Dialect-specific Acoustic Correlates of Stress in Spanish: The Role of Vowel Compression and Syllable Structure

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Abstract

The present paper is part of a wider project examining vowel compression and its impact on the phonetic signalling of stress across dialects of Spanish. Here within, we compare vowel compression effects in spontaneous Southern Chilean Spanish to previous findings from continuously read Altiplateau Mexican Spanish. Results show that, in Southern Chilean Spanish, vowels are shortened in CVC and CCV syllables irrespective of stress; although unstressed vowels are shorter than stressed, onset and coda-driven compression effects are visible on all vowels. Qualitative results show that stress-driven differences in vowel height are visible on /o/ and /a/ in open but not closed syllables: stressed vowels are lower in the vowel space. Conversely, results from Altiplateau Mexican Spanish showed that whilst unstressed vowels in CVC syllables were shortened and centralised, stressed vowels were not. Results therefore support theories that dialect-specific compression effects exist due to dialect-specific phonetic-phonological interactions (Authors under review): in this case, their interaction with stress. We further consider the implications of these variety-specific patterns in the context of debates concerning the dialect-specific nature of stress, arguing that compression effects may have implications on the wider vowel systems and the phonetic way in which stress is signalled across dialects.

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1. Background and Motivation

Vowel compression, or compensatory shortening, is the process in which vowels are shortened relative to syllable structure. In fundamental terms, the greater the number of segments within a syllable, the shorter the vowel (Maddieson 1985). Thus in (1), the /ɪ/ in *spins* is predicted to be shorter than in *sin* due to complex syllable structure of CCVCC versus CVC.

(1)	*sin*	/ˈsɪn/	CVC
	spins	/ˈspɪnz/	CCVCC

Despite previous claims that vowel shortening is universally coda-driven (Maddieson 1985)—i.e., vowels in closed syllables are universally shorter than those in open—research has shown that compression effects vary from language to language owing to language-specific phonetic-phonological interactions. For example, Katz (2012) showed that, in English, vowels adjacent to clusters were shorter than those adjacent to singleton consonants, although whether this was onset or coda-driven varied between speakers and the manner of the consonants within the clusters. Crucial to the present research, Aldrich and Simonet's (2019) study of Spanish showed that coda-driven compression did not occur, at least in data pooled from a variety of Spanish dialects. Rather, complex onsets, i.e., CCV, were shown to shorten vowels. Moreover, vowel-specific effects were noted, whereby the low vowel /a/ underwent relative greater shortening than /i/. Nonetheless, this analysis relies heavily on the assumption that dialects behave in a uniform manner with regard to compression. Thus, as Aldrich and Simonet highlight, it may be that dialect-specific shortening effects exist, but further research focusing on dialectal patterns would be required to determine this.

This point is the key motivation for the present case study, which aims to examine vowel compression in Southern Chilean Spanish (henceforth SCS). This research forms part of a larger project whose goal is to analyse compression in a range of phonologically distinct varieties of Spanish. In this connection, we previously analysed vowel compression in Altiplateau Mexican Spanish (henceforth AMS), the variety spoken in Mexico's Central Highlands (Authors under review). AMS is noted for several features, including Unstressed Vowel Reduction (henceforth UVR): the process in which unstressed vowels are shortened, devoiced and centralised in word-final position. Although all unstressed vowels are reduced, the mid and low vowels /e, a, o/ are particularly targeted (Boyd- Bowman 1952; Canellada & Zamora Vicente 1960; Dabkowski 2018; Delforge 2008, 2009; Lope Blanch 1960). Effects are also constrained by syllabic factors, where reduction is more extreme in closed syllables than in open ones (Dabkowski, 2018; Delforge 2008, 2009).

With this in mind, we re-examined UVR in AMS within a compression framework, analysing the mid and low vowels /e, a, o/ in word-final position in continuously read speech of six speakers. Participants were aged between 18 and 25 years old. All self-identified as female and were native speakers of the variety having been born and raised in the city of Toluca. Results showed that the occurrence of a coda was highly significant in driving shortening of unstressed vowels: CV~CVC comparisons confirmed strongly significant durational clipping in the latter context. Interestingly, as we can see in Figure 2, comparisons of stressed CV~CVC vowels did not display the same shortening trends. Furthermore, as Figure 2 highlights, given that we used a reading passage, there were a lack of tokens in stressed syllables outside of CV and CVC. Nonetheless, inferential testing confirmed that even for unstressed tokens, onset complexity was not significant in driving shortening, i.e., CV~CCV comparisons. With regards to quality, measures revealed that although all unstressed vowels raised in open and closed syllables (see Figure 1), stress was significant in driving centralisation only in closed syllables. Nevertheless, the significance of stress in driving these changes was vowel-specific: /o/ and /a/ underwent greater centralisation when compared to /e/, thus reflecting trends shown in Figure 2.

