.523e-03	1.655e-04	15.25	**<.0001**
Mean intensity (dB)	-1.626e-01	1.136e-02	-14.31	**<.0001**
Center of gravity * Mean intensity	-6.034e-05	2.979e-06	-20.26	**<.0001**

Note: The p-values were calculated using 'lmerTest' package. Statistically significant values are in bold.

Center of gravity (Hz). The main effect of center of gravity (Hz) indicates that a

token with higher center of gravity was more likely to coded as [s] while tokens with

lower center of gravity were more likely to be coded as [θ]; see Figure 5.26.

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[62] Future work will look to incorporate 2-3 native Andalusian listeners for interrater
reliability. I acknowledge that orthography is a confounding factor, as I know how words
are spelled. However, auditorily coding here follows nearly all-previous studies on
Andalusian coronal fricative variation in which highly trained linguistics researchers
auditorily code for [s] or [θ] (Ávila 1994; García Amaya 2008; Lasarte Cervantes 2010;
Melguizo 2007, 2009; Moya & García-Wiedemann 1995; Moya & Sosiński 2015; Regan
2017; Salvador 1980; Santana 2016; Sawoff 1980; Villena 1994, 1996, 2001, 2005, 2007;
Villena & Requena 1996; Villena et al. 1995).
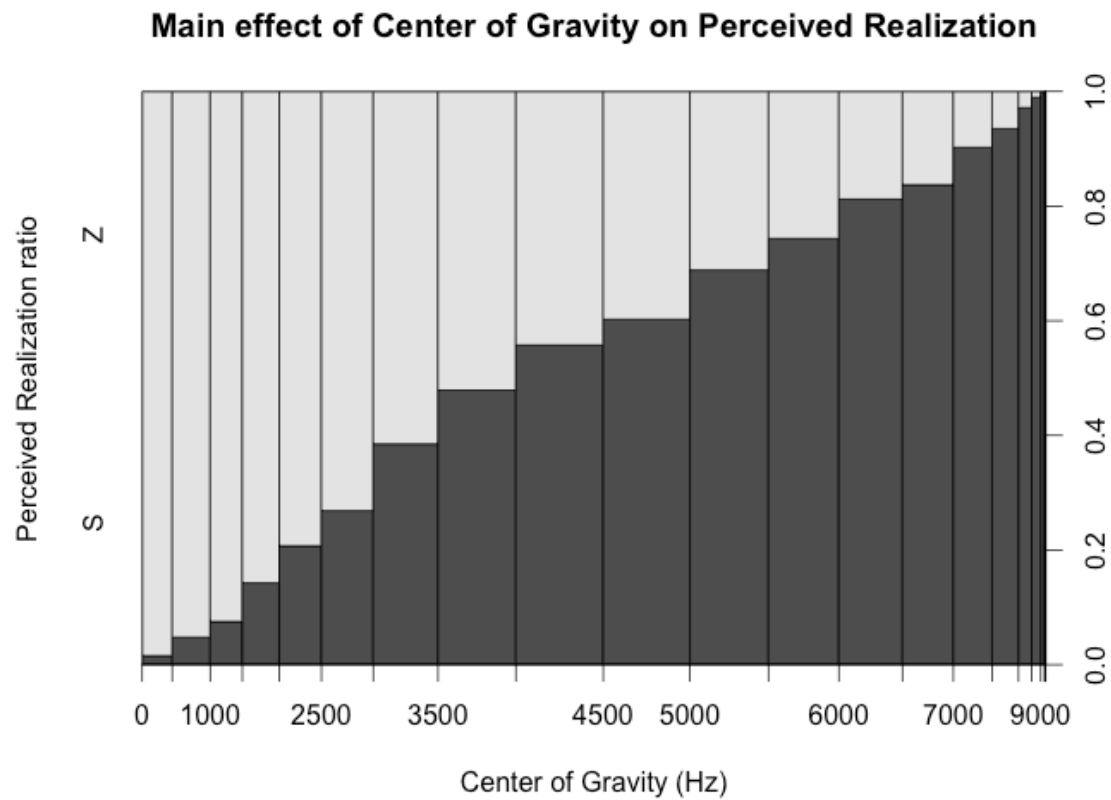
Figure 5.26: Bar graph of main effect of Center of gravity (Hz) for binary auditory realization (dark grey = [s]; light grey = [θ])

Mean intensity (dB). The main effect of mean intensity (dB) indicates that a token with higher mean intensity was more likely to coded as [s] while tokens with lower mean intensity were more likely to be coded as [θ]; see Figure 5.27.

Main effect of Mean Intensity on Perceived Realization
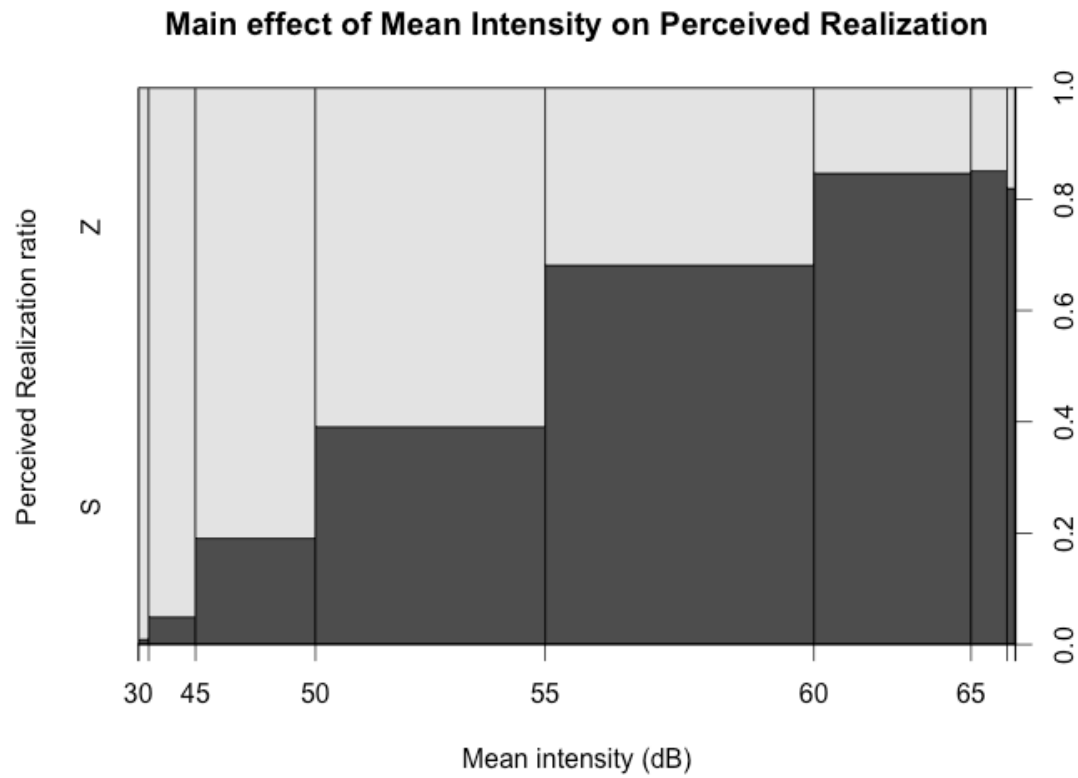
Figure 5.27: Bar graph of main effect of Mean Intensity (dB) for binary auditory
realization (dark grey = [s]; light grey = [θ])

Center of Gravity by Mean Intensity Interaction. The interaction indicates that the

two acoustic parameters work together in that tokens with both higher center of gravity

and higher mean intensity are more likely to be coded as [s] tokens, while tokens with

both lower center of gravity with lower mean intensity are more likely to be coded as [θ]

tokens; see Figure 5.28.

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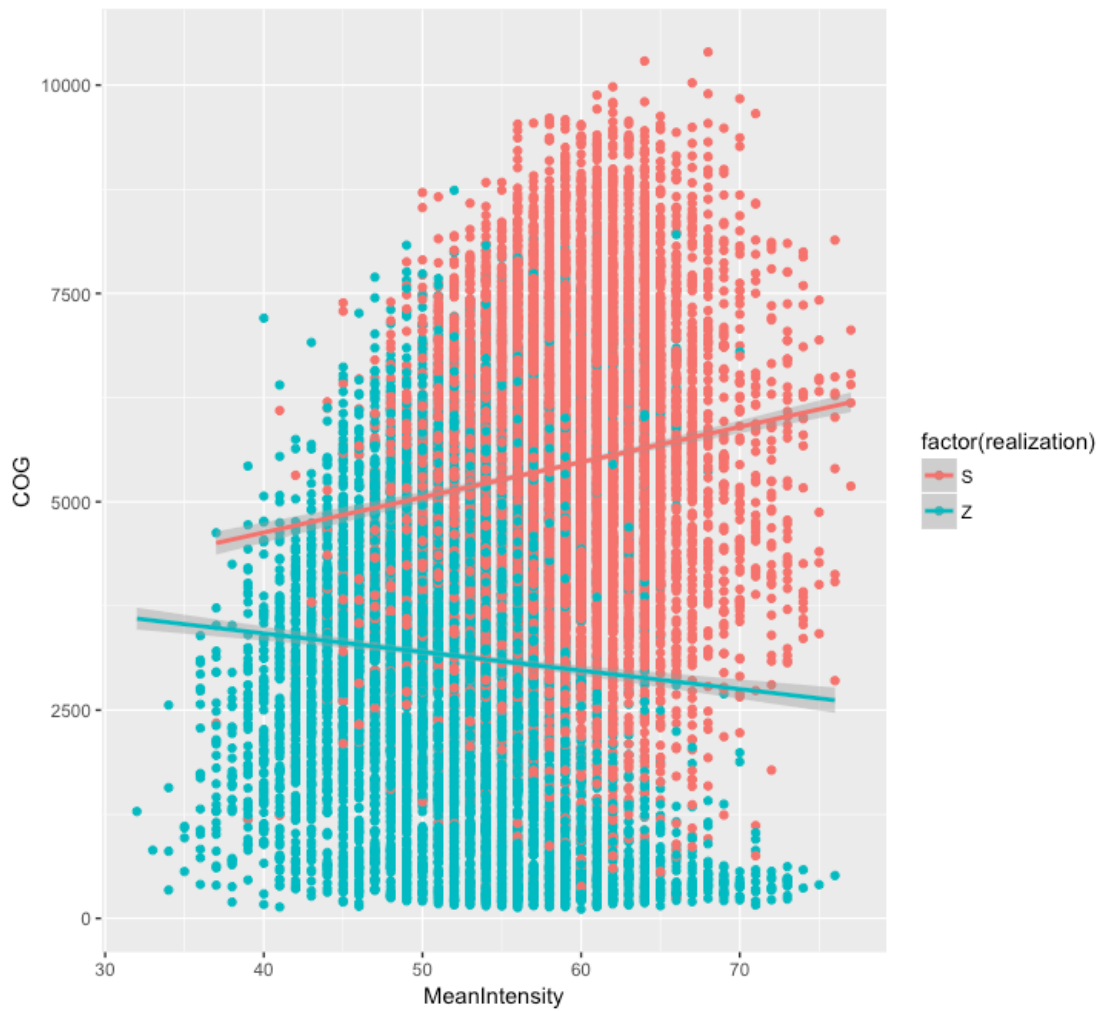
Figure 5.28: Scatterplot of Center of gravity (Hz) (y-axis) by Mean Intensity (dB) (x-axis) interaction for auditory coded binary realization (red = [s]; blue = [θ])

5.2.1 Summary of macro-level auditory analysis

The logistic mixed effects regression for auditory coded binary realizations ([s] vs. [θ]) found that for the main effects of center of gravity (Hz) (Figure 5.26) and mean intensity (dB) (Figure 5.27), as each acoustic parameter increases, the realization is more likely to be perceived as [s]. Conversely as each acoustic parameter decreases, the realization is more likely to be perceived as [θ]. The interaction of the two acoustic

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parameters (see Figure 5.28) indicates that as the center of gravity and the mean intensity increase together, the realization is more and more likely to be perceived as [s]. Conversely, as the center of gravity and the mean intensity both decrease together, the realization is more and more likely to be perceived as [θ]. These findings challenge traditional phonological approaches of categorical differences between phonemes, particularly sibilant versus non-sibilant phonemes. In neither acoustic parameter is there a particular point at which the perception from [s] to [θ] dramatically switches with an obvious phonemic boundary. Rather, these findings suggest a gradient phonetic continuum between the two phonemic realizations.

5.3 INDIVIDUAL SPEAKER ANALYSIS

5.3.1 Individual speaker t-tests

In addition to the global trends seen above in the linear and logistic regression of all the data together, it is important to also look at each individual in order to examine if there are individuals with a full merger, or perhaps those with a near-merger, as well as to analyze the number of speakers who demonstrate statistically significant differences on various dependent measures between phonemes based on the orthographic environment. Each speaker was analyzed by style (Passage reading [B], Word list [C]) for the three dependent measures of center of gravity (Hz), variance (Hz), and mean intensity (dB). A paired Welch Two Sample t-test was conducted for each dependent measure and style combination based on orthography for each individual; see Appendix H for individual

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statistical t-tests, mean scores per orthographic environment per style, as well as demerger indexes. As there were nine separate t-tests run for each individual, a Bonferroni correction was made. Specifically, the alpha of 0.05 was divided by nine to produce 0.0056. Thus, only p-vales below the adjustment alpha of 0.0056 were considered significant. Here "*" indicates a significant difference between orthographic environments for the given dependent measure (in the expected direction). All non-significant comparisons are labeled as "n.s." Additionally, the symbol "+" is used to indicate significance, but in the opposite direction as one would expect from a *distinción* speaker. This is perhaps a type of consonant *flip-flop*, in which speakers are producing a significant difference between orthographic environments, but this difference is opposite of the expected realizations. For center of gravity and mean intensity, [s] should have higher values than higher than [θ]. For variance, however, [s] should have lower values than [θ]. Finally, "---" indicates that the speaker was not able to read the longer passage due to lack of reading abilities or for not having one's reading glasses at the senior center during the interview.

As one can see from the individual summaries from Lepe (Table 5.7) and Huelva (Table 5.8), the majority of the speakers are able to produce some type of significant difference in at least one of the acoustic parameters. However, for the Passage Reading (Style B) there are to be nine speakers (L6, L9, L46, L47, L54, H4, H12, and H27) that demonstrate a full merger; a full merger in the sense that they do not show any significant difference in the individual t-tests for each of the three dependent measures. Then if we

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only consider center of gravity and mean intensity (the two most robust measures as mentioned previously) this number increase to ten speakers (with H27). For the more formal reading style, the Word list, there are five speakers that appear to demonstrate a full merger for all three dependent measures (L3, L23, L54[63], H32, H54). Then if we only consider center of gravity and mean intensity, the number of speakers that appear to demonstrate a full merger increases to ten (with L25, L46, L47, H12, H59).

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[63] L54 was unable to read the Passage Reading.

Table 5.7: Lepe table of individual speaker paired t-tests between orthographic <s> vs. <z> for dependent measures (Center of gravity, Variance, Mean intensity) by Style (Passage Reading, Word list)

Speaker	Passage Reading (B)			Word List (C)		
	Center of gravity	Variance	Mean intensity	Center of gravity	Variance	Mean intensity
L1.M.T46	*	*	*	*	*	*
L2.M.A23	*	*	*	*	*	*
L3.M.J62	*	n.s.	*	n.s.	n.s.	n.s.
L4.H.M58	+	*	*	+	*	*
L5.H.A31	*	n.s.	n.s.	*	*	*
L6.H.J24	n.s.	n.s.	n.s.	*	*	*
L7.H.D20	*	*	n.s.	*	*	*
L8.M.P58	*	*	*	*	*	*
L9.M.B51	n.s.	n.s.	n.s.	*	*	*
L10.M.MV42	*	*	*	*	*	*
L11.H.J18	n.s.	*	*	*	*	*
L13.H.A67	*	*	*	*	n.s.	*
L14.M.M31	*	*	*	*	*	*
L15.M.M27	*	*	*	*	*	*
L16.M.P26	*	*	*	*	*	*
L17.H.J39	*	*	*	*	*	*
L18.M.C49	*	*	*	n.s.	*	*
L19.M.R54	*	*	*	*	*	*
L20.H.R30	+	*	*	n.s.	*	*
L21.M.E47	*	*	*	*	*	*
L22.H.L34	*	*	*	*	n.s.	n.s.
L23.H.J27	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
L24.M.A26	*	*	*	*	*	*
L25.H.J31	*	*	n.s.	n.s.	*	n.s.
L26.H.A25	n.s.	*	*	n.s.	*	*
L27.H.J43	*	+	n.s.	*	*	*
L28.H.A21	*	*	*	n.s.	*	*
L29.H.M65	n.s.	*	*	n.s.	*	*
L30.H.F67	---	---	---	*	*	*
L31.H.M69	*	+	+	*	+	+
L32.H.JM61	n.s.	*	*	n.s.	*	*
L35.M.I28	*	+	*	*	+	*
L38.M.P52	*	n.s.	*	*	*	*
L39.H.JM48	*	*	*	*	*	*
L44.H.JR48	*	*	*	*	n.s.	*
L46.M.M68	n.s.	n.s.	n.s.	n.s.	*	n.s.
L47.M.M87	n.s.	n.s.	n.s.	n.s.	*	n.s.
L48.M.P78	*	n.s.	n.s.	*	*	*
L54.M.B73	---	---	---	n.s.	n.s.	n.s.
L56.M.D26	*	+	n.s.	*	n.s.	*

Note: * = significant difference (in expected direction); n.s. = not significant; + = significant difference (in opposite direction; i.e. a *flip-flop*)

Table 5.8: Huelva table of individual speaker paired t-tests between orthographic <s> vs. <z> for dependent measures (Center of gravity, Variance, Mean intensity) by Style (Passage Reading, Word list)

Speaker	Passage Reading (B)			Word List (C)		
	Center of gravity	Variance	Mean intensity	Center of gravity	Variance	Mean intensity
H1.M.E37	*	*	*	*	*	*
H3.H.J19	*	*	*	n.s.	*	*
H4.H.J51	n.s.	n.s.	n.s.	*	n.s.	*
H5.M.C25	*	n.s.	*	*	*	*
H7.M.A51	*	*	*	*	*	*
H8.H.JA57	*	*	*	*	*	*
H9.M.A29	*	*	*	*	*	*
H11.H.J50	+	*	*	n.s.	*	*
H12.H.JJ63	n.s.	n.s.	n.s.	n.s.	*	n.s.
H13.H.F34	*	*	*	n.s.	*	*
H14.H.JA38	*	*	*	n.s.	*	*
H16.H.J25	*	*	*	*	*	*
H17.H.H28	*	*	*	*	*	*
H18.H.L34	*	*	*	*	*	*
H20.M.A30	*	*	*	*	n.s.	*
H21.M.E38	*	*	*	*	*	*
H23.M.E23	*	*	*	*	*	*
H25.M.R19	*	n.s.	*	*	n.s.	*
H26.M.M19	*	*	*	*	*	*
H27.H.J44	n.s.	*	n.s.	*	*	*
H28.M.T65	*	*	*	*	*	*
H29.H.E23	+	*	*	n.s.	*	*
H31.H.M44	+	*	*	+	*	*
H32.H.JM62	*	n.s.	n.s.	n.s.	n.s.	n.s.
H33.M.T34	*	*	*	*	*	*
H34.H.F47	*	*	*	*	*	*
H36.M.R70	*	*	*	n.s.	*	*
H37.H.P47	*	*	*	n.s.	*	*
H38.M.E52	*	*	*	*	*	*
H44.H.A19	*	n.s.	*	*	*	*
H46.M.M69	*	*	*	*	n.s.	*
H48.H.J54	+	*	*	+	*	*
H49.M.E47	*	+	*	+	*	*
H53.M.D27	*	n.s.	*	*	*	*
H54.H.P69	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
H55.M.C48	*	*	*	*	*	*
H57.M.M49	*	+	*	*	+	*
H58.M.P60	*	*	*	*	n.s.	*
H59.M.M62	n.s.	n.s.	n.s.	n.s.	*	n.s.
H62.H.LR69	n.s.	*	*	*	*	*

Note: * = significant difference (in expected direction); n.s. = not significant; + = significant difference (in opposite direction; i.e. a *flip-flop*)

It is important to remember that these are formal reading tasks, so we would expect that even speakers who may typically produce a merger in conversation might be able to produce some type of small, but significant, difference in reading (particularly in the word lists where they were presented with several minimal pairs). There were a few older participants who were not included in this part of the study (the formal reading tasks) as they were not able to read. Preliminary analysis indicates that they are *ceceante* speakers. While most speakers did in fact demonstrate a significant difference between orthographic environments for one or more acoustic parameters, we will now look at the extent to which each speaker is separating these features. However, in spite of the formality of the task with the confound of orthography in these formal reading tasks, several speakers demonstrate what appears to be a fully merger across several acoustic parameters. The presence of speakers without any significant differences through several acoustic measures suggests that there was at one time, a full merger throughout the community.

5.3.2 Demerger Index

A follow up linear regression was run using a "demerger index." The purpose of creating a demerger index, was three-fold: (i) to normalize the data; (ii) to demonstrate the scale of demerger as individual analysis of speakers only reveal whether or not differences were significant (thus, provide a more quantitative and visual analysis of the

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degree of separation between orthographic environments for each dependent measure);

and (iii) to be able to better investigate the main effects and interactions of the extra-

linguistic factors of gender, age, education, occupation, mobility and origin as fixed

factors as this was more difficult with the inclusion of orthography in the linear

regressions of the raw data. The demerger index was calculated by subtracting each

individual's means from each orthographic environment per style taken from the paired

Welch Two Sample t-tests (Style B = $\mu_{<s>}$ - $\mu_{<z>}$; Style C = $\mu_{<s>}$ - $\mu_{<z>}$; Style B&C = $\mu_{<s>}$ -

$\mu_{<z>}$). The t-tests analyzed orthographic environment at each style (B, C, and B&C

together). For each style, the mean dependent measure score of <z,ci,ce> was subtracted

from the mean dependent measure score of <s>; see Appendix H for the various mean

values and the t-tests for each speaker. Demerger index scores should be interpreted as

follows: larger index numbers suggest a larger separation in phonemes based on the given

acoustic cue, while scores closer to zero indicate either a merger or a near-merger. For

example, speaker L2 has a center of gravity demerger index of 3,728.28 meaning that her

mean <s> realization is 3,728Hz higher than her mean <z,ci,ce> realization. On the other

hand, speaker L6 has a center of gravity demerger index of 209.28 meaning that her mean

<s> realization is only 209.28Hz higher than her mean <z,ci,ce> realization. The

demerger index simplifies the picture a bit as there are only eighty data points (one point

for each speaker), but also helps normalize the data and allows for a richer view of extra-

linguistic factor interactions, which were more difficult to conduct in the large-scale

linear regressions with the inclusion of orthography. Each speaker has only one score for

each dependent measure per style. Thus, all means were calculated over all the linguistic factor environments. Models were originally run separating demerger indexes based on style, but it was found that the best explanation of variation was the inclusion of both Style B the Passage reading (Style B) and the Word lists (Style C) together. Thus, the demerger indexes below represent both styles combined. After running several models, it was deemed that the Center of Gravity Demerger Index and the Mean Intensity Demerger Index produced better models of the variation. This section reviews the findings from these analyses.

5.3.2.1 Center of gravity demerger index: Linear regression

In order to investigate the main effects of the extra-linguistic factors on the Center of Gravity Demerger Index, a linear model was run with gender, age, education, occupation, mobility and origin as fixed factors with a gender by age interaction. The linear regression model produced significant main effects for gender, age, as well as the gender by age interaction; see Table 5.9.

Table 5.9: Summary of the linear regression model, with Center of Gravity Demerger
Index as the dependent measure; Intercept = female, Primary education,
Manual occupation, origin of Huelva; total n = 80.

Predictor	Estimate	Std. Error	t-value	p-vale
(Intercept)	5077.82	890.28	5.70	**<.0001**
Gender	-4531.35	894.02	-5.07	**<.0001**
Age	-60.70	14.24	-4.26	**<.0001**
Education				
Secondary	692.95	535.53	1.29	0.200
University	657.53	775.66	0.85	0.400
Occupation				
Professional	-172.15	697.54	-0.25	0.806
Service	449.77	489.77	0.92	0.362
Mobility	5.75	50.59	0.11	0.910
Origin	-35.903	318.20	-0.11	0.911
Age*Gender	54.62	18.89	2.89	**<.01**

Gender. There was a significant main effect for Gender. Women have a

significantly higher center of gravity demerger index (M = 2,966.68, SE = 230.20) than

men (M = 819.98, SE = 214.99). This indicates that women produce a significantly larger

separation in center of gravity between the two orthographic environments as compared

to men; see Figure 5.29. Remember, the mean demerger index of 2,966 indicates that as a

group, the women are separating these phonemes (based on orthography) by nearly

3,000Hz while the men as a group are only separating the phonemes by 820Hz.

Main effect of Gender on COG Demerger Index
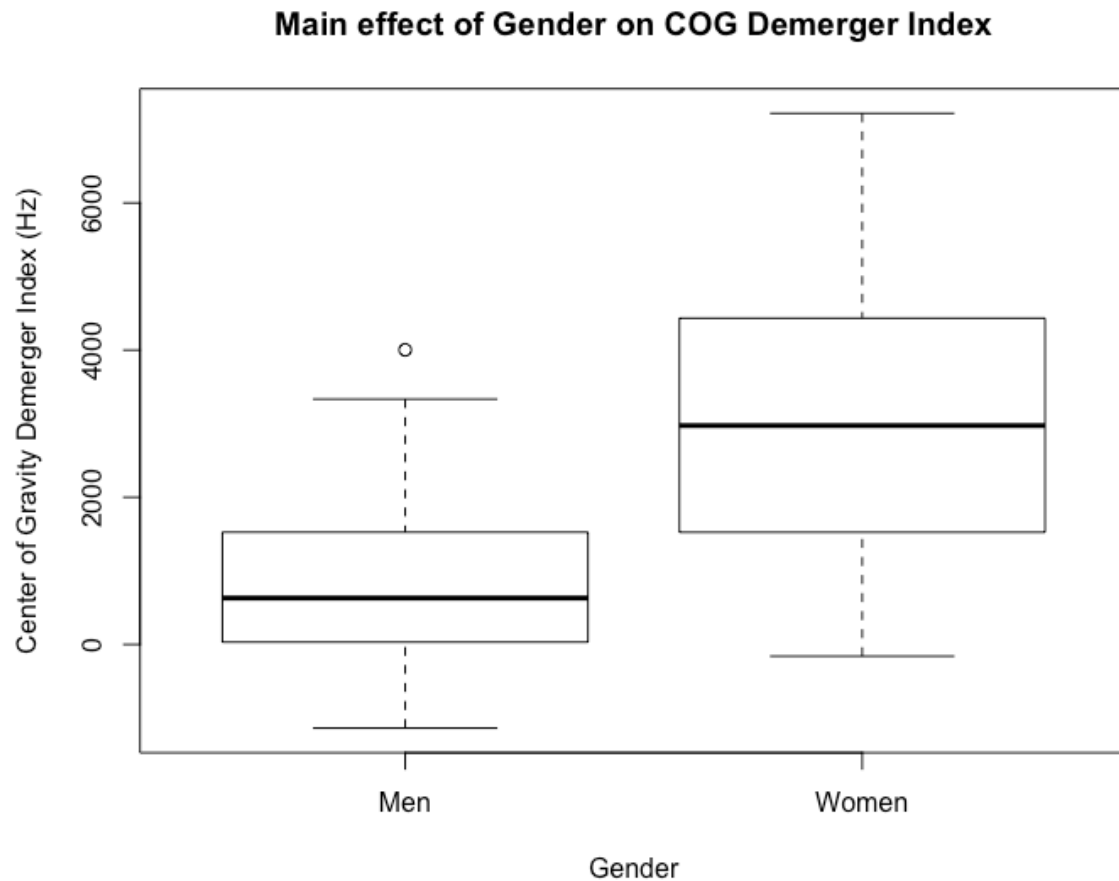
Figure 5.29: Boxplot of main effect of Gender (Men, Women) for Center of gravity
demerger index (zero indicates merger; higher scores indicate a great
demerger of phonemes)

Age. There was a significant main effect for age. With each increase in year, there

is a 34.34Hz decrease in center of gravity demerger index. This indicates that with each

additional year in age, there is less and less separation in center of gravity between the

two orthographic environments. Thus, with each decrease in year, there is an increase in

the center of gravity demerger index; see Figure 5.30.

Main effect of Age on COG Demerger Index
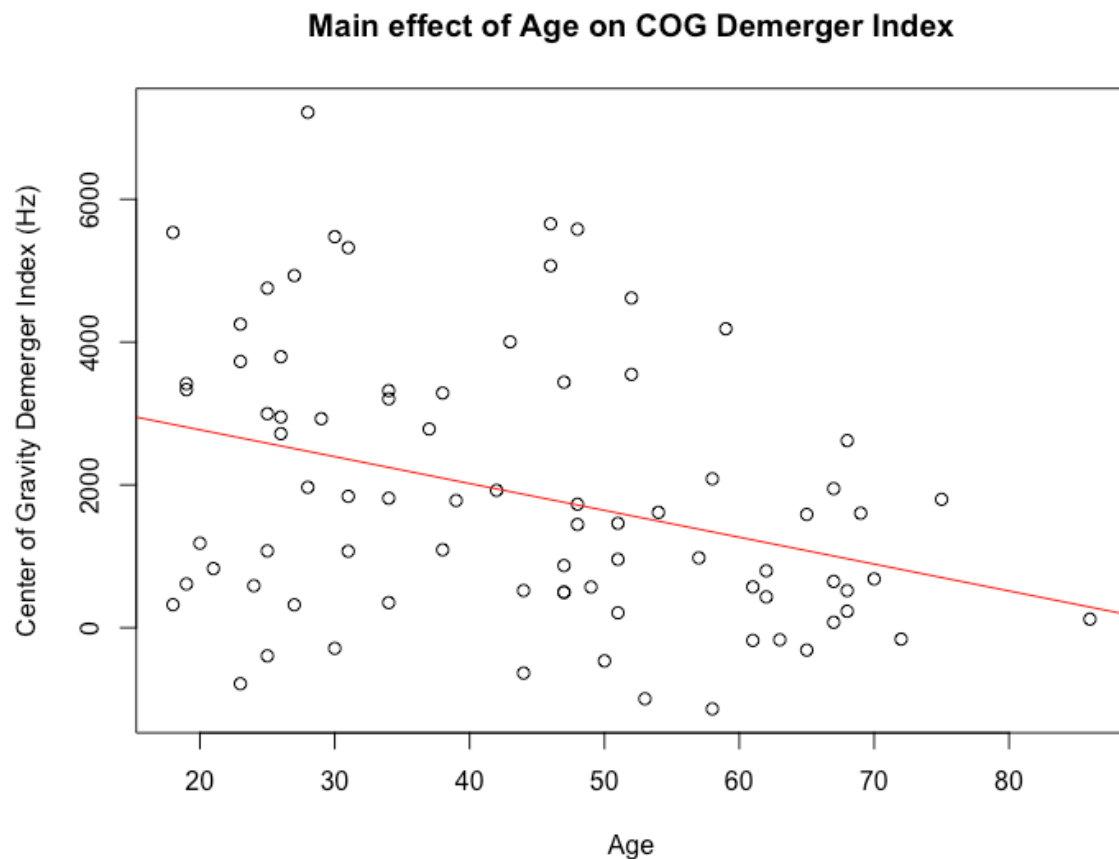
Figure 5.30: Scatterplot of main effect of Age (18-87) for Center of gravity demerger index (zero indicates merger; higher scores indicate a great demerger of phonemes)

Age by Gender Interaction. There was a significant Age by Gender interaction.

For each increase in year for men, there is a 6.08Hz decrease in center of gravity

demerger index. For each increase in year for women, there is a 60.7Hz decrease in

center of gravity demerger index. In other words, from the opposite direction, with each

decrease in year (from the oldest speakers), men increase the center of gravity demerger

index by 6.08Hz while women increase by 60.7Hz. This interaction indicates that

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although both men and women are separating the phonemes by center of gravity more

each year, that this is significantly stronger for women than for men; see Figure 5.31.
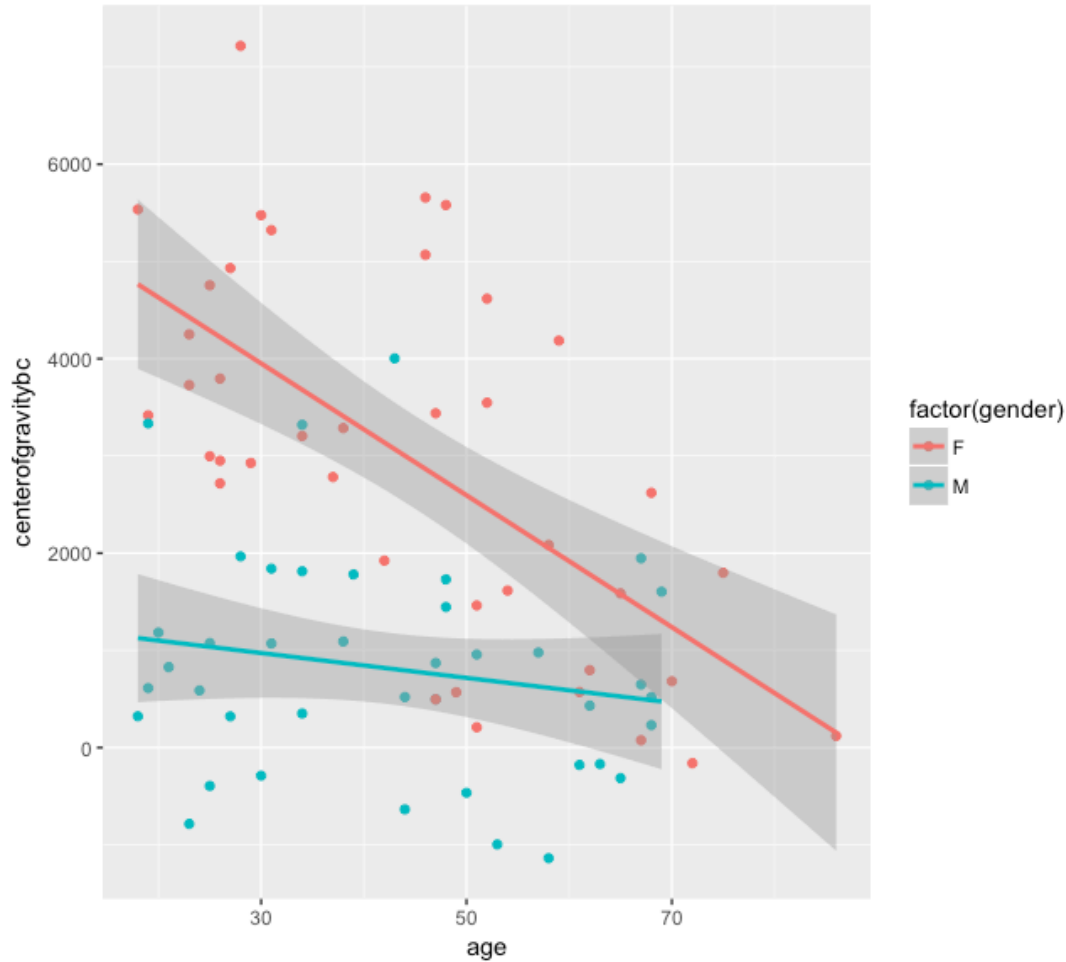
Figure 5.31: Scatterplot of Age (18-87) by Gender (red = Women; blue = Men)
interaction for Center of gravity demerger index (zero indicates merger;
higher scores indicate a great demerger of phonemes)

5.3.2.1.1 Summary of center of gravity demerger index analysis

The linear regression model of the center of gravity demerger index found that the

speaker with the largest score (that is, with the largest difference in center of gravity

between orthographic environments) was female and a younger speaker. Conversely, the

speaker with the lowest center of gravity demerger index is male and an older speaker. Additionally, an interaction between Gender and Age found that women have a much larger demerger score then men as age decreases. That is, while both men and women have larger demerger scores with each year less in age, but the women's score rises at a much higher rate than the men's. This suggests that the separation of phonemes is happening among all young speakers, but that women are leading the change in separating the phonemes to a larger degree than the men.

