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Language contact in Patagonia

Durational control in the acquisition of Spanish and Afrikaans phonology

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1. Introduction

One of the most important tasks of phonological grammar is to regulate the temporal organization of speech. Temporal organization is present at all levels of phonological grammar, ranging from the relative timing of different articulatory gestures (e.g., language-specific coarticulatory patterns) to the regulation of the duration of individual segments (e.g., compensatory lengthening, degemination, etc.), the relation between prosodic structure and segment duration (e.g., final lengthening), and more. Although some aspects of these timing relationships appear to be general properties of all languages, the exact realization of these relationships is language-specific, and controlling the phonological grammar of a language therefore requires knowledge of the intricate temporal patterns typical of that language (cf. Davidson 2006; Gick et al. 2006; Pouplier 2012).

A primary goal of this chapter is to explore how languages that differ from each other in terms of their temporal organization patterns impact each other when they are in close, long-term contact. Specifically, we focus on an Afrikaans-Spanish bilingual community that resides in Patagonia, Argentina. Unlike many situations of language contact, this community remained functionally monolingual in their heritage language (Afrikaans) during the first two generations after arrival to Patagonia between the early 1900s and the 1950s (van Schalkwyk 1989). In the middle of the twentieth century, the Patagonian region shifted nearly completely to Spanish. The currently oldest speakers (typically over 60 years of age) are third-generation speakers who acquired Afrikaans as their first language, and Spanish as a second language upon entering school (from the age of 6 or 7 to their late teenage years). Due to the changing socioeconomic structure of the community, Spanish then became the dominant language for these speakers during early adulthood, indicating a case of late subtractive bilingualism. As we will show in the research presented in this chapter, in a situation such as this, the newly dominant L2 can have a strong impact on the L1.

2. Background and hypotheses

2.1. Durational properties of consonantal and vocalic sequences in Afrikaans and Spanish

In this section, we give an overview of aspects of Afrikaans and Spanish phonotactic patterns and phonological processes that contribute to the duration of consonantal and vocalic intervals in these languages. These differences subsequently enable us to hypothesize possible mutual influences of the two languages in the speech of the Afrikaans-Spanish bilinguals.

Phonotactics

As a prototypical Germanic language, Afrikaans has a complex syllable inventory, including syllables with onset clusters of up to three consonants (*spraak* [spr̲ɑːk] 'speech') and codas of up to two consonants (*berg* [bærx̲] 'mountain'). As a consequence, consonantal sequences in an Afrikaans utterance can range in length from one to five consonants. The Afrikaans vowel inventory includes contrastively short and long monophthongs (*man* [mɑn] 'man' vs. *maan* [mɑːn] 'moon') and diphthongs (*matjie* [mɑ͡ɪ.ki] 'little rug' vs. *maatjie* [mɑː͡ɪ.ki] 'little friend'), so that syllabic nuclei can range from one to three morae in length. Since Afrikaans also allows onsetless syllables, vocalic intervals in an Afrikaans utterance can range from one up to six morae.

Spanish, in contrast, has a comparatively simpler syllable structure, with syllable onsets containing two consonants at maximum (*flor* [fl̲oɾ] 'flower'). Codas of up to two consonants are possible but rare (*perspectiva* [peɾs̲.pek.ˈti.βa] 'perspective'), resulting in consonantal sequences that range from one to three consonants. The Spanish vowel inventory does not include contrastively long and short vowels. The language does permit diphthongs, although they are considerably less frequent than in Afrikaans.

Because of these phonotactic differences in Afrikaans and Spanish, we expect the durations of vocalic and consonantal intervals in an Afrikaans utterance to be more variable than those in a Spanish utterance. The bilingual speakers all acquired Afrikaans first (with its more complex syllable and segmental inventory), so they should not have difficulty producing the simpler Spanish structures. We return to this issue again in section 5.2, where we will discuss this in relation to the superset/subset problem in language learning (Berwick 1985). The one exception may be in terms of the realization of phonemic vowel length differences in Afrikaans. As already mentioned, Afrikaans differentiates short and long monophthongs and diphthongs. This length contrast, however, has a fairly low functional load in Afrikaans. L1 Afrikaans speakers, who have shifted more regular language use to their L2 Spanish, may therefore lose the robustness of the Afrikaans phonemic length contrasts over time. Such a loss could be caused both by the fact that this contrast has a low functional load in Afrikaans (see Loporcaro 2015: 9, for arguments that low functional load contributed to the loss of contrastive vowel length in Latin) and by the fact that the speakers primarily function in their dominant language (Spanish), which does not use phonemic length contrasts. Attrition and contact can therefore contribute in tandem to the erosion of the length contrast for the bilingual speakers in our study.

Variation in vowel duration

In addition to these static phonotactic differences, Afrikaans and Spanish differ from each other in terms of phonological and phonetic processes that affect vowel duration. Afrikaans has

phonological rules of stress-induced vowel lengthening and reduction that can result in category changes between different vowels (i.e., more than just category-internal phonetic reduction). For the purposes of the current study, the existence of such rules is more important than the details about how and when they apply (however, see Wissing 1982 for these details). The examples in (1a) show that in some words stress can condition alternation between short [ɑ] and long [ɑː] (two sounds that also contrast phonemically in Afrikaans). In turn, the examples in (1b) show that Afrikaans also has productive vowel reduction processes that, for instance, replace bimoraic [i͡ə]/[u͡ə] with monomoraic [ə]/[u] in unstressed position (again a phonological process relating sounds that also contrast phonemically). Unlike Afrikaans, Spanish does not have phonological rules that manipulate the mora count of vowels under stress, so there is less expected variability in vowel duration in Spanish than in Afrikaans.

Spanish generally lacks phonological vowel reduction. However, phonological vowel reduction has been documented for a small number of Spanish varieties that have been in close and prolonged contact with languages that do have phonological vowel reduction. Delforge (2008), for instance, shows that the Andean Spanish spoken in Cusco has vowel reduction, and ascribes this as most likely due to contact with Quechua. Similarly, Gabriel and Kireva (2014b) document phonological vowel reduction in the Spanish of a small community of speakers of Judeo-Spanish in Bulgaria, and hypothesize that this reduction was introduced into Spanish due to contact with Bulgarian.

(1) a. Stress induced [ɑ]~[ɑː] alternation ([ɑ] when unstressed, [ɑː] when stressed)

Satan	[ˈsɑː.tɑn]	‘Satan’
satanies	[sɑˈ.tɑː.nis]	‘satanic’
satanis	[sɑ.tɑˈ.nəs]	‘satanist’

b. Reduction of [i͡ə]/[u͡ə] to [ə]/[u] in unstressed syllables

profeet	[pruˈ.fi͡ət]	‘prophet’	*profeteer*	[prɔ.fəˈ.ti͡er]	‘prophetize’
skool	[ˈsku͡əl]	‘school’	*skolier*	[skuˈ.lir]	‘student’

In addition to these categorical phonological processes affecting the mora count (and hence duration) of vowels, Afrikaans also has stress-related, category-specific variation in vowel duration. Considering short [ɑ] in closed syllables (a position where categorical phonological lengthening under stress as in (1a) is not possible), Wissing (2007) shows, for instance, that duration is the most reliable correlate of the difference between stressed and unstressed [ɑ]—even more reliable than intensity or pitch. Spanish does have gradient stress-induced vowel lengthening, but there is reason to suspect that this lengthening is less extreme. Hualde (2005: 273), for instance, says that the effect of stressed lengthening is “much greater in English than in Spanish.” Since Afrikaans and English are closely related Germanic languages, they pattern similarly regarding stress-related vowel reduction (Coetzee and Wissing 2007), and it can therefore be expected that stress-related reduction in Afrikaans will also be greater than in Spanish (Coetzee and Wissing 2007). In comparison to Wissing’s claim that duration is the primary cue for stress in Afrikaans, Hualde remarks that the “most important correlate of stress in Spanish is pitch” (Hualde 2005: 245). See also Ortega-Llebaria and Prieto (2010: 85), who report that the difference between stressed and unstressed syllables is larger in Catalan than in Spanish, and Alfano et al. (2009), who report that this difference is larger in Italian than in Spanish. Although it is expected that there are durational differences in stressed and unstressed vowels in both Spanish and Afrikaans, it is reasonable to assume that these differences are greater in Afrikaans.