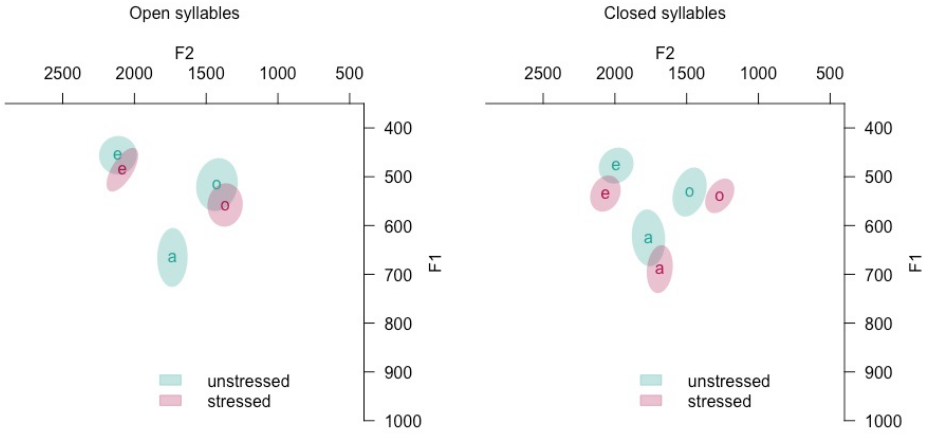

Figure 1: Vowel plots for vowels /e, a, o/ in stressed and unstressed position in AMS in open (left panel) versus closed (right panel) syllables.

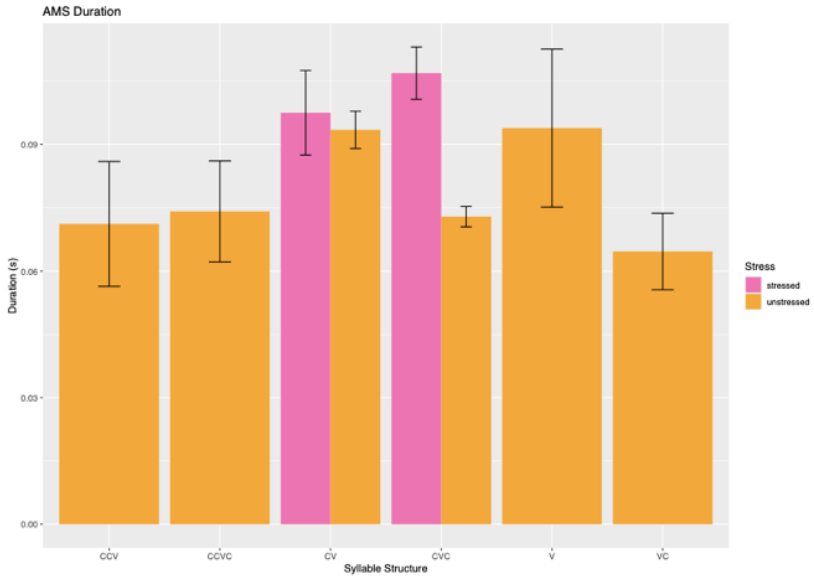

Figure 2: Mean duration (seconds) for AMS vowels in stressed and unstressed contexts in CCV, CCVC, CV, CVC, V and VC syllables. *3*

In light of these results, we concluded that coda-driven compression does occur in AMS but that it interacts strongly with stress. In other words, vowels in closed syllables exhibit greater stress-driven centralisation and shortening than those in open syllables. Nevertheless, there are limitations to this study which must be acknowledged. Firstly, our study on AMS relied on a small sample size and limited elicitation methods: all speakers self-identified as female and the analysis relied on data from a prepared reading passage with a limited number of stress and syllable contexts. Given previous research highlighting the variability of timing metrics across speech styles (Arvaniti 2009, 2012), we therefore see advantages of analysing compression in more spontaneous speech styles. Furthermore, since compression in AMS appears to depend strongly on stress, there is scope to explore the link between stress and vowel compression: i.e., whether there are mutual dependencies between variety-specific durational and qualitative reduction of vowels and lexical stress patterns in the language.