5.3.2.2 Mean intensity demerger index: Linear regression

In order to investigate the main effects of the extra-linguistic factors on the Mean Intensity Demerger Index, a linear regression model was run with gender, age, education, occupation, mobility and origin as fixed factors. Originally a Age by Gender interaction was also included, but as it was not significant it was taken out of the model. The linear regression model produced significant main effects for gender, age, occupation, and origin; see Table 5.10.

Table 5.10: Summary of the linear regression model, with Mean Intensity Demerger Index as the dependent measure; Intercept = female, Primary education, Manual occupation, origin of Huelva; total $n = 80$.

Predictor	Estimate	Std. Error	t-value	p-value
(Intercept)	7.13	1.61	4.41	**<.0001**
Gender	-2.59	0.66	-3.94	**<.0001**
Age	-0.05	0.02	-2.00	**<.05**
Education				
Secondary	1.85	1.14	1.62	0.109
University	1.25	1.63	0.76	0.447
Occupation				
Professional	2.93	1.42	2.05	**<.05**
Service	0.697	1.03	0.68	0.501
Mobility	0.002	0.11	0.02	0.98
Origin	-2.20	0.67	-3.27	**<.01**

Gender. There was a significant main effect for gender. Women have a significantly higher mean intensity demerger index ($M = 6.25$, $SE = 0.48$) than men ($M = 3.66$, $SE = 0.46$). This indicates that women produce a significantly larger separation in mean intensity between the two orthographic environments than men. As a group, women produce these phonemes (based on orthography) with a difference of 6.25dB, while men as group only produce 3.66dB difference between phonemes; see Figure 5.32.

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Main effect of Gender on Mean Intensity Demerger Index
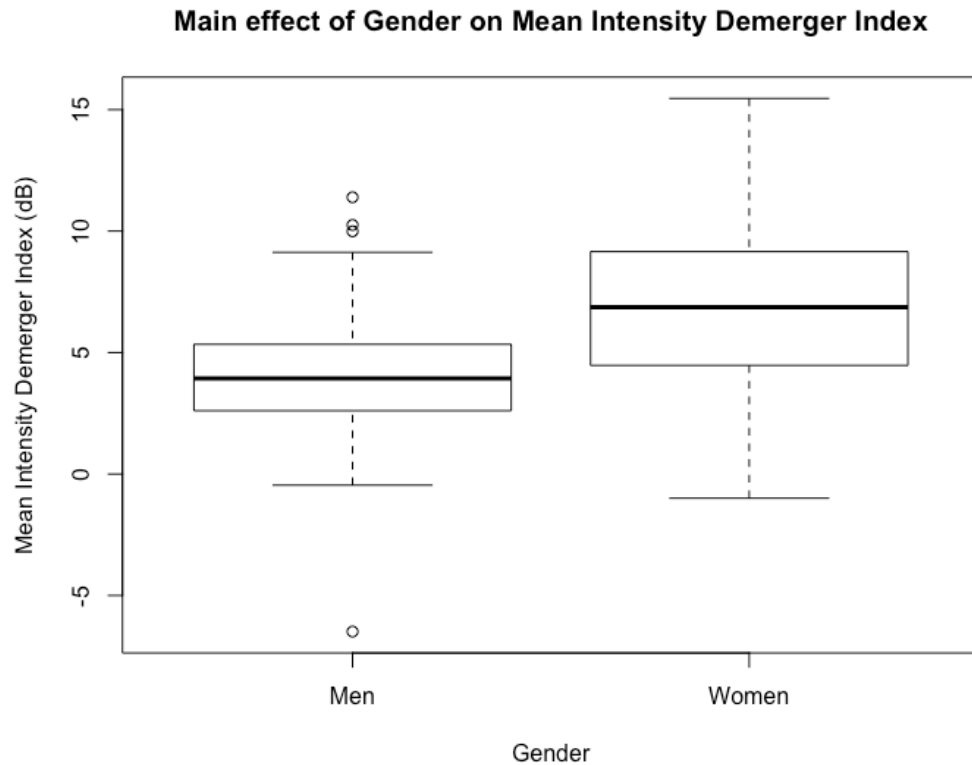
Figure 5.32: Boxplot of main effect of Gender (Men, Women) on Mean intensity demerger index (zero indicates full merger; higher scores indicate a great demerger of phonemes)

Age. There was a significant main effect for age. With each increase in year, there is a 0.05dB decrease in mean intensity demerger index. This indicates that with each year, there is less and less separation in mean intensity between the two orthographic environments; see Figure 5.33.

Main effect of Age on Mean Intensity Demerger Index
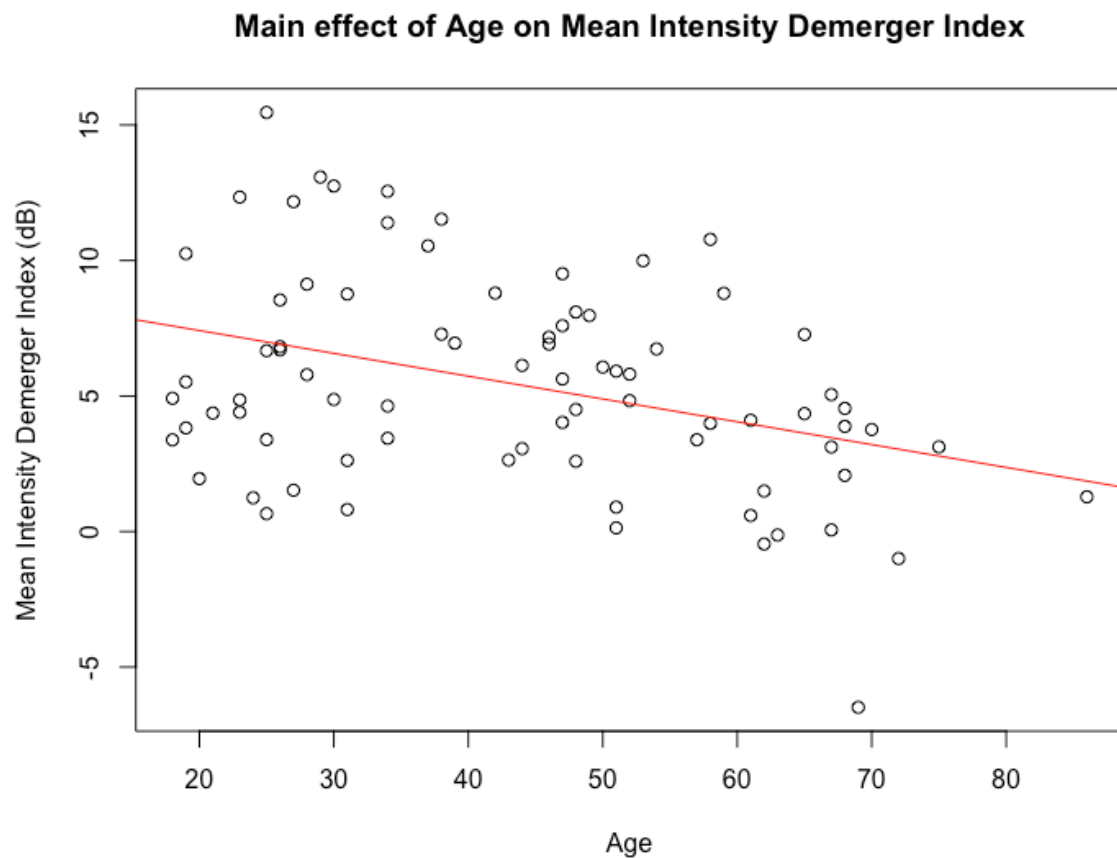
Figure 5.33: Scatterplot of main effect of Age (18-87) for Mean intensity demerger index (zero indicates merger; higher scores indicate a great demerger of phonemes)

Occupation. There was a significant main effect for occupation. Those with professional occupations (*M* = 6.67, *SE* = 0.78) have a significantly higher demerger index for mean intensity than those with manual occupations (*M* = 3.74, *SE* = 0.87). Those with Service occupations (*M* = 4.44, *SE* = 0.66) were not significantly different than either group; see Figure 5.34.
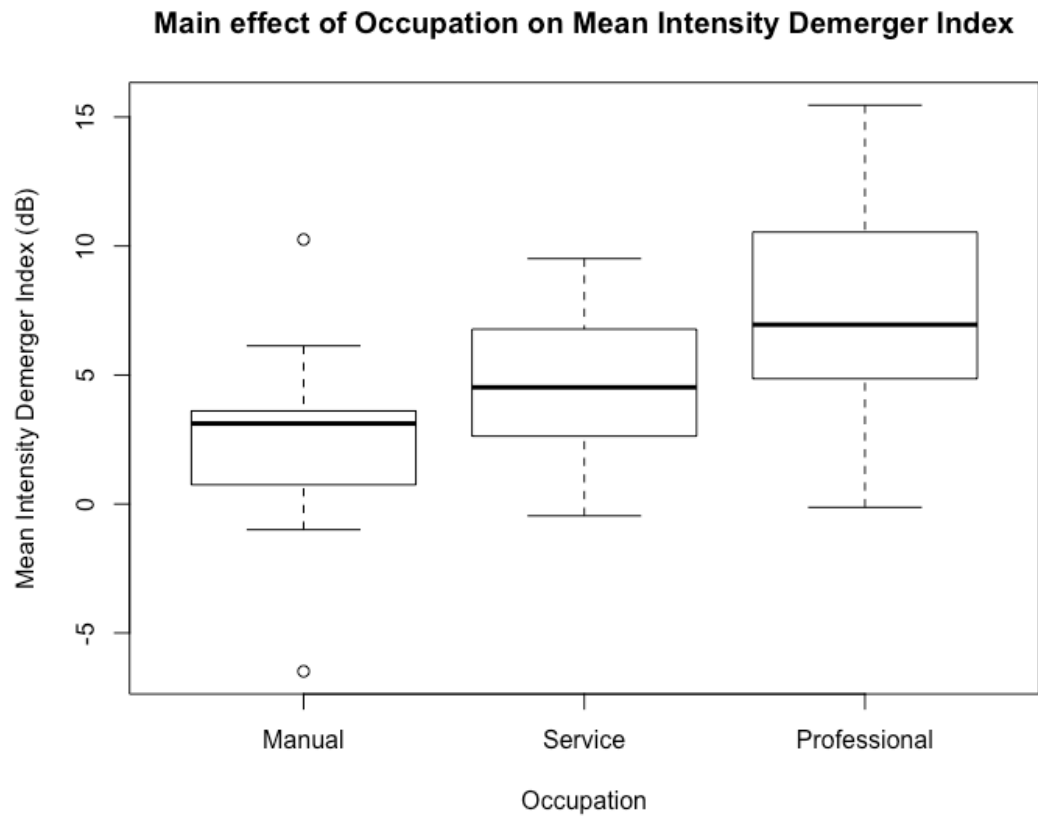
Figure 5.34: Boxplot of main effect of Occupation (Manual, Service, Professional) for
Mean intensity demerger index (zero indicates merger; higher scores
indicate a great demerger of phonemes)

Origin. There was a significant main effect for origin. Those of Huelva ($M = 6.05$,

$SE = 0.49$) have a significantly higher demerger index for mean intensity than those of

Lepe ($M = 3.85$, $SE = 0.46$); see Figure 5.35.

Main effect of Origin on Mean Intensity Demerger Index
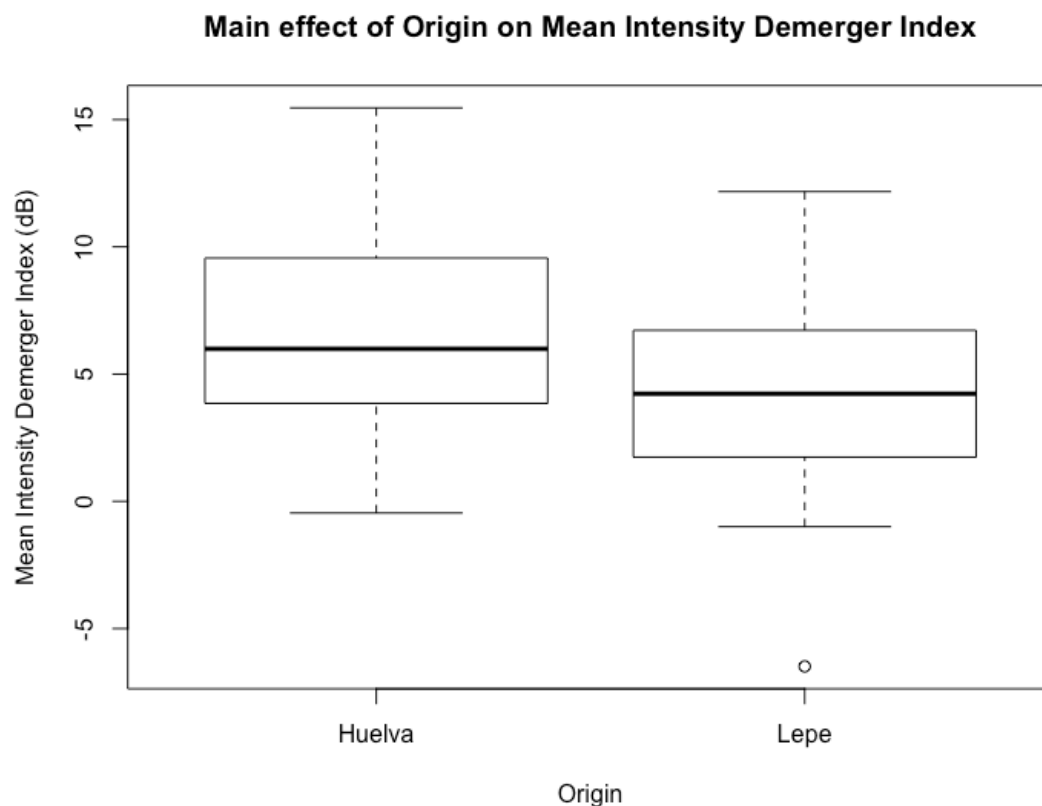
Figure 5.35: Boxplot of main effect of Origin (Huelva, Lepe) for Mean intensity demerger index (zero indicates merger; higher scores indicate a great demerger of phonemes)

5.3.2.2.1 Summary of mean intensity demerger index analysis

The linear regression model of the mean intensity demerger index found that the speaker with the largest demerger index (that is, the largest separation of phonemes for mean intensity) is female, younger, works a Professional occupation, and is from Huelva. Conversely, the speaker with the lowest demerger (closer to merger) is male, older, works a Manual occupation, and is from Lepe. The main effects of Gender and Age support much of the previous cited segmental studies. The main effect of Origin directly supports Lasarte Cervantes' (2010) mean intensity findings. Finally, it appears that speakers who

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have Professional occupations have the largest mean intensity demerger index, suggesting that their phonemes are significantly different in mean intensity in line with standard Castilian *distinción*. This indicates an adherence to the pressures of the linguistic market.

5.3.3 Demerger index correlation

A Pearson product-moment correlation coefficient was computed to assess the relationship between the intensity demerger index and the center of gravity demerger index. The two variables are strongly correlated, $r(78) = 0.46, p < .001$. A scatterplot summarizes the results; see Figure 5.36. For a reference point, the absolute point of demerger is 0,0. Overall there was a strong correlation between mean intensity demerger index and center of gravity demerger index. Increase in the center of gravity demerger index increases are correlated with increases in the mean intensity demerger index.

COG Demerger Index by Mean Intensity Demerger Index Correlation
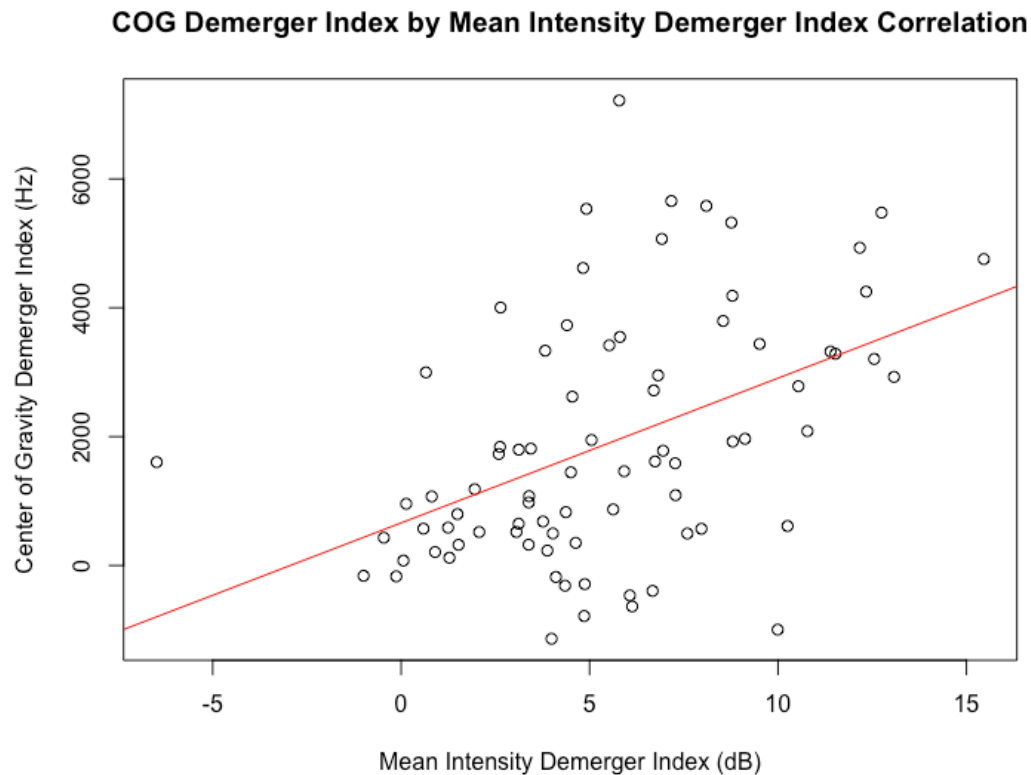
Figure 5.36: Scatterplot of correlation between Center of Gravity Demerger Index (Hz) and Mean Intensity Demerger Index (dB) (for both demerger indexes: zero indicates merger; higher scores indicate a great demerger of phonemes)

5.3.3.1 Summary of demerger index correlation

The Pearson product-correlation coefficient found a strong correlation between the mean intensity demerger index and the center of gravity demerger index. For the entire speech community, this suggests that these two dependent measures do not behave independently. That is, an increase in the center of gravity demerger index results in an increase in the mean intensity demerger index. Conversely, a decrease in the center of gravity demerger index results in a decrease in the mean intensity demerger index. It appears both of these cues work together supporting the auditory results of §5.2.

However, while this indicates communal trends, individuals are still able to use one acoustic parameter to distinguish phonemes while perhaps not utilizing the other acoustic parameter. As one observes in Figure 5.36, there are a great deal of speakers around zero to five on the mean intensity demerger index (meaning a difference of 0 to 5dB between the two orthographic environments) that are well below the correlation line and have a center of gravity demerger index score of zero or slightly under or over zero. This indicates that speakers with a merger may utilize mean intensity as an acoustic parameter to separate phonemes without any change in center of gravity. Perhaps this is a more attainable parameter to acquire as an adult than center of gravity. This would support the findings from Lasarte Cervantes (2010) in which two rural speakers used intensity to produce a subtle difference between phonemes, but not center of gravity. However, as one can see, there are also a few speakers with a mean intensity demerger index of zero, but do have a center of gravity demerger index greater than zero. Therefore, while on a communal-scale an increase in mean intensity demerger index correlates with an increase in center of gravity intensity demerger index, there are also individuals who have a score of close to zero in both demerger indexes or a score of closer to zero in only one demerger index, demonstrating the various stages of demerger present in the communities.

5.4 FAMILY CASE STUDIES

Thus far we have examined this phenomenon from a macro-level perspective in terms of the linear and logistic regressions. For a more qualitative perspective, here we will look at specific families to see how these phonetic changes are occurring at the micro-level, that of the nuclear family. Only the Passage Reading (Style) is examined

here as many of these speakers demonstrate a significant main effect of style. While both

tasks are relatively formal, the Passage Reading elicits less attention on the speaker to

their speech, hence representing a closer realization to their underlying phonological

representation (this of course is not a substitute for spontaneous speech). We will first

look at three families in Lepe by the three sectors of employment: manual, service, and

professional. The manual occupations represent the more traditional Lepe, while service

and professional oriented occupations represent a newer Lepe.

5.4.1 Manual occupation family (Lepe)

The manual occupation family is comprised primarily of field workers. L6, a 24

year-old male, works in the fields around Lepe and the surrounding area in harvesting

different fruits. His maximum education is primary. He recently married and has since

moved in with his wife just a few blocks away. He frequents the home[64] of his parents

(and younger siblings) daily. L7, a 20 year-old male (brother to L6), still lives at home.

He is the one member of his family who has decided to pursue a different career path and

is currently self-employed in stitchery making different garments for local *romerías*

'religious pilgrimages/festivals'. His maximum education is secondary. L9, a 51-year-old

woman, is their mother. She also works in the fields around Lepe and the surrounding

area. Her maximum education is primary. None of them have ever lived outside of Lepe.

Additionally, the father (L12) was also interviewed, who also works in the fields

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[64] As he has moved out of his parent's house, he has been exposed to speech in his new home from his wife
that may or may not differ from his parents. He has been grouped with his original nuclear family as his
family works primarily as field workers in agriculture. Thus, this represents a traditional employment in
Lepe. In this sense his nuclear family represents his occupation.

harvesting agriculture. However, the father was not included in the overall analysis as he demonstrated another traditional dialectal feature of *heheo*, that is, another type of merger, in which orthographic <s> and <z,ci,ce> (including syllable onset) are aspirated (this is also known as sibilant backing; see chapter 2). Here we will analyze the dependent measures of center of gravity and mean intensity by orthography for each speaker.

Center of gravity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography*speaker)[65] revealed a significant main effect for orthography $[F(1,421) = 14.48, p < .001]$, a significant main effect for speaker $[F(2,421) = 53.69, p < .001]$, and a significant interaction for orthography*speaker $[F(2,421) = 10.32, p < .001]$; see Figure 5.37. A *Tukey Post hoc* indicates that for L6, there was no significant difference between <s> and <z> ($p = 0.997$); for L9, there was no significant difference between <s> and <z> ($p = 0.999$); and finally, for L7, <s> had significantly higher center of gravity than and <z> ($p <. 001$). For orthographic <s>, L7 had significantly higher center of gravity than L9 ($p <. 001$) and L6 ($p <. 001$). For orthographic <z>, there was no significant difference between L7 and L9 ($p = 0.551$); and L6 had significantly lower center of gravity than L7 ($p <. 01$) and L9 ($p <. 001$). Thus, L6 and L9, who both work traditional agricultural manual occupations, do not demonstrate a difference in center of gravity between orthographic environments.

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[65] While the F-values of each main effect are presented, only the interactions will be covered in detail.
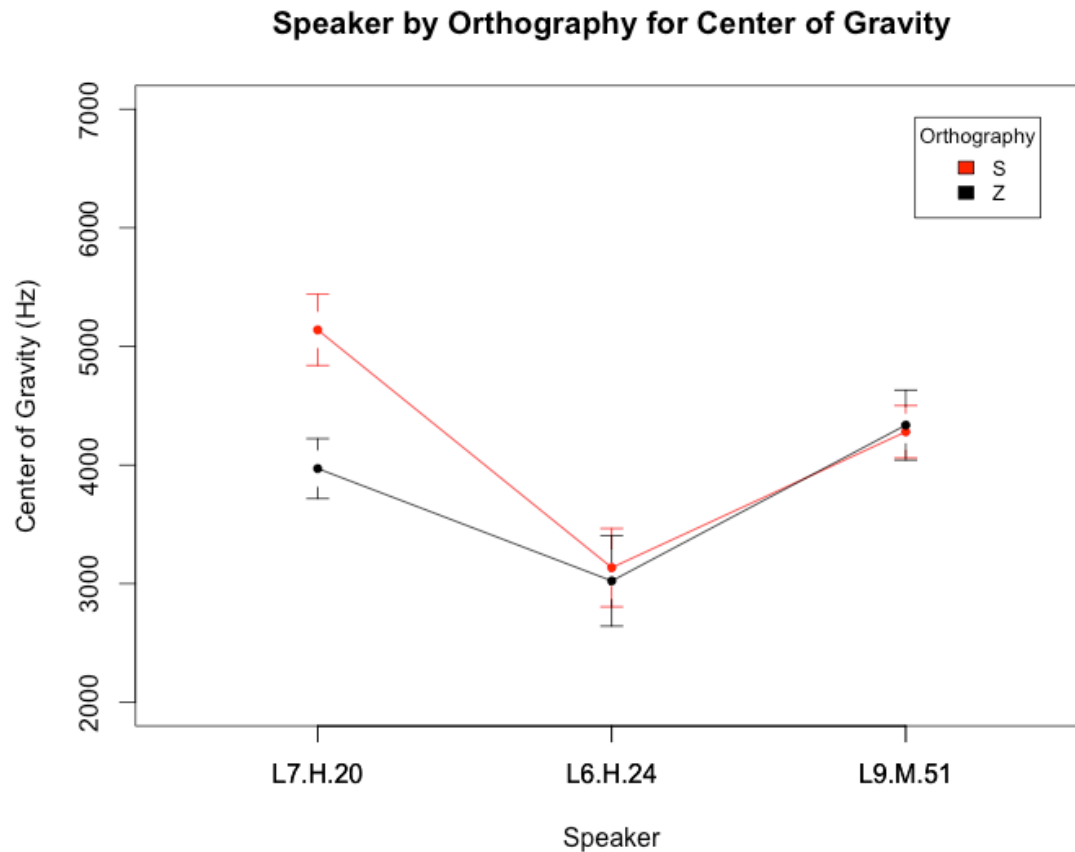
Figure 5.37: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L7 = younger son; L6 = older son; L9 = mother) interaction for center of gravity (Hz) of the manual occupation family of Lepe

Mean intensity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed no significant main effect for orthography [$F(1,421) = 2.14$, $p = 0.144$], a significant main effect for speaker ([$F(1,421) = 173.45$, $p < .001$]), and no significant interaction for orthography*speaker [$F(2,421) = 1.55$, $p = 0.213$]; see Figure 5.38. A *Tukey Post hoc* for speaker indicate that L9 had significantly lower mean intensity than her two sons, L7 and L6 ($p < .001$). The lack of interaction

indicates that all three speakers do not demonstrate any difference in mean intensity

between orthographic environments.

Speaker by Orthography for Mean Intensity
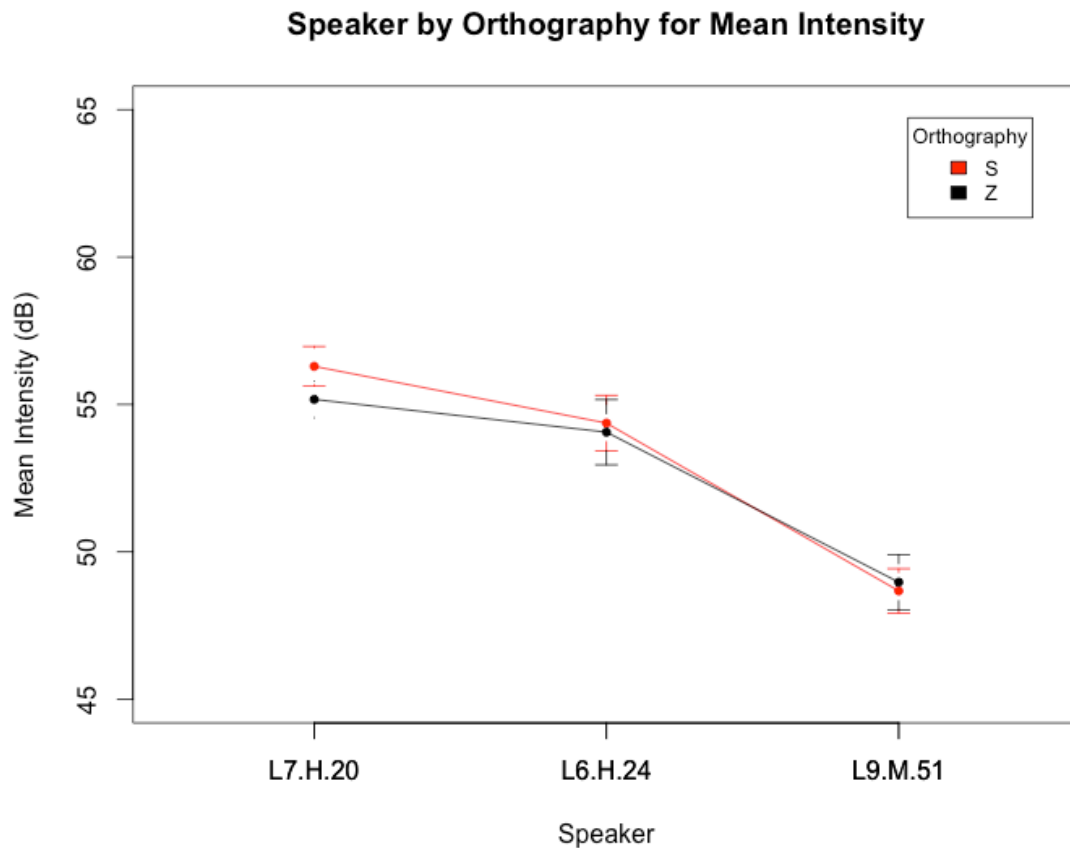
Figure 5.38: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L7 = younger son; L6 = older son; L9 = mother) interaction for mean intensity (dB) of the manual occupation family of Lepe

5.4.2 Service occupation family (Lepe)

The service occupation family is comprised of bakers who own a family-owned

bakery in Lepe. Similar to the women in the Milroys' studies in Belfast (1985a, 1992),

these two women interact with the public in selling the baked goods. Once the bakery

opens to the public, they are not back in the kitchen baking, but rather interacting with the

clients in service encounters; they are the face of the bakery. L2, a 23 year-old woman, works in the bakery and has a secondary education. L2 lives with her husband (L6), a few blocks away from her nuclear family. She visits her nuclear family daily as she works in her family's business. Her mother, L3, a 62 year-old woman, also works in the bakery and has a primary education. Neither the mother nor the daughter has ever lived outside of Lepe.