As is typical of Germanic languages, Afrikaans has significant final lengthening, comparable, for instance, to what is observed in English (Coetzee and Wissing 2007). Spanish also has final lengthening, although most likely to a lesser degree. Frota et al. (2007: 135), for instance, found that final syllables are twice as long as nonfinal syllables in Italian, while they found the increase in duration for Spanish to be only 40%. Rao (2010: 75) similarly reports limited final lengthening in Spanish, with an increase of 25% in final position. By comparison, Turk and Shattuck-Hufnagel (2007: 455, Figure 19.1) found that the rime of final syllables in English is on average 73% longer than that of nonfinal syllables. This again leads to the assumption that though both Afrikaans and Spanish will display effects of final lengthening, this lengthening is likely to be larger in Afrikaans than in Spanish.

Since our study focuses on a variety of Argentinian Spanish spoken in southern Patagonia, a potential complication to consider is that Buenos Aires Spanish (known as Porteño Spanish) was influenced to a significant degree by Italian due to Italian immigration to Buenos Aires during the first half of the 20th century. Porteño Spanish therefore may show more stress-related vowel lengthening and final lengthening than other varieties of Spanish (Gabriel and Kireva 2014a; Kireva and Gabriel 2015). Although Porteño Spanish may have influenced the Spanish spoken in the southern Patagonian region on which we focus, such influence would have been minimal given the remoteness of the region—see also Virkel (2004: 176–177) for evidence that Porteño Spanish had limited impact on the rural parts of Patagonia, and on the lower socio-economic sections even of urban communities in Patagonia. In particular, Porteño Spanish influence on the speakers who are the focus of our study is expected to be minimal. When these speakers acquired Spanish as young adults in the 1950s and 1960s, the region was sparsely populated, and Afrikaans was still the most common language in the community, which was also culturally oriented more toward South Africa than Argentina. Although it can be expected that the Spanish of this region may show some influence of Porteño Spanish, and may therefore have more stress-induced and final lengthening than other varieties of Spanish, it most likely does not participate in these phenomena to the same extent as Porteño Spanish.

Since Spanish and Afrikaans differ from each other in terms of the application of productive phonological and phonetic processes that control vowel duration, it is possible that the languages of the bilingual speakers in our study may influence each other in this regard. If their L1

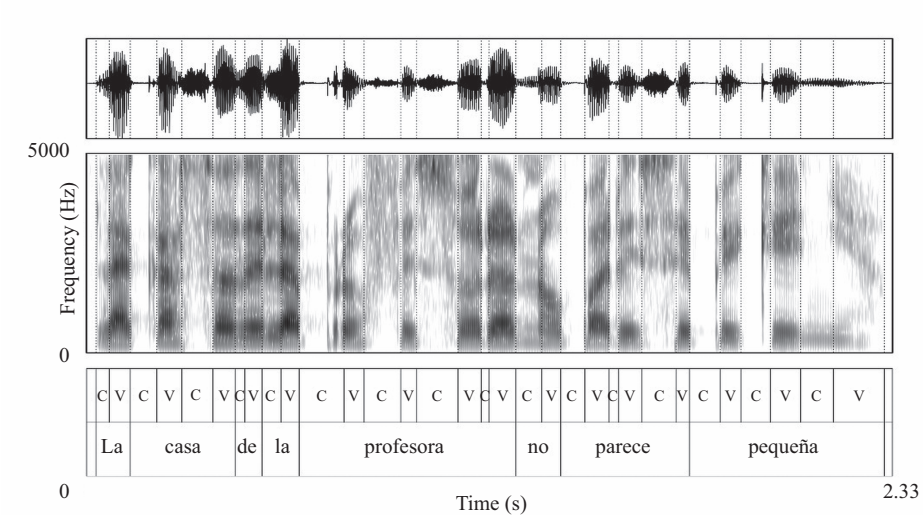

Figure 19.1 Waveform, spectrogram, and illustration of segmentation criteria for the sentence *La casa de la profesora no parece pequeña* 'The professor's house does not seem small,' produced by a Spanish monolingual speaker (female, age 53)

(Afrikaans) were to influence their L2 (Spanish), we may expect to see more variability in the duration of vocalic intervals in their Spanish than in the Spanish of L1 Spanish control speakers. However, if their dominant L2 (Spanish) were to influence their L1 (Afrikaans), we may expect less variation in the duration of vocalic intervals in their Afrikaans than in that of L1 Afrikaans speakers.

Variation in consonant duration

Neither Afrikaans nor Spanish has productive phonological processes that affect consonantal duration. Although consonants are also affected by stress-related lengthening and final lengthening, they are less susceptible to these phenomena than vowels are (Turk and Shattuck-Hufnagel 2000). Given that neither of the languages has phonological processes that control consonantal duration, and given the lower susceptibility of consonants to phonetic lengthening (e.g., Gay 1981), we do not expect to see significant influence by the two languages of the bilingual speakers on the duration of consonantal intervals in their languages. That is, we expect the variation in duration of consonantal intervals in the Afrikaans of the bilingual speakers to be comparable to that of control Afrikaans-dominant L1 speakers. Similarly, we expect the variation in consonantal intervals in their Spanish to be comparable to that of monolingual Spanish speakers.

In summary, we do not expect the consonantal phonotactic differences between Afrikaans and Spanish to result in the languages of the bilingual speakers in our study influencing each other. Additionally, given the absence of phonological processes affecting consonantal duration in both languages and the lower susceptibility of consonants to stress-induced and final lengthening, we do not expect to see mutual influence of the two languages on each other in terms of consonantal duration. Where we do expect to see influence of the languages on each other is in terms of the variability of vowel duration. First, it is possible that the phonemic length contrast of Afrikaans may be weakened in the speech of the bilinguals due to a combination of influence from Spanish (which lacks this contrast) and the low functional load of this contrast in Afrikaans. Second, given that Afrikaans has more extreme phonetic and phonological processes that affect vowel duration, we may also see influence of the languages on each other in terms of the variability of vowel duration. Specifically, if the L1 (Afrikaans) of the bilingual speakers were to influence their L2 (Spanish), we should see more variability in vowel duration in their Spanish than in the Spanish of L1 speakers. Conversely, if their L2 (Spanish) were to influence their L1 (Afrikaans), we should find less variability in the vowel duration of their Afrikaans than in that of Afrikaans-dominant control speakers. We lay out our hypotheses in clearer terms in section 2.3 of this chapter.

2.2. Bidirectional L1-L2 effects in phonology

Although most research on L1-L2 phonological interaction focuses on how speakers' L1 influences their L2, there is also a body of research that documents bidirectional influences, showing that the phonology of an L1 can also be influenced by that of an L2 (e.g., Flege 1987; Flege and Eefting 1987; Sancier and Fowler 1997; Guion 2003; Mennen 2004; Chang 2012). An early example comes from Flege (1987), who showed that L1 English speakers who are highly proficient in French produce English /t/ with voice onset time (VOT) values that differ from those of monolingual English speakers and that are in the direction of those of French monolinguals. Similarly, Flege found that L1 French speakers who are highly proficient in English produced French /t/ with VOT values that are in the direction of the English monolinguals. The L1 productions of both groups of highly proficient L2 speakers therefore showed evidence of influence

from their L2. Current models of second-language speech learning predict such bidirectional influences because L1 and L2 sounds are posited to coexist in a shared phonetic space in the bilingual grammar (e.g., Flege 1995; Best and Tyler 2007).

Flege's 1987 paper, and most other research on L2-to-L1 influences (e.g., Flege and Eefting 1987), focuses on examples of prolonged and intense exposure to the L2. There is also evidence, however, that an L2 can impact an L1 rapidly and after only limited exposure. Chang (2012), for instance, documents the influence of L2 Korean on several phonetic dimensions of the English spoken by English L1 learners of Korean even during their first six weeks of Korean instruction. An L2 can therefore impact an L1 even with minimal L2 exposure and proficiency. Even so, it is reasonable to expect differing levels of bidirectional influence between an L1 and L2 based on the amount of L2 exposure and proficiency of speakers, and also based on the usage dominance relation between the L1 and L2 of the speakers. Flege (1987), for instance, found that the VOT values of L1 English /t/ as produced by English learners of French showed more evidence of influence from French for speakers with higher proficiency in and more exposure to French. Based on results such as these, it can also be expected that L1-to-L2 influence will decrease with more exposure to, higher proficiency in, and more usage of the L2. This expectation is also supported by results from Flege (1987) with regard to the L2 production of French /u/. He found that L2 learners of French who had higher proficiency in French and more exposure to French produced French /u/ with formant values that were more in the direction of L1 French speakers.