The study reported on below is therefore motivated by these outstanding questions. In addition, we aimed to explore whether any of the compression patterns noted for AMS would occur in a geographically unconnected variety of Spanish that is also characterised by vowel reduction. Southern Chilean Spanish was chosen due to impressionistic reports that word-final

vowels are often devoiced on this variety (Lipski 1994; Rogers 2020). As such, vowel reduction processes may occur in this variety, but how these effects interact with syllable structure and stress is yet to be examined. The study is therefore guided by the following research questions.

1. What is the relationship between stress and vowel compression in Southern Chilean Spanish?
2. To what extent do acoustic cues to lexical stress vary according to syllable shape?
3. How may findings be interpreted as evidence for dialect-specific marking of stress that interacts with other phonological phenomena?

2. Methodology

For this study, the data comes from a corpus of spontaneous speech elicited via a photo and comic-strip description task. Recordings from six speakers of Southern Chilean Spanish are analysed. At the time of recording, these speakers were aged between 24 and 30 years old. Three self-identified as female and three self-identified as male. All were native, first-language speakers of SCS who had been born and raised in Santiago de Chile. Due to limitations to data-collection practices imposed by the COVID-19 pandemic, data were collected remotely. The video-call software platform Zoom was for this chosen due to its accuracy in recording audio data that is suitable for use in acoustic analysis (Zhang, Jepson, Lohfink, Arvaniti 2021). During the recording, participants were asked to sit in a quiet room away from windows. Participants wore headphones with an integrated microphone to ensure consistent distance from the microphone during recording. As speakers living in different locations were recorded for the study, it was not possible to record participants using identical equipment. Accordingly, Sound-to-Noise Ratios (SNR) were calculated using samples extracted from both the beginning and end of each recording to determine suitability for acoustic analysis. Only recordings with an SNR value of 50 or above were included in the analysis.

We analysed the mid and low vowels /e, o, a/ in word-final position in order to mirror the variable context of our previous study. The high vowels /i, u/ were excluded from the analysis due to their infrequency in appearing in word-final syllables in Spanish. Moreover, in order to avoid discrepancies in durational and formant frequency measurements, fake geminates (e.g., *lago o* [la.ɣo]) and contextual diphthongs (e.g., *lago y* [la.ɣoi̯]) were excluded from the analysis. Function words were also removed due to their inability to carry lexical stress in Spanish. Following these exclusions, a total of 3,332 tokens were included in the analysis.

Speech was transcribed and segmented using the *Montreal Forced Aligner* (McAuliffe, Socolog, Wagner & Sonderegger 2017). TextGrids were visually inspected in Praat (Boersma & Weenik 2021) and manually corrected where necessary in accordance with established segmentation protocols outlined in Turk, Nakai and Sugahara (2006). Praat scripts were written to extract durational and formant frequency of the vowels. Formant frequencies were collected from the mid-point to avoid co-articulatory effects from surrounding sounds (Freeman & De Decker 2021). We further calculated spectral tilt measures by script (Kirby 2020) due to their robustness in signalling stress across a variety of spoken languages (Gordon & Roettger 2017; Ortega-Llebaria 2006; Sluijiter, van Heuven & Pacilly 1997; Versteegh, Seidl & Cristia 2014). We focus particularly on H1A3 corrected measures as previous studies have confirmed that this measure can provide a reliable correlate of lexical stress (Gordon & Roettger 2017). However, in some cases, spectral tilt measures could not be collected due to fairly frequent occurrence of non-modal phonation, i.e., creaky voice. As such, analysis of spectral tilt is based on a subset of tokens from which H1A3 measurements could be reliably extracted (i.e., 2,068 tokens in total).

Tokens were coded for each of the following variable: *speaker, word, stress, vowel quality, following context, syllable openness* and *syllable structure. Speaker* was coded using anonymous participant codes and *word* represented the lexical word in which the target vowel appears (using standard Spanish orthography). *Stress* captures whether the target vowel occurred in a stressed or unstressed syllable and *vowel quality* codes whether target vowels were instances of /e/, /o/ or /a/. *Syllable structure* codes the shape of the word-final syllable of the *citation form* of each word. Thus, in a word like *hablar*, the final syllable /βlaɾ/ is coded as CCVC. In this way, no prior assumptions were drawn concerning the operation of resyllabification across word boundaries. Instead, we encoded the possibility of phrasal resyllabification within *following context*: i.e., pre-vocalic and pre-consonantal code whether

the word following the target word is vowel or consonant-initial, respectively; and pre-pausal indicates that a target word occurs before an intonational break or pause. In instances when data was subsetted further, e.g., for analysis of vowel-specific qualitative effects, too few tokens of certain syllable types occurred in the dataset to make syllable structure workable as a predictor of variation. Thus, we reverted to a simpler binary categorisation for syllable shape: *syllable openness* denotes whether the vowels are in open (i.e., for CV, CCV and V syllables) or closed (i.e., for CVC, CCVC and VC) syllables.