Center of gravity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed a significant main effect of orthography [$F(1,325) = 276.32$, $p < .001$], a significant main effect of speaker [$F(1,325) = 141.54$, $p < .001$], and a significant interaction for orthography*speaker [$F(1,325) = 67.94$, $p < .001$]; see Figure 5.39. A *Tukey Post hoc* indicate that for L2, <s> had a significantly higher center of gravity than <z> ($p < .001$); and that for L3, <s> also had a significantly higher center of gravity than <z> ($p < .001$). For orthographic <s>, L2 had a significantly higher center of gravity than L3 ($p < .001$). For orthographic <z>, there was no significant difference in center of gravity between L2 and L3 ($p = 0.432$). While both L2 and L3 demonstrate significant differences in center of gravity between orthographic environments, the interaction indicates that the daughter has a significantly larger difference in center of gravity between orthographic environments than her mother. Thus, while her mother demonstrates a slight difference between orthographic environments, the daughter has demerged these phonemes even further.
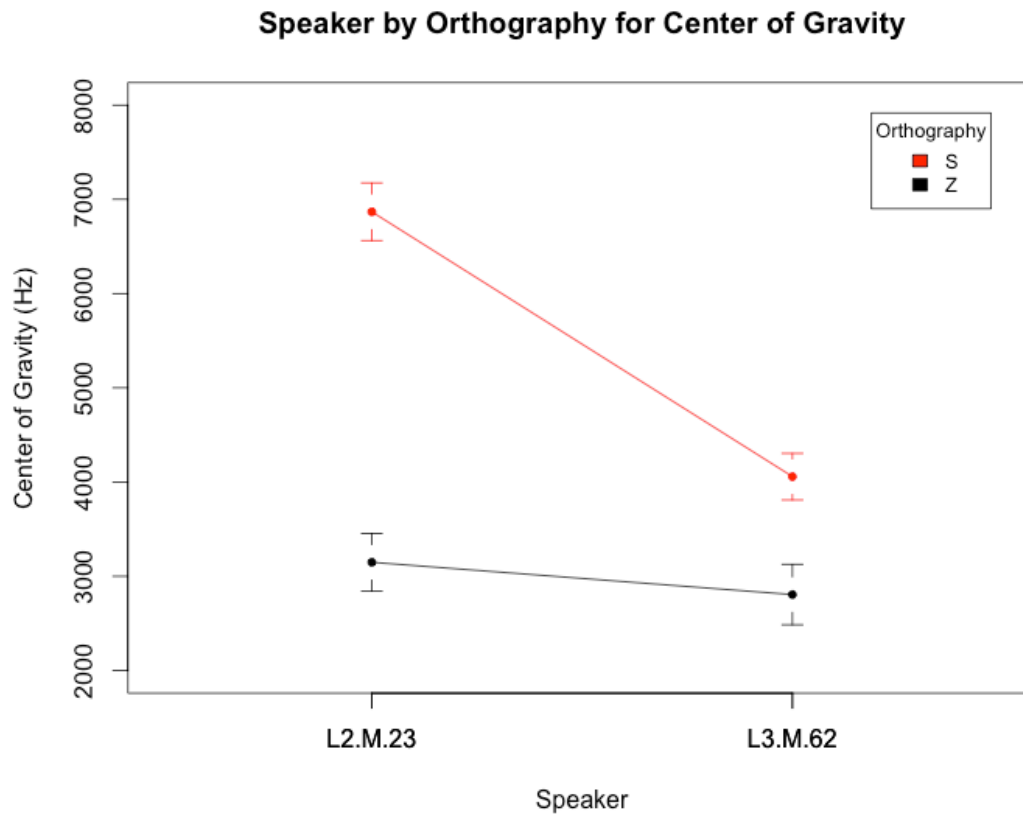
Figure 5.39: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L2 = daughter; L3 = mother) interaction for center of gravity (Hz) of the service occupation family of Lepe

Mean intensity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed a significant main effect of orthography [$F(1,325) = 59.66$, $p < .001$], a significant main effect of speaker [$F(1,325) = 520.58$, $p < .001$], and a significant interaction for orthography*speaker [$F(1,325) = 6.18$, $p < .05$]; see Figure 5.40. A *Tukey Post hoc* indicate that for L2, <s> had a significant higher mean intensity than <z> ($p < .001$); and for L3, <s> also had a significant higher mean intensity than <z> ($p < .001$). For orthographic <s>, L2 had a significantly higher mean

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intensity than L3 ($p < .001$). For orthographic <z>, L2 had a significantly higher mean intensity than L3 ($p < .001$). While both L2 and L3 demonstrate significant differences in mean intensity between orthographic environments, the interaction indicates that the daughter has a larger difference in mean intensity between orthographic environments than her mother; consequently the daughter demonstrates an increase in the demerger in the younger generation.
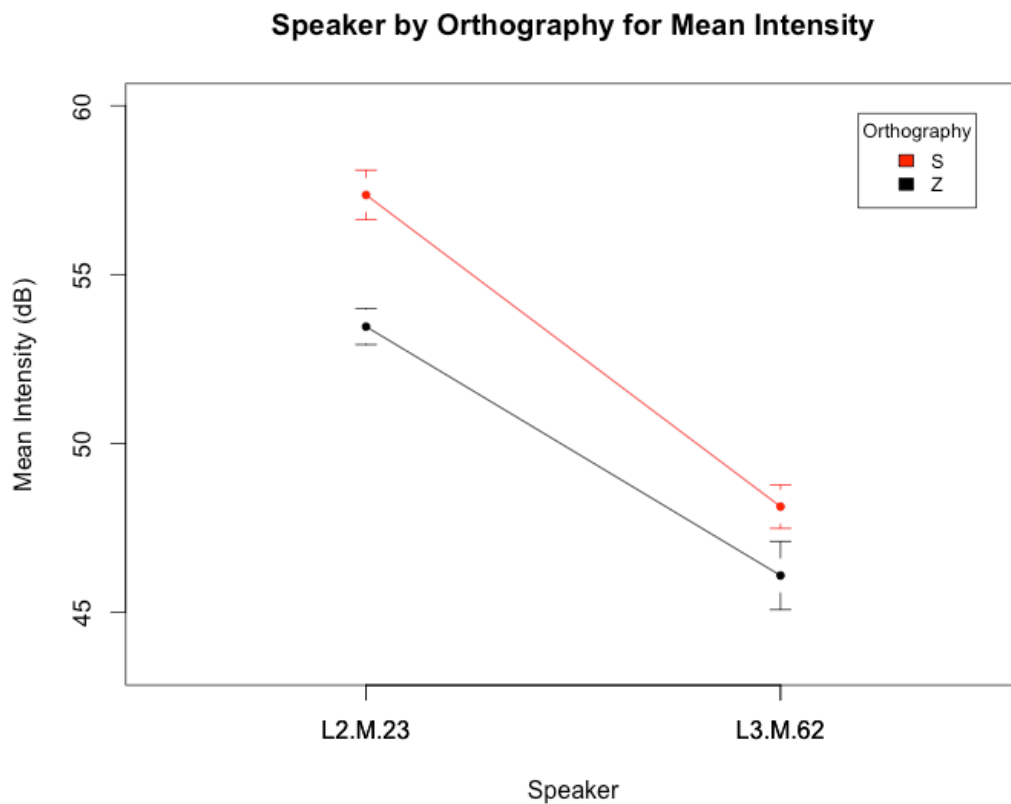
Figure 5.40: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L2 = daughter; L3 = mother) interaction for mean intensity (dB) of the service occupation family of Lepe

5.4.3 Professional occupation family (Lepe)

The professional occupation family is comprised of family members that all work professional-oriented occupations. L8, a fifty-eight-year-old female (the mother), works as a civil servant for the local Lepe government and has a secondary education. She has never lived outside of Lepe. L14, a 31-year-old female (the older daughter), is an adjunct professor at the university in Huelva and has a master's degree. Between studies and work she has lived nine years outside of Lepe. L16, a 26-year-old female (the younger daughter), at the time of the interview had just finished her university degree and was seeking employment. Due to her studies in Sevilla and study abroad she had lived six and a half years outside of Lepe.

Center of gravity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed a significant main effect of orthography [$F(1,503) = 1638.34$, $p < .001$], no main effect of speaker [$F(2,502) = 1.91$, $p = 0.149$], and a significant interaction for orthography*speaker [$F(2,503) = 94.79$ $p < .001$]; see Figure 5.41. A *Tukey Post hoc* indicates that for L14, <s> had significantly higher center of gravity than <z> ($p < .001$); for L16, <s> had significantly higher center of gravity than <z> ($p < .001$); and finally, for L8, <s> had significantly higher center of gravity than <z> ($p < .001$). For orthographic <s>, L14 had significantly higher center of gravity than L8 ($p < .001$) and L16 ($p < .001$). There was no significant difference between L16 and L8 ($p = 0.753$). For orthographic <z>, L14 had significantly lower center of gravity than L16 ($p < .001$) and L8 ($p < .001$). There was no significant difference between L16 and L8 ($p = 0.705$). These results indicate that each family member has a large separation

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of center of gravity between orthographic environments. The interaction indicates that the oldest daughter, who has spent more time away from home and holds the highest education, has a larger difference in center of gravity between orthographic environments than her mother and her younger sister.
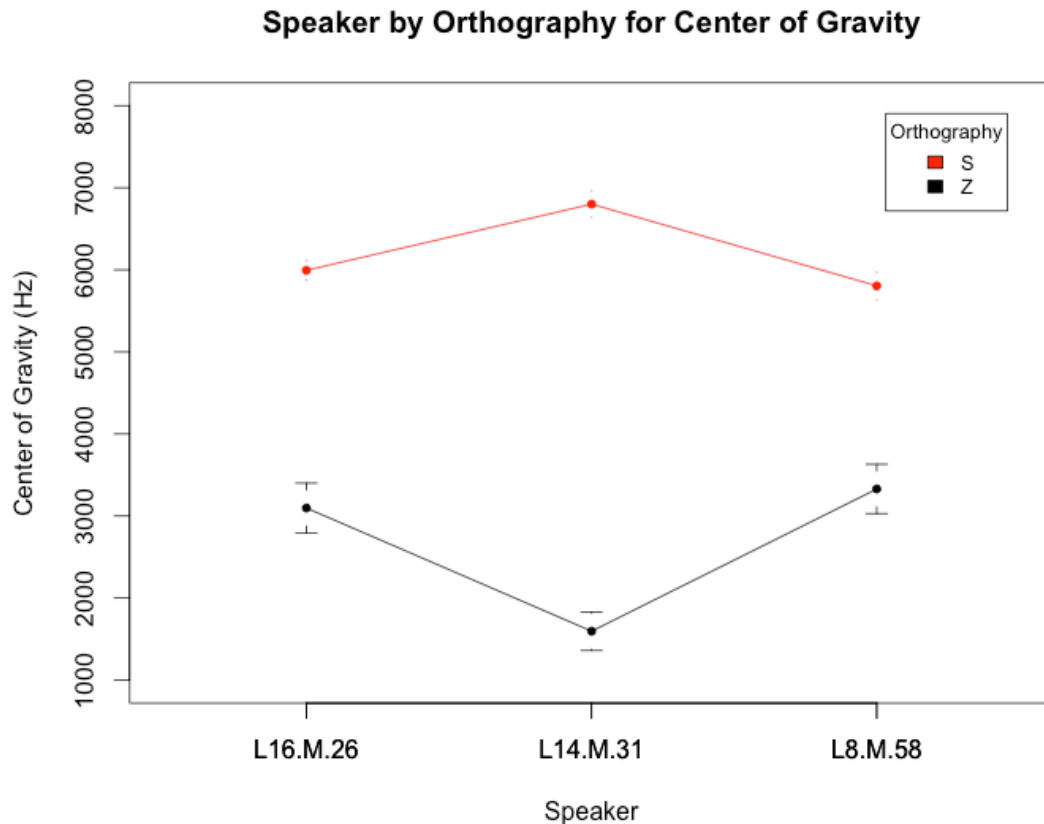
Figure 5.41: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L16 = younger daughter; L14 = older daughter; L8 = mother) interaction for center of gravity (Hz) of the professional occupation family of Lepe

Mean intensity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed a significant main effect of orthography $[F(1,503) = 1320.24, p < .001]$, a significant main effect of speaker $[F(2,503) = 18.85, p$

< .001], and a significant interaction for orthography*speaker [$F(2,503) = 58.06$, $p < .001$]; see Figure 5.42. A *Tukey Post hoc* indicates that for L14, <s> had a significant higher mean intensity than <z> ($p < .001$); for L14, <s> had a significant higher mean intensity than <z> ($p < .001$); and for L8, <s> had a significant higher mean intensity than <z> ($p < .001$). For orthographic <s>, L16 had a significantly lower mean intensity than L14 ($p < .001$) and L8 ($p < .001$). There was no significant difference in mean intensity between L14 and L8 ($p = 0.970$). For orthographic <z>, L8 had a significantly lower mean intensity than L14 and L16 ($p < .001$). There was no significant difference in mean intensity between L14 and L16 ($p = 0.988$). These results indicate that each family member has a very large separation of mean intensity between orthographic environments. The interaction indicates that the mother has the largest separation in mean intensity, followed by the older daughter, and then the younger daughter.
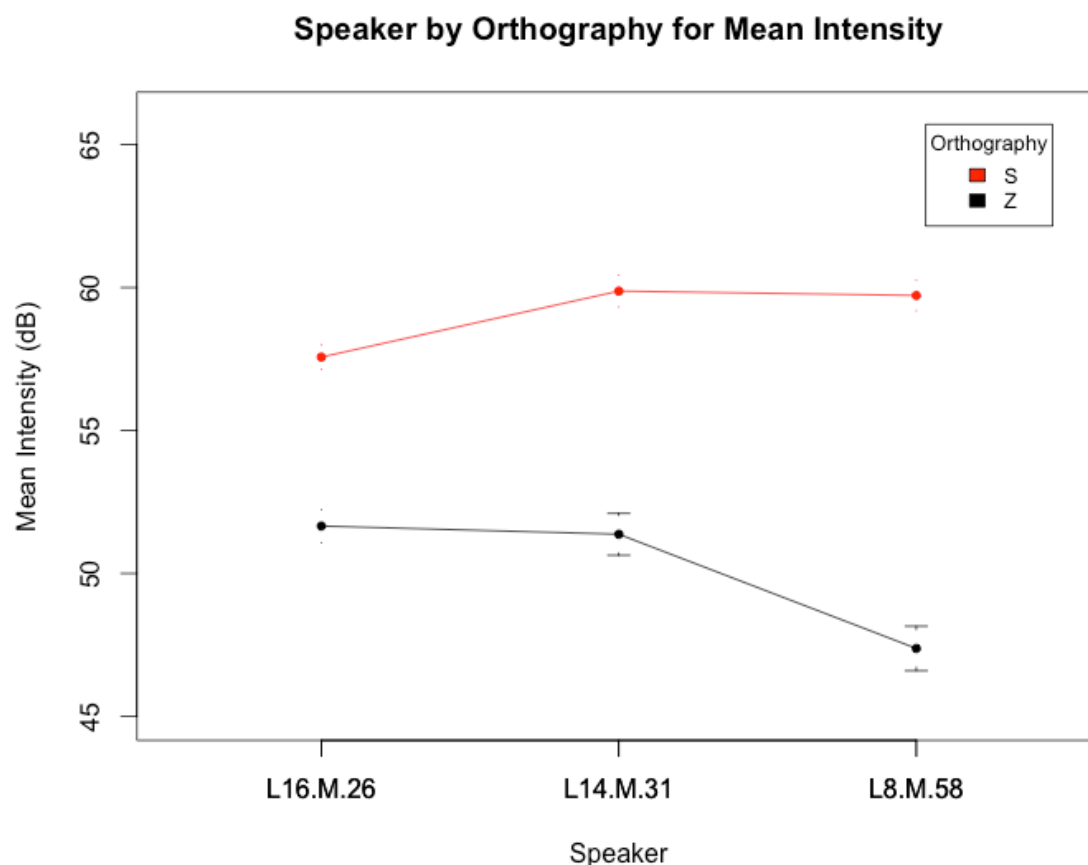
Figure 5.42: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (L16 = younger daughter; L14 = older daughter; L8 = mother) interaction for mean intensity (dB) of the professional occupation family of Lepe

5.4.4 Manual/Service/Professional occupation family (Huelva)

This family serves as an ideal example of societal-changes that have occurred within Huelva in the last two generations. They live in a lower middle class neighborhood of *Isla Chica*. H8, a 57 year-old male (the father), works in an industrial factory and has a primary education. H7, a 51 year-old female (the mother), is an administrative assistant and has a secondary education. Neither the father nor the mother has lived outside of Huelva. H9, a 29 year-old female (the older daughter), works as a

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high school teacher and has a university education. She has never lived outside of Huelva. H5, a 25 year-old female (the younger daughter), is a professional *cantaora* 'flamenco singer' with a secondary education (also completed one year of university education). Due to her profession she has lived six years outside of Huelva between other Andalusian cities (Sevilla, Granada) and Madrid. Here within one family we can see the older generation working in manual (the father) and service (the mother) oriented occupations, while the younger generation has more professional occupations with more education and mobility.

Center of gravity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography*speaker) revealed a significant main effect of orthography $[F(1,656) = 1107.6, p < .001]$, a significant main effect of speaker $[F(,656) = 143.9, p < .001]$, and a significant interaction for orthography*speaker $[F(,656) = 133.6, p < .001]$; see Figure 5.43. A *Tukey Post hoc* indicates that for H5, <s> had a significant higher center of gravity than <z> ($p < .001$); for H7, <s> had a significant higher center of gravity than <z> ($p < .001$); for H8, <s> had a significant higher center of gravity than <z> ($p < .001$); and for H9, <s> had a significant higher center of gravity than <z> ($p < .001$). For orthographic <s>, H8 had significantly lower center of gravity than H5 ($p < .001$), H7 ($p < .001$), and H9 ($p < .001$). Additionally, for <s>, H9 had significantly higher center of gravity than H8 ($p < .01$). No other comparisons were significant. For orthographic <z>, H5 had significantly lower center of gravity than H7 ($p < .001$), H8 ($p < .001$), and H9 ($p < .001$). Additionally for orthographic <z>, H8 lower center of gravity

than H7 ($p < .001$) and H9 ($p < .05$). Finally, for orthographic <z>, H9 had significantly lower center of gravity than H7 ($p < .001$). While all members of this family demonstrate significant differences in center of gravity between orthographic environments, the interaction indicates that H5 has the largest difference in center of gravity between environments, followed by H9, then H7, and finally H8. Here we can see the generational difference of H5 and H9 (the daughters) as compared to their parents, particularly their father (H8).
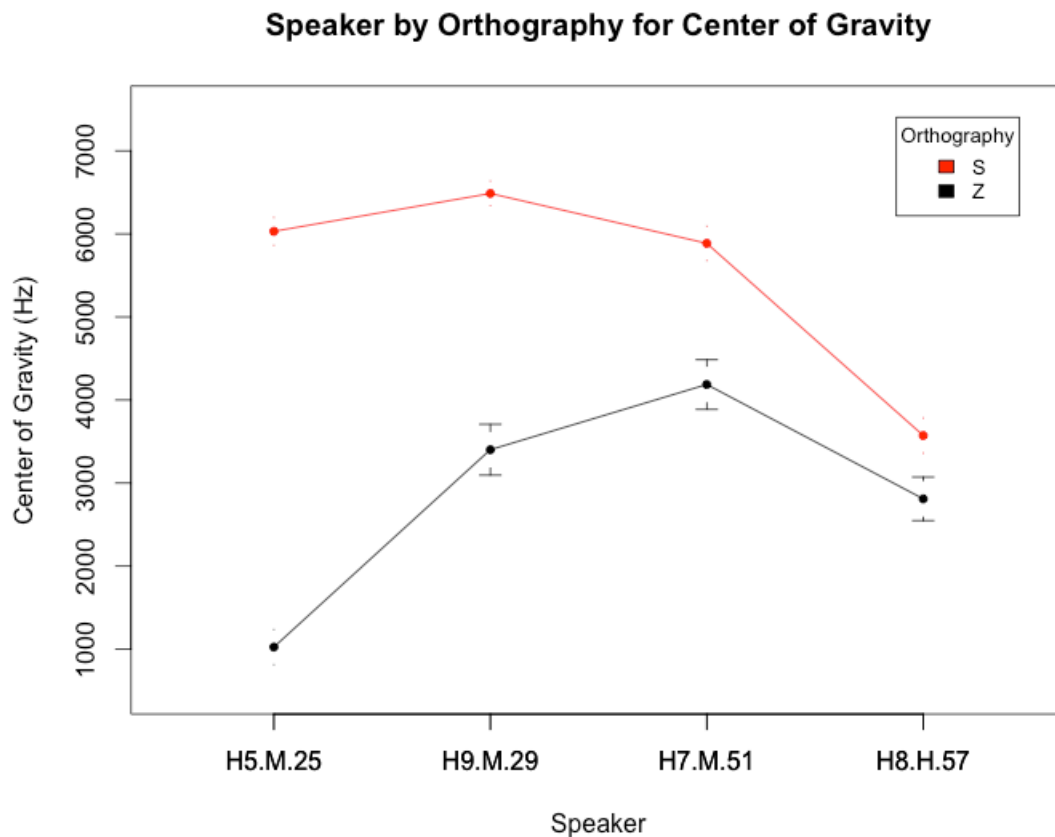
Figure 5.43: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (H5 = younger daughter; H9 = older daughter; H7 = mother; H8 = father) interaction for center of gravity (Hz) of the Manual/Service/Professional occupation family of Huelva

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Mean intensity. A three-way analysis of variance (ANOVA) (orthography X speaker X orthography* speaker) revealed a significant main effect of orthography [$F(1,656) = 1097.22$, $p < .001$], a significant main effect of speaker [$F(3,656) = 238.29$, $p < .001$], and a significant interaction for orthography*speaker [$F(3,656) = 91.96$, $p < .001$]; see Figure 5.44. A *Tukey Post hoc* indicates that for H5, <s> had a significant higher mean intensity than <z> ($p < .001$); for H7, <s> had a significant higher mean intensity than <z> ($p < .001$); for H8, <s> had a significant higher mean intensity than <z> ($p < .001$); and for H9, <s> had a significant higher mean intensity than <z> ($p < .001$). For orthographic <s>, H8 had significantly lower mean intensity than H5 ($p < .001$), H7 ($p < .001$), H9 ($p < .001$). Additionally, H9 had significantly higher mean intensity than H5 ($p < .01$) and H7 ($p < .001$). Finally, H5 had significant higher mean intensity than H7 ($p < .001$). For orthographic <z>, H8 had significantly higher mean intensity than H5 ($p < .001$), H7 ($p < .05$), and H8 ($p < .001$). No other comparisons were significant. While each family member demonstrated significant differences in mean intensity between orthographic environments, the interaction indicates that the two daughters (H5, H9) have significantly larger differences in mean intensity between orthographic environments as compared to their parents, particularly their father (H8).
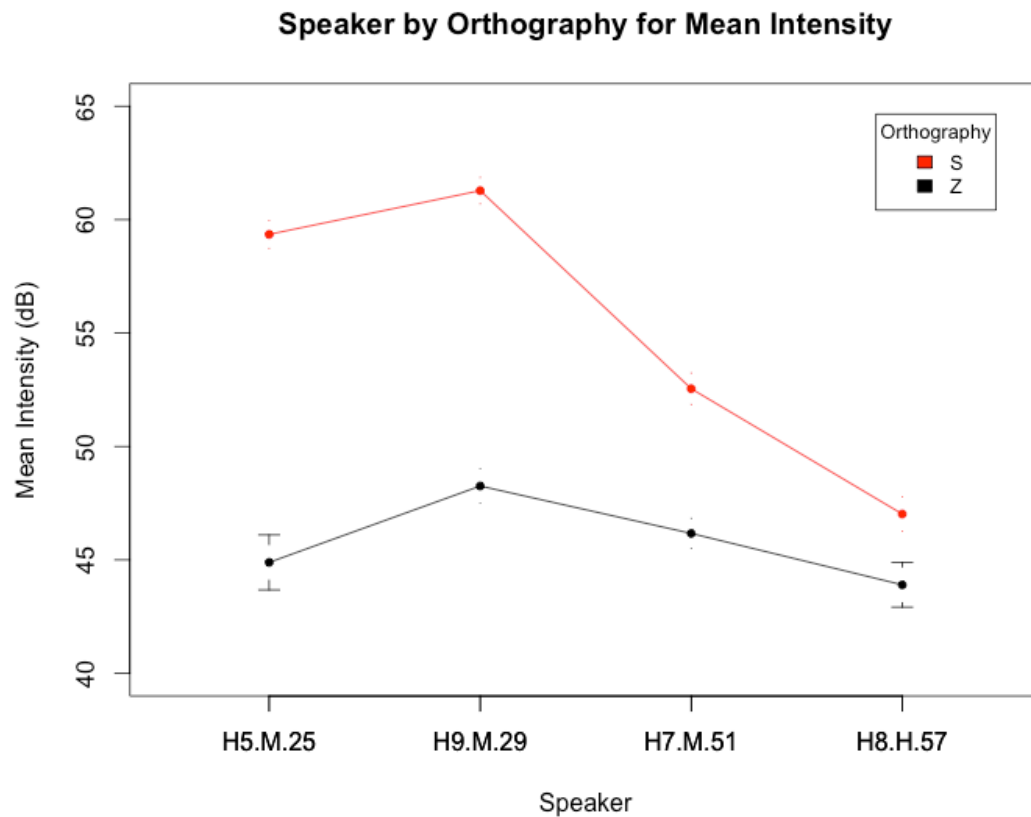
Figure 5.44: Line graph of Orthography (red = <s>, black = <z,ci,ce>) by Speaker (H5 = younger daughter; H9 = older daughter; H7 = mother; H8 = father) interaction for mean intensity (dB) of the Manual/Service/Professional occupation family of Huelva

5.4.5 Summary of family case studies

These four particular families (or members from families) demonstrate

qualitatively and quantitatively how the macro-level societal changes have affected the

micro-level of the nuclear family. The manual family, comprised primarily of agricultural

field workers, demonstrates an example of a family rooted to Lepe. L6 and L9 work in

agriculture, a traditional primary sector form of employment in Lepe. Neither L6 nor L9

demonstrate any difference for the Passage Reading in center of gravity nor mean

intensity, thus presenting what appears to be a full merger. L7, however, the sole member of the family to pursue non-agricultural employment in stitchery, demonstrates a significant difference of center of gravity between orthographic environments, but not mean intensity. In this sense, here we see that although L6 is quite young (24 years-old), that *ceceo* is present among those with more manual type employment, with less formal education, and less mobility (particularly where speakers from the same house maintain the traditional dialectal feature). Looking at the Word Lists, however, L6 is able to produce a larger difference in center of gravity and mean intensity than his mother, demonstrating that younger generations, even if they do not produce *distinción* in conversation, are more able to produce the two phonemes for more formal tasks.

For the service occupation family, the 62-year-old mother (L3) and 23-year-old daughter (L2) of the family-owned bakery, also represent another traditional form of employment, but one that falls in the service sector of employment. They are in daily contact and communication with customers from Lepe and the area. In this sense, the pressures of the linguistic market (similar to Belfast speakers in the Milroys' studies [1985a, 1992]) may be higher than for those working the primary sector of employment (such as farming). Both the mother and the daughter produce significant differences between orthographic environments for center of gravity, but the daughter produces a significantly larger difference than the mother. Similarly, they both produce significant differences between orthographic environments for mean intensity, but the daughter produces a significantly larger difference than the mother. Here we can see the

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generational difference in which the acoustic difference increases between phonemes with younger speakers.

The professionally oriented family demonstrates that the pressures of the linguistic market to adhere to more standard speech, particularly the use of *distinción* in civil servant jobs where language holds more linguistic capital. The 58-year-old mother (L8) demonstrates as large as a difference between orthographic environments for center of gravity as her 26-year-old daughter (L16). The 31-year old daughter (L14) demonstrates an even larger difference between orthographic environments for center of gravity as compared to her mother and sister. She has one of the largest acoustic differences in center of gravity between orthographic environments in this study, perhaps due to the fact that she has a master's degree, has lived away from home for nine years, and teaches university courses. Thus, the pressures brought through higher education and significant dialect contact have influenced her speech. Interestingly, the mother has the largest difference between orthographic environments for mean intensity, followed by the oldest daughter, and then the youngest daughter. While all have very large differences between orthographic environments, it appears the mother utilizes this feature the most to differentiate phonemes based on orthography. Consequently, *distinción*, while perhaps newer for families with more manual or service oriented occupations, appears to have been present for at least two generations among families with more professionally oriented occupations.

Finally, the family from *Isla Chica* in Huelva represents many of the societal-changes that have occurred in Huelva in the last two generations. H8, the 57-year-old father, represents the manual factory sector of Huelva. H7, the 51-year-old mother, represents the service sector of Huelva. The two daughters, 25-year-old H5 and 29-year-old H9, represent the professional sector of Huelva, a flamenco singer and teacher, respectively. All speakers demonstrate differences in center of gravity and mean intensity between orthographic environments, but the two daughters demonstrate the largest difference, followed by the mother, and then finally the father with a much smaller difference then the rest of the family. In this sense, here we can see the influence of age by gender as well as occupation. Anecdotally, several years earlier, H8 and H7 told me that when they first met, H8 was completely a *ceceante* speaker and she had mocked his speech in a type of *spousal coaching* (Regan 2014b); see Example (1). H8 has told me that over the years he has gone on accustoming himself to "*pronunciar correctamente, como castellano castellano*" 'pronounce correctly, like Castilian Castilian.'

(1) H8 and H7 (Regan 2014ab)

1 H8: *Yo, mi mujer te lo está diciendo. A mí me ha enseñado hablar.*
2 H7: *Bueno, enseñarte hablar no, enseñarte no cecear,*
3 H7: *que eras "a[s$^\theta$]í, e[s$^\theta$]o." [a su marido]*
4 H8: *Me ha enseñado a hablar mi mujer, ¿eh? [mira a mí]*

1 H8: I, my wife is telling it to you. She has taught me how to speak.
2 H7: Well, to teach to you to speak no, to teach you how to not *cecear*,
3 H7: that you were "like this, that." [to husband]
4 H8: My wife has taught me to speak, ya see? [looks at me]

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Here one observes in line 3, H7 mimics *ceceo* to demonstrate how her husband used to sound. Thus, even within the micro-level of the family, the social prestige of *distinción* is well known. As the economy of Huelva continues to change, younger generations are seeking more educational attainment and more professional oriented occupations, leading some to live more years away from home. All of these societal-changes provide the social context to promote an increased separation in phonemes.

5.5 ACOUSTIC OVERVIEW OF THE CORONAL FRICATIVE VARIATION

5.5.1 Acoustic properties of *ceceo* vs. *distinción* in Huelva/Lepe

In order to examine the acoustic properties of *distinción* in compared to *ceceo*, here we will look at two speakers with what appears to be a complete merger, and two speakers who demonstrate *distinción*. These comparisons are looking only at the Passage Reading (Style B). As studies of mergers and splits in the English variationist paradigm typically analyze vowels, following the norm of the F1-F2 scatterplot, here I am promoting a new way to plot and visualize Andalusian coronal fricatives with mean intensity (dB) on the x-axis and center of gravity (Hz) on the y-axis so that we can plot fricatives in a standardized and comparable way to English vowel studies of splits/mergers. My aim is that other studies will follow this type of visualization so that future studies can compare more fricative splits/mergers in this way.

The first comparison is between two women: L9 the 51-year-old mother from the manual occupation family of Lepe, and H20, a 30-year-old woman from Huelva with university education, 0 years lived away from Huelva, and is a teacher. L9's scatterplot

reflects the lack of significance difference in both dependent measures between orthographic environments. L9's average <s> token is 4,280.34Hz with 48.68dB while her average <z,ci,ce> token is 4,336.64Hz with 48.97dB. Her average orthographic environments are separated by about -130.47Hz and -0.295dB. As one can see, there is no separation of phonemes and in fact a large range of variation. On the other hand, H20 produces a clear separation between phonemes, with the exception of two <s> outliers; there is no overlap in phonemes. H20's average <s> token is 7,317Hz with 55.84dB while her average <z,ci,ce> token is 2,145.33Hz with 41.55dB. Thus, her average orthographic environments are separated by about 5,172Hz and 14.30dB. Comparing these two speakers, it appears that the merger of *ceceo* presents values that lie between both alveolar /s/ and interdental /θ/ for both parameters of center of gravity and mean intensity; see Figure 5.45.
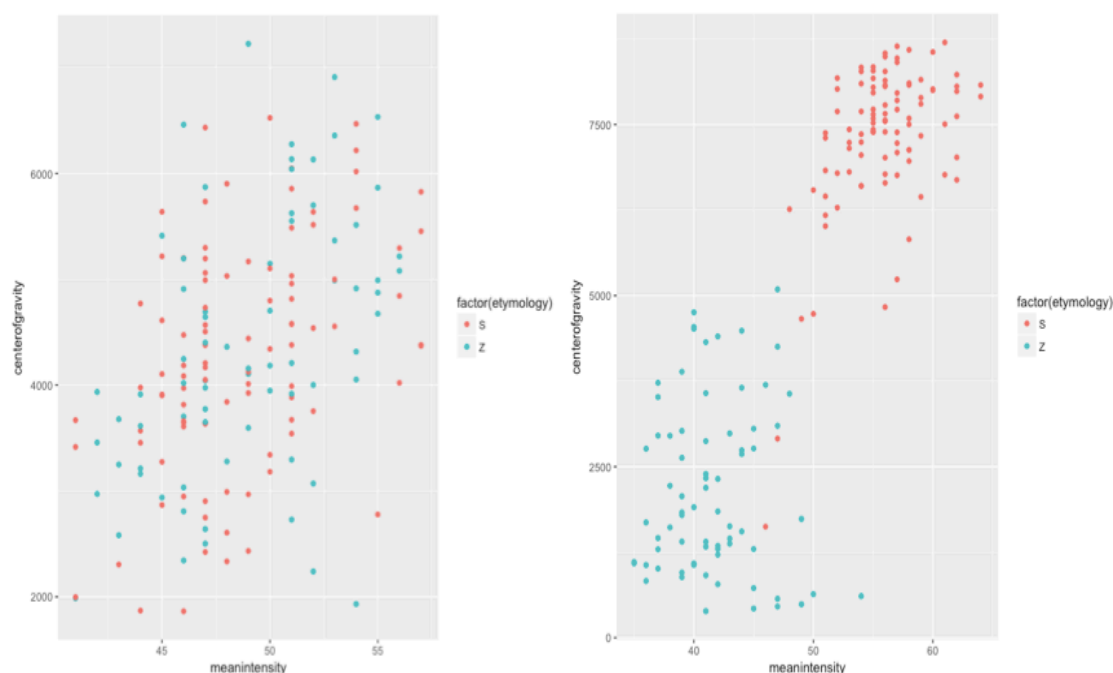
Figure 5.45: Scatterplots comparing speakers L9 (left) and H20 (right) in mean intensity (x-axis) by center of gravity (y-axis) for Passage Reading; L9 demonstrates a full merger of *ceceo*; H20 demonstrates a clear split of *distinción*

The second comparison is between two men, L6, the 24-year old male from the manual occupation family of Lepe, and H18, a thirty-four year old male from Huelva, who has spent 2 years away from Huelva, has a university education and is a teacher. L6's scatterplot reflects the lack of significance difference in both dependent measures between orthographic environments. L6's average <s> token is 3,134.99Hz with 54.37dB while his average <z,ci,ce> token is 3,022.959Hz with 54.06dB. His average orthographic environments are separated by about 112Hz and 0.30dB. As one can see, there is no separation of phonemes and in fact a large range of variation. On the other hand, H18 produces a clear separation between phonemes. In fact, with the exception of

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three <s> outliers, there is no overlap in phonemes, and they appear to be separated by a great deal of hertz and decibels. H18's average <s> token is 5,449.55Hz with 70.14dB while his average <z,ci,ce> token is 2053.45Hz with 59.59dB. His average orthographic environments are separated by about 3,396.11Hz and 10.55dB. His overall speaking intensity is higher than most speakers, but more importantly he shows a large difference in decibels between the orthographic environments. Comparing these two speakers, it again suggests that the merger of *ceceo* presents values that lie between alveolar /s/ and interdental /θ/ in both parameters of center of gravity and mean intensity; see Figure 5.46.
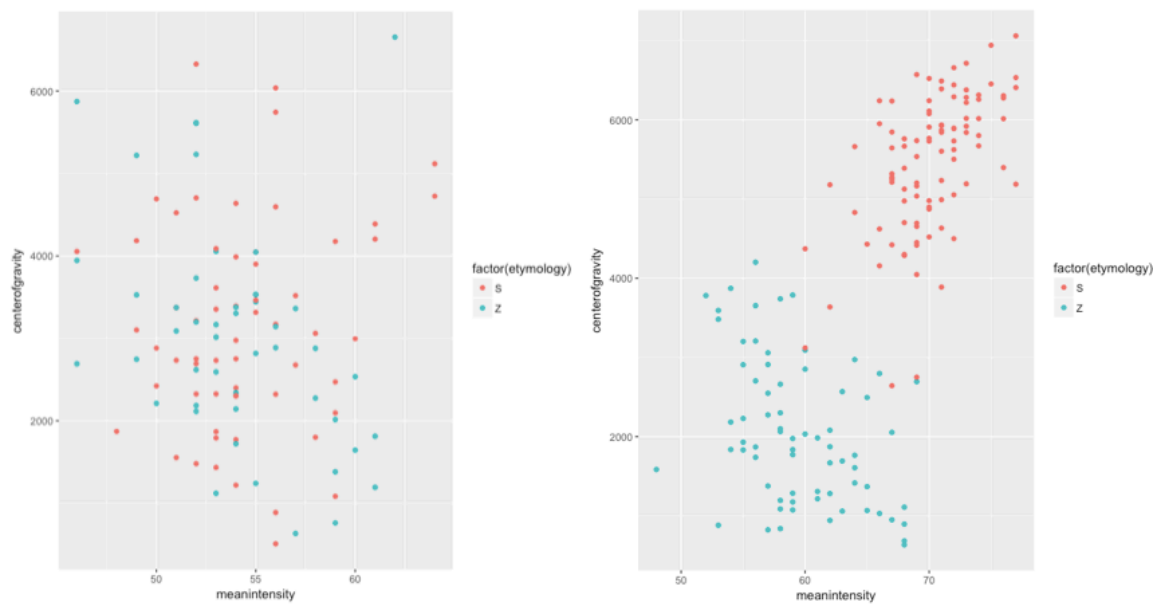
Figure 5.46: Scatterplots comparing speakers L6 (left) and H18 (right) in mean intensity (x-axis) by center of gravity (y-axis) for Passage Reading; L6 demonstrates a full merger of *ceceo*; H18 demonstrates a clear split of *distinción*

This intermediate realization was reflected in both the waveform and the spectrogram. Here we have three examples from speakers of a typical [s], [θ], and [s$^\theta$]

represented below. As one can see with [s] (Figure 5.47), the waveform demonstrates a

high intensity while the spectrogram demonstrates a concentration of higher energy

(reflecting the higher center of gravity). As one can see with [θ] (Figure 5.48), the

waveform demonstrates a low amount of intensity and the spectrogram does not reflect

any concentration of variation, but rather a more spread energy (reflected in the center of

gravity and the higher amount of variance found for *distinción* speakers). Finally, as one

observes with [sθ] (Figure 5.49), there is an intermediate amount of intensity seen by the

waveform between both [s] and [θ].