The research reviewed thus far establishes that mutual influence between the L1 and L2 of bilingual speakers is possible but focuses on aspects of consonantal articulation or the spectral properties of vowels. The main focus of the present analysis is the temporal properties of vowels, and research about mutual L1-L2 influence on vowel duration is therefore of particular relevance to our study. Robles-Puente (2014), for instance, shows that adult Spanish-English bilinguals who moved to the United States in early childhood display less variation in vowel duration in their English than do English monolingual speakers, and interprets this as evidence of their L1 Spanish influencing their L2 English. Similar results have been reported for L2 English as spoken by L1 speakers of other languages, with typically less vowel duration variation than monolingual English (e.g., Thomas and Carter 2006; see also Henriksen and Fafulas 2017). Although this research on vowel duration has documented the influence of an L1 on an L2, we hypothesize, based on the literature reviewed here, that L2 influence on L1 should also be observed for variation in vowel duration. This should be especially true for speakers who are highly proficient in their L2, who have experienced prolonged and intensive exposure to their L2, and who use their L2 substantially more often than their L1.

Our study focuses on an Afrikaans-Spanish bilingual community, and given the research reviewed in this section, it is reasonable that we may find evidence for L1-to-L2 and/or L2-to-L1 influence between the L1 Afrikaans and the L2 Spanish of this community. L2-to-L1 influence, in particular, seems likely. Not only have Spanish and Afrikaans been in prolonged and intensive contact in the community, but Spanish has been the dominant language (i.e., in terms of language use) for most members of the community for at least the past five decades (see section 3.1 for more on the community).

2.3. Hypotheses

Our hypotheses first focus on overall patterns of durational variation in Spanish and Afrikaans and then become more specific, in order to diagnose the sources of any effects found regarding general patterns of variation. Our general hypotheses focus on the extent of variability in the duration of consonantal and vocalic sequences in Afrikaans and Spanish utterances. For this

purpose, we rely on the so-called pairwise variability indices (PVIs) developed by Grabe and Low (2002; see also Low et al. 2000). The PVI is the mean durational difference over consecutive consonantal or vocalic intervals, as calculated over an utterance, such that higher values correspond to more durational variability. Grabe and Low calculated both raw PVIs and speech-rate normalized PVIs (where the durational differences between consecutive intervals are divided by their mean). Based on the observation that variation in speech rate is more likely to influence the duration of vowels than consonants (Gay 1981), they proposed using raw PVI scores for consonants (rPVI-C) and speech-rate normalized PVI scores for vowels (nPVI-V)—a practice that we adopt in the current study.

Taking into account the differences between Afrikaans and Spanish discussed in the preceding sections, we hypothesize that the Afrikaans control speakers will have more variability in both consonantal and vocalic sequences than the Spanish control speakers.

Hypothesis 1 (H1): Differences between the control speaker groups
We hypothesize that, compared to Spanish control speakers, Afrikaans control speakers will have higher values for both nPVI-V and rPVI-C.

Our hypotheses with regard to the bilingual speakers are more nuanced. First, as explained in section 2.1, we do not expect the languages of the bilinguals to influence each other in terms of the duration of consonantal sequences.

Hypothesis 2 (H2): No influence between Afrikaans and Spanish in terms of variability in consonantal interval duration

We hypothesize that the rPVI-C values of the Afrikaans-Spanish bilinguals in each of their languages should be similar to those of the respective control groups.

Afrikaans and Spanish differ from each other in terms of phonological and phonetic processes that control vowel duration, so that it is possible for the two languages of the bilingual speakers to influence each other in terms of vowel duration. Whether this influence will be bidirectional, or whether only the L1 (Afrikaans) will influence the L2 (Spanish), or only the L2 (Spanish) the L1 (Afrikaans), will depend on how the specific contact situation between Afrikaans and Spanish impacts the cognitive relation between these two languages for the bilinguals.

Hypothesis 3a (H3a): Spanish influence on Afrikaans vowel duration variability
If the L2 (Spanish) of the bilinguals influences their L1 (Afrikaans), the Afrikaans of the bilinguals will show less variability in vowel duration than the Afrikaans of the control speakers. We would then expect the nPVI-V values of the bilinguals in Afrikaans to be lower than those of the control Afrikaans speakers.

Hypothesis 3b (H3b): Afrikaans influence on Spanish vowel duration variability
If the L1 (Afrikaans) of the bilinguals influences their L2 (Spanish), the Spanish of the bilinguals will show more variability in vowel duration than the Spanish of the control speakers. We would then expect the nPVI-V values of the bilinguals in Spanish to be higher than those of control Spanish speakers.

The remaining hypotheses are conditional on whether H3a and/or H3b are confirmed, and are intended to determine specific aspects of the phonetic and phonological grammars that may

contribute to the influence between the languages. We first state the hypotheses that we will explore if H3a is confirmed (i.e., if we find evidence for Spanish-like Afrikaans values for the bilinguals), and then those that we will explore if H3b is confirmed (i.e., if we find evidence for Afrikaans-like Spanish values for the bilinguals). Based on the differences between Afrikaans and Spanish reviewed in section 2.1, we will focus on three possible sources of variation in vowel duration: the phonemic contrast between short /ɑ/ and long /ɑ:/ (for Afrikaans only), stress-induced lengthening, and final lengthening.

Hypothesis 4a (H4a): Sources of lesser vowel duration variation in the Afrikaans of bilingual speakers
If H3a is confirmed, we hypothesize that the bilingual speakers, in comparison to control L1 Afrikaans speakers, will have less robust durational differences between /ɑ/ and /ɑ:/, between stressed and unstressed vowels, and between vowels in utterance-final vs. utterance-initial syllables.

We focused on /ɑ/ since that is the only vowel for which there is a robust phonemic length contrast in Afrikaans. Most of the other long vowels of Dutch have turned into diphthongs in Afrikaans.

Hypothesis 4b (H4b): Sources of increased vowel duration variation in the Spanish of bilingual speakers
If H3b is confirmed, we hypothesize that the bilingual speakers, in comparison to control L1 Spanish speakers, will have more robust durational differences between stressed and unstressed vowels and between vowels in utterance-final vs. utterance-initial syllables.

Due to the dependency relation between H3a/H3b and H4a/H4b, we will explore H4a only if we find confirmation for H3a, and likewise we will explore H4b only if we find confirmation for H3b.

3. Method

3.1. Speakers

We collected speech data from 44 speakers: 26 Afrikaans-Spanish bilinguals (from Patagonia, Argentina), 8 Spanish controls (from Patagonia, Argentina), and 10 Afrikaans controls (from Potchefstroom, South Africa). The Afrikaans-Spanish bilinguals were recruited through social networks that we had established prior to our arrival in Patagonia. Upon interacting with the 26 speakers who self-identified as Afrikaans-Spanish bilinguals, it became clear that only 14 were sufficiently proficient in Afrikaans to conduct an interview with them. Of those 14, only 8 could read Afrikaans well enough to participate in the current study, given that data collection was based on participants having to read stimuli in Afrikaans (the bilinguals never received sustained formal instruction in Afrikaans). We therefore report data for those eight bilingual speakers only. This Afrikaans-Spanish bilingual group represents a case of late subtractive (i.e., attrited) bilingualism.

The resulting Afrikaans-Spanish bilingual group contained three men and five women, the Spanish control group two men and six women, and the Afrikaans control group five men and five women. The mean age of the bilingual group was 71.3 (range = 55–78, SD = 7.9); that of the Spanish control group was 51.8 (range = 38–64, SD = 8.4); and that of the Afrikaans control group was 71.5 (range = 65–81, SD = 7.1).