Finally, given that SCS is a variety of Spanish in which elision of word-final /s/ regularly occurs, a choice needed to be made about how final /CVs/ syllables should be coded when the /s/ was not phonetically realised. In this case, we relied on duration measures of the nuclear vowel in these syllables as a diagnostic: statistical comparisons revealed no significant difference in vowel duration in canonical CV syllables versus derived CV syllables ($t = 0.015$, $p > .1$). We therefore opted to code /CVs/ syllables in which the /s/ was retained (either as [s] or with aspiration to [h]) as CVC, whereas /CVs/ syllables displaying complete deletion of /s/ were coded as CV.

Statistical analysis was conducted using *R* (R Core Team 2020). Plots used for visualising patterns in the data were generated using both base *R* and the *ggplot2* package. Inferential testing was conducted using linear mixed-effects regression (*lme4* and *lmerTest* packages) for which models were built additively. Post-hoc comparisons with Bonferroni corrections were calculated using the *emmeans* package.

3. Results

3.1 Vowel Duration

Figure 3 shows mean vowel durations for all syllable-type categories in the dataset. For ease of comparison, plots are included for three following contexts relevant for the study: i.e., pre-vocalic, pre-consonantal and pre-pausal environments. We see evidence of coda-driven compression in pre-consonantal and pre-pausal CVC syllables in both stress contexts: in comparison to CV structures, vowels shorten in closed syllables where the vowel is followed by a coda consonant. Interestingly, vowels in pre-vocalic positions show a marginal increase in duration with the addition of the coda in both stressed and unstressed syllables. Nevertheless, strong effects of stress are visible in all environments: across test contexts and environments—including open CV syllables—stressed vowels are consistently longer than unstressed vowels. In terms of onset complexity, onset complexity causes vowel shortening: this is observable in comparisons of CV~CCV syllables (i.e., mean durations of 0.074 vs 0.063 seconds in unstressed syllables, respectively).[1] Impressionistically, our findings therefore suggest that both onset complexity *and* the occurrence of a coda drive vowel shortening in Southern Chilean Spanish and that both stressed and unstressed vowels are targeted.

Inferential testing confirms these initial observations. Due to low token count, it was not possible to included data from CCVC syllables in the analysis: linear mixed-effects models were therefore fit using the subset of syllable shapes included in Figure 3. The best-fit regression model for duration (log transformed) included *syllable, vowel quality, stress* and *following context* as fixed effects, and interaction term for *syllable* × *stress* and random intercepts for *speaker* and *word.* Main effects of *syllable structure, vowel quality* and *stress* were observed but no significant interactions. Across syllable types tested, unstressed vowels are shorter than stressed vowels ($t = –5.407$, $p < .001$). In general, realisations of /a/ are marginally longer than both /e/ and /o/, but this effect fails to reach significance ($p > .05$). Significant shortening effects were noted for CVC ($t = –3.641$, $p < .001$) and CCV ($t = –3.086$, $p < .01$), relative to the reference value for *syllable*, i.e., CV. Pairwise post-hoc comparisons confirm that for all three vowels, the presence of a coda is highly significant in shortening vowels (i.e., CV~CVC: $p < .01$). Similarly, onset complexification results in significant durational clipping of the following vowel, although this is somewhat less robust than coda-driven compression (i.e. CV~CCV: $p < .05$).

[1] Note that no stressed CCV syllables occurred in the dataset.