FAMOSOS
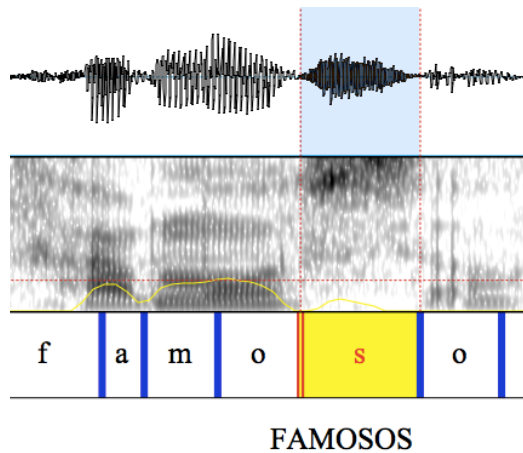
Figure 5.47: [s] token from *<famoso>* (Speaker H20)
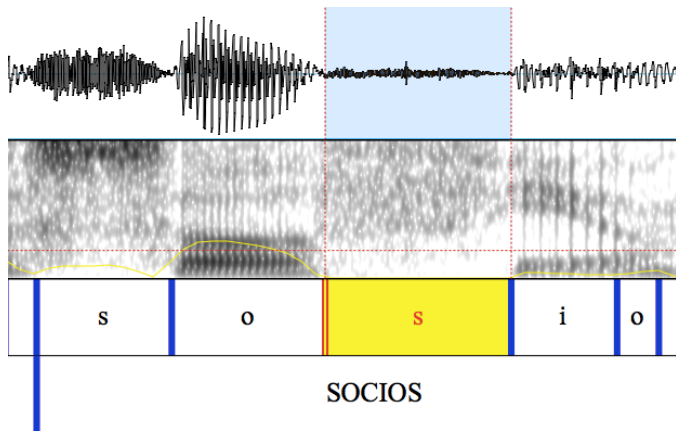
Figure 5.48: [θ] token from <*socios*> (Speaker H20)
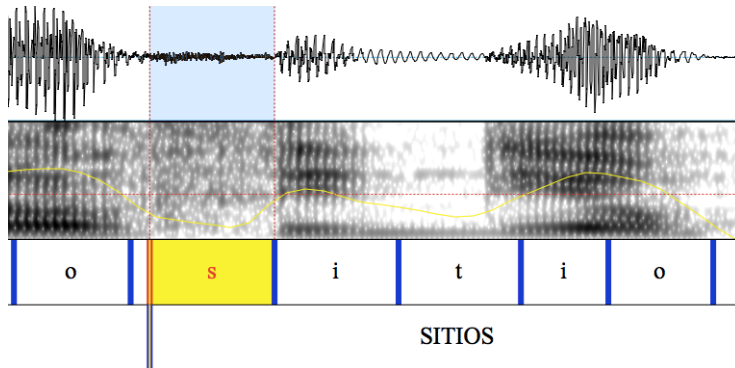
Figure 5.49: [s$^{\theta}$] token from <*sitios*> (Speaker L6)

5.5.2 Speaker strategies to distinguish phonemes

There were several speakers who demonstrated a full merger in one or both

parameters for the Passage Reading (Style B), but were able to make a small, but

significant difference in the more formal word list task. While the interaction of Style and

Orthography was not significant in the linear regression analyses of center of gravity and

mean intensity due to the large number of speakers able to produce separate phonemes

for both tasks, there were some individuals that demonstrated a difference between the

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Passage Reading and the Word List as seen in the individual t-test analysis (see Tables 5.7 and 5.8). In order to better able understand how speakers with a merger are attempting to separate phonemes, particularly individuals with a merger on the Passage Reading and some degree separation for the Word List, here we will observe a few examples.

Speaker H4, a 51-year-old man from Huelva, demonstrates no difference in center of gravity (Hz) for the Passage Reading, but then a significant difference in center of gravity between orthographic environments for the Word List (*); see Figure 5.50. His <z> tokens remain at the same low center of gravity space as the merged values in the Passage Readings, but his <s> tokens are produced with a much higher center of gravity. For mean intensity, he does not demonstrate a significant difference (n.s.) between orthographic environments in the Passage Reading. However, he demonstrates a significant difference in mean intensity per orthographic environment for the more formal Word List (*). It appears that he is able to utilize both center of gravity (Hz) and mean intensity (dB) in the more formal style.

H4: Center of Gravity
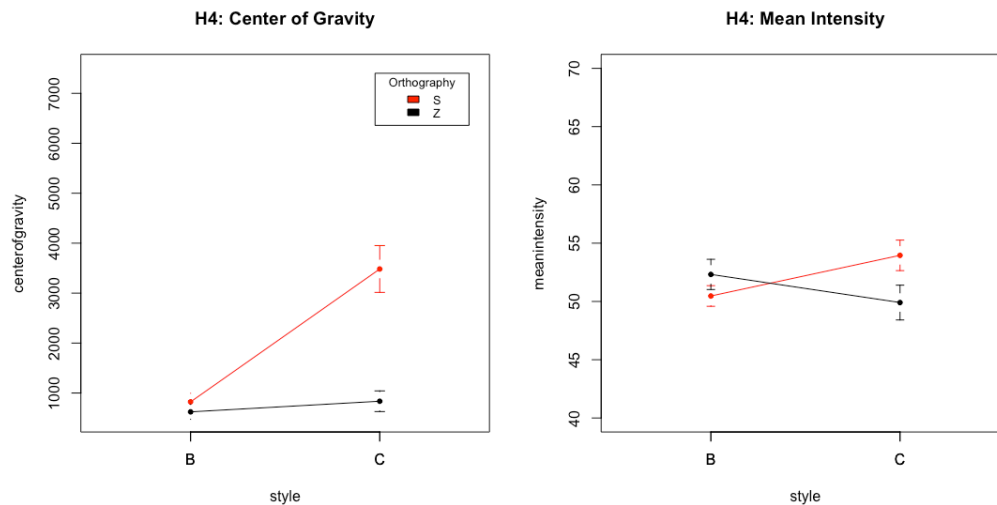
H4: Mean Intensity

Figure 5.50: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B = Passage Reading; C = Word List) interaction for Speaker H4 for center of gravity (left) and mean intensity (right)

Speaker H32, a 62-year-old man from Huelva, demonstrates a small, but statistically significant difference in center of gravity (Hz) for the Passage Reading (*), but no significant difference for the Word List (n.s.); see Figure 5.51, which is in the opposite direction of most speakers. In terms of mean intensity, while he increases his overall intensity for the more formal Word List task, there is no significant difference in mean intensity between orthographic environments for either the Passage Reading (n.s.) or the Word List (n.s.). It appears that he is partially able to use the center of gravity parameter to distinguish between orthographic environments, but does not utilize the parameter of mean intensity. While H32 is able to produce subtle, but significant difference for the Passage Reading in center of gravity (Hz), we do not know if this would in fact be perceptually relevant. That is, although statistically significant, it is

unknown whether or not this subtle difference would be perceived by listeners. Future

work should look at the just noticeable difference in fricatives for center of gravity as

well as mean intensity. Thus would allow us to understand whether or not subtle

statistically significant production differences are actually relevant to listeners.
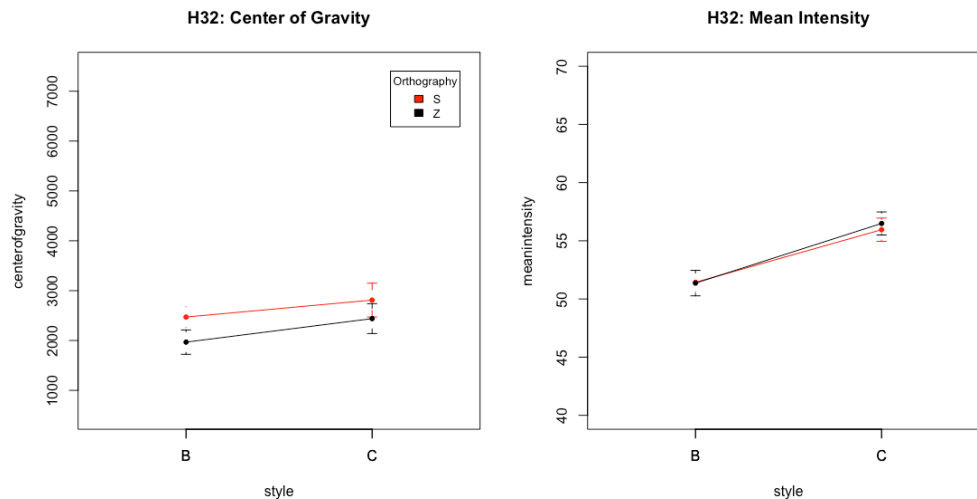
Figure 5.51: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B =
        Passage Reading; C = Word List) interaction for Speaker H32 for center of
        gravity (left) and mean intensity (right)

Speaker H62, a 69 year-old man from Huelva, does not produce a significant

difference in center of gravity (Hz) between orthographic environments for the Passage

Reading (n.s.), but a small significant difference in the Word List task (*); see Figure

5.52. For mean intensity, he produces a significant difference between orthographic

environments for both the Passage Reading (*) and the Word List (*). While he appears

to be able to use both parameters to separate phonemes, it appears that he relies more so

on mean intensity. This could be seen as an easier parameter to acquire (that of mean

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intensity), as opposed to a change in articulation needed for the center of gravity difference.
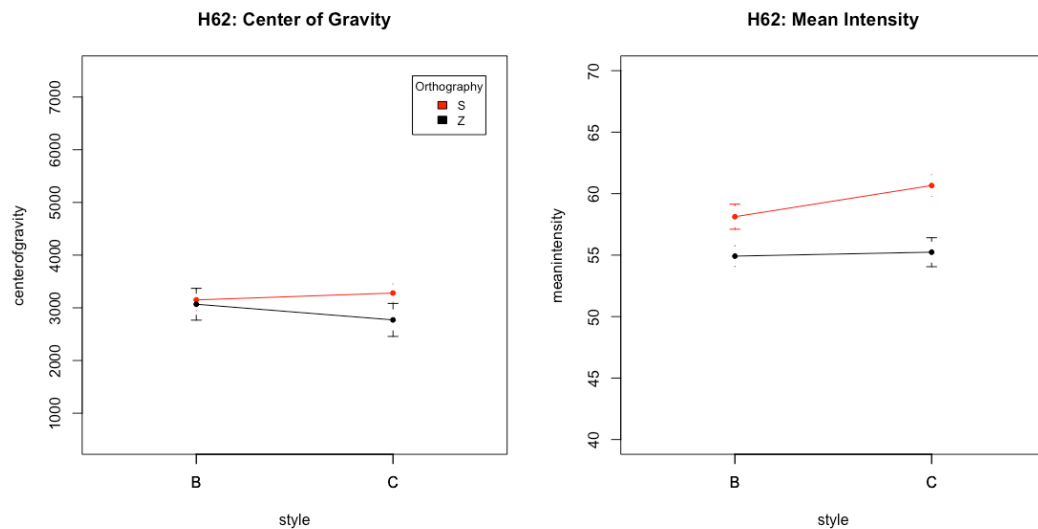
Figure 5.52: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B = Passage Reading; C = Word List) interaction for Speaker H62 for center of gravity (left) and mean intensity (right)

Speaker L6, a 24 year-old male from Lepe, does not produce a significant difference between orthographic environments in center of gravity for the Passage Reading (n.s.), but is able to produce a significant difference for the Word List (*); see Figure 5.53. His mean intensity results mirror his center of gravity, in which there is no significant difference between orthographic environments in mean intensity for the Passage Reading (n.s.), but a significant difference for the Word List (*). L6 provides an example of a younger speaker who may have an underlying phonological representation of a full merger, but through exposure to standard *distinción*, is able to separate phonemes in the more formal task.

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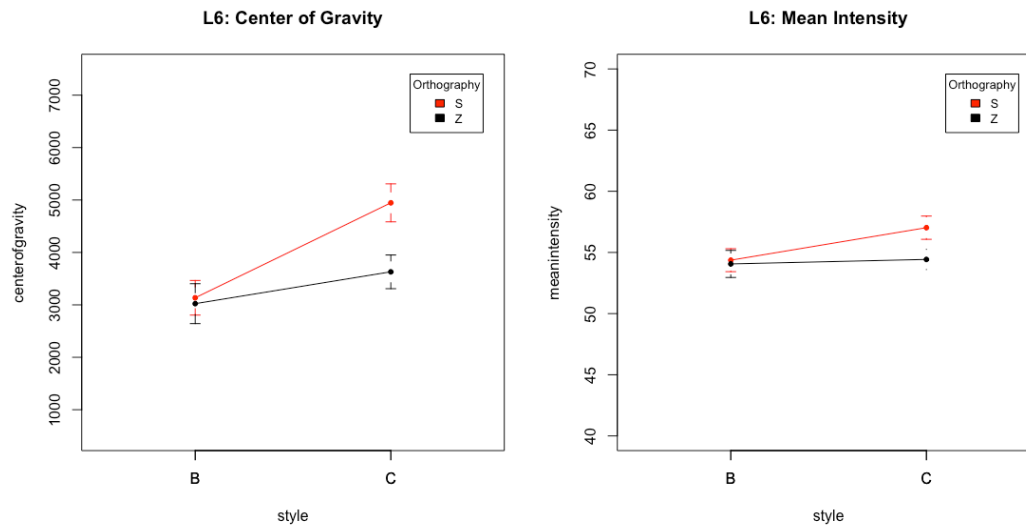
Figure 5.53: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B =
        Passage Reading; C = Word List) interaction for Speaker L6 for center of
        gravity (left) and mean intensity (right)

Speaker L9, a 51-year-old women from Lepe, does not produce a significant

difference between orthographic environments in center of gravity for the Passage

Reading (n.s.), but is able to produce a significant difference between orthographic

environments for the Word List (*); see Figure 5.54. She does not produce a significant

difference in mean intensity between orthographic environments for the Passage Reading

(n.s.), but a significant difference for the Word List (*). Speaker L9 reflects her son's

linguistic patterns (L6), in which she produces a full merger in the Passage Reading, but

with more attention paid to speech in the Word List, is able to produce differences

between orthographic environments using both acoustic parameters.
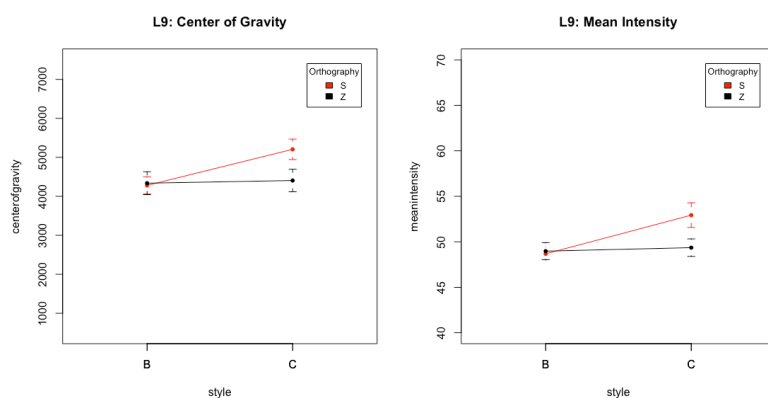
Figure 5.54: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B = Passage Reading; C = Word List) interaction for Speaker L9 for center of gravity (left) and mean intensity (right)

While most of the speakers who produced a merger on the Reading Passage were able to produce some subtle difference in one or both acoustic parameters (center of gravity and mean intensity) for the Word List, there were a few speakers who were unable to produce a significant difference in either acoustic parameter for both the Reading Passage and the Word List (i.e. L23, L46, L47, L54, H12, H54, H59). One such example is that of Speaker L47, an 87 year-old-women from Lepe. She does not produce a significant difference between orthographic environments in center of gravity nor in mean intensity for either the Reading Passage (n.s.) or the Word List (n.s.); see Figure 5.55.
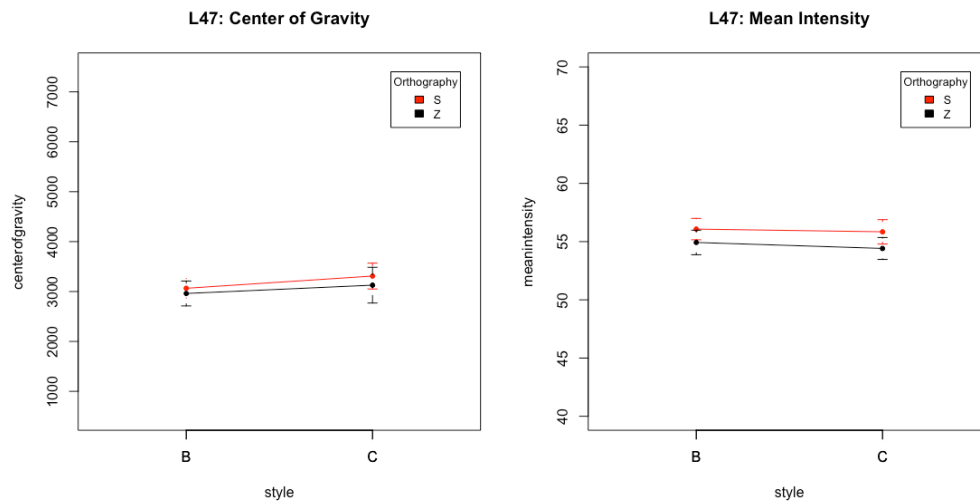
Figure 5.55: Line graphs of Orthography (red = <s>, black = <z,ci,ce>) by Style (B = Passage Reading; C = Word List) interaction for Speaker L47 for center of gravity (left) and mean intensity (right)

6. Discussion and Conclusion

The overarching goal of this project was to contribute to on-going scholarly discourse on Andalusian coronal fricative variation, European social dialectology findings of dialect contact leading to dialect convergence, and sociolinguistic theories surrounding mergers and splits; as well as connect these three conversations. Specifically, this project has sought to analyze the demerger of *ceceo* into *distinción* due to dialect contact and societal changes. Here we will discuss the research questions (§6.1), theoretical implications (§6.2), limitations of the project (§6.3), future research (§6.4), broader contributions (§6.5), and finally, conclusions (§6.6).

6.1 DISCUSSION OF RESEARCH QUESTIONS

Here we review the research questions in light of the results from chapter five.

6.1.1 RQ1: Demerger

Is there a demerger underway in Huelva and/or Lepe, such that the putatively merged ceceo realization for orthographic <s> and <z,ci,ce> is splitting into two separate categories? The hypothesis, based on my own pilot work of Huelva capital (Regan 2014ab, 2017) and surrounding areas (Regan 2015), that there is currently a demerger from the traditional dialect feature of *ceceo* towards *distinción*, is strongly supported by the findings. The significant main effect of orthography for center of gravity (Hz), variance (Hz), and mean intensity (dB) for the linear regression analyses, as well as the demerger index, demonstrate that Huelva and Lepe, as a community, produce significant acoustic differences between the two orthographic environments. This

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indicates that the community appears to follow the norm of *distinción*. The current study's results sharply contrast with earlier dialectology accounts (Alvar et al. 1973; Mendoza Abreu 1985; Navarro Tomás et al. 1933) of Huelva and Lepe as a predominantly *ceceante*. In comparing the present work to earlier dialectology studies, it appears that this change has taken place since the 1950s. The robust orthography main effect suggests the importance of the rise of literacy and educational attainment in Huelva/Lepe in acquiring the prescribed grapheme-to-phoneme *distinción*. Additionally, the main effect of age (see §6.1.2 for details), indicates that in this demerger-in-progress, there is an increase in phonetic space in center of gravity and mean intensity between orthographic environments as age decreases.

The demerger of *ceceo* in Huelva and Lepe appears to challenge claims[66] (Hernández & Villena 2009; Villena 2008; Villena & Vida 2012) that only Eastern Andalucía is converging towards certain national prestige features while Western Andalucía is maintaining traditional dialectal features. Such theoretical claims that Western Andalucía maintains traditional dialectal features appear to be based on limited previous research in Western Andalucía (Carbonero 1982, 1985; Carbonero et al. 1992; Lamíquiz & Carbonero 1987; Sawoff 1980). One supporting part of these claims is the influence of *la norma sevillana* 'Sevilla norm', but Huelva and Lepe do not appear to be emulating Sevilla norms, but rather prefer the national prestige feature of *distinción*.

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[66] These claims were made based on previous existing research in Western Andalucía that appeared to demonstrate maintenance of both *ceceo* and *seseo*. The current study in line with more recent studies, while they appear to contradict such claims Eastern convergence versus Western divergence, they may actually be accurate in the sense that this change could have started first in Eastern Andalucía and is now spreading through Western Andalucía.

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Thus, on the contrary to such claims, the current study of Huelva and Lepe, in addition to more recent studies (García Amaya 2008; Regan 2017; Santana 2016a), indicates that parts of Western Andalucía are in fact converging on certain phonological features towards more prestigious national standards, such as the case of the demerger of *ceceo* to *distinción*. Thus, Huelva and Lepe, similar to Eastern Andalucía, appear to be eliminating certain traditional dialectal features, such as *ceceo*, in favor of national prestige features, such as *distinción*. This dialect convergence may be due to the salience[67] (Erker 2017; Kerswill & Trudgill 2005; Trudgill 1986) of particular linguistic features. As the term *salience* in linguistics has many different connotations depending upon the subfield of linguistics, here I am referring to *sociolinguistic salience*. That is to say, "the salience of a variable linguistic feature, from a sociolinguistic point of view, relates to the level of awareness that speakers have of that variable, which in turn is connected to the social meanings that become attached to its variants" (Llamas et al. 2016: 2). Given the sociolinguistic salience and overt stigmatization of *ceceo*, that people explicitly comment on its use and its indexical connection to particular social groups, this most likely promotes dialect convergence towards *distinción*. This salience of *ceceo* appears to encourage dialect convergence, that is, its split towards the prestige Castilian norm of

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[67] Future work should examine less sociolinguistic salient variables to analyze differences between Eastern and Western Andalusian Spanish. For example, Ruch and Harrington (2014: 12) have recently found that younger Sevilla speakers produced /st/ with "a shorter pre-aspiration and with a longer post-aspiration" compared to their older Sevilla counterparts and Eastern Andalusian speakers from Granada. As it is not as salient as a feature, this has perhaps allowed for this divergence in Western Andalucía. I propose that this is most likely due to its lack of salience compared to other Andalusian phonological variation as dialect leveling (a process of convergence) is more common when features are salient (Kerswill & Trudgill 2005; Trudgill 1986).

distinción, while other non-socially salient traditional Andalusian features are maintained, such as aspiration of coda /s/ or the elision of intervocalic /d/.

6.1.2 RQ2: Near-merger vs. complete merger

If there is a demerger, is there evidence within either community that there was a near-merger or a complete merger? The current apparent-time study leaves no doubt that there is a demerger of *ceceo*. The findings in both center of gravity (Hz) and mean intensity (dB), in raw data and in the demerger indexes, demonstrate that there is a significant main effect for age. Even among speakers that demonstrate statistically significant differences for acoustic measures between orthographic environments, younger speakers are producing these differences with a larger amount of hertzs and decibels between orthographic environments than older speakers; that is, the phonetic space between phonemes is increasing among younger speakers. Thus, the question returns to the two main theses of explaining a split: a split of a near-merger, or the split of a full merger due to dialect contact. In line with Trudgill et al. (2003), I believe both the split of an incomplete neutralization, or near-merger, is possible in certain contexts and that the split of a full merger is also possible in situations of dialect contact. Given that several speakers in the current study do not demonstrate a significant difference across several acoustic measures between the two orthographic environments for one or both of the formal reading tasks[68] (see individual analysis in §5.3), suggests that *ceceo* is a full merger as originally reported by dialectologists (Alvar et al. 1973; Navarro-Tomás et al.

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[68] Future work on the spontaneous speech should shed more light onto this situation.

1933). This does not indicate that there are not speakers in the community without a near-merger. As this study has only relied on production, there are several speakers that demonstrate subtle, but statistically significant differences in one or more acoustic measures, but as perception tasks were not conducted (and as we do not yet know the just noticeable difference in hertz of decibels for these Andalusian coronal fricatives), it may be that these speakers cannot themselves hear a difference. This could be true of the first generation of speakers to separate the phonemes; that is, the near-merger could be the beginning of the demerger process of a full merger. I am not arguing that this is what a near-merger is in all cases, but rather that in this particular case, this would be a plausible hypothesis that the first step in demerger of *ceceo* may in fact be a near-merger. From an articulatory standpoint, this appears logical. The case of a near-merger seems much more likely among vowels than consonants, particularly that of fricatives. It seems unlikely that speakers would have maintained some subtle difference since the 15th century. There would have been little dialect contact until the 20th century and given the importance of education in this change, there would have also been high rates of illiteracy until the 20th century. Finally, television and radio did not arrive to the area until the late 1950s indicating that most speakers in Huelva and Lepe, until the mid 20th century would not have been exposed to *distinción*. Thus, the current results suggest that *ceceo* is/was a full merger. However, this is not necessarily conclusive. Future work must look at spontaneous speech to attempt to verify the full merger status. In either case, whether

ceceo is a full merger or near-merger, the current study demonstrates that there is an on-going demerger of *ceceo*.

6.1.3 RQ3: Factors leading to demerger

What social and linguistic factors contribute most to the probability that a speaker will manifest a split (i.e., distinción) rather than ceceo?

Review of social factors: The hypothesis that the social factors of gender, age, and education would be strong predictors of whether a speaker realizes *ceceo* or *distinción* are supported by the results; specifically that women, younger speakers, and those with more education would lead this change. The hypothesis that speakers with professional or service-oriented occupations would demonstrate more *distinción* than those with manual occupations was also supported. The hypothesis that speakers with more mobility (more years lived outside of Huelva or Lepe) would separate phonemes more than non-mobile speakers was slightly supported. The hypothesis that speakers with more exposure to mass media would demonstrate a larger phonetic difference between phonemes than those with less exposure to mass media was not supported. The hypothesis that speakers with lower local integration would demonstrate a larger phonetic difference between phonemes than those with higher local integration was not supported. Finally, the hypothesis that the more formal Word List (Style C) would demonstrate a larger phonetic difference between phonemes than the less formal Passage Reading (Style B) was partially supported. Below we will review each significant social factor in relation to previous studies.

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Gender. The gender by orthography interaction of the large-scale linear regressions as well as the gender main effect of the demerger index linear regressions supports nearly all previous work of Andalusian coronal fricatives where as a group, women favor *distinción* more-so than men (Ávila 1994; García Amaya 2008; Martínez & Moya 2000; Melguizo 2007, 2009ab; Moya & García-Wiedeman 1995; Moya & Sosiński 2015; Regan 2017; Santana 2016b; Villena 1994, 1996, 2001, 2005, 2007; Villena et al. 1995; Villena & Requena 1996). This is not to say that each group behaves monolithically, as gender interacts with other social categories (particularly age in the current study), but it appears that as a group, women are leading this change. This gender finding of women leading the change from *ceceo* to *distinción*, supports one of the strongest patterns throughout the sociolinguistic literature, Principle 3 of the *Gender Pattern*: "In linguistic change from above, women adopt prestige forms at a higher rate than men" (Labov 1990: 213; 2001: 274). Several scholars (Eckert 1989, 2000, 2008; Eckert & McConnell-Ginet 2003) suggest, however, that gender is under theorized in such claims. As Eckert (1989: 253) states, gender does not have a uniform effect, but always interacts with other social factors such as ethnicity, class, and age. As Eckert suggests (1989: 254), "the differentiation on the basis of gender might well be sought within, rather than between, sex groups." While the *Gender Pattern* (Labov 1990, 2001) is supported here, a detailed look reveals that there may be underlying confounding factors. One such factor could be that in Huelva and Lepe, women are obtaining higher levels of educational attainment and are more likely to work in the tertiary sector in

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which the linguistic market (Bourdieu 1991; Bourdieu & Boltanski; 1975; Sankoff & Laberge 1978) devalues[69] traditional dialectal features like *ceceo*, whereas men are still able to work in the primary sector (agriculture) and secondary sector (factories) where less weight is given to linguistic capital. Notwithstanding such confounds, the current results in line with previous studies strongly support Labov's Principle 3 of the *Gender Pattern* as leaders in change away from stigmatized *ceceo* towards prestigious *distinción*.

 Age. The age by orthography interaction of the large-scale linear regressions as well as the age main effect of the demerger index linear regressions demonstrate an apparent-time change-in-progress from the *ceceo* merger to the demerged *distinción* supporting previous studies (García Amaya 2008; Martínez & Moya 2000; Melguizo 2007, 2009a, 2009b; Moya & García-Wiedemann 1995; Moya & Sosiński 2015; Villena 1994, 1996, 2001, 2005, 2007; Villena et al. 1995). This apparent-time study supports Villena's (2001) hypothesis that the demerger of *ceceo* began in the 1950s. The younger speakers are producing a larger difference in acoustic measures between orthographic environments as compared to older generations. This is unmistakably related to education, as the educational levels of younger generations are higher than those of older generations due to the large-scale societal changes that have occurred in the last fifty years in the region. Additionally, as demonstrated by the demerger index linear regression of center of gravity, it appears that age interacts with gender. While younger

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[69] Additionally, it is important to mention that *ceceo* appears to serve as a mark of identity (LePage & Tabouret-Keller 1985) for certain speakers. While *ceceo* is overtly socially devalued, it appears to enjoy from some amount of covert prestige (Trudgill 1972) among certain social circles.

generations are producing a greater separation of phonemes based on orthography than older generations, this difference is significantly increased for women.

Education. The education by orthography interaction found in the large-scale linear regressions supports previous studies in which more formal education leads to more *distinción* than less formal education (Ávila 1994; García Amaya 2008; Martínez & Moya 2000; Melguizo 2007, 2009a, 2009b; Moya & García-Wiedemann 1995; Moya & Sosiński 2015; Regan 2017; Santana 2016a; Villena 1996, 2001, 2005, 2007; Villena et al. 1995; Villena & Requena 1996). In the current study those with secondary and university education demonstrate a greater phonetic difference between orthographic environments for several acoustic measures than those with primary education. This should come at no surprise. Formal Andalusian educational settings teach the standard *distinción*; the prescribed one-to-one grapheme-to-phoneme. Thus, the longer someone remains in the educational system, the more exposure they would have to *distinción*. This is a case in which there has been an educational campaign to promote a split, as *distinción* is considered standard and the merger (*ceceo*) is considered less educated[70] or rural.

Occupation. The occupation by orthography interaction of the large-scale linear regressions as well as the occupation main effect of the mean intensity demerger index

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[70] This is not to say *ceceante* speakers are uneducated or unintelligent. By no means do I argue this. Here I am referring to the general consensus of speakers from the community from what I have observed throughout the years (having taught in a high school there) as well as through the metalinguistic commentaries at the end of each interview. *Distinción* holds prestige over *ceceo* in forma institutions and settings. *Ceceo*, can, and does, hold covert prestige among certain social circles. In fact, several university educated male speakers in Lepe demonstrate *ceceo* in spontaneous speech as a badge of local pride.

linear regression exhibit the importance of the linguistic market (Bourdieu 1991; Bourdieu & Boltanski; 1975; Sankoff & Laberge 1978). Those with professional or service-oriented occupations demonstrate a significantly larger phonetic separation of phonemes than do those with manual occupations. As *distinción* has more linguistic capital, speakers in more formal work environments are both exposed to more standard features and expected to use more standard features, or at least avoid using particular traditional features such as *ceceo*. There is not as much linguistic capital gained by speakers with manual occupations to produce *distinción* instead of *ceceo*. In fact, in certain circle socials, *ceceo* appears to enjoy covert prestige.

Origin. The origin by orthography interaction of the large-scale linear regressions as well as the occupation main effect of the mean intensity demerger index linear regression demonstrate that speakers of an urban environment are more likely to produce a larger phonetic separation based on orthography as compared to those from a more rural environment. These results support previous findings comparing nearby urban and rural communities in Andalucía (Lasarte Cervantes 2010, 2012; Melguizo 2007, 2009ab). This is not to say that each community behaves monolithically in that all speakers from Huelva demonstrate *distinción* and all speakers in Lepe demonstrate *ceceo*. It does, however, suggest that as a speech community, Huelva appears to be more advanced in the demerger process than Lepe. Huelva-Lepe comparisons will be reviewed in more detail below in §6.1.4.

Mobility. The mobility by orthography interaction was only significant in the linear regression of variance (Hz). Those with more years lived away had a larger separation of variance between orthographic environments. This small findings supports general sociolinguistic trends on the influence of mobility on dialect leveling (Britain 2012b; Chambers 2002; Milroy 2002). It is hypothesized that the change from *ceceo* to *distinción* in both communities is so advanced, as there are now younger generations who have not lived away, but nonetheless demonstrate *distinción*, indicating that mobility may have a higher impact on older speakers. In this sense, this small effect only found in one acoustic measure was not found in the other linear regressions, as it was not as strong as a predictor as other social factors.

Style. The style by orthography interaction found in the linear regression of variance (Hz) as well as the individual t-tests (see Tables 5.7 and 5.8) demonstrated that there was a greater phonetic separation of phonemes based on orthography for the more formal Word List (Style C) as compared to the less formal Reading Passage (Style B). This finding was not revealed in the linear regression of center of gravity nor mean intensity. I believe the reason it is much more robust at the individual level is due to the fact that the majority of the speakers in both speech communities have already separated the two phonemes based on orthography (or at least are able to produce the difference in formal tasks). Given the number of speakers already producing *distinción*, this indicates that in the linear regression, other factors were much more influential in phonetic separation between orthographic environments. However, for the few speakers that still

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demonstrate a merger in the Passage Reading, the main effect of Style can be see at the individual level as certain speakers utilize one or both acoustic cues to separate the phonemes in the more formal task (see §5.3 and §5.5.2).