The Afrikaans control speakers were in actual fact bilinguals with English as an L2 (as is true of almost all Afrikaans speakers in South Africa). Given that Afrikaans and English have similar vowel duration grammars, we do not anticipate interference from English in the Afrikaans of these speakers (Coetzee and Wissing 2007). Additionally, although these speakers are Afrikaans-English bilinguals, they are Afrikaans-dominant and live in an area of South Africa where English has very limited social reach. We thus refer to these speakers as "control" speakers rather than straightforward "monolingual" speakers throughout this chapter.

Even though the Spanish monolinguals were younger than the Afrikaans-Spanish bilinguals, to our knowledge there is no generational shift in the durational properties of the variety of Patagonian Spanish spoken in the Argentinian province of Chubut. The Spanish monolingual speakers also come from the social circles of bilingual speakers and are therefore representative of the Spanish to which the bilingual speakers are regularly exposed.

Although Pettorino and Pellegrino (2014) documented that older Italian speakers produce overall longer vocalic intervals than younger speakers, they do not report that age differences result in a change in the variability of vowel duration. Since H1 through H3 (for which we compared the L1 and L2 Spanish speakers) focus not on the absolute duration of individual vowels, but on the variability of vowel duration across an utterance, we do not expect the age differences between the bilingual speakers and the Spanish monolingual speakers to substantially impact the results of our research.

Our aim for this group (of bilingual speakers) was to record speakers who were fluent and biliterate in Afrikaans and Spanish. Although we did not conduct formal quantitative tests of proficiency for either language with the bilingual speakers, we evaluated their proficiency in three ways. First, we included only speakers who were fluent enough in both Afrikaans and Spanish that we could have conversations with them about a range of topics in both languages (our research team contained a native speaker of Afrikaans and a native speaker of Spanish). Second, we included only speakers who were proficient readers in both Afrikaans and Spanish (due to the reading-task nature of our research design). Since all participants attended Spanish-medium schools, all could read Spanish well. Reading proficiency in Afrikaans, however, was more limited, resulting in the elimination of several potential participants from the study. Third, all bilingual participants completed the Bilingual Language Profile (BLP) (Birdsong, Gertken, and Amengual 2012), a questionnaire in which bilinguals rate themselves on questions related to language use, identity, proficiency, and attitudes. The BLP has a potential of rendering scores in the range from −180 (Afrikaans-dominant) to +180 (Spanish-dominant). All eight of the speakers whom we included in this study fell into the middle two quartiles of the BLP range. In Table 19.1 we provide demographic information for the eight bilingual speakers.

3.2. Speech materials

All speakers participated in a sentence reading task. The bilinguals read sentences in Spanish and Afrikaans, and the control speakers read sentences in their respective native languages. When reading the sentences in Afrikaans, the bilinguals interacted with the second author exclusively (who is a native speaker of Afrikaans). When reading the sentences in Spanish, the bilinguals interacted with either the first or the second author (a highly proficient L2 and a native speaker of Spanish, respectively). We followed this procedure to control for language mode and to keep any cross-language activation effects to a minimum (e.g., Antoniou et al. 2012, 2013).

The stimuli used for the analyses in this chapter were collected as part of a larger project investigating the Afrikaans and Spanish of the bilingual community. Specifically, we draw from recordings of two separate sets of sentences that we will call Set A and Set B, both of which are included in the appendix. Set A was recorded for a related study investigating the global

Table 19.1 Demographic information for the eight Afrikaans-Spanish bilinguals

Speaker	*Age*	*Age of acquisition: Afrikaans*	*Age of acquisition: Spanish*	*BLP score*
M1	73	Since birth	9	–38.4
F1	64	Since birth	8	–4.7
F2	78	Since birth	10	45.6
M2	75	Since birth	11	52.4
M3	69	Since birth	8	77.0
F3	77	Since birth	8	87.1
F4	76	Since birth	5	81.8
F5	55	Since birth	5	88.5
Average	70.9	(Since birth)	8.0	48.7

"M" and "F" in speaker codes indicate the gender of speakers. The individual scores in the BLP range from –180 (Afrikaans-dominant) to +180 (Spanish-dominant).

rhythmic patterns in the speech of the bilingual speakers (see Coetzee et al. 2015 for a full report on this project). In order to allow for comparability with other studies investigating the rhythmic properties of Spanish, we used the same sentences as Arvaniti (2012) for Spanish and constructed a comparable set of sentences for Afrikaans. Set A contained 12 sentences each for Afrikaans and Spanish (24 sentences total).

For Afrikaans and Spanish, each list of 12 sentences consisted of three subsets of four sentences each: CV sentences (with mostly "simpler" CV syllables), CVC sentences (with more "complex" CVC syllables), and uncontrolled sentences (taken from novels in Afrikaans and Spanish). This syllabic complexity difference is relevant for comparing rhythmic measures between languages. However, since our current study does not focus on rhythm, the differences between the sentences are not relevant here, and we therefore do not include sentence type as a factor in our statistical models.

Set B was collected from Afrikaans speakers only. This set of sentences was originally recorded for a project investigating the acoustic properties of specific consonants and vowels in different sentential contexts in Patagonian Afrikaans and contained a total of 16 different sentences.

3.3. Acoustic analysis

For each of the sentences in Set A (relevant for investigating H1 through H3), measurements of consonantal and vocalic intervals were made by simultaneous inspection of waveforms and wide-band spectrograms in Praat (Boersma and Weenink 2019), following standard segmentation criteria (Peterson and Lehiste 1960). Figure 19.1 shows an example of vowel and consonantal intervals labeled for the Spanish utterance *La casa de la profesora no parece pequeña* 'The professor's house does not seem small.' Following Arvaniti (2012), we relied on the phonetic properties of segments, rather than their phonological status. After this, we used a Praat script to generate rPVI-C and nPVI-V values for each sentence separately. Speaker means are therefore based on scores from individual sentences rather than all sentences combined.

In order to investigate H4, we needed sufficiently large numbers of Afrikaans vowels that differed in duration based on the Afrikaans phonemic vowel length differences between /ɑ/ and /ɑː/, between stressed and unstressed position, and between sentence-final and sentence-initial syllables. Since the sentences in Set A did not contain enough examples of the relevant vowels and contexts, we extracted examples from both Sets A and B for this purpose. In particular, for every Afrikaans speaker (from both groups), we identified 60 tokens each of phonemically long

/ɑː/ and short /ɑ/, 24 tokens each of stressed and unstressed /i ɑ ə/ (for a total of 72 stressed and unstressed vowels for each speaker), and 60 tokens of a stressed vowel from a sentence-final syllable and a stressed vowel from a sentence-initial syllable. For each of these tokens, we identified the vowel based on inspection of the spectrogram and waveform representations in Praat and then extracted the duration of the vowel using a Praat script.

Since function words in Afrikaans are often subject to severe reduction, or even deletion, we identified as the "sentence-initial syllable" the first stressed syllable of a nonfunction word in the sentence.

4. Results

We performed all statistical modeling using the MIXED procedure in IBM SPSS Statistics, Version 24. Degrees of freedom and *p*-values for approximate F- and *t*-statistics for fixed effects were computed using the Satterthwaite approximation. For the data derived from Set A to test H1 through H3, each linear mixed effect model (LMEM) included random effects of SPEAKER and SENTENCE within SPEAKER. This approach allowed us to accommodate two levels of correlations among the repeated measurements of the dependent variables: measures within a speaker from different sentences would have a constant correlation, and measures from the same sentences within the same speaker would have a different (constant) correlation.

4.1. Consonantal and vocalic variability: comparisons between control Afrikaans and Spanish speakers (H1)

Per H1, we expect Spanish control speakers to have lower rPVI-C and nPVI-V values than Afrikaans control speakers. Figures 19.2a and 19.2b represent the rPVI-C and nPVI-V data for these speaker groups and show higher scores on both metrics for the Afrikaans controls compared to the Spanish controls. In order to investigate these differences further, we fit separate LMEMs to the rPVI-C and nPVI-V, with speaker GROUP (Afrikaans control, Spanish control) as a fixed factor. Both models returned significant effects for GROUP, indicating that both PVI values were higher for the Afrikaans controls than the Spanish controls, in agreement with H1 (for rPVI-C, $F(1, 15.847) = 13.904$, $p = .002$; for nPVI-V, $F(1, 16.046) = 139.202$, $p \leq .001$).