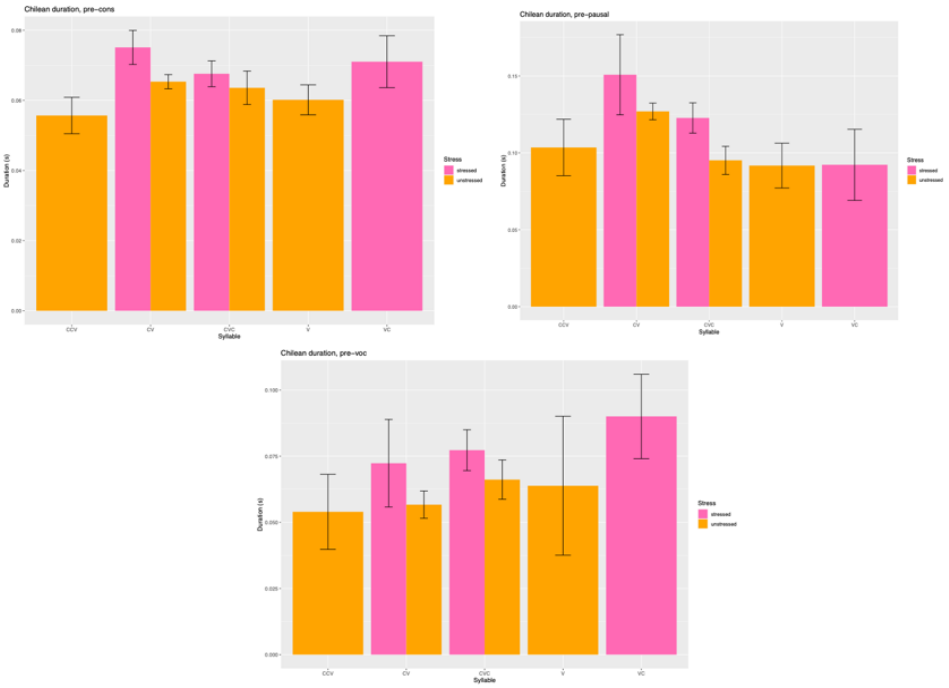

Figure 3: Mean duration (seconds) for vowels in stressed and unstressed CCV, CV, CVC, V and VC syllables in pre-consonantal (top left), pre-pausal (top right) and pre-vocalic (bottom) environments.

3.2 Vowel Quality

F1 and F2 values for stressed and unstressed vowels in open versus closed syllable are plotted below in Figure 4. Results show that differences in vowel height are observable between stressed and unstressed vowels in open and closed syllables: stressed vowels appear lower in the vowel space and unstressed vowels have a higher quality. These effects are more extreme in open syllables than closed and are also vowel-specific: /o/ and /a/ in open syllables show the greatest difference in height between stress contexts, whereas the effects on /e/ are smaller. In closed syllables, although similar differences in height between stressed and unstressed vowels are visible, these differences are marginal in comparison to open syllables.

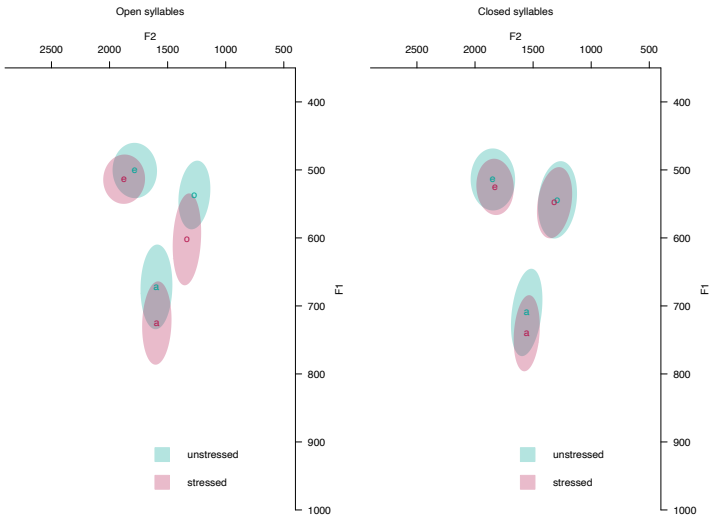

Figure 4: Vowel plots for realisations of /e, a, o/ in stressed and unstressed position in open (left panel) versus closed (right panel) syllables.