Review of linguistic factors: The hypothesis that there would be a strong main effect of orthography with acoustic differences found between orthographic environments in producing [s] and [θ] was supported in the current student. The hypothesis that tonic tokens would favor a larger phonetic difference in phonemes in comparison to atonic tokens was only slightly supported. The hypothesis that functional tokens such as <s> in *masa* 'mass' and <z> in *maza* 'hunting club' would be more likely to be produced acoustically different than would non-functional <s> in *cosa* 'thing' and <z> in *andaluza* 'Andalusian (fem)' was only partially supported. The hypothesis that words with two Different coronal fricative environments would produce a smaller acoustic difference between [s] and [θ] as compared to words with No additional coronal fricative or the Same coronal fricative environment was strongly supported.

Orthography. The role of orthography is discussed above in §6.1.1.

Syllabic stress. The stress by orthography interaction in the linear regressions of variance (Hz) and mean intensity (dB) demonstrates that tonic tokens have a larger phonetic separation of phonemes than atonic tokens. This suggests that stressed tokens are subject to less reduction tendencies than atonic tokens.

Functionality. The functionality by orthography interaction in the linear regression of variance (Hz) (but not mean intensity nor center of gravity) supports

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functionalist approaches in which functional tokens had a larger phonetic separation of phonemes than did non-functional tokens. Wedel (2004, 2006) and Wedel et al. (2013) suggest that phonological maintenance is increased in languages with potential mergers when phonemes have a functional load. This finding loosely supports these predictions, but in the opposite direction of a split. This suggests that functional tokens are perhaps some of the first tokens to demerge. This is perhaps due to the influence of formal education and the formality of the reading task. This also supports a previous finding by Villena (2007) in which functional <s> tokens were more likely to be realized as [s] than [θ]. However, given that Functionality was not significant for the other two dependent measures, this appears not to be such a strong finding, suggesting that other factors are much more important in predicting the demerger.

Assimilation. The assimilation by orthography interaction for the linear regressions of center of gravity and mean intensity (but not variance) demonstrates that words with an additional Same fricative environment (i.e. *sesión*, *cerveza*) have the largest phonetic separation between phonemes, followed by words with No additional fricative (i.e. *cosa*, *dice*), and then the smallest phonetic separation is among words with an additional Different fricative environment (i.e. *gracioso*, *social*). These results support previous findings (Moya & García-Wiedemann 1995; Regan 2017; Villena 2007). From my own observations it appears that the presence of a fricative can trigger an assimilation effect (either progressive/preservative assimilation or regressive/anticipatory assimilation) when there are two different fricatives in the same word. The current study

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(as does Regan 2017) expands on this assimilation effect originally pointed out by Moya and García-Wiedemann (1995) as an *entorno simple* 'simple environment' such as *cosa* 'thing or an *entorno doble* 'double environment' such as *precioso* 'precious'. The current analysis demonstrates that there is in fact a three-point continuum in which a word with two of the Same fricative environments displays the greatest phonetic separation of phonemes, words with two Different fricative environments displays the least phonetic separation of phonemes, and words with No additional fricative displays an intermediate phonetic separation.

The extra-linguistic factors appear to show stronger and more consistent effects on the coronal fricative realizations across different dependent measures as compared to the linguistic factors. In this sense, the leaders of change in demerger are females, younger speakers, those with secondary or university education, those with service or professional oriented occupations, and those from Huelva. Consequently, this is a socially motivated *change from above* (Labov 2001) where the traditional dialectal feature of *ceceo* has become a *linguistic marker* (Labov 1972). Consequently, while language-internal factors must be accounted for, as Milroy (2003) states, it is speakers who initiate language change, not language itself.

6.1.4 RQ4: Rural-Urban dichotomy

Does rural Lepe demonstrate differences in the linguistic change as compared to urban Huelva? The findings suggest that as entire speech communities, Huelva produces a larger phonetic difference in several acoustic measures between orthographic

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environments than Lepe. In this sense, *urban* Huelva is significantly different from *rural* Lepe. However, while there is a quantitative difference found here between Huelva and Lepe, I propose that Huelva is different than Lepe in the *rate/stage* of linguistic change, but not necessarily in the *process* of linguistic change. The findings suggest that Huelva is perhaps a generation ahead of Lepe in the demerger of *ceceo*. These findings support Britain's (2009a, 2010, 2012ab, 2013) rejection of the rural-urban dichotomy. Here we find that the urban community is more advanced in the change due to increased dialect contact brought by the *Polo Industrial* in the 1960s, but the same processes of increased educational attainment, changes in population, and changes in economy have led to similar processes of linguistic change. In fact, individual analysis (for the sake of space they were not included) were run for each community for each dependent measure and the significant extra-linguistic factors were the same in both communities. It appears that the large-scale societal changes (see Chapter 3) of increase and change in population, increase in educational attainment, and changes in sectors of employment, have affected both speech communities. It is perhaps the specific histories of each speech community have led to this difference in rate of change. Specifically, the rapid industrialization of Huelva in the 1960's with the arrival of the *Polo industrial*, which brought speakers from other parts of the province, Andalucía, and the country. This initiated dialect contact much earlier in Huelva than Lepe. Lepe, different than other small towns near Huelva, has been economically independent allowing for traditional dialect features to remain in place without much dialect contact. However, both communities (as well as other parts of

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Andalucía and Spain) have seen a massive increase in educational levels attained, which has motivated many younger speakers to travel to other cities for university education (something that was nearly unheard of two generations ago). In this sense, while the dialect contact began in Huelva earlier than in Lepe, large-scale societal changes such as increase in education, increase in dialect contact, and a move from traditional forms of employment to more service and professionally-oriented occupations, has influenced both communities.

6.1.5 RQ5: Acoustic properties of the coronal fricatives

Acoustic properties of the coronal fricatives: *What are the acoustic properties of fricative tokens that are auditorily coded as [θ] vs. [s] by the author?* The results from the large-scale linear regressions and the demerger index[71] scores, the logistic regression of the auditory analysis, and the individual analyses reveal that there is a large continuum of possible phonetic realizations for the two phonemes of /s/ and /θ/. Specifically, as observed in the logistic regression of the forced choice auditory analysis, tokens that were higher in center of gravity and mean intensity were more likely to be perceived as [s] while tokens that are lower in center of gravity and mean intensity are more likely to be perceived as [θ]. The acoustic analyses demonstrate that *ceceante* speakers produce realizations that are intermediate (and overlapping) to these two phonemes. Consequently, there is a continuum of realizations with those on either extreme of the

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[71] The correlation of the demerger indexes (Figure 5.36) also reveals such gradient differences.

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continuum being perceived more as [s] and [θ], while intermediate realizations are more difficult to perceive as one or the other.

Within a segmental phonological approach, /s/ and /θ/ are said to be categorically different from one another. Many phonologists have used the binary feature of sibilant or non-sibilant to differentiate between these two phonemes. However, as Laver (1994: 260) indicates, there is no phonetic basis for using sibilant versus non-sibilant[72] as there exists "a scale of sibilance, or stridency, a continuum." In fact Laver (1994) and Crystal (2003) indicate that there is a lack of consensus between which segments are [+/-] sibilant. The current data demonstrate this scale of sibilance (or stridency). This (non-binary) scale of sibilance is supported in the current study's findings of gradient realizations from /s/ to /s^{θ}/ to /θ/ in Andalusian Spanish.

A detailed look at specific speakers with the merger versus speakers with a large phonetic separation in phonemes reveals that *ceceo* presents a great deal of phonetic variation and overlap between the two phonemes of /s/ and /θ/. The speakers that have acquired *distinción* demonstrate a clear separation of phonemes with no overlap when looking at both center of gravity and mean intensity. Thus, as Lasarte Cervantes (2010: 489) added *ceceo* as an intermediate realization on the intensity continuum (see Figure 2.9) proposed by Martínez Celdrán and Fernández Planas (2007: 107), here I build on this idea by prosing that this is also the case for center of gravity (see Figure 6.1). In this sense, speakers of *distinción* are producing /θ/ between 1,000 and 3,000 Hz and /s/

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[72] Laver (1994) believes, however, that this categorical distinction may be of use for a more auditory-phonological basis.

between 4,500 and 7,500 Hz. Those demonstrating the merger /s$^\theta$/, however, are producing this merger in-between these two values, with a large range and partial overlap of the other two phonemes.

Center of Gravity (Hz) Continuum
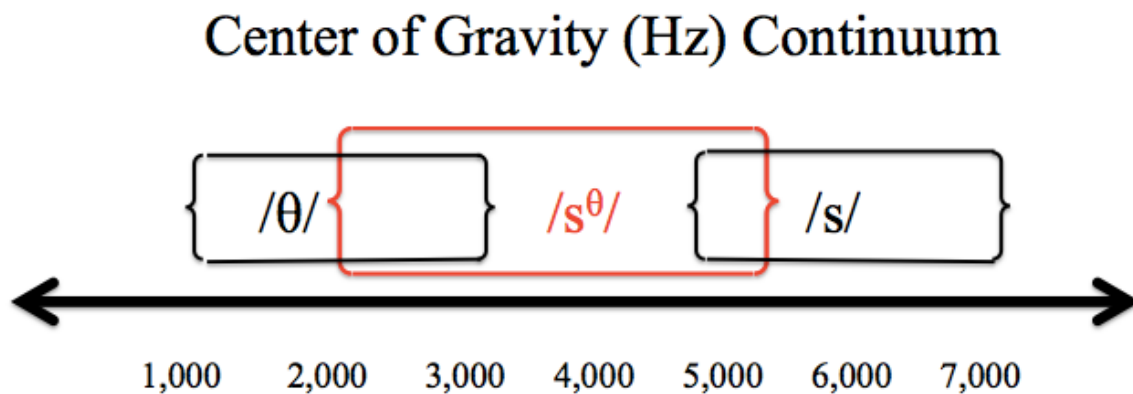
Figure 6.1: Proposed *Center of Gravity Continuum* for Andalusian coronal fricatives
(black = *distinción* with /θ/ and /s/; red = *ceceo* with /s$^\theta$/)

However, as seen in the auditory logistic regression and the correlation of the demerger indexes, center of gravity (Hz) and mean intensity (dB) do not work independently of one another in the production of Andalusian coronal fricatives. In this vein I propose a center of gravity (Hz) by mean intensity continuum (dB); see Figure 6.2. I have specifically shown /s/ to have the least amount of variation both in center of gravity and mean intensity as it appears the *distinción* speakers demonstrate a smaller amount of variation for /s/ as they do for /θ/, particularly with the acoustic parameter of center for gravity. Additionally, I have intentionally shown the phonetic range of /s$^\theta$/ to overlap with both /s/ and /θ/ as *ceceante* speakers shown a large range of variation in both parameters.

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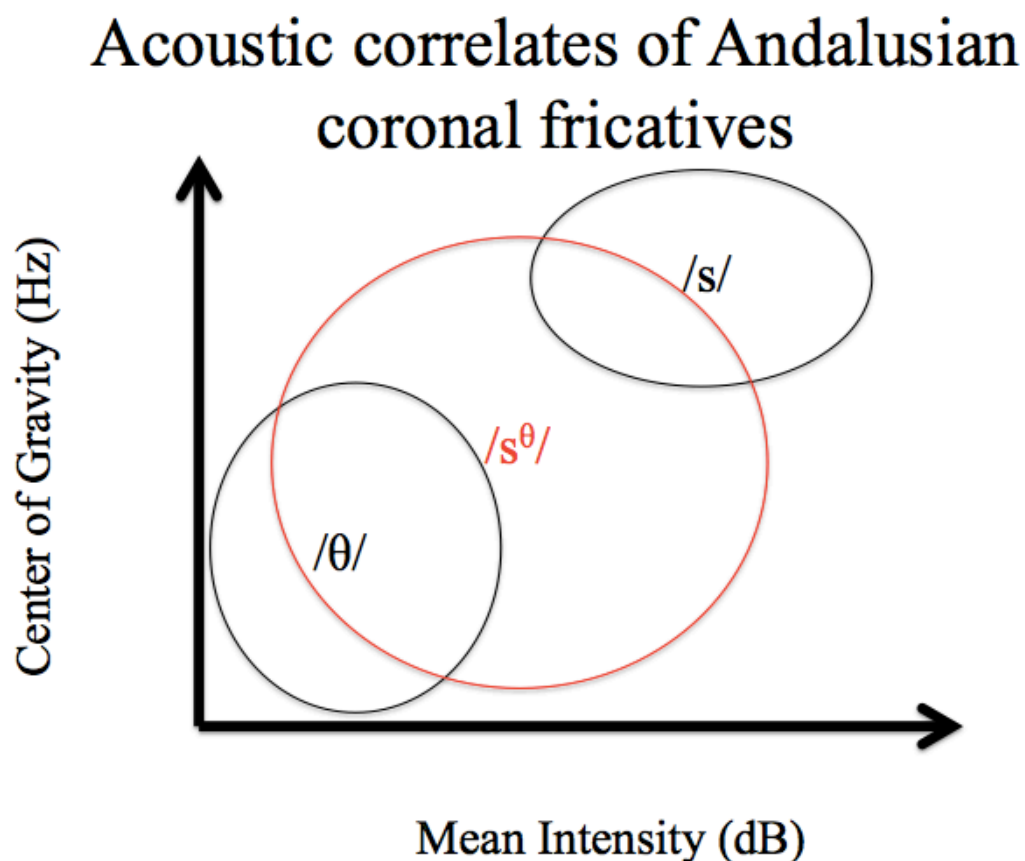
Figure 6.2: Proposed *Center of Gravity by Mean Intensity Continuum* for Andalusian
coronal fricatives (black = *distinción* with /θ/ and /s/; red = *ceceo* with /s$^\theta$/)

In line with the proposed center of gravity by mean intensity continuum, I hope to

also proposed a useful way of visualizing fricatives as seen in Figures 5.45 and 5.46.

Based on the variationist tradition of Labov and colleagues to plot vowels by F2 (x-axis)

by F1 (y-axis), I suggest that future studies plot coronal fricatives by mean intensity (x-

axis) by center of gravity (y-axis); see Figure 6.3 This allows for a visualization of

speaker production similar to that of vowels to allow for comparisons of mergers and

splits.
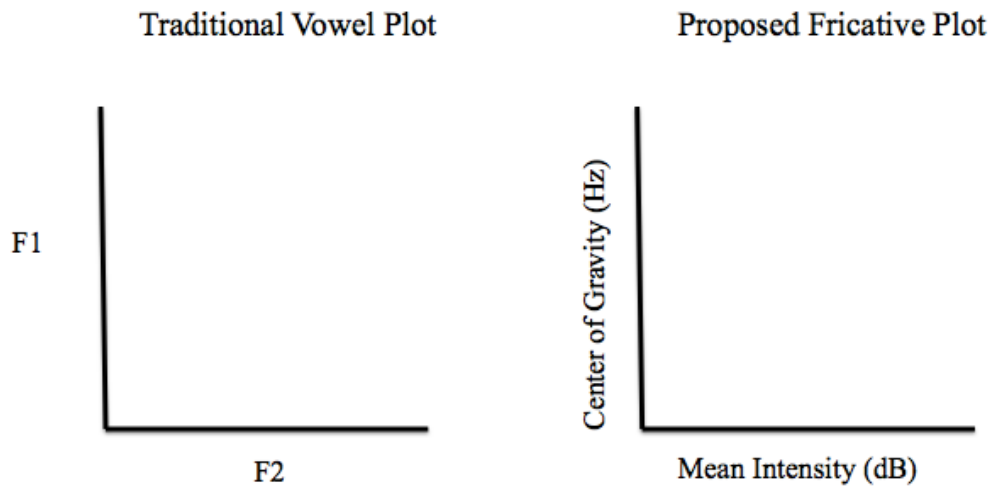
Figure 6.3 Proposed Fricative Plot (right) based on Traditional Vowel Plot (left)

     In view of the gradient phonetic continuum of fricatives, similar to the merger by approximation (Trudgill & Foxcroft 1978), I propose that the change from *ceceo* to *distinción* is a *split by approximation* in which there is a phonetically gradual split that takes one to two generations to complete. As *ceceante* speakers produce an intermediate merger between the two phonemes of /s/ and /θ/, the split requires a decreasing of the center of gravity and mean intensity for <z,ci,ce> and an increasing in center of gravity and mean intensity for <s>. Speakers who still produce a merger may only be able to move in one direction, that is, use either center of gravity and/or mean intensity to produce higher <s> values, but may not also lower <z,ci,ce> values. With each generation, the approximation towards *distinción* in both directions increases.

6.2 THEORETICAL IMPLICATIONS

6.2.1 Sociolinguistic theory of mergers/splits (Garde's and Herzog's Principles)

Social affect of mergers/splits. Given that the social factors were the strongest

predictors of separating phonemes based on orthography, this suggests a socially

motivated community-wide split. The social pressures brought about by large-scale

societal changes of increased education, changes in occupation, and dialect contact, have

provided the adequate social context for *ceceo* to become socially stigmatized, leading to

its split. In this sense, *ceceo* is not absent of social affect as demonstrated by many

metalinguistic comments. Speakers are very aware of the social associations surrounding

ceceo. Several speakers made explicit comments that "*se habla mucho con la zeta aquí*"

'people speak a lot with the zee around here' or that "*se cecea mucho por aquí*" 'people

cecea [verb] a lot around here.' Others would even make direct connections to

socioeconomic levels, education, or occupation with *ceceo*. Those in Huelva indicated

strongly that those in Lepe (and other towns) spoke more *bruto*, especially in regards to

the extended use (or perceived use) of *ceceo*. Contrary to native English speakers, who

may not be aware of the COT-CAUGHT[73] or PIN-PEN mergers, Andalusian Spanish speakers

do in fact refer to the *ceceo* and *seseo* mergers in common speech. That is, non-linguists

are very aware of *ceceo*, *seseo*, and *distinción* as well as the social associations with each

fricative norm. These observations confront Labov's (1994: 343) claim that "as a rule,

mergers and splits have no social affect associated with them." Labov cites the multitude

of COT-CAUGHT merger studies to support such arguments in which speakers do not

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[73] Or as I prefer, the JON-JAWN merger.

demonstrate any social awareness of such merger (1994: 344; 2010: 129). While such theory[74] may hold true for English vowels, this is not the case of the coronal fricative variation in Andalucía. The current study supports previous work (Maguire 2008; Maguire et al. 2013) that emphasizes the importance of sociolinguistic awareness as the enabling factor in the split of a merger. As Maguire et al. (2013: 234-235) state, if a merger becomes socially stigmatized, there is then strong motivation for a split.

Garde's Principle. Now we can return to Garde's Principle (Garde 1961: 38-9), which states, "Innovations can create mergers, but cannot reverse them. If two words have become identical through a phonetic change, they can never be differentiated by phonetic means" (*Labov's translation* 1994: 311). As mentioned previously, Labov summarizes this as "Mergers are irreversible by linguistic means" (1994: 311). It would appears that Garde's Principle does not discuss the notion of dialect contact, and that perhaps dialect contact would allow the reversal of a full merger. In fact, Labov (1994: 343, 348) acknowledges that contact and education may allow individuals to reverse a merger with the appropriate context. In the current case, the original innovation was during the 14th through 17th century in which dialect contact led to the reduction of four medieval sibilants into one phoneme of dental /s̪/ in Andalusian Spanish, phonetically realized as *seseo* or *ceceo* depending upon the region (Penny 2000; 2002). Remember, however, that in Castilian Spanish, these four medieval sibilants merger into two phonemes; apico-alveolar /s/ and interdental /θ/ (Penny 2000; 2002) (see §2.2). The

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[74] Such claims that mergers/splits have no social value may persist in sociolinguistic theory due to an overreliance on the English language, particularly the analysis of vowels, in variationist theory.

modern day contact of Castilian Spanish speakers with Andalusian speakers, perhaps

beginning in the 1960s in Huelva with the arrival of speakers with *distinción* from other

regions[75] working in the *Polo Industrial*, allowed for dialect contact and subsequent

demerger of the centuries old merger. This timeline also co-occurs with the arrival of

television and radio to the region in the late 1950s (see §3.3) allowing for increased

exposure to *distinción*. Thus, in this sense, it is dialect contact that brought about the split

of *ceceo*, not necessarily "linguistic means." Maguire et al. (2013: 234) believe

irreversible by "linguistic means" to be quite ambiguous. If Garde's Principle is simply to

mean that in the absence of dialect contact that a merger will not split, than the current

study has little to say about Garde's Principle. If, on the other hand, Garde's Principle is

interpreted to mean that splits are impossible, the current study challenges such a notion.

If the latter is the correct interpretation of Garde's Principle, the current study provides

phonetic support for what phonological claims have been made by other scholars based

on auditory analysis (Moya & Sosiński 2015: 35; Regan 2017: 152; Villena 2001: 126;

Villena & Vida 2012: 117-118) citing the demerger of *ceceo* as an exception to Garde's

Principle.

Additionally, not only does the current study demonstrate evidence of a split of a

few individuals, but rather two entire speech communities. While Labov believes

individuals can reverse a merger as seen through Sankoff's (2004) case student of British

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[75] This perhaps would be a moderate type of dialect "swamping" (Thomas 2006) in which a community
with the merger is swamped (normally through immigration) by speakers who do not have the merger,
resulting in speakers, especially those in acquisition, being exposed to both the merger and the distinction.
The reversal of the NURSE-NORTH merger in Tyneside was a type of swamping (Maguire 2008; Maguire et
al. 2013).

students ability to acquire the /ʌ/~/u/ distinction, he claims that "it does not seem likely that an entire speech community can do so" (2010: 121). The current study demonstrates that not only is it possible for a speech community to split a merger, but that it is quite advanced in doing so between Huelva and Lepe.

Herzog's Principle. This leads us Herzog's Principle, which states, "mergers expand at the expense of distinctions" (Herzog 1965; Labov 1994: 313). The amount of empirical support for such this principle is overwhelming. For example, the single largest phonological change in American English is the merger of the COT-CAUGHT vowels, which have merged across "Western New England, Western Pennsylvania, the Far West, and Canada" (1994: 316-317). Study after study, particular on English vowels, as well as Spanish consonants, have demonstrated the overwhelming tendency of a merger expanding at the expense of a distinction. However, as Maguire et al. (2013: 234-235) note, Herzog's Principle "may be compromised when the merger involved is, or becomes heavily stigmatized" (Maguire et al. 2013: 234-235). As evidence, they cite the current split of the long-standing NURSE-NORTH merger in Tyneside English. The current study demonstrates a counter example to Herzog's Principle in which a distinction is expanding at the expense of a centuries old merger due to social stigmatization as a result of dialect contact. In fact, if we look at the trends occurring throughout Andalucía in connection to the current results in Huelva and Lepe, there is evidence of the demerger of *ceceo* (and/or *seseo*) in Granada (Martínez & Moya 2000; Melguizo 2007, 2009ab; Moya 2016; Moya & García-Wiedemann 1995; Moya & Sosiński 2015; Salvador 1980), Málaga (Ávila

1994; Lasarte Cervantes 2010, 2012; Villena 1994, 1996, 2001, 2005, 2007; Villena & Ávila 2014; Villena et al. 1995; Villena & Requena 1996; Villena & Vida 2012), Jerez de la Frontera (García Amaya 2008), and Sevilla (Santana 2016a). In light of these findings, I propose that the demerger of *ceceo* into *distinción* may be one of the largest phonological changes occurring in the Spanish-speaking world; and perhaps even one of the largest demergers in recorded linguistics, as it appears to be occurring throughout coastal Andalucía due to the social stigmatization of the feature. The change is so advanced that I believe that the *distinción* norm is perhaps more common than the mergers in Andalucía, particularly among younger generations.

Thus, the current study supports other previous findings on fricative demerger in Andalucía (Ávila 1994; García Amaya 2008; Lasarte Cervantes 2010, 2012; Martínez & Moya 2000; Melguizo 2007, 2009ab; Moya & García-Wiedemann 1995; Moya & Sosiński 2015; Regan 2017; Salvador 1980; Villena 1994, 1996, 2001, 2005, 2007; Villena et al. 1995; Villena & Requena 1996; Villena & Vida 2012) and vowel demerger in the English speaking world (Johnson 2010; Johnson & Nycz 2015; Maguire 2008; Maguire et al. 2013; Nycz 2011, 2013), in which the split of a full merger is possible due to dialect contact, particularly in the case when a merger becomes socially stigmatized. While there is overwhelming evidence in support of both Garde's and Herzog's Principles, in light of the current results in connection with recent studies, I propose both principles are strong tendencies, but that particular social contexts and dialect contact allow for exceptions.

These results also shed light into second dialect acquisition of new features (Chambers 1992)[76]. Different from individuals moving from one dialect area to another, here (and throughout Andalucía) speakers of Andalusian Spanish are adopting certain prestige features (such as *distinción*) from Castilian Spanish, while maintaining other traditional Andalusian features. In this sense, this demerger is unlike those seen in St. Louis or Charleston, S.C. (Labov 2010: 138) in which entire small city dialects are converging towards regional dialects. Rather this situation presents a type of intermediate variety, or regional koiné, referred to as *español común* (Hernández & Villena 2009; Villena 2008; Villena & Vida 2012; Villena & Vida *in press*; see chapter 2). Consequently, this presents a unique analysis of the acquisition of a split by adults. The current study indicates, that for speakers moving from a merger (*ceceo*) to a split (*distinción*), the acquisition of mean intensity (dB) appears to be a more realistic acoustic parameter to acquire as an adult in the process of demerging than perhaps is center of gravity (Hz). This is particularly evident in Figure 5.36 in the demerger indexes correlation in which many speakers have close to zero on the center of gravity demerger index, but a positive score on the mean intensity demerger index. Thus, instead of a full articulatory change in speech (needed for a change in center of gravity (Hz)), this would allow for demerging speakers to acquire something less complex, that of changes in mean intensity (dB).

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[76] See Nycz (2016) for a review of studies of second dialect acquisition of phonological features.

6.2.2 Large-scale societal changes and dialect convergence

The motivation for the demerger of *ceceo* is fundamentally social. The large-scale societal changes that have occurred throughout Europe in the last several decades have also affected both Huelva and Lepe (see Chapter 3 for details); areas that have been historically isolated due to its geographic isolation with Portugal to the west, the Atlantic Ocean to the south, *la sierra de Aracena* 'Aracena mountain range' to the north, and the *Parque Nacional de Doñana* to the east. Change appears to have first affected Huelva, principally during the 1960s with the *Polo Industrial*, which brought speakers with *distinción* from other parts of the country. Additionally during this time, Spanish television began in 1956, which would have promoted Castilian Spanish (i.e. *distinción*) through the television and the radio (see §3.3). Although the current study did not find a main effect for mass media, the increase in contact with mass media[77] should not to be underestimated. Since the 1960s, both communities have seen large-scale changes in their economies. Huelva moved from an agricultural/fishing town into an industrial city while Lepe continued with agriculture, but effectively lost its fishing tradition. However, in the most recent decades both communities have shifted toward more service and professional

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[77] While dialect contact through mass media does not undermine the primary means of systematic linguistic change, that is, in-person "face-to-face interaction" (Labov 2001: 228), it should not be discredited as a complementary factor in linguistic change. In fact, recent work has found that speakers with strong engagement to certain television programs demonstrate accelerated linguistic change for on-going changes in the community (Stuart-Smith et al. 2013); suggesting that mass media can serve a role in on-going language change (Stuart-Smith 2006, 2011). In this sense, it is probable that the omnipresence of *distinción* on the television and radio beginning in the late 1950s worked (and continues to work) in tandem with an increase in face-to-face dialect contact with *distinción*.

oriented occupations (not to mention a recent boom in national and international tourism to both the city of Huelva and the nearby beaches of Lepe). This change in economies is significant as within the linguistic market, service and professional oriented occupations give much more linguistic capital to *distinción* as compared to *ceceo* (Bourdieu 1991; Bourdieu & Boltanski; 1975; Sankoff & Laberge 1978). These occupational changes of course are coupled with a significant increase in educational attainment. The role of education is absolutely fundamental in this change. As *distinción* is a prescribed grapheme-to-phoneme, which is taught in the schools, this is a principle mechanism of the change. As educational attainment levels increase among younger generations, so too does the amount of *distinción* in these communities. Additionally, changes in occupation and educational attainment have provided opportunities for more mobility. That is, younger generations are taking jobs or pursuing a university education in other cities (within and outside of Andalucía). Such mobility was not common two generations ago. Finally, fewer Huelvans and Leperos are living in homes with three generations as was more common several generations ago. As cited by previous scholars (Hinskens et al. 2005; Kerswill & Trudgill 2005), the younger generations are subsequently receiving less traditional dialect input from their grandparents, which allows for reduction of traditional features in favor of either standard or koineised forms. Consequently, these large-scale societal changes have not only allowed for, but have also motived the split of *ceceo* in favor of *distinción*.

As mentioned previously, the split of *ceceo* (or *seseo*) into *distinción* appears to

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be occurring throughout Andalucía due to similar large-scale societal changes. In fact, contrary to previous claims (Henández & Villena 2009; Villena 2008; Villena & Vida 2012) that only Eastern Andalucía is converging towards *distinción*, while Western Andalucía maintains the merger, it appears as though this change is occurring in both Eastern and Western Andalucía. The current results support the overwhelming trend found in European social dialectology of dialect convergence[78] in which traditional dialect features are converging towards more regional or national standard features due to large-scale societal changes such as an increase in education, mobility, and dialect contact; among others (Auer & Hinskens 1996; Auer et al. 2005; Hinskens et al. 2005). In this line, I strongly believe it is essential to document societal change in order to understand the social motivation of a particular sound change (Labov 1963). Such societal-changes have led to the stigmatization of the *ceceo* merger, thus promoting its split into the national prestige feature of *distinción*.

6.3 LIMITATIONS

While the results are significant, the study is not without limitations. In terms of the acoustic analysis, the lack of fricative normalization is a significant limitation. It is known that there are different inter-speaker variation effects, particularly related to gender, that affect the production of fricatives. The use of the demerger index was the author's attempt to veer away from absolute values of dependent measures in favor of a

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[78] While convergence normally leads to a type of simplification, that is dialect leveling through a reduction of a phoneme or allophone, this convergence results in an addition of a phoneme as originally pointed out by Villena & Vida (2012).

more relative demerger index to compare the effect of social factors. In terms of the auditory analysis, the lack of interrater reliability is a limitation. This coding will need to have an additional two to three native Andalusian coders in order to assure reliability in auditory coding.

The largest methodological limitation was the lack of spontaneous speech in the current analysis. As *ceceo* is an overtly stigmatized feature (although it appears to enjoy covert prestige in certain circles within Lepe and Huelva), it is hypothesized for some speakers that there is a difference between how speakers read formal tasks and how they speak with their peers. That is, the current study, looking at read speech, has asked the question: Are speakers *able* to produce a difference based on orthography? Most speakers were able to produce some type of phonetic difference between orthographic environments, while a minority of speakers was not. Future work analyzing the spontaneous speech will ask the question: *Do* speakers produce a difference based on orthography? That is, what is their underlying phonological representation? From an impressionistic perspective on the part of the author during the interviews, there were many speakers, in particular from Lepe that appeared to produce the *ceceo* merger in spontaneous speech, but then would switch fricative norms during the reading tasks and were able to produce differences, especially with the minimal pairs. This ability to switch[79] from *ceceo* into a subtle *distinción* was strongest for the younger and middle

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[79] A follow up analysis will look specifically at speakers who produce a merger in spontaneous speech and compare this to their formal reading tasks. This will shed light into the precise acoustic profile of *ceceo* /s$^\theta$/ in comparisons to a fully alveolar /s/ and interdental /θ/.

generations. The oldest generation appeared to have less ability to change from *ceceo* into *distinción* for the reading tasks.

6.4 FUTURE RESEARCH

Future research will include an analysis of the semi-led conversation (Style A). It is hypothesized that there will be more *ceceo*-like realizations in the spontaneous speech, especially for speakers of Lepe. Thus, spontaneous speech may demonstrate a difference between underlying *phonological representations* as compared to *phonetic abilities*. In addition future studies will analyze the metalinguistic commentaries part of the interview as this in connection with the spontaneous speech, would prove fruitful from a third wave sociolinguistic (Eckert 2008, 2012) perspective of analyzing stylistic variation and the social meaning of linguistic variation in discourse. Analysis on the spontaneous speech is underway. Also of interest would be comparing the results of the spontaneous speech to any type of legacy data found in the region. This would allow for an even larger chronological comparison.

Future work should also look into the question of lexical diffusion. That is, does a demerger impact certain lexical items more/less frequently than others? For instance, are highly frequent locally used words more conservative with respect to demerger? This would shed light into one of the longest debates in linguistics, that of the neogrammarian controversy on sound change (Labov 1981, 1994). According to the neogrammarian principles, sound change is lexically exceptionless, affecting all words of a given word class at the same time (Osthoff & Brugmann 1878). However, dialectologists have long

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held the view that "each word has it own history" (Gilliéron 1918; Labov 1994: 16; Malkiel 1967) and that lexical irregularity in sound change is the norm. Recently, the lexical perspective of sound change has been supported by scholars working within exemplar-based models (Pierrehumbert 2001, 2002, 2003, 2006) and frequency/usage-based models (Bybee 2001). These models propose that word-specific phonetic effects based on each speaker's experience (frequencies) are stored by speakers. In this case, lexical irregularities in sound change are to be expected. Thus, analyzing the demerger of *ceceo* based on word frequency would provide new insights into the diffusion of sound change.

Future work should also look towards perception studies in order to assess both the just noticeable difference in hertz and decibels that speakers are able to hear building on the intensity perception study conducted by Lasarte Cervantes (2012). This would also help to shed light onto the status of *ceceo* as a full or near-merger.

As this study has focuses on the production of coronal fricatives, future studies conducted in the same region of Spain should be devoted to investigations of the social evaluation of the variable under consideration here (i.e., the maintenance of *ceceo* versus the demerged *distinción*). In this way we can better understand the language attitudes surrounding particular dialectal and standard features that may promote or inhibit language change. A matched-guise experiment on *distinción* and *ceceo* with the communities of Huelva and Lepe is already underway.

Finally, in line with ongoing work[80] in Málaga and Granada, future work will also look at other traditional dialect features of Lepe and Huelva to assess their status of convergence or divergence toward more standard features. Similar to scholarly and popular stereotypes of Huelva and Lepe as *ceceante* regions, there are many other features associated with the region that appear to be converging towards more standard features. In this light, future work should assess which traditional dialectal features are being maintained and which are converging towards more standard features.