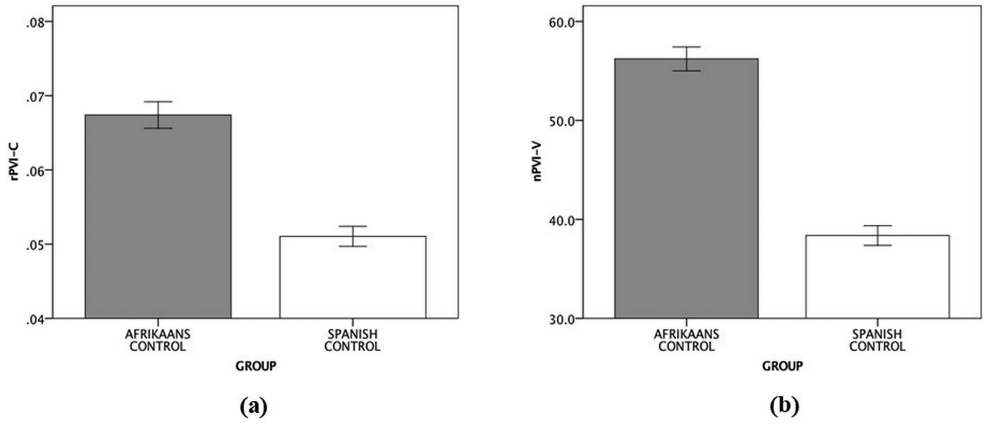

Figure 19.2 Control-group comparisons for (a) rPVI-C and (b) nPVI-V. Error bars indicate 95% confidence intervals.

4.2. Consonantal variability: comparisons of control and bilingual speakers in Afrikaans and Spanish (H2)

According to H2, we do not expect differences between the bilinguals and the two respective control groups in terms of variability in consonantal duration. Figure 19.3 shows that the expected patterns were observed in the data: the bilingual speakers displayed similar values on rPVI-C relative to the Afrikaans controls (Figure 19.3a) and also to the Spanish controls (Figure 19.3b). These patterns were investigated with separate LMEMs for Afrikaans and Spanish, respectively, with GROUP (control vs. bilingual) as a fixed factor. The LMEMs did not show a significant effect of GROUP for either comparison: $F(1, 15.770) = 0.196$, $p = .664$ for Afrikaans, and $F(1, 14.094) = 0.293$, $p = .597$ for Spanish.

4.3. Vocalic variability: comparisons of control and bilingual speakers in Afrikaans and Spanish (H3)

H3 contains two subhypotheses, each of which depends on the relation between the two languages of the bilingual speakers. On the one hand, if the L2 (Spanish) of the bilingual speakers influenced their L1 (Afrikaans), then, by H3a, we would expect less variation in the duration of vowels in Afrikaans for the bilingual relative to the control Afrikaans speakers (i.e., nPVI-V scores in Afrikaans should be lower for the bilingual than the control speakers). On the other hand, if the L1 (Afrikaans) of the bilingual speakers influenced their L2 (Spanish), then, by H3b, we would expect more variation in the duration of vowels for the bilingual than the control Spanish speakers (i.e., nPVI-V scores in Spanish should be higher for the bilingual relative to the control speakers). Figure 19.4 shows that the expected outcome was observed for H3a but not for H3b, implying that the influence between the two languages of the bilinguals is unidirectional, with their L2 influencing their L1, but not the opposite. These patterns are also confirmed by the results of LMEMs fit separately to the Afrikaans and Spanish data. For both models, GROUP (control, bilingual) was entered as a fixed factor. For the Afrikaans model, a significant effect of GROUP was returned ($F(1, 214.009) = 15.006$, $p \leq .001$), but not for the Spanish model ($F(1, 13.997) = 0.008$, $p = .929$).

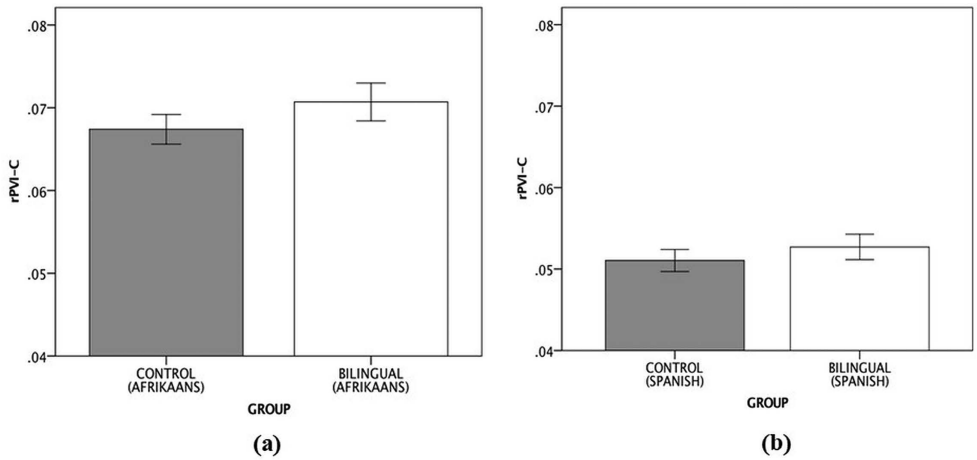

Figure 19.3 Mean rPVI-C data based on speaker group in (a) Afrikaans and (b) Spanish. Error bars indicate 95% confidence intervals.

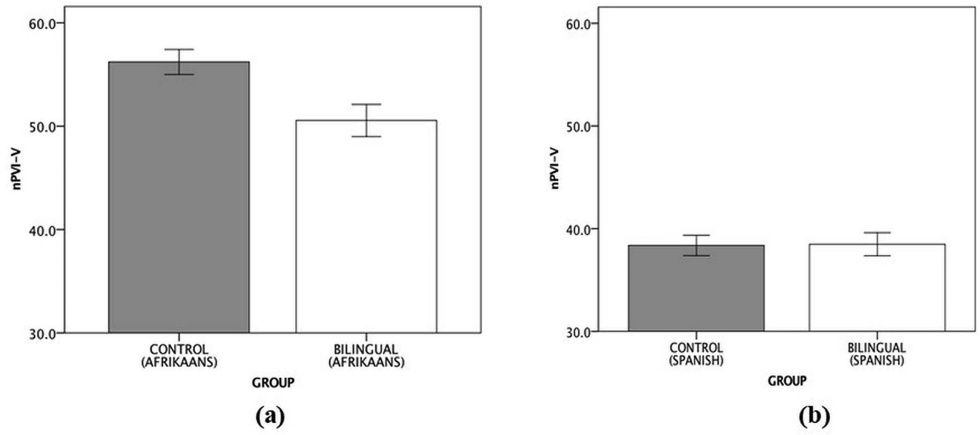

Figure 19.4 Mean nPVI-V data based on speaker group in (a) Afrikaans and (b) Spanish. Error bars indicate 95% confidence intervals.

4.4. Language-internal vowel duration differences (H4)

We found confirmation for H3a but not for H3b. Given this outcome, we explore the control and bilingual Afrikaans data in further detail in order to uncover the possible origins of the lower nPVI-V values in the speech of bilingual compared to control Afrikaans speakers. Specifically, we hypothesize (H4a) that, relative to the Afrikaans controls, the bilinguals will produce phonemic vowel length contrasts less robustly and apply stress-sensitive reduction/lengthening and final lengthening to a lesser extent. To investigate this hypothesis, we conducted three analyses to examine the local durational properties of the bilinguals' speech in Afrikaans relative to that of control Afrikaans speakers.

We relied on sentences from both Sets A and B (see section 3.2) to investigate these hypotheses. As a reminder, we extracted tokens that allowed us to compare, for each speaker, the duration of 60 tokens each of phonemically short /ɑ/ and long /ɑː/, 24 tokens each of stressed and unstressed /i ɑ ə/, and 60 tokens each of vowels from sentence-initial and sentence-final syllables. The differences between control and bilingual speakers in terms of these three phenomena were modeled with three separate LMEMs. Each model contained as fixed effects GROUP (control, bilingual) and either LENGTH (/ɑ/, /ɑː/), STRESS (stressed, unstressed), or POSITION (final, initial), as well as the interaction between the two fixed effects. The models included random intercepts of SPEAKER and SENTENCE. Figures 19.5 through 19.7 plot the summary differences between the control and bilingual speakers for each of the three comparisons (Figures 19.5a, 19.6a, 19.7a), as well as ratios comparing the two syllable types in question for individual speakers, with control speakers represented by black bars and bilingual speakers by gray bars (Figures 19.5b, 19.6b, 19.7b).