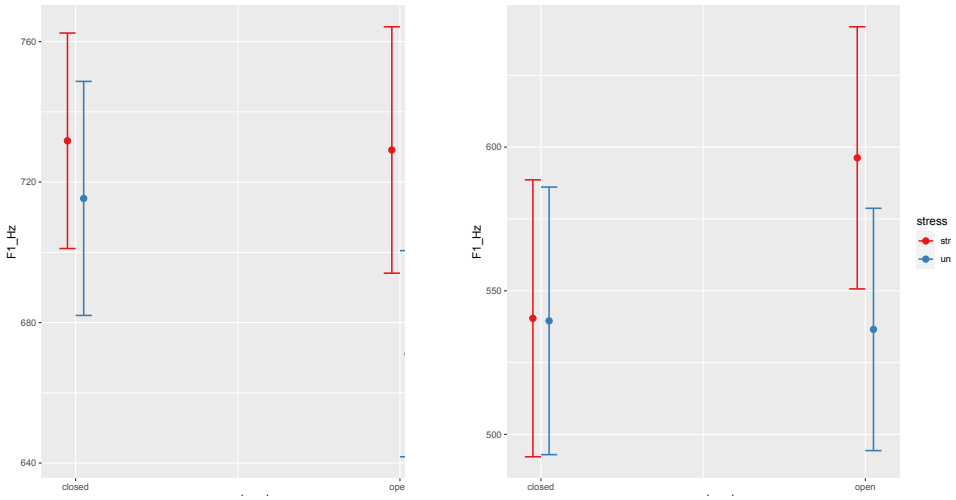

Figure 5: Fitted values for F1 (Hz) for /a/ (left panel) and /o/ (right panel) showing the interaction between *syllable type* (closed vs open syllables) and *stress* (stressed vs unstressed vowels).

Given that vowels seem to lower or raise depending on stress, we modelled F1 for each vowel, with *stress* and *syllable openness* as fixed effects, a *stress* × *syllable* openness interaction term and random intercepts for *speaker* and *word*. A significant main effect of *syllable openness* was observed for /o/ and /a/ ($p > .001$ in both cases) and the *stress* × *syllable* interaction reached significance for both vowels (for /o/, $t = –3.064$, $p < .01$; for /a/, $t = -2.401$, $p < .05$). As shown in Figure 5 above, unstressed /o/ has significantly higher F1 values than stressed /o/ in open syllables. Similarly, for /a/, unstressed vowels have significantly higher F1 values compared to stressed in open syllables. Interestingly, for both /o/ and /a/, stress is only significant in open syllables: comparisons between stressed and unstressed syllables in closed syllables do not achieve significance for either vowel. For /e/, no significant main effects and no significant interaction obtained (n.s. $p > .1$ in all cases). These results therefore confirm that differences in vowel height may contribute to the marking of stress in this variety. However, this is constrained by syllable type and vowel quality, affecting only /o/ and /a/ in open syllables.[2] We attribute this to coda-induced durational clipping of vowels in closed syllables which we discuss further in Section 4.1.

3.3 Spectral Tilt

Figure 6 shows mean spectral tilt measures and ranges for all vowels in all syllables. These effects were harder to interpret, nonetheless, an emerging pattern is that effects appear to be scalar, meaning that mean measures and ranges drop with the addition of segments to the syllables, irrespective of whether these are onset of coda. This is most perceivable with CCVC structures, where the combination of the complex onset and coda leads to both the lowest spectral mean and range.[3] These effects are less perceivable for CV~CCV and CV~CVC comparisons, suggesting that it is therefore the combination of the complex onset and coda which is significant. Stress effects are also visible whereby unstressed vowels seem have lower spectral measures and ranges. However, this does appear minor and is not observable in all syllabic context, i.e., CCV and VC.

For spectral tilt vowel-specific models were fitted with *syllable*, *stress* and *following context* as fixed effects and *speaker* and *word* as random intercepts. For /e/, significant effects emerge for CVC: /e/ in CVC syllables shows higher spectral tilt measures ($t = 2.884$, $p > .01$) relative to the reference value for syllable, i.e., CV. No other significant effects were observed for this vowel. For /a/, CCVC was significant in dropping mean spectral tilt measurements ($t = –2.426$, $p > .05$). Significant effects were also noted for V structures with a drop in spectral tilt ($t = –2.013$, $p > .05$). We attribute these effects from the proceeding vocalic context: /a/ in V

[2] We note that final /o/ and /a/ carry crucial gender information in nouns than /e/ does not.

[3] Recall, however, that token count for CCVC syllables is low, such that this finding ought not to be over-interpreted.

syllables likely appears following the stressed /i/, thus it could be that the significance of V cannot be solely attributed to syllable structure but rather outlying changes in quality.