6.5 BROADER CONTRIBUTIONS

Sociolinguistics: In line with calls for more quantitative linguistic studies of Andalusian Spanish, this study provides the second rigorous sociolinguistic study in the province of Huelva. This contributes to the sociolinguistic literature on demerger promoted by language-external pressures. In terms of general sociolinguistic theory, the current study provides a non-English counter example to the long-standing sociolinguistic merger/split claims of Garde's and Herzog's Principles, suggesting that more non-English examples should be used to analyze general sociolinguistic theory. Additionally, in line with Britain (2009a, 2010, 2012ab, 2013), the current study has counteracted the "urban turn" in sociolinguistics by using quantitative approaches to a rural area in comparison to an urban community in order to examine the urban-rural dichotomy.

Sociophonetics: The field of sociophonetics is relatively new (Foulkes & Docherty 2006; Foulkes et al. 2010; Hay & Drager 2007) and the vast majority of the

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[80] See Villena and Vida (*in press*) for an up-to-date overview of dialect convergence and divergence of several phonological features throughout Andalucía; see also Villena and Ávila (2014).

work has been done on English. In this manner, this project fills a major gap in subsegmental analyses of Spanish. Spanish fricatives have been the locus of the research in sociolinguistic studies of Spanish phonetic variation but, until recently (Gerfen 2002; Lasarte Cervantes 2010, 2012; Erker 2010, 2012), most linguists have examined fricative productions in Spanish via auditory analysis only. In fact, building on Lasarte-Cervantes (2010), this is the first large-scale sociophonetic study on Andalusian coronal fricatives. Additionally, this study fills a major gap in subsegmental analyses of consonants in the variationist paradigm (Docherty & Foulkes 1999; Docherty & Mendoza-Denton 2012). The current study has also proposed two methodological advancements for sociophonetics studies on fricatives and mergers/splits. Inspired by the variationist vowel plot, the current study has established a *fricative plot* (mean intensity by center of gravity) to be used in future studies in order to visualize the acoustic space of fricative mergers and splits. Secondly, the current study has developed a *Demerger Index*, which will hopefully be of use for future studies on *ceceo* or *seseo* (and other consonant mergers/splits) as a means of normalizing data as well as creating individual demerger scores for speakers.

Phonetics and phonology: The detailed gradient differences in *ceceo* and *distinción* bolster phonetic claims against the binary phonological theories that have prevailed, not only in Andalucía, but in general linguistic accounts of a merger. In particular, the current study has demonstrated that *ceceo* (and its split into *distinción*) demonstrates a gradient nature of sibilance supporting previous claims of sibilance

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having a scale as opposed to being binary (Crystal 2003; Laver 1994). In light of these findings, the current study has proposed a *Center of Gravity Continuum* as well as the *Center of Gravity by Mean Intensity Continuum* for Andalusian coronal fricatives, building on previous intensity continuums (Lasarte Cervantes 2010; Martínez Celdrán & Fernández Planas 2007).

Dialectology: Although Andalusian Spanish has been studied quite a bit in the traditional dialectal literature (Alvar 1996; Alvar et al. 1973; Mondéjar 1991; Navarro Tomás et al. 1933; Penny 2000), this study highlights the need for more local empirical examinations. In addition, this study contributes to the rich literature of linguistic convergence induced by dialectal contact found in modern social dialectology (Auer & Hinskens 1996; Auer et al. 2005; Chambers & Trudgill 1988; Hinskens et al. 2005; Trudgill 1972, 1974, 1986; Villena 1996).

6.6 CONCLUDING REMARKS

The current work supports ongoing studies by several scholars looking at Andalusian coronal fricatives, particularly the split of a centuries old merger. Specifically, this dissertation has provided the first large-scale phonetic analysis of *ceceo* and *distinción*, indicating that there is a gradient phonetic continuum. The findings demonstrate that the large-scale societal changes in the last fifty years of increased education, changes in population, changes in sectors of employment, increased mass media, and increased mobility and dialect contact, has led to the adequate social context to promote the split of a traditional dialectal merger. Specifically, both urban Huelva and

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rural Lepe are moving from the local traditional dialectal feature of *ceceo* towards the national prestige feature of *distinción*. While Huelva is more advanced in the change than Lepe, both speech communities appear to be adhering to the same linguistic process. Thus, Western Andalucía, previously thought to maintain traditional dialectal features, is in fact, similar to Eastern Andalucía, converging from traditional dialectal features such as *ceceo* towards standard Castilian features such as *distinción*. This socially motivated change from above demonstrates the importance of social pressure and prestige in sound change, even if it runs contrary to natural language tendencies. While stereotypes continue to exist about the speech of Huelva and Lepe, these regions are not timeless carriers of traditional dialects, but rather subject to the linguistic market brought through the large-scale societal changes. The split of *ceceo* into *distinción* demonstrates a socially motivated community-wide demerger, challenging long-standing sociolinguistic claims about mergers and splits. While much work remains to be done to understand the lexical diffusion of the change, this study contributes to an ongoing scholarly conversation on Andalusian coronal fricatives, dialect contact and convergence, and variationist analysis of mergers and splits; and consequently promotes new directions for future research.

Appendices

APPENDIX A. DEMOGRAPHIC INFORMATION OF HUELVA PARTICIPANTS

ID	Sex	Age	Birth year	Edu.	Occupation	Years away	Barrio (Current/Former)	Mass Media
H1.M.37	F	37	1977	Univ.	Biologist (P)	8.333	La Pescadería	15
H3.H.19	M	19	1996	Prim.	Unemployed (M)	0	La Orden	13
H4.H.51	M	51	1964	Prim.	Plumber (M)	0	Isla Chica	17
H5.M.26	F	25	1989	Sec.	Flamenco singer (P)	6	Isla Chica	8
H7.M.51	F	51	1964	Sec.	Administrative (S)	0	Isla Chica	19
H8.H.57	M	57	1957	Prim.	Factory worker (M)	0	Isla Chica	15
H9.M.29	F	29	1985	Univ.	Teacher (P)	0	Isla Chica	15
H11.H.50	M	50	1964	Sec.	Factory worker (M)	1	La Orden	16
H12.H.63	M	63	1952	Sec.	Chemist/Business/ Bar owner (P)	1.5	La Orden	19
H13.H.34	M	34	1981	Sec.	Travel agent (P)	0	El Molino	21
H14.H.38	M	38	1977	Univ.	Real Estate Admin. (P)	5	Torrejón / Isla Chica	20
H16.H.25	M	25	1989	Sec.	Unemployed (M)	0	El Molino	18
H17.H.28	M	28	1986	Sec.	Hotel receptionist (S)	0	El Centro	14
H18.H.34	M	34	1980	Univ.	Teacher (P)	2	Polígono San Sebastián/ Perez Cubillas	20
H20.M.30	F	30	1985	Univ.	Teacher (P)	1	El Centro	14
H21.M.38	F	38	1977	Univ.	Nurse (P)	0	La Orden/ La Hispanidad	13
H23.M.23	F	23	1991	Univ.	Univ. student (P)	0	Isla Chica	10
H25.M.19	F	18	1996	Univ.	Univ. student (P)	0	El Molino nuevo	15
H26.M.19	F	19	1996	Univ.	Univ. student (P)	0	Las 3 Ventanas/ La Hispanidad	17
H27.H.44	M	44	1970	Prim.	Unemployed (M)	0	La Orden	11
H28.M.65	F	65	1949	Sec.	Clinic assistant (S)	0	Huerto Paco/ Isla Chica	13
H29.H.23	M	23	1992	Univ.	Univ. student (P)	4	El Centro	17
H31.H.44	M	44	1970	Sec.	Technician (M)	0	La Orden	21
H32.H.62	M	62	1953	Prim.	Bar owner (S)	0	La Orden	11
H33.M.34	F	34	1980	Univ.	Social worker (P)	0	Barriada Nueva (La Orden)/ Adoratrices	15
H34.H.47	M	47	1968	Sec.	Bar tender (S)	6.583	El Centro	21
H36.M.70	F	70	1945	Prim.	Nurse's assistant (S)	0	Adoratrices	9
H37.H.47	M	47	1968	Prim.	Bar tender (S)	0	Isla Chica/ La Orden	16
H38.M.52	F	52	1963	Univ.	Teacher (P)	0	Bellavista/ El Centro	16
H44.H.19	M	19	1996	Sec.	Unemployed (M)	0	Los Rosales	12

H46.M.69	F	68	1947	Prim.	Pension keeper (S)	0	El Centro	13
H48.H.54	M	53	1962	Univ.	Director of Tourism Office (P)	2	Punta Umbría/ La Merced	21
H49.M.47	F	46	1968	Univ.	Journalist (P)	8.75	El Centro	22
H53.M.27	F	26	1989	Sec.	Supermarket worker (S)	0	San Juan/ La Orden (S. Marta)	9
H54.H.69	M	68	1947	Sec.	Bank Director (P)	10.25	Isla Chica	17
H55.M.48	F	47	1968	Univ.	Tourism Promoter (P)	0	Isla Chica	22
H57.M.49	F	48	1967	Sec.	Store clerk (S)	0.5	El Molino	19
H58.M.60	F	59	1955	Sec.	Shoe store owner (S)	0	Huerto Paco	9
H59.M.62	F	61	1953	Prim.	Stay-at-home (M)	5	San Juan/ La Orden/ Isla	8
H62.H.69	M	68	1947	Prim.	Construction (M)	0	Isla Chica	17

ID	Sex	Age	Birth year	Edu.	Occupation	Years Away	Barrio (Current/Former)	Mass Media
L1.M.46	F	46	1978	Univ.	Teacher (P)	10	La Ermita/ Centro	11
L2.M.23	F	23	1991	Sec.	Baker (S)	0	Centro	15
L3.M.62	F	62	1953	Prim.	Baker (S)	0	Centro	8
L4.H.58	M	58	1956	Univ.	City hall administrative (P)	0	Centro	13
L5.H.31	M	31	1983	Univ.	Bar owner (S)	6	Centro	10
L6.H.24	M	24	1990	Prim.	Field worker (M)	0	Centro	15
L7.H.20	M	20	1995	Sec.	Stitchery (S)	1	Centro	7
L8.M.58	F	58	1956	Sec.	City hall administrative (P)	0	Centro	16
L9.M.51	F	51	1964	Prim.	Field worker (M)	0	Centro/ Las cruces	12
L10.M.42	F	42	1972	Univ.	Univ. Professor (P)	10	Centro	12
L11.H.8	M	18	1997	Sec.	High school student/ Field worker (M)	0	Centro	19
L13.H.67	M	67	1947	Univ.	Teacher (P)	8	Centro	23
L14.M.31	F	31	1983	Univ.	Univ. Professor (P)	9	Centro	18
L15.M.27	F	27	1988	Sec.	X-ray technician (P)	5	Centro	13
L16.M.26	F	26	1989	Univ.	Univ. student (P)	6.5	Centro	13
L17.H.39	M	39	1975	Univ.	Teacher (P)	5	Teatro/ San Roque	22
L18.M.49	F	49	1965	Univ.	Teacher (P)	16	Centro	17
L19.M.54	F	54	1961	Sec.	Elderly Assistant (S)	0.5	Centro	14
L20.H.30	M	30	1985	Univ.	Unemployed/ Engineer (P)	10	Centro	12
L21.M.47	F	47	1967	Sec.	Shop owner (S)	0	Centro	20
L22.H.34	M	34	1980	Univ.	Civil Servant Administrative (P)	0.25	Centro	16
L23.H.27	M	27	1987	Univ.	Bookstore clerk (S)	6	Centro	4
L24.M.26	F	26	1988	Univ.	Lawyer (P)	5.75	La Pendola	19
L25.H.31	M	31	1983	Univ.	Lawyer (P)	1	La Pendola	18
L26.H.25	M	25	1990	Univ.	Real estate agent (P)	7	Urbanización Vir.B/La Pendola	16
L27.H.43	M	43	1971	Sec.	Bookstore owner (S)	0	Centro	13
L28.H.21	M	21	1993	Univ.	Univ. student (P)	4	Urbanización	17
L29.H.65	M	65	1949	Prim.	Fruit stand owner (S)	0	Centro	13
L30.H.67	M	67	1948	Prim.	Fisherman (M)	3	Centro	18
L31.H.69	M	69	1945	Prim.	Fisherman (M)	2	Las Colonias	12
L32.H.61	M	61	1953	Sec.	Flamenco guitarist (P)	9	Cornacho	14
L35.M.28	F	28	1986	Sec.	Shop owner (S)	3	Centro	15
L38.M.52	F	52	1962	Sec.	Cleaner (M)	0	San Roque (~Cornacho)	14
L39.H.48	M	48	1967	Univ.	Painter (P)	10	Centro	20
L44.H.48	M	48	1966	Sec.	Family restaurant (S)	0	El Cendro	16
L46.M.68	F	67	1947	Prim.	Stay-at-home (M)	0	La Bacaba/ Don	16

							Ramiro	
L47.M.87	F	86	1929	Prim.	Stay-at-home (M)	0	Centro	13
L48.M.78	F	75	1939	Prim.	Stay-at-home (M)	0	Centro	4
L54.M.73	F	72	1943	Prim.	Stay-at-home (M)	0	Don Ramiro	9
L56.M.26	F	25	1989	Sec.	Bar tender (S)	2	Don Ramiro	14

APPENDIX C. SEMI-DIRECTED CONVERSATION QUESTIONS

CIUDAD Y PROVINCIA:
¿Huelva capital?
¿Pasatiempo favorito aquí?
¿La provincia?
¿Con que frecuencia viajas a la sierra onubense? (Aracena) ¿Qué haces allí?
¿Qué tal las playas onubenses? ¿Cuál es tu playa favorita? ¿Por qué?
¿Te sientes una conexión a la provincia de Huelva? ¿a la tierra?
¿Cómo te identificas? ¿Como español, andaluz o onubense? ¿Cuál es tu orden de preferencia?
¿Qué opinas de la palabra "*choquero*"? ¿Es lo mismo como onubense? o ¿Es algo más?
¿Podrías vivir en otra ciudad/provincia/comunidad? ¿Por qué?

CULTURA:
¿Semana santa?
¿La Romería de El Rocío? ¿La Romería de la Bella?
¿Las Colombinas?
¿La virgen de la Cinta? ¿Cuál es tu virgen favorita?

COMIDA:
¿Comida local? → La costa vs. la sierra
¿Cuál es la mejor comida que hace tu madre? ¿tu abuela?
¿Qué tal el jamón serrano de la sierra onubense?
¿Qué tal el choco? ¿Es mejor que el pescado frito gaditano?
¿Qué tal las gambas? ¿mejor marisco aquí en Huelva?
¿Qué tal la comida de Huelva en comparación a otras regiones de España?
¿Fresa? ¿Cereza? ¿cítricos? ¿zumo? ¿aceite de olvida? ¿altramuz?

CAMBIOS:
¿Podrías comentarme los cambios que has visto y vivido aquí desde tu niñez?
¿Cómo se notan diferencias entre las generaciones diferentes?

SEVILLA:
¿Por qué va con frecuencia la gente a Sevilla? ¿Tú?
¿Qué piensas de Sevilla? ¿Qué piensas de los sevillanos?
¿Por qué existe un pique entre Sevilla y Huelva? ¿En cuanto a las ciudad? ¿deportes? ¿playas?
¿Existe algún tipo de pique entre Lepe y Cartaya?

PORTUGAL:
¿Por qué va con frecuencia la gente a Portugal? ¿Tú?
¿Qué piensa de Portugal?

DEPORTES:
¿Real Club Recreativo Huelva (el Recre)?
¿Real Madrid vs. Barcelona? ¿Sevilla o Betis?

LA CRISIS/ POLITICA
En cuanto a la crisis, ¿cómo ha afectado la gente aquí? ¿A ti?
¿Cómo lo ves la situación política ahora mismo en Huelva/ Andalucía/ España?
¿Qué opinas del grupo "PODEMOS"? ¿Puede solucionar algo?

CITY & PROVINCE:
Huelva city?
Favorite pastime here?
The province?
With how much frequency do you travel to the Sierra de Aracena? What do you do there?
How are the Huelvan beaches? Which is your favorite beach? Why?
Do you feel a connection to the province of Huelva? Or to the land?
How do you identify yourself? As a Spaniard, Andalusian, or Huelvan/Lepero? Which is your order of preference?
What's your opinion of the word *choquero* 'coloquial gentilic of Huelva'? Is it the same as *onubense* 'official gentilic of Huelva'? Or is it something more?
Would you be able to live in another city/province/autonomous community? Why?

CULTURE:
Holy week?
The Rocío? 'local religious pilgrimage'
The Romería de la Bella? 'religious pilgrimage in Lepe of the Virgen Bella'
The Colombinas? 'The fair of Huelva celebrating the departure of Columbus from Huelva'
The Virgen of the Cinta? Which is your favorite Virgen? (Virgen here referring to mother Mary)

FOOD:
Local food? → The coast vs. the mountains
Which is the best food that your mother makes? Your grandmother?
How's the Serrano ham in the *Sierra*?
How's the *choco* 'local sepia'? Is it better than the fried fish from Cádiz?
How are the prawns? Are they the best seafood in Huelva?
How is the food in Huelva compared to other regions in Spain?
Strawberries? Cherries? Citruses? Juice? Olive oil? Lupin bean?

SEVILLA:
Why do people go to Sevilla frequently? Do you? Why?
What do you think about Sevilla? What about people from Sevilla?
Why does there exist a rivalry/quarrel between Sevilla and Huelva? Is it city? Sports? Beaches?
Is there a rivalry between Lepe and Cartaya?

PORTUGAL:
Why do people go with frequency to Portugal? You?
What do you think about Portugal?

CHANGES:
Can you tell me the changes that you have seen/lived here since your childhood?
How does one note differences between the different generations here?

SPORTS:
Real Club Recreativo de Huelva (el Recre)? 'Huelva's soccer team'
Do you prefer Real Madrid or Barcelona? Sevilla or Betis? Why?

THE CRISIS/POLTICIS:
In terms of the crisis, how has this affected the people here? You?
How do you see the political situation right now in Lepe/Huelva, Andalucía, and Spain?
What do you think of the group "PODEMOS"? Do you think they can solve anything?

LECTURA

Yo pienso que Huelva capital tiene mucho para ofrecer a cualquier persona. A pesar de ser una ciudad chica, tiene muchas cosas para hacer, ver y comer. Además, es una ciudad muy cómoda, no hace falta conducir. La gente es muy acogedora, maja, social, andaluza, o sea, gente muy salada. Ha crecido mucho desde los años sesenta cuando se instaló el Polo Industrial que tiene muchas empresas internacionales. Huelva tiene un vocabulario riquísimo. Para llamar la atención de un chaval, se dice chiquillo, quillo o incluso illo. A veces la gente dice picha, pero eso ya es más de Cádiz. Para decir en casa de Pepe, es "anca Pepe." Las personas de Huelva son onubenses, o sea, choqueros.

Huelva capital tiene una riqueza de gastronomía. No hay nada soso. La gamba blanca, el puchero, el cochino y el gazpacho andaluz son geniales. El choco frito y las habas con choco también son riquísimos y famosos. El jamón serrano está para morirse. Las abuelas suelen cocer algunas sopas muy ricas. Los bares, como el Rey del Barril, tienen una selección buena de cerveza y tapas. Hay buenos sitios para salir. Huelva tiene unos barrios muy bonitos. Las casas del barrio inglés son preciosas. La zona del centro es muy bella, pero es cara también. Me encanta pasear por la Plaza de la Merced o la Plaza de las Monjas donde se puede tomar una cervecita, comer una hamburguesa y pasar tiempo con los amigos. El Real Club Recreativo de Huelva ya lleva muchos años en la segunda división, pobrecillos. Por eso, ya no hay muchos socios. Casi subió hace unos años. Si practicas deportes hay un carril bici para correr y montar en bicicleta. Huelva tiene muchas celebraciones, romerías y fiestas incluyendo Las Colombinas, el Rocío (que pertenece a Almonte) y la Romería[81] de la Cinta. La ermita de la Cinta es bonita; todavía algunos jóvenes se casan allí. También hay que ver los pasos de la Semana Santa. Esas procesiones tienen mucha fama. Así que, a pesar de la crisis, la gente no cesa de divertirse.

La provincia tiene muchas cosas para ver. La sierra de Aracena es preciosa. Se hace mucho senderismo en la sierra de Huelva. Alguna gente practica la caza allí. Jabugo es bien conocido por el jamón de pata negra y el chorizo. Esa pata negra está buenísima. Hay que reconocer que la provincia tiene playas preciosas como las de Punta Umbría, Mazagón, La Antilla, El Rompido e Isla Cristina. A diferencia de las playas de Málaga no hay muchísimas personas, pero hay bastantes sevillanos y muchos ingleses. Los sevillanos suelen decir que Matalascañas es suya, incluso dicen casi siempre que el Rocío es suyo también. Es un caso raro. Supuestamente por esas razones existe un pique con Sevilla.

Hay unos pueblos conocidos en la provincia como Bollullos, Gibraleón, Cartaya y Lepe. Los leperos tienen muchos chistes graciosos, pero también tiene una agricultura de riqueza con una gran cosecha. La fresa, la frambuesa y los cítricos son muy dulces. El zumo de naranja de allí es muy bueno y tiene su sazón durante el invierno. A veces se hacen postres con las cerezas. También es una gente muy simpática y acogedora. Bueno, Andalucía es un lugar genial, pero yo pienso que la provincia de Huelva tiene de todo. Que pena que no sea tan conocida como el resto de Andalucía, pero al mismo tiempo, mejor para nosotros que somos de Huelva.

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[81] The author intentionally used *Romería* to elicit word initial <r>. The proper name is *la fiesta de la Cinta*.

READING

I think that Huelva capital has much to offer any person. In spite of being a small city, it has many things to do, see, and eat. Besides, it is a very comfortable city, where one does not need to drive. The people are very inviting, kind, social, Andalusian, that is, really 'salted' people. The city has grown much since the sixties when an Industrial Plant was installed that has many international companies. Huelva has the richest vocabulary. In order to call the attention of a young man, one says *chiquillo*, *quillo*, or even *illo*. Sometimes the people say *picha*, but that is more of Cádiz. In order to say in the house of Pepe, it's *anca* Pepe. The persons of Huelva are *onubenses*, that is, *choqueros*.

Huelva capital has a wealth of gastronomy. There isn't anything bland. The white pawn, the stew, the pork, the Andalusian gazpacho are great. The fried *choco* and the beans with *choco* are also very tasty and famous. The Serrano ham is to die for. The grandmothers are in the habit of cook/boil some very rich soups. The bars, like the Rey del Barril, have a good selection of beer and tapas. There are good places to go out. Huelva has some very beautiful neighborhoods. The houses of the English neighborhood are precious. The zone of the center is very beautiful, but it's also expensive. I love to stroll through the *Plaza de la Merced* or the *Plaza de las Monjas* where on can have a beer, eat a hamburger and spend time with their friends. The *Real Club Recreativo de Huelva* has spent many years now in the second division, poor things. For that, now there aren't many associates. The team almost rose [to the first division] a few years ago. Si you practice sports there is a bike path to run and ride your bike. Huelva has many celebrations, *romerías*, and festivities included the *Colombinas*, the Rocío (which pertains to Almonte) y that *Romería de la Cinta*. The small sanctuary of the Cinta is nice; still some youths get married there. Also, one must see the steps of the Holy week. These processions have much fame. In this way, in spite of the crisis, the people do not cease to have fun.

The province has many things to see. The mountain range of Aracena is precious. One can hike a lot in the mountain range of Huelva. Some people practice hunting there. Jabugo is well known for the black leg ham and the sausage. This black leg ham is outstanding. One has to recognize that the province has precious beaches such as those of Punta Umbría, Mazagón, La Antilla, El Rompido e Isla Cristina. Different from the beaches of Málaga there aren't many persons, but there are plenty people from Sevilla and many people from England. The *sevillanos* are in the habit of saying that Matalascañas is theirs, they even say almost always that the Rocío is theirs as well. It's a strange case. Supposedly for these reasons there exists a rivalry/quarrel with Sevilla.

There are some known towns in the province like Bollullos, Gibraleón, Cartaya and Lepe. The *leperos* have many funny jokes, but they also have an agriculture of wealth with a rich harvest. The strawberry, the raspberry, and the citruses are very sweet. The orange juice is very good and has its ripeness during the winter. Sometimes people make deserts with the cherries. It's also a very kind and inviting people. Well, Andalucía is an outstanding place, but I think the province of Huelva has everything. What a shame that it's not as well known as the rest of Andalucía, but at the same time, better for us that are from Huelva.

1. masa / maza
2. Mazagón / Encinasola
3. beso / misa
4. pazo / paso
5. casa / caza
6. carro / caro
7. coser / cocer
8. posa / poza
9. olla / hoya
10. cazan / casan
11. losa / loza
12. roza / rosa
13. cazo / caso
14. chorizo / puchero
15. laso / lazo
16. basa / baza
17. cierra / sierra
18. sien / cien
19. rico / pobrecillo
20. seta / zeta
21. cerrado / serrado
22. sumo / zumo
23. cidra / sidra
24. pozo / poso
25. cansado / frustrado
26. cidra / sidra
27. perro / pero
28. sesenta / soso
29. sesión / posesión
30. raya / ralla
31. cerveza / cereza
32. gente / personas
33. celebración / precisamente
34. proceso/ necesidad
35. jumo / humo
36. precioso / gracioso
37. cochino / chiquillo
38. sencillo / oposiciones
39. social / sazón
40. solicitar / socio
41. choquero / sevillano
42. raro / organización

1. mass (dough) / club (weapon)
2. Mazagón/ Encinasola (towns)
3. kiss / mass (church)
4. Galician country house / step
5. house / hunt
6. car / expensive
7. to sew / to boil
8. s/he places (sets) / puddle
9. pot / hole, pit, or valley
10. they hunt / they marry
11. stone slab / pottery (ceramic)
12. s/he brushes against / rose
13. casserole pot / case
14. pork sausage / stew
15. weary / lasso
16. pedestal (base) / trick, chance
17. s/he closes / mountain range
18. temple (head) / one-hundred
19. rich / poor thing
20. mushroom / zee
21. closed / sawed

22. supreme / juice
23. citron (fruit) / cider
24. well / a trace
25. tired / frustrated
26. citron (fruit) / cider
27. dog / but
28. sixty / bland
29. session / possession
30. line / s/he grates
31. beer / cherry
32. people / persons
33. celebration / precisely
34. process / necessity
35. drunk / smoke
36. precious / funny, amusing
37. hog, boar, pig / little kid
38. simple / entrance exams
39. social / seasoning, ripeness
40. to apply, request / associate
41. Huelvan / Sevillan
42. rare / organization

¿Cómo se habla por aquí?

¿Cuales son los rasgos más típicos en cuanto al habla choquera/lepera?

¿Cómo se habla aquí en comparación a Lepe/ Huelva/ Cartaya?

¿Cómo se habla aquí en comparación a Sevilla/Madrid?

¿Que piensa de la forma de hablar en Madrid o Sevilla?

¿Que piensan ellos (los madrileños y los sevillanos) de tu forma de hablar?

¿Existe alguna diferencia en la forma de hablar entre ti y tus abuelos/padres (o hijos/nietos)? ¿Podrías explicarla?

How do people speak here?

What are the most typical features in terms of Huelva or *Lepero* speech?

How do the people speak here in comparison to Lepe/Huelva/Cartaya?

How do the people speak here in comparison to Sevilla/Madrid?

What do you think about the way of speaking in Madrid or Sevilla?

What do they (the people from Madrid and Sevilla) about your form of speaking?

Is there a difference between your way of speaking and that of your grandparents/parents (or kids/grandkids)? Could you explain it?

Parte 1: Ficha de información del informante:

Día de entrevista: _____**Lugar**_____ **Nº:** _____

Nombre: _____ **Sexo**: _____

Edad: _____ **Año de nacimiento:** _____

Estudios realizados: (Sin estudios, Primaria, Secundaria, Bachillerato, Ciclo profesional,

formación profesional, Carrera, Estudios pos-graduados) _____

Dónde: _____**Carrera**: _____

Ocupación:_____

Barrio actual (años allí): _____

Barrios anteriores (años allí): _____

¿Con que barrio te sientes identificado?: _____

¿Con cuanta frecuencia te vas al centro/Huelva capital?: _____

¿Con cuanta frecuencia te vas a Sevilla?: _____

¿Tiempo (años y meses) fuera de Huelva/Lepe (dónde)?: _____

Lenguas que hablas y nivel: _____

Viajes: _____

Información familiar:

Esposo/a o pareja estable:_____ **Años juntos:** _____

   Origen: _____Profesión: _____Estudios:_____

Padre:

   Origen: _____Profesión: _____Estudios:_____

Madre:

   Origen: _____Profesión: _____Estudios:_____

Los abuelos maternos:

H: Origen: _____Profesión: _____Estudios:_____

M: Origen: _____ Profesión: _____ Estudios:_____

Los abuelos paternos:

H: Origen: _____Profesión: _____Estudios:_____

M: Origen: _____ Profesión: _____Estudios:_____

Parte 2: Integración a la comunidad local (rango: 0-9):

¿Eres miembro de alguna cofradía? ¿Hermandad?
_____Yes =1

¿Eres parte de la Semana Santa?
_____Yes =1

¿Eres miembro de algunas asociaciones voluntarias? ¿Del barrio?
_____Yes =1

¿Eres parte de una caseta durante las Colombinas?
_____ Yes =1

¿Eres parte de una hermandad del Rocío?
_____ Yes =1

¿Eres muy rociero? ¿Todos los años?
_____Yes =1

¿Eres muy de la romería de la Bella (Lepe)?/ ¿Es muy de La fiesta de la Cinta (Huelva)?
_____Yes =1

¿Podrías vivir fuera de Lepe?
_____No = 1

¿Te gustaría vivir fuera de Lepe por un tiempo?
_____No = 1

Parte 3: Exposición a los medios de comunicación (Villena et al. 2003):

Libros al año	Ninguno [0]	Alguno [1]	Más de cinco [2]	Más de diez [3]	Más de veinte [4]
Periódicos locales	Nunca [0]	Alguna vez [1]	Al menos un día a la semana [2]	Varios días a la semana [3]	Todos los días [4]
Periódicos nacionales	Nunca [0]	Alguna vez [1]	Al menos un día a la semana [2]	Varios días a la semana [3]	Todos los días [4]
Programas de TV: noticias, documentales	Nunca [0]	Alguna vez [1]	Al menos un día a la semana [2]	Varios días a la semana [3]	Todos los días [4]
Programas de TV: noticias del corazón y similar	Todos los días [4]	Varios días a la semana [3]	Al menos un día a la semana [2]	Alguna vez [1]	Nunca [0]
Programas de radio: noticias, culturales	Nunca [0]	Alguna vez [1]	Al menos un día a la semana [2]	Varios días a la semana [3]	Todos los días [4]

Parte 4: Densidad (Villena et al. 2003):

Marque (x) la respuesta que corresponda en cada una de las preguntas siguientes:

1. Las personas a las que trata con frecuencia *se conocen* entre sí. Sí___No ___

2. Las personas a las que trata con frecuencia *se tratan* entre sí.   Sí___No ___

3. ¿Tiene usted en cuenta *lo que piensan esas personas* de sus propias decisiones

   antes de tomarlas (comprar un piso, etc.)?   Sí___No ___

4. ¿Les *consulta* antes de tomar una decisión?   Sí___No ___

5. En caso de necesidad, ¿podría reunirlos a todos para algo importante? Sí__No __

6. ¿Se reúne usted con todos ellos alguna vez?   Sí___No ___

7. ¿Se reúne usted con todos periódicamente?   Sí___No ___

Parte 5: Multiplicidad (Villena et al. 2003):

Marque (x) la respuesta que corresponda en cada una de las preguntas siguientes:
1. La mayoría de sus vecinos trabaja en el mismo sitio que usted (más de dos).
   Sí___No ___
2. Se ve, sale usted en sus ratos de ocio o se visita con compañeros del trabajo
   Sí___No ___
3. Se ve, sale usted en sus ratos de ocio o se visita con vecinos.
   Sí___No ___
4. En el vecindario viven sus parientes (más de dos)
   Sí___No ___
5. Sus amigos más íntimos viven en el vecindario
   Sí___No ___
6. Algunos de sus amigos más íntimos son parientes suyos (más de dos).
   Sí___No ___

Parte 6: Fuerza de los vínculos (Villena et al. 2003):

Usted pediría un favor muy importante (marque la respuesta que corresponda en cada una
de las preguntas siguientes).

1. Solo a sus familiares inmediatos (mujer, padres, hijos, etc.)   Sí___No ___

2. Solo a algunas de las personas a las que trata con frecuencia. Sí___No ___

3. A todas las personas a las que trata con frecuencia.   Sí___No ___

4. A todas las personas a las que conocer.   Sí___No ___

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Parte 7: Contactos del barrio:

1. ¿Trabajas en su barrio?   Sí___No ___
2. ¿Pasas la mayoría de sus horas de ocio en su barrio? Sí___No ___
3. ¿Pasas poco tiempo fuera de su barrio? Sí___No ___
4. ¿Tienes la mayoría de sus amigos en su barrio? Sí___No ___

Parte 8: Contactos fuera del barrio:

1. ¿Pasas mucho tiempo en el centro? Sí___No ___
2. ¿Vas al centro de vez en cuando?   Sí___No ___
3. ¿Viajas Sevilla con frecuencia?   Sí___No ___
4. ¿Tienes amigos en Sevilla?   Sí___No ___
5. ¿Tienes muchos amigos fuera de su barrio? Sí___No ___
6. ¿Tienes contactos personales o profesionales fuera de Huelva? Sí___No ___
7. ¿Tienes contactos personales o profesionales fuera de Andalucía? Sí___No ___

Parte 9: Lealtad local lingüística:
¿Tienes orgullo de tu forma de hablar?

Escala 1-5 (1 = vergüenza; 3 = neutral; 5 = orgullo) 1   2   3   4   5
_____

Cuando viajas fuera de su tierra, o estás hablando con un forastero, ¿cambias su forma de hablar? ¿Modificas un poco tu forma de hablar, como acomodación?
_____

En cuanto de identidad personal, ¿cual sería tu orden de preferencia (1-3)?
_____ Choquero/a | Lepero/a:
_____ Andaluz/a:
_____ Español/a:

Part 1: Informant information index

Day of interview: _____**Place**_____ **Nº:** _____

Name: _____ **Sex**: _____

Age: _____ **Birth year:** _____

Max. studies: (Without, Primary, Secondary, *Bachillerato*, Professional cycle,

Professional formation, University, Post-graduate) _____

Where: _____**Degree**: _____

Occupation: _____

Current neighborhood (years there): _____

Previous neighborhood (years there): _____

¿Which neighborhood do you identify with?:_____

¿How often do you go to the center of Huelva/ the city of Huelva?: _____

¿How often do you go to Sevilla?: _____

¿Time (years and months) away from de Huelva/Lepe (where)?: _____

Languages that you speak (and level): _____

Trips: _____

Family information:

Spouse or stable partner: (Y/N); Years together: _____

   Origin: _____Occupation: _____Studies:_____

Father:

   Origin: _____Occupation: _____Studies:_____

Mother:

   Origin: _____Occupation: _____Studies:_____

Maternal grandparents:

M: Origin: _____Occupation: _____Studies:_____

F: Origin: _____Occupation: _____Studies:_____

Paternal grandparents:

M: Origin: _____Occupation: _____Studies:_____

F: Origin: _____Occupation: _____Studies:_____

Part 2: Integration into the local community:
¿Are you a member of a brotherhood (for religious/cultural festivities)?