As seen in Figures 19.5a and 19.6a, although both control and bilingual speakers maintain a duration difference between short /ɑ/ and long /ɑː/, and between stressed and unstressed vowels, respectively, the differences are larger for control speakers than bilingual speakers. The individual data for long-to-short and stressed-to-unstressed ratios (Figures 19.5b and 19.6b) confirm the trends indicated by the group comparisons, showing that, in both cases, the Afrikaans control speakers typically have higher ratios than the bilinguals. The LMEM for long /ɑː/ and short /ɑ/ showed significant effects of LENGTH ($F(1, 51.440) = 46.149$, $p \leq .001$) and the GROUP-BY-LENGTH interaction ($F(1, 578.665) = 17.326$, $p \leq .001$). The interaction confirms that although

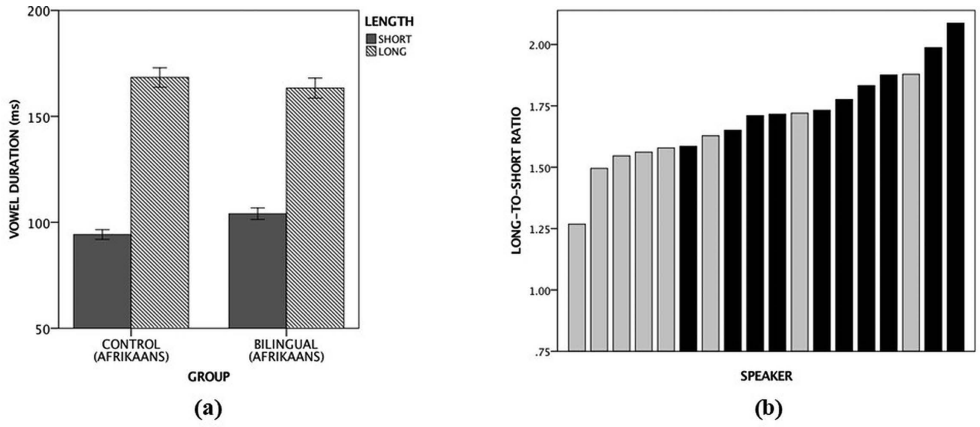

Figure 19.5 (a) Mean vowel duration (in milliseconds) for control and bilingual Afrikaans speakers for short /ɑ/ and long /ɑː/. Error bars indicate 95% confidence intervals. (b) Ratios (long /ɑː/ to short /ɑ/) for individual speakers. Control speakers are shaded in black, and bilingual speakers are shaded in gray.

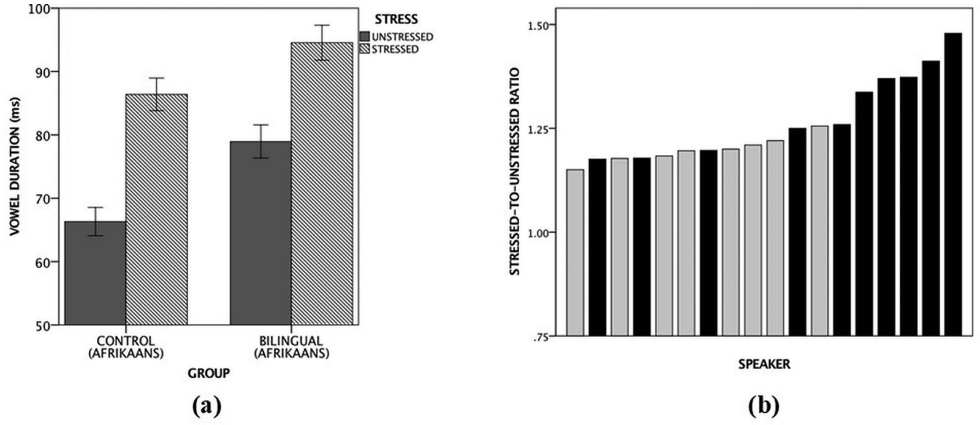

Figure 19.6 (a) Mean vowel duration (in milliseconds) for control and bilingual Afrikaans speakers for unstressed and stressed vowels. Error bars indicate 95% confidence intervals. (b) Ratios (stressed-to-unstressed vowels) for individual speakers. Control speakers are shaded in black, and bilingual speakers are shaded in gray.

both groups maintain a difference between long and short vowels, the difference is greater for the control than the bilingual speakers. The LMEM for stressed vs. unstressed vowels indicated significant effects of STRESS ($F(1, 42.372) = 9.634$, $p = .003$) and GROUP ($F(3, 698.812) = 49.524$, $p \leq .001$), and a marginally significant interaction of GROUP-BY-STRESS ($F(1, 698.812) = 3.671$, $p = .056$). The nearly significant interaction confirms that although both groups maintain a difference between stressed and unstressed vowels, the difference tends to be larger for the control than the bilingual speakers.

In terms of vowels in sentence-final vs. sentence-initial syllables, Figure 19.7a shows that the control Afrikaans speakers maintain a more robust difference between final and initial position.

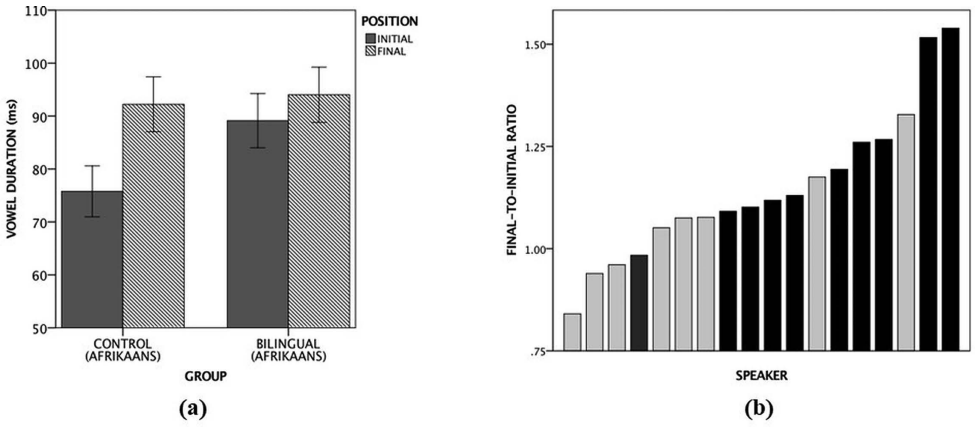

Figure 19.7 (a) Mean vowel duration (in milliseconds) for control and bilingual Afrikaans speakers in sentence-initial vs. sentence-final syllables. Error bars indicate 95% confidence intervals. (b) Ratios (final-to-initial vowels) for individual speakers. Control speakers are shaded in black, and bilingual speakers are shaded in gray.

However, unlike in the short-to-long and stressed-to-unstressed comparisons, the bilingual speakers show virtually no difference between final and initial syllables. The LMEM returned significant effects for GROUP ($F(1, 618.984) = 7.897$, $p = .005$) and the GROUP-BY-POSITION interaction ($F(1, 794.556) = 5.229$, $p = .022$). As with the other two comparisons, the significant interaction shows that the control speakers realize a more pronounced difference between syllables in sentence-final and nonfinal position than do the bilingual speakers. The group effect is also confirmed by inspection of the individual speaker ratios (Figure 19.7b), which indicate that the control speakers are more clustered toward the higher end of the individual ratios and the bilingual speakers toward the lower end.

5. Discussion

Our results show that Afrikaans control speakers had higher rPVI-C and nPVI-V values than their Spanish counterparts. These findings were expected per H1, given differences in the phonotactics of the two languages (for both consonants and vowels), as well differences in the phonological and phonetic processes impacting duration (for the vowels in particular). We also found, in agreement with H2, that with regard to variation in consonantal duration, the bilingual speakers were native-like in both Spanish and Afrikaans. With regard to variability in vowel duration, however, we found that the bilingual speakers showed less variability in their Afrikaans than the control Afrikaans speakers (in agreement with H3a), but they patterned similarly to the control Spanish speakers' speech (counter to H3b). This shows, at least in terms of the specific part of the grammar controlling durational variability across vowels, that the L2 (Spanish) of the bilingual speakers influences their L1 (Afrikaans) more than the L1 does the L2. Finally, we found evidence for three of the possible sources of lesser segment-to-segment variability in the vowel duration of the bilingual speakers' Afrikaans: the realization of relative differences between phonemically long and short vowels, between stressed and unstressed vowels, and between vowels appearing in sentence-final and sentence-initial syllables in Afrikaans.