Interestingly, for /o/, no significant effects of any fixed predictors were observed. A marginal lowering of spectral tilt in CVC relative to CV was observed, but this did not achieve significance for /o/ ($t = –0.875$, $p < .1$). Similarly, onset complexity did not result in significant differences in tilt (i.e., CV~CCV: $t = –0.56$, $p < .1$). These findings are particularly interesting as they differ from the qualitative results for /o/. As noted, /o/ undergoes the most significant stress-driven changes in quality yet shows little variation in spectral tilt. On the other hand, /e/ undergoes non-significant qualitative changes yet shows the greatest effects of coda in its spectral tilt measurements. It therefore could be that changes in spectral tilt are instead the result of coda-driven changes in quality elsewhere in the spectrum. In other words, there may be further effects of coda consonants visible on vowel quality, e.g., beyond F1, which affect spectral tilt measurements. It is beyond the scope of this paper to explore this possibility further. Nevertheless, our data do confirm that the presence of coda consonants affects spectral tilt at least for /a/ and /e/ in SCS, and that this appears not to interact with stress.

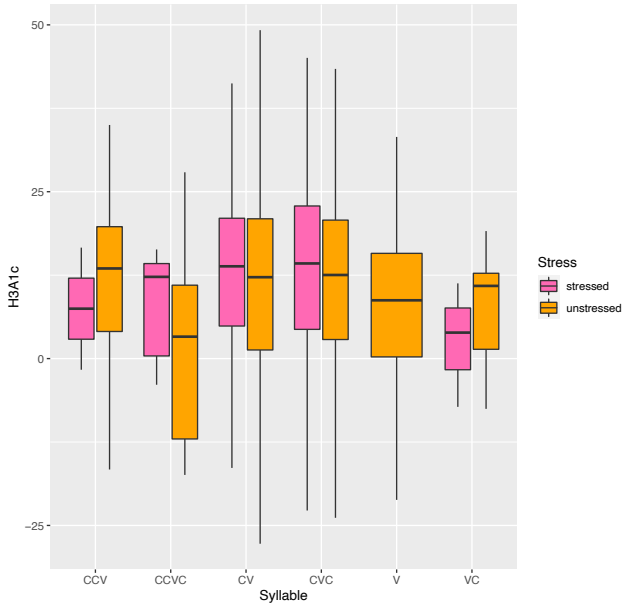

Figure 6: Spectral tilt measures for stressed and unstressed vowels in SCS in CCV, CCVC, CV, CVC, V and VC syllables.

3.4 Summary of Results

In sum, our results allow for the following conclusions to be drawn:

1. Syllable complexity drives shortening in SCS: vowels in CCV and CVC are significantly shorter than in CV syllables. Unstressed vowels are shorter than stressed vowels, although coda and onset-driven compression shorten all vowels independently of stress.
2. Differences in stress cause height differences in /a/ and /o/: i.e., unstressed vowels are raised in the vowel space and stressed vowels are lowered. However, these stress effects are only visible in open syllables. Similar effects are not observed for /e/ in any stress context.
3. Spectral tilt is lower in /CeC/ than /Ce/. Spectral tilt is lower in /a/ following a heterosyllabic high vowel (which we attribute to coarticulation). Stress effects are not noted and /o/ shows no significant changes in any text context.

4. Discussion

4.1 Dialect-Specific Stress

Returning to our initial Research Questions, RQ1 and RQ2 ask about the relationship between vowel compression and stress in SCS and the extent to which acoustic cues to lexical stress vary according to syllable shape. Our results show that there is a clear relationship between stress

and vowel compression, although this is complex in nature. With regard to vowel duration, unstressed vowels are not targeted for compression to a greater extent than stressed vowels in SCS. By contrast, we have observed that all unstressed vowels are shorter than stressed vowels in SCS, and all stress contexts are susceptible to compression according to syllable shape. What is most interesting, however, is our findings in relation to vowel quality. Results show that stress effects—in the form of vowel raising and lowering—are visible in open syllables, but not closed. We hypothesise that may be attributable to durational clipping induced by coda-driven compression in closed syllables. As noted, the occurrence of a coda in CVC syllables causes compression of the preceding vowel. Consequently, there is a more limited duration during which changes to vowel height can serve as a reliable cue to stress. This is to say that coda-driven compression appears to *block* stress-driven lowering and raising, meaning that stress is marked qualitatively only in open syllables where there is sufficient duration for vowels to raise and lower. Whether this reflects a phonological operation or a more gradient phonetic tendency merits further research.

Relatedly, we note that phonetic studies on other varieties have documented categorical vowel-quality effects in derived CV contexts that are triggered by /s/-elision (e.g. Hendriksen 2017). Whether /s/-elision in SCS contributes to the vowel quality patterns shown in Figures 4–5 is therefore an outstanding question: further investigation using more controlled materials than spontaneous speech will be necessary to determine this. At this point, however, our findings suggests that duration may be the most reliable and consistent correlate of stress in SCS. Although this may also cluster together with changes in F1, vowel height critically depends on the occurrence or non-occurrence of coda-driven compression, and spectral tilt does not appear to function as a major acoustic cue to stress, if at all.