_____
¿Are you part of Holy week?

_____
¿Are you a member of any volunteer associations in town or your neighborhood?

_____
¿Are you part of a *caseta* during las Colombinas?

_____
¿Are you part of a brotherhood for the Romería Del Rocío?

_____
¿Are you very *rociero*? ¿Each year?

_____
¿Are you very much of the Romería of la Bella? / La fiesta de la Cinta?

_____
¿Could you live outside of Huelva/Lepe?

_____
¿Would you like t olive outside of Huelva/Lepe for a time?

_____

Part 3: Mass media exposure (Villena et al. 2003):

Books per year	None	Some	More than five	More than ten	More than twenty
Local newspapers	Never	Every once in a while	At least one day a week	Various days per week	Every day
National newspapers	Never	Every once in a while	At least one day a week	Various days per week	Every day
TV Programs: news, documentaries	Never	Every once in a while	At least one day a week	Various days per week	Every day
TV Programs: day-time tv; soap-operas	Every day	Various days per week	At least one day a week	Every once in a while	Never
Radio Programs: news, cultural	Never	Every once in a while	At least one day a week	Various days per week	Every day

Part 4: Density (Villena et al. 2003):

Mark (x) the response that corresponds to each one of the following questions:

1. The people that you relate to frequently *know* each other. Yes___No ___

2. The people that you relate to frequently *relate* to each other. Yes ___No ___

3. Do you take into account *that which these people think* in your own decisions before you make such decisions (buy a flat, etc.) Yes ___No ___

4. Do you *consult* them before making a decision Yes ___No ___

5. In the necessary case, would you be able to gather all of them for something important? Yes____No _

6. Do you get together with all of them every once in a while? Yes ___No ___

7. Do you get together with them periodically? Yes ___No ___

Part 5: Multiplicity (Villena et al. 2003):

Mark (x) the response that corresponds to each one of the following questions:

1. More than two of your neighbors work in the same place as you? Yes__No ___

2. When you go out for leisure do you visit with your work colleagues? Yes__No __

3. When you go out for leisure do you visit with your neighbors? Yes__No ___

4. Do any relatives (>2) live in your neighborhood? Yes__No ___

5. Do your best friends live in your neighborhood? Yes__No ___

6. Are any of your best friends also relatives (>2)? Yes__No ___

Part 6: Strength of ties/links (Villena et al. 2003):

If you were to ask a very important favor (Mark (x) the response that corresponds to each one of the following questions).

5. Only your immediate family (wife, parents, children, etc.) Yes__No ___

6. Only to some of the people you relate to with frequency? Yes__No ___

7. To all the people you relate to with frequency? Yes__No ___

8. To all the people the people that you know? Yes__No ___

Part 7: Neighborhood contacts

5. ¿Do you work in your neighborhood?   Yes__No ___

6. ¿Do you spend the majority of leisure time in your neighborhood? Yes__No

7. ¿Do you spend little time in your neighborhood?   Yes__No

8. ¿Do the majority of your friends live in your neighborhood? Yes__No ___

Part 8: Contacts outside of the neighborhood:

1. ¿ Do you spend a lot of time in the center?   Yes__No

7. ¿Do you go to the center every once in a while?   Yes__No

8. ¿Do you travel to Sevilla frequently?   Yes__No

9. ¿Do you have friends in Sevilla?   Yes__No

10. ¿ Do you have many friends outside of your neighborhood?   Yes__No ___

11. ¿ Do you have personal or professional contacts outside of Huelva? Yes__No

12. ¿ Do you have personal or professional contacts outside of Andalucía? Yes__No

Part 9: Local linguistic loyalty:
¿Are you proud of the way you speak?

Scale 1-5 (1 = ashamed; 3 = neutral; 5 = proud)   1 2 3 4 5

_____

When you travel out of your land, or when you are speaking with a person not of Huelva/Lepe, do you change your way of speaking? Do you modify a little your way of speaking, such as accommodation?

_____

In terms of personal identity, which would be your order of preference (1-3)?
_____ Choquero/a | Lepero/a:
_____ Andaluz/a:
_____ Español/a:

APPENDIX H. INDIVIDUAL SPEAKER DEMERGER INDEX AND T-TESTS

Individual demerger indexes were calculated based on subtracting the mean value of <z,ci,ce> from the mean value of <s>. Thus, a *distinción* speaker would have a positive Center of Gravity (Hz) demerger index, a negative Variance (Hz) demerger index, and a positive Mean Intensity (dB) demerger index. Scores should be interpreted as follows: larger index numbers (in positive or negative directions) suggest a larger separation in phonemes; scores closer to zero indicate either a merger or a near-merger. A paired Welch Two Sample t-test was conducted for each dependent measure and style combination based on orthography. As there were nine separate t-tests run for each individual, a Bonferroni correction was made (0.05/9 = 0.005555). Thus, significant values here are those only below 0.0055 and are bolded for the convenience of the reader.

Speaker L1.M.46:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	8,436.86	2,626	5,810.86	94.13	25.25	**<.001**
	C	8,654.51	3,223.72	5,430.79	52.9	17.9	**<.001**
	B & C	8,504.78	2,848.03	5,656.74	148.95	30.56	**<.001**
Variance (Hz)	B	2648.691	3280.737	-632.05	104.61	-5.04	**<.001**
	C	1965.398	3710.686	-1745.29	76.04	-12.04	**<.001**
	B & C	2435.465	3440.541	-1005.08	195.32	-10.00	**<.001**
Mean Intensity (dB)	B	60.75258	54.50704	6.25	118.16	9.89	**<.001**
	C	65.38636	55.90476	9.48	77.93	13.97	**<.001**
	B & C	62.19858	55.02655	7.17	225.27	14.13	**<.001**

Speaker L2.M.23:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	4245.785	3906.733	339.052	38.12	0.93	0.358
	B	6867.761	3148.660	3718.34	162.13	17.11	**<.001**
	C	7804.509	3926.779	3877.73	48.76	15.38	**<.001**
	B & C	7164.285	3435.336	3728.95	233.9	21.07	**<.001**
Variance (Hz)	A	3023.031	3716.419	-693.388	32.36	-3.80	**<.001**
	B	2998.456	3930.625	-932.17	111.23	-7.86	**<.001**
	C	2598.520	4290.471	-1691.95	69.92	-10.69	**<.001**
	B & C	2871.857	4063.200	-1191.34	187.07	-12.28	**<.001**
Mean Intensity (dB)	A	57.26042	56.73333	0.52709	56.31	0.82	0.413
	B	57.35789	53.45833	3.90	159.88	8.57	**<.001**
	C	59.84091	54.23810	5.60	83.9	10.31	**<.001**
	B & C	58.14388	53.74561	4.40	241.44	11.90	**<.001**

Speaker L3.M.62:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	3164.089	1930.741	1233.348	63.05	4.49	**<.001**
	B	4057.162	2805.817	1251.345	136.35	6.16	**<.001**
	C	4401.531	4291.936	109.595	79.80	0.41	0.68
	B & C	4161.748	3364.816	796.932	207.18	4.54	**<.001**
Variance (Hz)	A	2795.521	2459.112	336.409	55.72	1.94	0.056
	B	2730.559	2676.772	53.787	130.44	0.64	0.526
	C	2765.729	2878.631	-112.902	79.69	-1.22	0.228
	B & C	2741.240	2752.701	-11.461	216.12	-0.18	0.858
Mean Intensity (dB)	A	50.89130	48.68182	2.20948	61.32	2.36	0.0214
	B	48.12766	46.08824	2.03942	118.85	3.40	**<.001**
	C	50.00	49.04878	0.95122	77.72	1.20	0.233
	B & C	48.69630	47.20183	1.49447	198.34	3.00	**<.004**

Speaker L4.H.58:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	3934.826	4599.708	-664.882	40.06	-2.44	0.019
	B	4178.249	5336.461	-1158.212	97.00	-7.03	**<.001**
	C	4360.307	5433.676	-1073.369	64.80	-5.22	**<.001**
	B & C	4234.569	5371.424	-1136.855	162	-8.87	**<.001**
Variance (Hz)	A	2162.812	3096.971	-934.159	41.65	-8.93	**<.001**
	B	2060.713	3021.333	-960.62	108.51	-13.17	**<.001**
	C	1861.535	3051.008	-1189.473	69.90	-11.71	**<.001**
	B & C	1999.097	3032.005	-1032.908	183.84	-17.41	**<.001**
Mean Intensity (dB)	A	58.53086	56.34286	2.188	65.09	3.11	**<.003**
	B	55.98958	52.69863	3.29095	131.05	6.08	**<.001**
	C	57.69767	52.21951	5.47816	69.67	9.30	**<.001**
	B & C	56.51799	52.52632	3.99167	211.73	9.64	**<.001**

Speaker L5.H.31:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4295.112	3256.826	1038.286	118.62	3.18	**<.002**
	C	5265.989	1920.643	3345.346	48.69	12.08	**<.001**
	B & C	4607.767	2767.333	1840.434	182.03	7.50	**<.001**
Variance (Hz)	B	2205.894	2299.037	-93.143	123.63	-0.77	0.44
	C	1989.895	2487.709	-497.814	50.38	-3.56	**<.001**
	B & C	2136.335	2368.154	-231.819	183.48	-2.47	0.014
Mean Intensity (dB)	B	57.3250	56.1875	1.1375	136.2	1.72	0.09
	C	60.34211	54.78378	5.55833	71.44	5.58	**<.001**
	B & C	58.29661	55.67327	2.62334	212.34	4.59	**<.001**

Speaker L6.H.24:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	2638.831	2460.063	178.768	45.25	0.46	0.651
	B	3134.999	3022.959	112.04	101.14	0.45	0.656
	C	4945.964	3629.772	1316.192	82.1	5.49	**<.001**
	B & C	3891.033	3303.027	588.006	190.52	2.97	**<.004**
Variance (Hz)	A	3267.844	2924.627	343.217	40.35	1.48	0.146
	B	2670.329	2906.484	-236.155	101.92	-2.13	0.036
	C	2508.153	3108.847	-600.694	74.06	-6.41	**<.001**
	B & C	2602.625	2999.882	-397.257	182.64	-5.26	**<.001**
Mean Intensity (dB)	A	61.41463	62.92308	-1.50845	41.30	-1.19	0.241
	B	54.36667	54.06122	0.30545	100.05	0.42	0.674
	C	57.02326	54.42857	2.59469	81.66	4.16	**<.001**
	B & C	55.47573	54.23077	1.24496	191.74	2.48	0.014

Speaker L7.H.20:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	2893.977	2376.342	517.635	49.09	2.01	0.051
	B	5139.394	3970.211	1169.183	147.62	5.94	**<.001**
	C	6029.433	4599.717	1429.716	66.57	6.30	**<.001**
	B & C	5418.362	4234.603	1183.759	227.06	7.59	**<.001**
Variance (Hz)	A	2930.579	2792.275	138.304	41.93	1.01	0.319
	B	3104.729	3374.779	-270.05	146.29	-5.12	**<.001**
	C	3016.045	3462.355	-446.31	57.84	-6.17	**<.001**
	B & C	3076.933	3411.561	-334.628	224.31	-8.00	**<.001**
Mean Intensity (dB)	A	54.37879	56.62500	-2.24621	56.22	-2.98	**<0.005**
	B	56.29348	55.17241	1.12107	2.44	144.8	0.016
	C	57.50000	54.09524	3.40476	75.19	5.61	**<.001**
	B & C	56.67164	54.72000	1.95164	231.96	5.28	**<.001**

Speaker L8.M.58:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	6533.258	4883.315	1649.943	48.65	5.05	**<.001**
	B	5804.179	3329.560	2474.619	115.71	14.23	**<.001**
	C	6745.639	5158.837	1586.802	53.68	6.41	**<.001**
	B & C	6088.649	4003.504	2085.145	167.63	12.30	**<.001**
Variance (Hz)	A	2312.502	3776.931	-1464.429	62.54	-16.34	**<.001**
	B	1973.767	3364.678	-1390.911	132.19	-17.92	**<.001**
	C	1746.830	3578.426	-1831.596	74.11	-21.36	**<.001**
	B & C	1905.196	3443.427	-1538.231	214.21	-25.60	**<.001**
Mean Intensity (dB)	A	64.15686	55.91176	8.2451	66.57	10.23	**<.001**
	B	59.72165	47.37500	12.34665	132.07	26.07	**<.001**
	C	63.02381	54.33333	8.69048	81.97	15.57	**<.001**
	B & C	60.71942	49.93860	10.78082	189.71	21.72	**<.001**

Speaker L9.M.51:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	2856.993	2987.459	-130.466	52.56	-0.45	0.653
	B	4280.342	4336.642	-56.3	140.72	-0.30	0.762
	C	5205.809	4405.271	800.538	82.77	4.14	**<.001**
	B & C	4571.203	4361.926	209.277	238.86	1.47	0.142
Variance (Hz)	A	2895.456	2837.496	57.96	71.90	0.47	0.640
	B	3183.362	3183.041	0.321	162.68	0.005	0.996
	C	2533.959	3281.618	-747.659	83.73	-7.44	**<.001**
	B & C	2979.264	3219.359	-240.095	250	-3.97	**<.001**
Mean Intensity (dB)	A	55.82222	57.23333	-1.41111	62.81	-1.05	0.297
	B	48.67708	48.97222	-0.29514	147.16	-0.49	0.626
	C	52.93182	49.35714	3.57468	76.74	4.33	**<.001**
	B & C	50.01429	49.11404	0.90025	251.9	1.77	0.078

Speaker L10.M.42:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	5129.325	4227.821	901.504	122.79	3.79	**<.001**
	B	5568.252	3814.634	1753.618	140.3	9.55	**<.001**
	C	6428.380	4082.402	2345.978	54.58	9.02	**<.001**
	B & C	5836.661	3913.286	1923.375	207.7	12.35	**<.001**
Variance (Hz)	A	2726.839	3108.684	-381.845	123.98	-3.84	**<.001**
	B	2467.327	3222.754	-755.427	152.2	-8.01	**<.001**
	C	2078.012	3454.451	-1376.439	82.89	-12.53	**<.001**
	B & C	2345.838	3308.116	-962.278	243.26	-12.90	**<.001**
Mean Intensity (dB)	A	55.87097	49.39062	6.48035	100.6	10.54	**<.001**
	B	57.98969	49.93056	8.05913	159.27	16.36	**<.001**
	C	61.34091	50.76190	10.57901	82.19	15.51	**<.001**
	B & C	59.03546	50.23684	8.79862	253	21.01	**<.001**

Speaker L11.H.18:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	4898.525	5101.428	-202.903	28.79	-0.48	0.635
	B	5282.775	5877.854	-595.079	148.5	-2.41	0.017
	C	6072.383	4173.825	1898.558	65.16	5.75	**<.001**
	B & C	5550.027	5227.225	322.802	209.8	1.49	0.14
Variance (Hz)	A	3402.291	3890.135	-487.844	36.50	-4.35	**<.001**
	B	2940.572	3720.383	-779.811	110.54	-8.46	**<.001**
	C	2555.330	3806.884	-1251.554	73.93	-9.83	**<.001**
	B & C	2810.182	3753.411	-943.229	195.94	-12.40	**<.001**
Mean Intensity (dB)	A	60.10959	58.11111	1.99848	24.72	1.82	0.082
	B	58.53488	56.77941	1.75547	151.53	2.89	**<.005**
	C	61.36364	55.02381	6.33983	83.32	8.32	**<.001**
	B & C	59.49231	56.10909	3.38322	237.86	6.83	**<.001**

Speaker L13.H.67:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5470.049	3620.682	1849.367	111.81	11.02	**<.001**
	C	5504.196	3413.515	2090.681	74.90	6.49	**<.001**
	B & C	5481.097	3533.672	1947.425	179.01	12.02	**<.001**
Variance (Hz)	B	2714.620	2912.493	-197.873	107.49	-2.99	**<.004**
	C	2795.550	2851.467	-55.917	78.02	-0.42	0.673
	B & C	2740.803	2886.862	-146.059	181.46	-2.25	0.0259
Mean Intensity (dB)	B	63.27174	57.48276	5.78898	125.93	12.64	**<.001**
	C	64.47727	60.16667	4.3106	79.14	7.26	**<.001**
	B & C	63.66176	58.61000	5.05176	198	12.94	**<.001**

Speaker L14.M.31:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	5684.2265	756.1613	4928.0652	111.58	25.49	**<.001**
	B	6800.270	1596.176	5204.094	135.01	36.42	**<.001**
	C	7248.228	1650.431	5597.797	81.40	23.02	**<.001**
	B & C	6937.857	1615.689	5322.168	227.21	42.49	**<.001**
Variance (Hz)	A	2831.136	1907.165	923.971	54.16	6.52	**<.001**
	B	1897.287	2894.036	-996.749	90.88	-9.17	**<.001**
	C	1726.015	2975.576	-1249.561	49.42	-7.39	**<.001**
	B & C	1844.682	2923.362	-1078.68	142.38	-11.70	**<.001**
Mean Intensity (dB)	A	58.59259	57.25714	1.33545	59.39	2.00	0.05
	B	59.87629	51.36986	8.50643	144.29	18.35	**<.001**
	C	61.67442	52.19512	9.4793	72.87	12.41	**<.001**
	B & C	60.42857	51.66667	8.7619	221.29	21.42	**<.001**

Speaker L15.M.27:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	7732.820	2815.104	4917.716	116.55	28.88	**<.001**
	C	8151.407	3139.129	5012.278	62.16	19.60	**<.001**
	B & C	7867.257	2935.538	4931.719	181.75	34.2	**<.001**
Variance (Hz)	B	2264.907	3352.711	-1087.804	119.44	-10.72	**<.001**
	C	2196.291	3382.230	-1185.939	67.15	-8.86	**<.001**
	B & C	2242.870	3363.683	-1120.813	198.46	-13.89	**<.001**
Mean Intensity (dB)	B	61.77419	49.90141	11.87278	147.29	23.63	**<.001**
	C	62.31818	49.57143	12.74675	81.90	20.45	**<.001**
	B & C	61.94891	49.77876	12.17015	233.39	31.03	**<.001**

Speaker L16.M.26:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	4638.931	1520.689	3118.242	70.31	12.41	**<.001**
	B	5993.793	3097.549	2896.244	94.94	17.68	**<.001**
	C	6515.248	4031.924	2483.324	79.47	11.90	**<.001**
	B & C	6156.517	3438.799	2717.718	171.77	20.07	**<.001**
Variance (Hz)	A	2722.564	2464.809	257.755	38.21	1.67	0.102
	B	2137.155	3093.222	-956.067	103.84	-12.69	**<.001**
	C	1900.824	3565.006	-1664.182	72.86	-21.75	**<.001**
	B & C	2063.406	3265.526	-1202.12	172.52	-20.06	**<.001**
Mean Intensity (dB)	A	60.01163	59.40625	0.60538	40.20	0.72	0.477
	B	57.56701	51.65753	5.90948	139.73	16.40	**<.001**
	C	56.63636	48.69048	7.94588	72.86	-21.75	**<.001**
	B & C	57.27660	50.57391	6.70269	208.69	21.27	**<.001**

Speaker L17.H.39:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4201.858	2185.860	2015.998	95.44	12.50	**<.001**
	C	4158.113	2785.922	1372.191	53.09	5.84	**<.001**
	B & C	4188.207	2406.935	1781.272	148.16	13.11	**<.001**
Variance (Hz)	B	1838.565	2861.285	-1022.72	96.38	-10.61	**<.001**
	C	1842.176	3278.863	-1436.687	48.39	-8.78	**<.001**
	B & C	1839.692	3015.130	-1175.438	142.29	-13.44	**<.001**
Mean Intensity (dB)	B	60.34021	53.61111	6.7291	130.49	11.32	**<.001**
	C	60.86364	53.45238	7.41126	68.46	10.17	**<.001**
	B & C	60.50355	53.55263	6.95092	204.25	15.01	**<.001**

Speaker L18.M.49:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5553.626	4731.474	822.152	96.123	4.36	**<.001**
	C	5576.917	5436.273	140.644	64.31	0.50	0.621
	B & C	5560.946	4991.137	569.809	158.61	3.57	**<.001**
Variance (Hz)	B	2570.554	3515.608	-945.054	98.59	-13.36	**<.001**
	C	2732.211	3805.720	-1073.509	53.68	-9.70	**<.001**
	B & C	2621.361	3622.491	-1001.13	153.35	-16.17	**<.001**
Mean Intensity (dB)	B	56.35417	48.13889	8.21528	150.54	15.38	**<.001**
	C	55.79545	48.33333	7.46212	74.65	10.02	**<.001**
	B & C	56.17857	48.21053	7.96804	250.2	18.66	**<.001**

Speaker L19.M.54:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	A	1754.475	3699.342	-1944.867	32.62	-4.99	**<.001**
	B	5752.150	4533.306	1218.844	154.85	5.27	**<.001**
	C	6927.449	4505.663	2421.786	79.10	8.93	**<.001**
	B & C	6138.069	4522.654	1615.415	234	8.81	**<.001**
Variance (Hz)	A	2549.832	3186.443	-636.611	56.80	-3.71	**<.001**
	B	2723.329	3651.419	-928.09	145.69	-12.07	**<.001**
	C	2269.231	3438.362	-1169.131	78.35	-10.04	**<.001**
	B & C	2574.222	3569.324	-995.102	225.88	-14.67	**<.001**
Mean Intensity (dB)	A	54.31373	54.73913	-0.4254	56.95	-0.43	0.672
	B	61.31111	55.92537	5.38574	153.24	7.70	**<.001**
	C	65.31818	55.83333	9.48485	59.56	9.97	**<.001**
	B & C	62.62687	55.88991	6.73696	213.8	11.64	**<.001**

Speaker L20.H.30:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4218.216	4794.351	-576.135	108.64	-4.62	**<.001**
	C	4667.566	4399.819	267.747	69.50	1.33	0.189
	B & C	4360.456	4648.997	-288.541	183.58	-2.63	0.0094
Variance (Hz)	B	2050.612	2946.427	-895.815	118.28	-10.29	**<.001**
	C	1830.247	3776.881	-1946.634	66.36	-16.96	**<.001**
	B & C	1980.856	3252.384	-1271.528	171.13	-16.04	**<.001**
Mean Intensity (dB)	B	57.31579	54.23611	3.07968	130.91	5.99	**<.001**
	C	59.29545	51.07143	8.22402	82.32	16.19	**<.001**
	B & C	57.94245	53.07018	4.87227	211.77	11.89	**<.001**

Speaker L21.M.47:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6734.945	3170.514	3564.431	114.78	19.71	**<.001**
	C	6959.162	3705.481	3253.681	69.37	13.66	**<.001**
	B & C	6804.913	3365.893	3439.02	184.67	23.62	**<.001**
Variance (Hz)	B	2357.843	3379.967	-1022.124	148.4	-12.42	**<.001**
	C	2235.695	3399.445	-1163.75	83.22	-10.19	**<.001**
	B & C	2319.726	3387.081	-1067.355	244.06	-16.13	**<.001**
Mean Intensity (dB)	B	56.07216	46.52055	9.55161	153.51	20.23	**<.001**
	C	55.22727	45.90476	9.32251	83.91	12.62	**<.001**
	B & C	55.80851	46.29565	9.51286	242.88	23.79	**<.001**

Speaker L22.H.34:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5615.156	3439.362	2175.794	102.51	10.15	**<.001**
	C	5247.054	4122.173	1124.881	77.21	3.24	**<.002**
	B & C	5500.821	3687.107	1813.714	184.52	9.80	**<.001**
Variance (Hz)	B	2584.418	3109.316	-524.898	109.44	-5.29	**<.001**
	C	2765.764	3021.620	-255.856	72.73	-1.68	0.097
	B & C	2640.745	3077.498	-436.753	186.03	-5.25	**<.001**
Mean Intensity (dB)	B	58.28571	54.13889	4.14682	132.87	6.14	**<.001**
	C	55.68293	53.85366	1.82927	79.99	1.99	0.0495
	B & C	57.47727	54.03540	3.44187	226.79	6.28	**<.001**

Speaker L23.H.27:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3335.432	2918.034	417.398	154.84	2.00	0.0476
	C	4210.059	3936.616	273.443	75.49	0.96	0.339
	B & C	3607.096	3285.855	321.241	231	1.80	0.073
Variance (Hz)	B	2727.581	2756.004	-28.423	151.8	-0.37	0.713
	C	2710.102	2809.945	-99.843	74.89	-1.18	0.24
	B & C	2722.152	2775.483	-53.331	231.52	-0.91	0.364
Mean Intensity (dB)	B	53.96703	52.00000	1.96703	151.09	2.80	0.0057
	C	55.46341	54.51282	0.95059	77.521	0.96	0.34
	B & C	54.43182	52.90741	1.52441	229.49	2.61	0.0098

Speaker L24.M.26:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6471.560	2784.393	3687.167	120.82	21.22	**<.001**
	C	6742.718	2726.571	4016.147	81.17	17.17	**<.001**
	B & C	6558.016	2763.090	3794.926	207.45	27.39	**<.001**
Variance (Hz)	B	2704.609	3124.608	-419.999	161.84	-4.69	**<.001**
	C	2645.034	3220.922	-575.888	82.02	-4.53	**<.001**
	B & C	2685.614	3160.092	-474.478	245.58	-6.45	**<.001**
Mean Intensity (dB)	B	53.77660	45.59722	8.17938	158.37	20.15	**<.001**
	C	54.20455	44.97619	9.22836	82.07	14.87	**<.001**
	B & C	53.91304	45.36842	8.54462	248.67	25.15	**<.001**

Speaker L25.H.31:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3529.508	2023.938	1505.57	135.86	8.56	**<.001**
	C	3415.851	3104.596	311.255	81.36	1.06	0.29
	B & C	3493.269	2422.075	1071.194	210.57	6.68	**<.001**
Variance (Hz)	B	2293.262	2631.009	-337.747	101.05	-4.02	**<.001**
	C	2253.615	3031.718	-778.103	64.21	-5.99	**<.001**
	B & C	2280.621	2778.639	-498.018	162.32	-6.82	**<.001**
Mean Intensity (dB)	B	59.85106	59.27778	0.57328	158.98	1.07	0.286
	C	60.11364	58.85714	1.2565	82.83	1.84	0.070
	B & C	59.93478	59.12281	0.81197	244.68	1.92	0.056

Speaker L26.H.25:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4545.007	4794.516	-249.509	144.81	-1.51	0.13
	C	4826.797	5432.504	-605.707	60.98	-2.85	0.00599
	B & C	4634.102	5028.066	-393.964	208.33	-2.92	**<.004**
Variance (Hz)	B	2453.229	4234.741	-1781.512	130.52	-13.59	**<.001**
	C	1816.397	4017.518	-2201.121	81.82	-24.14	**<.001**
	B & C	2251.878	4155.222	-1903.344	196.29	-19.54	**<.001**
Mean Intensity (dB)	B	58.54839	52.26761	6.28078	152.45	8.19	**<.001**
	C	62.30233	54.43902	7.86331	68.25	11.92	**<.001**
	B & C	59.73529	53.06250	6.67279	221.46	11.43	**<.001**

Speaker L27.H.43:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5386.263	1278.191	4108.072	161.16	26.27	**<.001**
	C	6309.523	2340.774	3968.749	66.98	18.12	**<.001**
	B & C	5676.430	1673.133	4003.297	231.08	28.14	**<.001**
Variance (Hz)	B	2959.185	2166.608	792.577	107.84	8.53	**<.001**
	C	2574.012	2970.472	-396.46	70.75	-2.95	**<.005**
	B & C	2838.131	2465.390	372.741	173.17	4.34	**<.001**
Mean Intensity (dB)	B	58.25000	57.09859	1.15141	135.52	1.86	0.065
	C	61.34091	55.71429	5.62662	82.4	7.91	**<.001**
	B & C	59.22143	56.58407	2.63736	232.01	5.39	**<.001**

Speaker L28.H.21:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3260.442	2215.529	1044.913	146.8	4.95	**<.001**
	C	3931.991	3380.979	551.012	66.05	1.62	0.109
	B & C	3474.343	2646.010	828.333	206.7	4.31	**<.001**
Variance (Hz)	B	2576.401	3155.293	-578.892	97.11	-5.36	**<.001**
	C	2492.251	3334.540	-842.289	59.56	-6.28	**<.001**
	B & C	2549.598	3221.502	-671.904	158.15	-7.97	**<.001**
Mean Intensity (dB)	B	61.85870	57.3428	4.5159	132.5	7.37	**<.001**
	C	61.23256	57.19512	4.03744	75.76	5.90	**<.001**
	B & C	61.65926	57.28829	4.37097	213.4	9.44	**<.001**

Speaker L29.H.65:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4406.106	4596.080	-189.974	117.46	-0.81	0.418
	C	4459.751	4973.267	-513.516	59.29	-1.79	0.079
	B & C	4423.193	4736.668	-313.475	181	-1.72	0.088
Variance (Hz)	B	2607.925	3321.830	-713.905	134.09	-5.96	**<.001**
	C	2219.683	3035.777	-816.094	81.32	-5.78	**<.001**
	B & C	2484.263	3215.210	-730.947	223.57	-7.79	**<.001**
Mean Intensity (dB)	B	66.43478	63.07246	3.36232	152.41	4.86	**<.001**
	C	69.79070	63.29268	6.49802	81.68	6.25	**<.001**
	B & C	67.50370	63.15455	4.34915	239.14	7.28	**<.001**

Speaker L30.H.67:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	---	---	---	---	---	---
	C	4173.327	3524.606	648.721	81.68	3.75	**<.001**
	B & C						
Variance (Hz)	B	---	---	---	---	---	---
	C	2309.736	2760.106	-450.37	78.90	-4.77	**<.001**
	B & C						
Mean Intensity (dB)	B	---	---	---	---	---	---
	C	60.70455	57.58537	3.11918	71.36	4.85	**<.001**
	B & C						

Speaker L31.H.69:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	2096.8900	469.2026	1627.6874	124.94	18.68	**<.001**
	C	2127.4298	559.6663	1567.7635	58.80	13.42	**<.001**
	B & C	2106.7705	502.8263	1603.9442	185.78	22.96	**<.001**
Variance (Hz)	B	1757.9053	889.4511	868.4542	142.88	10.22	**<.001**
	C	1729.879	1085.803	644.076	79.58	5.93	**<.001**
	B & C	1748.8380	962.4316	786.4064	224.02	11.66	**<.001**
Mean Intensity (dB)	B	59.64130	66.73239	-7.09109	155.15	-10.30	**<.001**
	C	63.56818	68.52381	-4.95563	79.50	-5.01	**<.001**
	B & C	60.91176	67.39823	-6.48647	241.44	-10.93	**<.001**

Speaker L32.H.61:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4776.927	4927.912	-150.985	128.31	-1.05	0.297
	C	4784.597	5008.557	-223.96	80.73	-1.08	0.285
	B & C	4779.337	4957.365	-178.028	213.06	-1.51	0.132
Variance (Hz)	B	2345.637	3147.317	-801.68	143.77	-15.59	**<.001**
	C	1815.802	3273.236	-1457.434	79.73	-22.62	**<.001**
	B & C	2179.117	3193.305	-1014.188	251.06	-22.22	**<.001**
Mean Intensity (dB)	B	58.31250	54.34247	3.97003	148.34	9.06	**<.001**
	C	61.75000	56.92857	4.82143	83.97	9.18	**<.001**
	B & C	59.39286	55.28696	4.1059	245.35	10.76	**<.001**

Speaker L35.M.28:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	8390.786	1182.779	7208.007	162.34	42.02	**<.001**
	C	8969.869	1662.107	7307.762	61.23	35.39	**<.001**
	B & C	8576.769	1359.373	7217.396	246.31	52.09	**<.001**
Variance (Hz)	B	3129.404	2088.675	1040.729	125.35	7.77	**<.001**
	C	2405.741	2527.964	-122.223	57.14	-0.61	0.541
	B & C	2896.987	2250.518	646.469	195.51	5.51	**<.001**
Mean Intensity (dB)	B	57.58065	52.01389	5.56676	131.74	8.79	**<.001**
	C	59.86364	53.40476	6.45888	82.77	10.50	**<.001**
	B & C	58.31387	52.52632	5.78755	223.77	12.21	**<.001**

Speaker L38.M.52:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	7215.625	2631.065	4584.56	125.58	17.61	**<.001**
	C	7772.049	3016.908	4755.141	65.82	13.27	**<.001**
	B & C	7389.261	2771.981	4617.28	195.83	21.76	**<.001**
Variance (Hz)	B	2974.394	3173.079	-198.685	110.54	-1.76	0.081
	C	2295.670	3429.508	-1133.838	64.33	-7.35	**<.001**
	B & C	2762.594	3266.731	-504.137	195.59	-5.30	**<.001**
Mean Intensity (dB)	B	60.51546	56.61644	3.89902	158.63	7.64	**<.001**
	C	64.63636	57.59524	7.04112	75.35	8.97	**<.001**
	B & C	61.80142	56.97391	4.82751	252.57	10.62	**<.001**

Speaker L39.H.48:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4263.811	2834.674	1429.137	95.69	6.35	**<.001**
	C	4932.489	2585.633	2346.856	79.79	8.63	**<.001**
	B & C	4472.477	2742.110	1730.367	179.09	9.96	**<.001**
Variance (Hz)	B	2112.310	2604.105	-491.795	96.83	-4.80	**<.001**
	C	1983.281	3231.339	-1248.058	60.86	-9.32	**<.001**
	B & C	2072.045	2837.236	-765.191	153.82	-8.90	**<.001**
Mean Intensity (dB)	B	60.01031	57.59155	2.41876	119.59	4.82	**<.001**
	C	63.20455	59.80952	3.39503	79.30	4.66	**<.001**
	B & C	61.00709	58.41593	2.59116	214.75	5.88	**<.001**

Speaker L44.H.48:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3161.323	2032.890	1128.433	157.6	4.66	**<.001**
	C	4781.423	2558.768	2222.655	82.00	6.47	**<.001**
	B & C	3669.822	2223.695	1446.127	239.61	6.88	**<.001**
Variance (Hz)	B	2216.367	2643.795	-427.428	134.75	-4.30	**<.001**
	C	2310.518	2666.784	-356.266	80.65	-2.71	0.00825
	B & C	2245.918	2652.136	-406.218	220.89	-5.16	**<.001**
Mean Intensity (dB)	B	56.77660	53.06944	3.70716	153.22	4.82	**<.001**
	C	61.74419	55.17073	6.57346	79.59	6.67	**<.001**
	B & C	58.33577	53.83186	4.50391	230.03	6.94	**<.001**