5.1. L2-to-L1 influence

In agreement with H3a and counter to H3b, we found evidence for L2-to-L1, but not L1-to-L2, influence in the durational properties of vowels in the speech of the bilingual speakers in our study. Current research on bilingual language-contact situations points to three possible explanations for these differences. One possibility is that the bilingual speakers fully acquired Afrikaans durational patterns during childhood but subsequently lost certain aspects of their Afrikaans competence due to decreased use of Afrikaans and/or contact with Spanish (i.e., attrition). A second possibility is that the input varieties to which the control and bilingual Afrikaans speakers in our study were exposed already displayed systematic differences (e.g., Escobar and Potowski 2015: 91). Yet a third possibility is that the bilingual speakers did not fully acquire those aspects of Afrikaans grammar that control vowel duration during childhood (i.e., incomplete acquisition; for review, see Montrul 2008, 2016). Although the origin of the differences between the Afrikaans of the control and bilingual speakers in our study cannot be determined definitively based on available information, the first possibility presents the most likely explanation. In other words, we attribute our finding of L2-to-L1 influence to contact-induced attrition in the Afrikaans of the bilingual speakers, especially given that these speakers have been living in a Spanish-dominant environment for at least two-thirds of their lives. The second and third possibilities are both unlikely. First, the control Afrikaans speakers in our study were recruited from the same Afrikaans dialect region as where the majority of the original Patagonian Afrikaans settlers came from, so that the caretakers of the control and bilingual speakers most likely spoke very similar varieties of Afrikaans. Second, when the bilingual speakers were acquiring Afrikaans (during the 1940s and 1950s), there was still very little contact between Afrikaans and Spanish in Patagonia, implying that the bilinguals functioned as virtually monolingual speakers of Afrikaans until late childhood or early adolescence.

5.2. What factors do and do not transfer between the languages of a bilingual?

We documented evidence that the differences between Afrikaans and Spanish in terms of vowel duration result in interference by the L2 (Spanish) of the bilingual speakers in their L1 (Afrikaans). These differences were found both in terms of the phonetic processes that affect vowel duration (stressed vowel lengthening and final lengthening) and in the difference between the phonemically long /ɑː/ and short /ɑ/. Since Spanish and Afrikaans differ in terms of the application of stress- and position-related lengthening, interference between the two languages of the bilinguals with regard to application of these processes was expected. Since the Afrikaans distinction between long /ɑː/ and short /ɑ/ is a contrast in segmental inventory, and not in the application of a phonetic or phonological process, the smaller durational difference between these two vowels for the bilingual speakers (as compared to controls) cannot be ascribed to differential application of phonetic or phonological processes. This discrepancy is more likely the result of a gradual weakening of the length contrast from the Afrikaans of the bilingual speakers. Due to the low functional load of this contrast in Afrikaans, and the limited opportunities for most of the community members to speak Afrikaans, they may not have sufficient exposure to the forms necessary to reinforce and maintain this contrast. This is compounded by the fact that Spanish, the currently dominant language for most members of the community, lacks a phonemic vowel length contrast.

Unlike for vowel duration, however, we did not find evidence that the differences in the consonantal grammars of Afrikaans and Spanish impacted the durational properties of consonantal sequences in the speech of the bilingual speakers. Possible reasons for this are that neither

Spanish nor Afrikaans has phonological processes that impact the duration of consonants, and that phonetic processes such as stress-related and final lengthening impact consonants to a lesser degree than vowels. However, Afrikaans and Spanish do differ in terms of their consonantal phonotactics (see section 2.1). Specifically, Afrikaans allows both more clusters overall and more complex consonant clusters than Spanish. Given evidence that L1 Spanish speakers simplify complex consonant clusters in an L2 such as English via vowel epenthesis (Carlisle 1998; Lipski 2016), and given the evidence that the Afrikaans of the bilingual speakers in our study is influenced by their Spanish, one possible outcome is that the bilingual speakers could have shown Spanish-like production patterns for the more complex Afrikaans clusters. Had they broken up Afrikaans consonant clusters via epenthesis, their Afrikaans utterances would have had fewer multiconsonant clusters than the Afrikaans of the control speakers (i.e., the Afrikaans bilinguals would have had lower rPVI-C scores than the Afrikaans controls).

Why does the simpler Spanish consonantal phonotactics not impact the Afrikaans of the bilingual speakers? The reason for this should most likely be ascribed to the so-called superset/subset principle in language acquisition (Berwick 1985). Applying this principle to L2 acquisition, it should be expected that learners whose L1 allows a superset of the structures allowed by an L2 should not, after acquisition of the L2, develop difficulties in producing the more complex structures in their L1. Since the originally acquired grammar allows all of the structures that are observed in the subsequently acquired grammar, the learner is not presented with any learning data from the L2 that would counter the more permissive original grammar, and would therefore not have any reason to change the grammar of the L1. Applied to the case of the L1 Afrikaans speakers acquiring Spanish as an L2, this would mean that our speakers would not have encountered any evidence in L2 Spanish that the more complex clusters of their L1 Afrikaans were ungrammatical; the mere absence of such clusters in Spanish is not interpreted as evidence that they are ungrammatical. There is hence no reason to expect that the bilingual speakers would have modified their L1 Afrikaans after learning their L2 Spanish. Had the acquisition happened conversely—i.e., had L1 Spanish speakers acquired L2 Afrikaans—we would expect such speakers to have difficulty with Afrikaans clusters and to resolve these through epenthesis (see, for example, Trapman and Kager 2009; see also Toribio 2004 for discussion relating to bilingual convergence).

5.3. The relation between local and global durational properties of speech

In this chapter we have relied on global measures of durational variability (nPVI-V and rPVI-C) to compare different languages (Spanish and Afrikaans), as well as different varieties of the same language (control and bilingual Spanish/Afrikaans). These global PVI scores, however, are not direct reflections of the durational control components of grammar but are rather epiphenomenal of more local durational mechanisms that are directly controlled by grammar, and of the syllabic complexity of the utterances over which the scores are calculated (for the latter, see Arvaniti 2012). Spanish has lower nPVI-V and rPVI-C scores than Afrikaans not because Spanish and Afrikaans grammar specify different targets for these measures, but because the languages differ in their local durational control phenomena (stress lengthening, vowel reduction, final lengthening, etc.) and in phonotactic restrictions (resulting in Afrikaans utterances on average being syllabically more complex than Spanish utterances). Whether PVI scores are used to make comparisons between two different languages or between different varieties of the same language, the utility of these metrics is limited. These metrics are best used as a primary confirmation of whether two languages or language varieties differ in terms of their durational control

grammars. Critically, any global differences found in terms of PVI scores must be investigated further—as we demonstrated in section 4.4—in order to determine which local patterns in the grammars of the languages give rise to the PVI differences.

As Arvaniti (2012) has shown, discrepancies between languages in terms of these scores are influenced strongly by phonotactics, which can translate to large differences in the syllabic complexities of utterances in different languages. This complication in the use of PVI scores is avoided when varieties of the same language are analyzed using the same speech materials. The Spanish and Afrikaans sentences used in our study differed in syllabic complexity due to the phonotactic differences between Spanish and Afrikaans, contributing at least partially to differences in PVI scores between the two languages. However, we performed the PVI comparisons of control and bilingual Spanish and Afrikaans speakers based on the bilingual speakers' reading of the same sentences as their control counterparts in each language. By basing the within-language comparisons on the same test sentences, we thus circumvented the problems caused by differences in syllabic complexities between languages, pointed out by Arvaniti (2012). The disparity in nPVI-V scores between control and bilingual Afrikaans speakers that we documented (section 4.3) therefore cannot be ascribed to variation in the syllabic complexity of the sentences read by the two speaker groups. Instead, they must reflect other differences in the phonological and phonetic grammars of the two Afrikaans-speaking groups.