Thus, noteworthy dialect-particular tendencies emerge through comparison of SCS with AMS. Recall that in AMS, vowel quality effects and durational reduction cluster together, specifically as a result of vowel compression in closed syllables (i.e. UVR). In SCS, by contrast, vowel quality and duration also pattern together but in a critically different way. In the Chilean data, vowel height appears to function as a secondary cue to stress, which itself is dependent upon vowel duration. This is of particular interest as it highlights that dialect-specific phonological processes impact on how stress is marked between dialects: although qualitative variation between stressed and unstressed syllables is observed in both dialects, the *reason* for this variation seems to be substantially different.

There are clear parallels in our data from SCS to the findings of previous research into language and dialect-specific stress marking. For example, with reference to Ibero-Romance, Ortega-Llebaria & Prieto (2010) showed that a drop in spectral tilt marked distinctions between stressed and unstressed vowels in Catalan, but crucially not in Spanish. This is attributed to an interaction between well-studied patterns of phonological vowel reduction in Catalan and stress marking in the language. Similarly, Smith & Rathcke (2020) compared the marking of prominence in two varieties of English, Southern Standard British English (SSBE) and Glaswegian English (GE). The authors note that SSBE marks prominence on stressed vowels principally through manipulations of length and quality. GE, on the other hand, marks prominence through duration, pitch and intensity. Much like Ortega-Llebaria & Prieto's identification of phonological vowel reduction as being a factor of critical relevance for the marking of stress in Catalan, Smith & Rathcke relate the differences in stress marking between SSBE and GE to dialect-specific patterning of tense and lax vowels (i.e., as noted by Aitken 1981 for Scottish varieties of English). These studies therefore highlight that dialect-specific phonological processes may have wider implications on the vowel systems, influencing *which* acoustics properties may cluster together to mark stress. Our findings may support this, showing that the dialect-specific operation of compression and reduction effects in Spanish have wider implications the phonetic realisation of stress across varieties.

4.2 Limitations

There are limitations to the present research that must be acknowledged. Firstly, it compares two different dialects from two distinct tasks: a reading passage and a spontaneous speech task. Thus, as existing research highlights (Arvaniti 2009, 2012), it could be that style impacts compression. Moreover, it could be that other phonological processes, i.e., accentual lengthening, are also visible on our measures, e.g., duration. We therefore see advantages to comparing compression and stress in a more controlled environment. Secondly, there may be advantages to exploring the impact of /s/-elision and putative word-final resyllabification on the

observed effects, i.e., the qualitative and durational differences. Furthermore, spectral tilt was not measured in the initial experimentation of AMS; thus, it could be the case that tilt functions as a cue to stress in this variety. This is however something that has not fully explored for most varieties of Spanish to date.

Thirdly, and perhaps most crucially, there could be further phonetic constraints to compression. As Aldrich and Simonet (2019) highlight, the degree of vowel compression may further depend on the manner of surrounding consonants in onset and coda position. Considering the prevalence of /s/-lenition in SCS, there is room to explore the role of aspiration or elision on syllable structure and compression effects. Preliminarily, our data show that elision can have an impact on nuclear vowel length, with vowels in derived open syllables patterning with those in canonical open syllables. Moreover, we have observed impressionistically that aspirated realisations of /s/ (i.e. [h]-realisations) appear to drive greater shortening than sibilant /s/ (i.e., unlenited [s]-realisations). This is something that merits fuller investigation in future research on SCS. Lastly, there is clearly opportunity to compare these findings to other phonologically similar and distinct varieties of Spanish, particularly other Southern Cone varieties. At the time of writing, we are unaware of any studies seeking to test the relationship between stress marking, vowel compression and the variety-specific operation of other phonological patterns (like /s/-elision). This is therefore a further gap that future research should aim to fill.

5. Conclusion

Our findings from SCS firstly confirm the conclusions of previous research: namely, that vowel compression operates in a dialect-specific manner in Spanish. Secondly, we note that acoustic properties may cluster together in variety-specific ways to signal lexical stress phonetically. Thirdly, our results both from AMS and SCS highlight the need for a closer, dialect-focused approach to examining mutual dependencies between stress marking, vowel compression and other related phenomena—not least /s/-lenition and elision—across varieties of Spanish.

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