Speaker L46.M.68:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4592.531	4667.466	-74.935	116	-0.26	0.798
	C	5230.674	4827.256	403.418	74.81	1.15	0.254
	B & C	4807.033	4731.038	75.995	201.3	0.34	0.735
Variance (Hz)	B	3161.834	3212.479	-50.645	130.09	-0.50	0.621
	C	3421.797	3738.275	-316.478	74.07	-2.92	**<.005**
	B & C	3249.216	3421.666	-172.45	205.98	-2.13	0.03439
Mean Intensity (dB)	B	50.21519	50.60714	-0.39195	129.65	-0.47	0.642
	C	52.82500	51.67568	1.14932	73.82	1.45	0.152
	B & C	51.09244	51.03226	0.06018	209.96	0.10	0.922

Speaker L47.M.87:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3064.734	2960.702	104.032	106.9	0.66	0.513
	C	3309.665	3127.190	182.475	68.33	0.84	0.406
	B & C	3151.043	3030.519	120.524	176.71	0.93	0.354
Variance (Hz)	B	2249.281	2423.020	-173.739	118.74	-1.65	0.101
	C	2219.510	2605.788	-386.278	65.80	-3.55	**<.001**
	B & C	2238.790	2499.665	-260.875	195.37	-3.40	**<.001**
Mean Intensity (dB)	B	56.07353	54.92593	1.1476	112.89	1.64	0.103
	C	55.83784	54.41026	1.42758	72.72	2.06	0.04336
	B & C	55.99048	54.70968	1.2808	194.08	2.56	0.01136

Speaker L48.M.78:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5356.330	3487.237	1869.093	126.9	6.61	**<.001**
	C	6142.816	4333.933	1808.883	79.16	6.75	**<.001**
	B & C	5595.189	3797.188	1798.001	212.62	8.51	**<.001**
Variance (Hz)	B	2922.531	2929.830	-7.299	144.79	-0.08	0.940
	C	2703.031	3558.477	-855.446	75.66	-9.24	**<.001**
	B & C	2855.868	3159.960	-304.092	225.21	-3.99	**<.001**
Mean Intensity (dB)	B	60.50000	58.94366	1.55634	115.52	2.20	0.03007
	C	63.19512	56.90244	6.29268	76.52	8.75	**<.001**
	B & C	61.31852	58.19643	3.12209	212.81	5.83	**<.001**

Speaker L54.M.73:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	---	---	---	---	---	---
	C	6409.486	6569.426	-159.94	82.00	-0.52	0.604
	B & C						
Variance (Hz)	B	---	---	---	---	---	---
	C	2295.742	2317.378	-21.636	82.00	-0.16	0.869
	B & C						
Mean Intensity (dB)	B	---	---	---	---	---	---
	C	62.93023	63.92683	-0.9966	76.96	-0.95	0.346
	B & C						

Speaker L56.M.26:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4755.567	2127.882	2627.685	146.18	8.00	**<.001**
	C	5621.067	1858.489	3762.578	77.8	8.77	**<.001**
	B & C	5029.538	2032.521	2997.017	243.66	11.50	**<.001**
Variance (Hz)	B	2967.576	2073.173	894.403	119.73	6.24	**<.001**
	C	2731.529	2497.409	234.12	81.753	1.19	0.238
	B & C	2892.856	2223.345	669.511	208.06	5.75	**<.001**
Mean Intensity (dB)	B	54.21053	55.75342	-1.54289	143.93	-2.35	0.02018
	C	57.52273	52.50000	5.02273	63.73	4.83	**<.001**
	B & C	55.25899	54.60177	0.65722	211.1	1.11	0.27

Speaker H1.M.37:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5772.219	2575.982	3196.237	104.46	19.84	**<.001**
	C	5438.715	3423.543	2015.172	71.08	4.94	**<.001**
	B & C	5669.049	2886.250	2782.799	176.03	15.47	**<.001**
Variance (Hz)	B	1879.137	2905.633	-1026.496	96.69	-10.51	**<.001**
	C	1956.762	2553.788	-597.026	60.67	-3.43	**<.002**
	B & C	1903.151	2776.832	-873.681	155.91	-9.81	**<.001**
Mean Intensity (dB)	B	55.75000	43.02817	12.72183	151.53	21.09	**<.001**
	C	51.46512	45.36585	6.09927	78.15	4.20	**<.001**
	B & C	54.42446	43.88393	10.54053	229.9	15.83	**<.001**

Speaker H3.H.19:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5239.380	4453.195	786.185	115.93	4.62	**<.001**
	C	5599.869	5241.409	358.46	67.73	1.19	0.060
	B & C	5353.492	4741.065	612.427	184.03	4.59	**<.001**
Variance (Hz)	B	2056.042	3619.648	-1563.606	127.36	-27.04	**<.001**
	C	1876.397	3837.632	-1961.235	78.06	-29.26	**<.001**
	B & C	1999.176	3699.259	-1700.083	209.21	-37.22	**<.001**
Mean Intensity (dB)	B	58.31579	48.38356	9.93223	156.71	20.45	**<.001**
	C	59.79545	48.78571	11.00974	77.22	15.56	**<.001**
	B & C	58.78417	48.53043	10.25374	251.71	25.63	**<.001**

Speaker H4.H.51:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	822.9014	622.8803	200.0211	165.99	1.75	0.082
	C	3483.0092	835.6435	2647.3657	59.01	10.42	**<.001**
	B & C	1658.9353	701.2667	957.6686	187.87	6.25	**<.001**
Variance (Hz)	B	1588.922	1409.491	179.431	141.64	1.64	0.103
	C	1813.497	1773.414	40.083	80.52	0.33	0.74
	B & C	1659.503	1543.568	115.935	225.18	1.37	0.171
Mean Intensity (dB)	B	50.46875	52.31944	-1.85069	131.77	-2.35	0.02043
	C	53.95455	49.90476	4.04979	82.10	4.12	**<.001**
	B & C	51.56429	51.42982	0.13447	224.44	0.21	0.83

Speaker H5.M.25:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6030.338	1026.423	5003.915	147.31	36.94	**<.001**
	C	6389.359	2013.809	4375.55	59.99	18.82	**<.001**
	B & C	6142.373	1387.034	4755.339	193.01	36.73	**<.001**
Variance (Hz)	B	2212.857	1921.755	291.102	116.04	2.40	0.01808
	C	1886.482	2710.941	-824.459	57.65	-5.37	**<.001**
	B & C	2111.009	2209.979	-98.97	173.14	-0.96	0.336
Mean Intensity (dB)	B	59.35052	44.89041	14.46011	109.02	21.16	**<.001**
	C	59.56818	42.33333	17.23485	71.34	23.57	**<.001**
	B & C	59.41844	43.95652	15.46192	177.64	29.65	**<.001**

Speaker H7.M.51:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5885.787	4186.966	1698.821	133.51	9.29	**<.001**
	C	6305.239	5184.160	1121.079	67.00	4.12	**<.001**
	B & C	6016.680	4554.353	1462.327	195.78	9.15	**<.001**
Variance (Hz)	B	2333.198	3632.886	-1299.688	137.36	-18.58	**<.001**
	C	2461.244	3752.798	-1291.554	77.29	-11.66	**<.001**
	B & C	2373.156	3677.064	-1303.908	216.12	-21.75	**<.001**
Mean Intensity (dB)	B	52.54639	46.16667	6.37972	165.27	13.20	**<.001**
	C	52.50000	47.38095	5.11905	80.98	9.22	**<.001**
	B & C	52.53191	46.61404	5.91787	252.93	15.87	**<.001**

Speaker H8.H.57:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3572.734	2810.300	762.434	142.62	4.51	**<.001**
	C	4772.877	3270.572	1502.305	83.94	5.43	**<.001**
	B & C	3961.016	2982.902	978.114	242.46	6.34	**<.001**
Variance (Hz)	B	2547.373	2758.519	-211.146	146.2	-2.95	**<.004**
	C	2508.522	2935.177	-426.655	75.69	-3.88	**<.001**
	B & C	2534.803	2824.766	-289.963	219.93	-4.75	**<.001**
Mean Intensity (dB)	B	47.02174	43.90000	3.12174	139.07	4.99	**<.001**
	C	52.20455	47.66667	4.53788	81.70	4.55	**<.001**
	B & C	48.69853	45.31250	3.38603	233.11	5.66	**<.001**

Speaker H9.M.29:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6486.436	3401.822	3084.614	101.83	18.03	**<.001**
	C	6679.958	3987.075	2692.883	65.36	11.43	**<.001**
	B & C	6548.589	3621.292	2927.297	166.64	20.83	**<.001**
Variance (Hz)	B	2199.359	3185.405	-986.046	90.41	-12.08	**<.001**
	C	2066.782	3366.669	-1299.887	47.74	-11.34	**<.001**
	B & C	2156.780	3253.379	-1096.599	140.98	-16.28	**<.001**
Mean Intensity (dB)	B	61.27957	48.25714	13.02243	138.18	27.08	**<.001**
	C	62.18182	48.88095	13.30087	76.39	25.77	**<.001**
	B & C	61.56934	48.49107	13.07827	221.54	36.07	**<.001**

Speaker H11.H.50:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3280.595	3705.595	-425	113.15	-4.08	**<.001**
	C	3733.019	4175.576	-442.557	74.22	-2.76	0.007292
	B & C	3423.809	3888.365	-464.556	191.36	-5.03	**<.001**
Variance (Hz)	B	1565.630	2767.609	-1201.979	146.26	-16.39	**<.001**
	C	1484.853	2935.547	-1450.694	76.91	-22.28	**<.001**
	B & C	1540.061	2832.918	-1292.857	234.43	-23.61	**<.001**
Mean Intensity (dB)	B	61.27368	55.86364	5.41004	139.6	9.27	**<.001**
	C	63.84091	56.26190	7.57901	59.05	9.86	**<.001**
	B & C	62.08633	56.01852	6.06781	197.05	12.79	**<.001**

Speaker H12.H.63:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4721.764	4848.997	-127.233	148.33	-1.12	0.264
	C	4936.341	5138.442	-202.101	81.53	-1.39	0.170
	B & C	4788.144	4956.881	-168.737	238.42	-1.87	0.063
Variance (Hz)	B	2748.213	2804.104	-55.891	155.27	-0.88	0.379
	C	2458.228	2758.758	-300.53	80.20	-3.82	**<.001**
	B & C	2658.506	2787.202	-128.696	246.55	-2.54	0.0116
Mean Intensity (dB)	B	61.40625	61.86957	-0.46332	145.94	-0.96	0.336
	C	60.11628	59.90244	0.21384	81.90	0.33	0.739
	B & C	61.00719	61.13636	-0.12917	231.12	-0.33	0.744

Speaker H13.H.34:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4084.026	3393.727	690.299	156.6	5.50	**<.001**
	C	4370.575	4554.776	-184.201	61.52	-0.80	0.425
	B & C	4176.733	3825.268	351.465	194.7	2.74	0.006622
Variance (Hz)	B	2005.684	3023.658	-1017.974	127.03	-15.64	**<.001**
	C	1856.781	3480.429	-1623.648	68.17	-15.07	**<.001**
	B & C	1957.510	3193.431	-1235.921	185.23	-20.34	**<.001**
Mean Intensity (dB)	B	53.67391	49.02817	4.64574	157.07	9.38	**<.001**
	C	53.43182	48.85714	4.57468	83.82	7.30	**<.001**
	B & C	53.59559	48.96460	4.63099	244.05	11.91	**<.001**

Speaker H14.H.38:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5185.177	3781.884	1403.293	88.16	6.73	**<.001**
	C	5310.345	4727.110	583.235	50.78	2.39	0.02073
	B & C	5224.515	4133.207	1091.308	139.52	6.62	**<.001**
Variance (Hz)	B	2435.942	3622.386	-1186.444	95.12	-13.66	**<.001**
	C	2424.013	3704.851	-1280.838	65.42	-16.66	**<.001**
	B & C	2432.193	3653.037	-1220.844	159.77	-19.77	**<.001**
Mean Intensity (dB)	B	57.82292	50.64789	7.17503	146.61	15.45	**<.001**
	C	55.93182	48.76190	7.16992	82.79	11.56	**<.001**
	B & C	57.22857	49.94690	7.28167	234.06	18.81	**<.001**

Speaker H16.H.25:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4306.237	3322.953	983.284	98.04	5.65	**<.001**
	C	4749.820	3453.982	1295.838	61.63	5.85	**<.001**
	B & C	4446.652	3371.227	1075.425	164.83	7.82	**<.001**
Variance (Hz)	B	2413.650	3058.178	-644.528	110.37	-8.47	**<.001**
	C	2307.940	3106.623	-798.683	75.40	-8.81	**<.001**
	B & C	2380.188	3076.026	-695.838	188.02	-11.92	**<.001**
Mean Intensity (dB)	B	58.03158	55.00000	3.03158	123.22	6.01	**<.001**
	C	59.56818	55.33333	4.23485	79.70	7.29	**<.001**
	B & C	58.51799	55.12281	3.39518	211.3	8.76	**<.001**

Speaker H17.H.28:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4522.903	2670.673	1852.23	126.73	10.75	**<.001**
	C	4826.874	2618.803	2208.071	79.94	8.25	**<.001**
	B & C	4618.437	2651.563	1966.874	211.62	13.55	**<.001**
Variance (Hz)	B	2246.247	3272.000	-1025.753	100.37	-11.51	**<.001**
	C	2273.983	3196.117	-922.134	59.60	-7.04	**<.001**
	B & C	2254.964	3244.043	-989.079	160.8	-13.42	**<.001**
Mean Intensity (dB)	B	64.32292	55.40278	8.92014	140	19.59	**<.001**
	C	62.77273	53.52381	9.24892	81.91	15.28	**<.001**
	B & C	63.83571	54.71053	9.12518	225.42	24.23	**<.001**

Speaker H18.H.34:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5449.553	2053.445	3396.108	145.84	23.79	**<.001**
	C	6030.059	2745.099	3284.96	81.43	16.10	**<.001**
	B & C	5633.310	2312.815	3320.495	153.45	-9.46	**<.001**
Variance (Hz)	B	2408.450	2811.932	-403.482	88.99	-4.48	**<.001**
	C	2061.084	3283.923	-1222.839	58.61	-11.66	**<.001**
	B & C	2298.492	2988.929	-690.437	153.45	-9.46	**<.001**
Mean Intensity (dB)	B	70.13684	59.58571	10.55113	125.91	15.95	**<.001**
	C	70.75000	57.85714	12.89286	76.12	17.00	**<.001**
	B & C	70.33094	58.93750	11.39344	204.36	22.39	**<.001**

Speaker H20.M.30:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	7317.448	2145.335	5172.113	145.01	27.58	**<.001**
	C	7233.037	1239.596	5993.441	73.28	25.79	**<.001**
	B & C	7290.919	1814.543	5476.376	215.1	35.97	**<.001**
Variance (Hz)	B	1750.404	2636.500	-886.096	106.89	-9.23	**<.001**
	C	1890.499	2154.297	-263.798	53.81	-1.28	0.207
	B & C	1794.434	2460.391	-665.957	153.7	-6.71	**<.001**
Mean Intensity (dB)	B	55.84375	41.54795	14.2958	148.49	24.37	**<.001**
	C	58.00000	47.64286	10.35714	76.81	10.79	**<.001**
	B & C	56.52143	43.77391	12.74752	203.17	21.87	**<.001**

Speaker H21.M.38:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6085.100	2697.613	3387.487	139.47	19.83	**<.001**
	C	6618.858	3433.875	3184.983	63.51	14.12	**<.001**
	B & C	6252.853	2966.509	3286.344	206.58	23.12	**<.001**
Variance (Hz)	B	2083.715	3126.847	-1043.132	110.39	-13.10	**<.001**
	C	1812.276	3421.624	-1609.348	70.92	-15.73	**<.001**
	B & C	1998.406	3234.505	-1236.099	186.12	-19.09	**<.001**
Mean Intensity (dB)	B	52.82292	41.23288	11.59004	154.01	24.13	**<.001**
	C	55.75000	43.92857	11.82143	83.33	19.46	**<.001**
	B & C	53.74286	42.21739	11.52547	242.83	27.97	**<.001**

Speaker H23.M.23:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	7412.676	3054.471	4358.205	143.8	29.16	**<.001**
	C	7537.878	3448.991	4088.887	78.76	17.53	**<.001**
	B & C	7452.887	3202.416	4250.471	221.89	33.90	**<.001**
Variance (Hz)	B	2390.589	3276.613	-886.024	141.58	-10.24	**<.001**
	C	2227.788	3573.054	-1345.266	76.89	-10.71	**<.001**
	B & C	2338.303	3387.778	-1049.475	217.49	-14.39	**<.001**
Mean Intensity (dB)	B	56.23656	44.27143	11.96513	160.7	24.86	**<.001**
	C	56.00000	43.07143	12.92857	72.53	22.76	**<.001**
	B & C	56.16058	43.82143	12.33915	242.08	33.09	**<.001**

Speaker H25.M.19:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6888.976	1269.840	5619.136	104.98	33.34	**<.001**
	C	7137.899	1714.859	5423.04	55.44	22.32	**<.001**
	B & C	6968.922	1433.794	5535.128	161.91	39.40	**<.001**
Variance (Hz)	B	2364.037	2085.658	278.379	118.21	2.30	0.0233
	C	2047.134	2428.116	-380.982	52.41	-1.91	0.062
	B & C	2262.258	2211.827	50.431	170.04	0.47	0.641
Mean Intensity (dB)	B	56.25806	51.45833	4.79973	134.59	6.86	**<.001**
	C	56.47727	51.33333	5.14394	70.68	5.28	**<.001**
	B & C	56.32847	51.41228	4.91619	207.33	8.66	**<.001**

Speaker H26.M.19:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5811.766	2128.729	3683.037	137.64	20.59	**<.001**
	C	5794.380	2834.797	2959.583	72.67	11.18	**<.001**
	B & C	5806.302	2388.859	3417.443	206.67	22.49	**<.001**
Variance (Hz)	B	2592.248	2876.236	-283.988	97.17	-2.93	**<.005**
	C	2296.881	3103.985	-807.104	62.51	-6.26	**<.001**
	B & C	2499.418	2960.143	-460.725	165.06	-5.87	**<.001**
Mean Intensity (dB)	B	57.72917	52.15278	5.57639	132.99	10.99	**<.001**
	C	56.43182	51.19048	5.24134	83.32	7.07	**<.001**
	B & C	57.32143	51.79825	5.52318	224.65	13.14	**<.001**

Speaker H27.H.44:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4199.438	3840.838	358.6	30.42	1.00	0.324
	C	5219.939	4487.494	732.445	63.79	3.05	**<.004**
	B & C	4759.068	4238.780	520.288	104.06	2.44	0.01648
Variance (Hz)	B	2460.115	2812.729	-352.614	37.42	-3.95	**<.001**
	C	2484.723	3148.030	-663.307	63.74	-7.17	**<.001**
	B & C	2473.610	3019.068	-545.458	105.25	-7.99	**<.001**
Mean Intensity (dB)	B	48.85714	46.90000	1.95714	39.33	1.69	0.099
	C	52.02941	47.93750	4.09191	57.51	3.63	**<.001**
	B & C	50.59677	47.53846	3.05831	110.88	3.72	**<.001**

Speaker H28.M.65:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5413.779	3958.037	1455.742	136.67	7.22	**<.001**
	C	5950.407	4077.332	1873.075	82.53	7.57	**<.001**
	B & C	5588.590	4001.988	1586.602	227.36	10.07	**<.001**
Variance (Hz)	B	2408.35	2861.55	-453.2	157.79	-7.25	**<.001**
	C	2451.711	3012.358	-560.647	80.85	-5.94	**<.001**
	B & C	2422.475	2917.111	-494.636	243.92	-9.44	**<.001**
Mean Intensity (dB)	B	55.55056	48.22222	7.32834	151.2	8.61	**<.001**
	C	57.11628	49.76190	7.35438	75.61	7.12	**<.001**
	B & C	56.06061	48.78947	7.27114	243.28	11.01	**<.001**

Speaker H29.H.23:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4226.961	5176.118	-949.157	97.73	-5.39	**<.001**
	C	4589.496	5047.330	-457.834	55.96	-2.22	0.03079
	B & C	4343.396	5127.822	-784.426	159.87	-5.79	**<.001**
Variance (Hz)	B	2277.783	3727.151	-1449.368	130.61	-26.9	**<.001**
	C	2163.858	3672.885	-1509.027	78.65	-22.11	**<.001**
	B & C	2241.194	3706.801	-1465.607	214.71	-34.52	**<.001**
Mean Intensity (dB)	B	57.60215	52.38571	5.21644	141.57	8.56	**<.001**
	C	57.09091	52.90476	4.18615	77.51	6.58	**<.001**
	B & C	57.43796	52.58036	4.8576	225.38	10.70	**<.001**

Speaker H31.H.44:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3317.109	3995.232	-678.123	83.71	-5.56	**<.001**
	C	3342.227	3895.868	-553.641	63.62	-4.67	**<.001**
	B & C	3325.003	3959.944	-634.941	140.53	-7.14	**<.001**
Variance (Hz)	B	1637.515	3113.402	-1475.887	118.09	-26.67	**<.001**
	C	1611.750	3029.414	-1417.664	67.47	-20.82	**<.001**
	B & C	1629.417	3083.575	-1454.158	187.53	-33.67	**<.001**
Mean Intensity (dB)	B	55.84375	49.75362	6.09013	159.6	11.53	**<.001**
	C	56.63636	50.34211	6.29425	69.84	9.67	**<.001**
	B & C	56.09286	49.96262	6.13024	236.41	14.71	**<.001**

Speaker H32.H.62:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	2470.617	1967.487	503.13	146.23	3.12	**<.003**
	C	2810.708	2439.094	371.614	78.83	1.66	0.101
	B & C	2574.674	2143.268	431.406	234.84	3.27	**<.002**
Variance (Hz)	B	2455.331	2261.803	193.528	142.18	2.04	0.044
	C	2128.485	2215.305	-86.82	79.99	-0.64	0.524
	B & C	2355.326	2244.472	110.854	232.81	1.42	0.158
Mean Intensity (dB)	B	51.43011	51.36232	0.06779	135.69	0.098	0.922
	C	55.95122	56.48780	-0.53658	80.00	-0.77	0.443
	B & C	52.81343	53.27273	-0.4593	222.11	-0.78	0.435

Speaker H33.M.34:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	7078.364	3901.333	3177.031	99.77	20.85	**<.001**
	C	7018.802	3778.215	3240.587	70.69	16.83	**<.001**
	B & C	7059.645	3854.325	3205.32	171.32	27.01	**<.001**
Variance (Hz)	B	2099.68	3483.03	-1383.35	119.36	-22.37	**<.001**
	C	2153.597	3596.526	-1442.929	78.25	-14.34	**<.001**
	B & C	2116.626	3526.365	-1409.739	198.92	-26.36	**<.001**
Mean Intensity (dB)	B	57.40625	44.73529	12.67096	161.59	26.56	**<.001**
	C	54.75000	42.85714	11.89286	75.47	13.54	**<.001**
	B & C	56.57143	44.01818	12.55325	244.05	27.80	**<.001**

Speaker H34.H.47:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	2327.699	1533.554	794.145	120.03	5.05	**<.001**
	C	4099.916	2839.123	1260.793	64.13	5.35	**<.001**
	B & C	2880.731	2010.370	870.361	220.11	5.45	**<.001**
Variance (Hz)	B	2088.960	2447.809	-358.849	82.91	-3.10	**<.003**
	C	2400.536	3257.981	-857.445	58.50	-7.17	**<.001**
	B & C	2186.190	2743.698	-557.508	138.4	-5.98	**<.001**
Mean Intensity (dB)	B	59.60825	55.39726	4.21099	110.95	7.68	**<.001**
	C	62.20455	53.73810	8.46645	83.32	16.77	**<.001**
	B & C	60.41844	54.79130	5.62714	204.97	13.63	**<.001**

Speaker H36.M.70:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5168.985	4471.769	697.216	109.88	3.25	**<.002**
	C	5243.802	4574.966	668.836	75.07	2.26	0.027
	B & C	5192.332	4509.458	682.874	186.36	3.97	**<.001**
Variance (Hz)	B	1870.938	2492.332	-621.394	113.76	-7.20	**<.001**
	C	1895.982	2882.809	-986.827	59.96	-6.73	**<.001**
	B & C	1878.753	2634.941	-756.188	169.08	-9.68	**<.001**
Mean Intensity (dB)	B	61.40206	57.98630	3.41576	124.67	5.35	**<.001**
	C	60.00000	55.83333	4.16667	82.89	4.14	**<.001**
	B & C	60.96454	57.20000	3.76454	213.82	6.86	**<.001**

Speaker H37.H.47:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4359.332	3686.407	672.925	148.9	3.29	**<.002**
	C	5095.398	4799.051	296.347	72.34	0.98	0.33
	B & C	4594.020	4096.328	497.692	218.42	2.77	0.006
Variance (Hz)	B	2488.388	3582.559	-1094.171	156.59	-10.98	**<.001**
	C	2284.531	3863.371	-1578.84	84	-10.75	**<.001**
	B & C	2423.390	3686.016	-1262.626	243.99	-15.11	**<.001**
Mean Intensity (dB)	B	57.24468	53.08333	4.16135	162.59	7.56	**<.001**
	C	58.18182	54.26190	3.91992	74.56	5.45	**<.001**
	B & C	57.54348	53.51754	4.02594	242.65	9.14	**<.001**

Speaker H38.M.52:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6454.792	2614.784	3840.008	124.47	21.02	**<.001**
	C	6488.979	3437.932	3051.047	80.01	9.60	**<.001**
	B & C	6465.537	2918.049	3547.488	203.11	21.44	**<.001**
Variance (Hz)	B	2396.405	3008.344	-611.939	136.98	-7.19	**<.001**
	C	2305.308	3212.490	-907.182	79.88	-7.43	**<.001**
	B & C	2367.774	3083.556	-715.782	218.56	-10.19	**<.001**
Mean Intensity (dB)	B	61.07292	55.00000	6.07292	159.66	9.50	**<.001**
	C	60.61364	55.33333	5.28031	83.24	6.80	**<.001**
	B & C	60.92857	55.12281	5.80576	249.87	11.73	**<.001**

Speaker H44.H.19:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5154.928	1539.472	3615.456	90.56	16.47	**<.001**
	C	5653.901	2735.345	2918.556	51.97	8.07	**<.001**
	B & C	5314.021	1980.057	3333.964	142.83	16.71	**<.001**
Variance (Hz)	B	2440.156	2591.679	-151.523	82.68	-1.07	0.289
	C	2150.831	3352.158	-1201.327	45.43	-5.82	**<.001**
	B & C	2347.907	2871.856	-523.949	130.11	-4.27	**<.001**
Mean Intensity (dB)	B	61.05319	58.68056	2.37263	100.63	3.60	**<.001**
	C	62.61364	56.09524	6.5184	69.35	7.40	**<.001**
	B & C	61.55072	57.72807	3.82265	170.56	7.08	**<.001**

Speaker H46.M.69:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4914.19	2346.237	2567.953	116.08	10.60	**<.001**
	C	5924.844	3081.579	2843.265	68.80	6.64	**<.001**
	B & C	5236.103	2615.425	2620.678	190.87	11.76	**<.001**
Variance (Hz)	B	3445.299	2611.745	833.554	97.38	7.80	**<.001**
	C	2920.031	2802.060	117.971	70.55	0.79	0.430
	B & C	3277.991	2681.414	596.577	181.78	6.71	**<.001**
Mean Intensity (dB)	B	59.66304	55.19718	4.46586	130.65	5.94	**<.001**
	C	60.60465	55.80488	4.79977	79.43	4.36	**<.001**
	B & C	59.96296	55.41964	4.54332	214.66	7.34	**<.001**

Speaker H48.H.54:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4506.724	5278.157	-771.433	106.88	-5.12	**<.001**
	C	4920.444	6247.329	-1326.885	66.28	-7.10	**<.001**
	B & C	4636.751	5632.116	-995.365	170.53	-7.90	**<.001**
Variance (Hz)	B	1556.054	3730.336	-2174.282	128.15	-40.87	**<.001**
	C	1511.560	3436.796	-1925.236	66.56	-33.65	**<.001**
	B & C	1542.07	3623.13	-2081.06	192.19	-49.45	**<.001**
Mean Intensity (dB)	B	63.09375	52.89041	10.20334	160.9	20.93	**<.001**
	C	63.93182	54.19048	9.74134	74.67	13.62	**<.001**
	B & C	63.35714	53.36522	9.99192	252.93	24.78	**<.001**

Speaker H49.M.47:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5977.597	952.596	5025.001	164.79	31.73	**<.001**
	C	6182.408	1007.517	5174.891	78.24	23.37	**<.001**
	B & C	6041.5099	972.8299	5068.68	245.69	39.38	**<.001**
Variance (Hz)	B	2551.427	1798.350	753.077	114.77	6.31	**<.001**
	C	2453.914	1846.797	607.117	66.67	3.72	**<.001**
	B & C	2520.997	1816.199	704.798	183.84	7.34	**<.001**
Mean Intensity (dB)	B	57.00000	50.41667	6.58333	136.45	10.05	**<.001**
	C	57.04545	49.54762	7.49783	72.43	8.98	**<.001**
	B & C	57.01418	50.09649	6.91769	212.27	13.37	**<.001**

Speaker H53.M.27:

DM	Style	<s> (mean)	<z> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6501.531	3576.114	2925.417	141.12	14.42	**<.001**
	C	7590.623	4411.149	3179.474	81	11.02	**<.001**
	B & C	6840.360	3889.252	2951.108	230.49	16.86	**<.001**
Variance (Hz)	B	3188.617	3426.491	-237.874	129.89	-2.71	0.0075
	C	2719.721	3802.760	-1083.039	73.30	-9.35	**<.001**
	B & C	3042.738	3567.592	-524.854	213.7	-7.07	**<.001**
Mean Intensity (dB)	B	55.91398	49.41429	6.49969	108.75	12.71	**<.001**
	C	57.35714	49.76190	7.59524	73.02	10.27	**<.001**
	B & C	56.36296	49.54464	6.81832	223.5	16.54	**<.001**

Speaker H54.H.69:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	2589.613	2036.431	553.182	165.84	2.60	0.010
	C	2861.449	2364.972	496.477	79.02	1.79	0.077
	B & C	2672.345	2152.728	519.617	247.39	3.04	**<.003**
Variance (Hz)	B	2358.608	2379.913	-21.305	146.07	-0.20	0.840
	C	2759.634	2731.336	28.298	79.91	0.19	0.853
	B & C	2480.660	2504.311	-23.651	233.83	-0.27	0.790
Mean Intensity (dB)	B	56.75000	54.19178	2.55822	139.89	2.80	0.0058
	C	64.78571	62.47500	2.31071	79.82	2.81	0.006
	B & C	59.19565	57.12389	2.07176	229.29	2.52	0.013

Speaker H55.M.48:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	4930.809	4420.647	510.162	104.13	3.18	**<.002**
	C	4924.635	4452.523	472.112	78.37	2.87	**<.0055**
	B & C	4928.869	4432.494	496.375	181.23	4.23	**<.001**
Variance (Hz)	B	1901.511	3270.331	-1368.82	99.87	-23.34	**<.001**
	C	1706.659	3633.734	-1927.075	53.33	-20.54	**<.001**
	B & C	1840.272	3405.401	-1565.129	153.79	-29.15	**<.001**
Mean Intensity (dB)	B	62.12500	54.76056	7.36444	143.01	14.68	**<.001**
	C	62.06818	54.09524	7.97294	83.56	14.70	**<.001**
	B & C	62.10714	54.51327	7.59387	232.63	20.18	**<.001**

Speaker H57.M.49:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6173.8292	689.6057	5484.2235	164.06	35.08	**<.001**
	C	6484.8741	691.2588	5793.6153	68.07	28.29	**<.001**
	B & C	6270.8929	690.2095	5580.6834	235.87	44.89	**<.001**
Variance (Hz)	B	2599.956	1579.135	1020.821	111.87	8.97	**<.001**
	C	2251.319	1632.913	618.406	62.62	4.43	**<.001**
	B & C	2491.162	1598.775	892.387	183.7	9.98	**<.001**
Mean Intensity (dB)	B	61.21649	53.28767	7.92882	113.21	11.51	**<.001**
	C	62.45455	53.88095	8.5736	57.77	8.43	**<.001**
	B & C	61.60284	53.50435	8.09849	173.88	14.08	**<.001**

Speaker H58.M.60:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	6975.916	3372.536	3603.38	104.44	17.43	**<.001**
	C	6962.273	1764.639	5197.634	83.24	17.70	**<.001**
	B & C	6971.659	2785.304	4186.355	179.42	23.10	**<.001**
Variance (Hz)	B	2316.450	3381.977	-1065.527	132.14	-11.95	**<.001**
	C	2309.684	2680.465	-370.781	56.86	-2.07	0.044
	B & C	2314.339	3125.773	-811.434	169.85	-8.85	**<.001**
Mean Intensity (dB)	B	56.40206	45.71233	10.68973	143.78	21.02	**<.001**
	C	60.93182	54.78571	6.14611	64.15	7.69	**<.001**
	B & C	57.81560	49.02609	8.78951	180.53	14.11	**<.001**

Speaker H59.M.62:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	5807.998	5220.676	587.322	119.94	2.76	0.007
	C	6533.417	5897.144	636.273	66.80	2.20	0.031
	B & C	6039.291	5467.734	571.557	192.9	3.25	**<.002**
Variance (Hz)	B	3198.790	3292.535	-93.745	141.06	-1.25	0.214
	C	2754.817	3090.376	-335.559	74.20	-2.90	**<.005**
	B & C	3057.233	3218.703	-161.47	227.13	-2.43	0.016
Mean Intensity (dB)	B	53.08511	52.41096	0.67415	149.37	1.33	0.186
	C	52.54545	52.16667	0.37878	83.84	0.50	0.615
	B & C	52.91304	52.32174	0.5913	238.81	1.41	0.159

Speaker H62.H.69:

DM	Style	\<s\> (mean)	\<z\> (mean)	Mean diff. Demerger index	d.f.	t-value	p-value
Center gravity (Hz)	B	3149.958	3067.702	82.256	130.43	0.452	0.652
	C	3279.887	2770.120	509.767	64.13	2.88	**<.0055**
	B & C	3190.503	2959.020	231.483	203.95	1.72	0.086
Variance (Hz)	B	2222.414	2948.230	-725.816	160.4	-7.05	**<.001**
	C	1754.165	2836.443	-1082.278	80.91	-11.00	**<.001**
	B & C	2076.294	2907.404	-831.11	234.39	-10.58	**<.001**
Mean Intensity (dB)	B	58.12371	54.91781	3.2059	167.53	4.82	**<.001**
	C	60.65909	55.23810	5.42099	76.79	7.44	**<.001**
	B & C	58.91489	55.03478	3.88011	253.72	7.48	**<.001**

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