Related to the analysis of local durational properties, our inclusion of individual data is in line with Ortega (2016), who calls for studies that include in the design analyses of all languages by the individual multilingual speakers themselves (i.e., Afrikaans and Spanish sentences by the bilinguals), as well as representative samples of the languages from appropriate controls (i.e., Afrikaans from South Africa and Spanish from Patagonia). Having presented these data in Figures 19.5b, 19.6b, and 19.7b, we have shown that one bilingual speaker displays patterns like many of the Afrikaans control speakers with respect to the long-to-short (Figure 19.5b) and final-to-initial (Figure 19.7b) ratios. This bilingual speaker was M2, who scored 52.4 (Spanish-dominant) on the BLP. One of the reasons that M2 scored Spanish-dominant is that his spouse is a native speaker of Spanish (as are their children), and thus M2's primary language of communication is currently Spanish. Nonetheless, M2 is the only bilingual speaker who served as Argentina's Honorary Consul to South Africa and traveled to South Africa on 11 different occasions as an adult.

We would further point out that speaker M1, the bilingual with the most Afrikaans-dominant score, had traveled to South Africa only once in his life. Speaker M1 is married to another Afrikaans-Spanish bilingual speaker who did not participate in this study due to her limited reading proficiency in Afrikaans.

6. Conclusion

We tested four hypotheses on the patterns of temporal organization for L1 speakers of Afrikaans who acquired L2 Spanish in a Spanish-dominant context, L1 Afrikaans controls, and L1 Spanish controls. We showed, first, that L1 Afrikaans displays greater temporal variability in both consonants and vowels than L1 Spanish (H1). Second, we demonstrated that Afrikaans-Spanish bilinguals display native-like patterns in consonant variability in each of their languages (H2). Third, we showed that, for vowels, the L2 Spanish of the bilinguals influences their L1 (Afrikaans) more than their L1 influences their L2 (H3). Finally, we identified three possible sources of this L2-to-L1 influence: the realization of relative differences between phonemically long and short vowels, between stressed and unstressed vowels, and between vowels appearing in sentence-final

and sentence-initial syllables in Afrikaans (H4). We have argued that the presence of phonetic and phonological processes affecting vowels (but not consonants), in addition to the relative (i.e., L1 vs. L2) complexity of phonotactic patterns, intervenes to yield consequences for a speaker's vocalic control grammar.

References

Alfano, Iolanda, Renata Savy, and Joaquim Llisterri. 2009. Sulla realtà acustica dell'accento lessicale in italiano ed in spagnolo: La durata vocalica in produzione e percezione [On the acoustic reality of lexical stress in Italian and Spanish: Vowel duration in production and perception]. In Luciano Romito, Vincenzo Galatà, and Rosita Lio (eds.), *La fonetica sperimentale: Metodo e applicazioni. Atti del 4o convegno nazionale AISV*. Torriana (RN), Italy: EDK Editore, 22–39.

Antoniou, Mark, Catherine T. Best, and Michael D. Tyler. 2012. Two ways to listen: do L2-dominant bilinguals perceive stop voicing according to language mode? *Journal of Phonetics* 40.582–594.

Antoniou, Mark, Catherine T. Best, and Michael D. Tyler. 2013. Focusing the lens of language experience: Perception of Ma'di stops by Greek and English bilinguals and monolinguals. *Journal of the Acoustical Society of America* 133.2397–2411.

Arvaniti, Amalia. 2012. The usefulness of metrics in the quantification of speech rhythm. *Journal of Phonetics* 40 351–373.

Berwick, Robert C. 1985. *The Acquisition of Syntactic Knowledge*. Cambridge, MA: MIT Press.

Best, Catherine T. and Michael D. Tyler. 2007. Nonnative and second-language speech perception: Commonalities and complementarities. In Ocke-Schwen Bohn and Murray J. Munro (eds.), *Language Experience in Second Language Speech Learning*. Amsterdam: John Benjamins, 13–44.

Birdsong, David, Libby M. Gertken, and Mark Amengual. 2012. *Bilingual Language Profile: An Easy-to-Use Instrument to Assess Bilingualism*. COERLL, University of Texas at Austin. [Available online at: https://sites.la.utexas.edu/bilingual/ [21 April 2019].)

Boersma, Paul and David Weenink. 2019. *PRAAT: Doing Phonetics by Computer*. (Available online at: www.praat.org/ [21 Apri 2019].)

Carlisle, Robert S. 1998. The acquisition of onsets in a markedness relationship. *Studies in Second Language Acquisition* 20(2).245–260.

Chang, Charles B. 2012. Rapid and multifaceted effects of second-language learning on first-language speech production. *Journal of Phonetics* 40(2).249–268.

Coetzee, Andries W., Lorenzo García-Amaya, Nicholas Henriksen, and Daan Wissing. 2015. Bilingual speech rhythm: Spanish-Afrikaans in Patagonia. *ICPhS 2015 -Conference Proceedings, the 18th International Congress of Phonetic Sciences*. Glasgow, UK: The University of Glasgow, Paper number 0911.

Coetzee, Andries W. and Daan Wissing. 2007. Global and local durational properties in three varieties of South African English. *Linguistic Review* 24.263–289.

Davidson, Lisa. 2006. Phonotactics and articulatory coordination interact in phonology: Evidence from nonnative production. *Cognitive Science* 30.837–862.

Delforge, Ann Marie. 2008. Unstressed vowel reduction in Andean Spanish. In Laura Colantoni and Jeffrey Steele (eds.), *Selected Proceedings of the 3rd Conference on Laboratory Approaches to Spanish Phonology*. Somerville, MA: Cascadilla, 107–124.

Escobar, Anna María and Kim Potowski. 2015. *El español de los estados unidos*. Cambridge: University of Cambridge Press.

Flege, James E. 1987. The production of "new" and "similar" phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of Phonetics* 15.47–65.

Flege, James E. 1995. Second language speech learning: Theory, findings, and problems. In Winifred Strange (ed.), *Speech Perception and Linguistic Experience: Issues in Cross-Language Research*. Timonium, MD: York Press, 233–277.

Flege, James E. and Wieke Eefting. 1987. Cross-language switching in stop consonant perception and production by Dutch speakers of English. *Speech Communication* 6.185–202.

Frota, Sonia, Mariapaola D'Imperio, Gorka Elordieta, Pilar Prieto, and Marina Vigario. 2007. The phonetics and phonology of intonational phrasing in Romance. In Pilar Prieto, Joan Mascaró, and Maria-Josep Solé (eds.), *Segmental and Prosodic Issues in Romance Phonology*. Amsterdam: John Benjamins, 131–154.

Gabriel, Christoph and Elena Kireva. 2014a. Prosodic transfer in learner and contact varieties: Speech rhythm and intonation of Buenos Aires Spanish and L2 Castilian Spanish produced by Italian native speakers. *Studies in Second Language Acquisition* 36(2).257–281.

Gabriel, Christoph and Elena Kireva. 2014b. Speech rhythm and vowel raising in Bulgarian Judeo-Spanish. In Nick Campbell, Dafydd Gibbon, and Daniel Hirst (eds.), *Speech Prosody 7 — Conference Proceedings, the 7th International Conference on Speech Prosody*, Dublin, Ireland, 728–732.

Gay, Thomas T. 1981. Mechanisms in the control of speech rate. *Phonetica* 38 145–158.

Gick, Bryan, Fiona Campbell, Sunyoung Oh, and Linda Tamburri-Watt. 2006. Toward universals in the gestural organization of syllables: A cross-linguistic study of liquids. *Journal of Phonetics* 34.49–72.

Grabe, Esther and Ee L. Low. 2002. Durational variability in speech and the rhythm class hypothesis. In Carlos Gussenhoven and Natasha Warner (eds.), *Laboratory Phonology* 70. Berlin: Mouton de Gruyter, 515–546.

Guion, Susan G. 2003. The vowel systems of Quichua-Spanish bilinguals: Age of acquisition effects on the mutual influence of the first and second languages. *Phonetica* 60(2).98–128.

Henriksen, Nicholas and Stephen Fafulas. 2017. Prosodic timing and language contact: Spanish and Yagua in Amazonian Peru. *Studies in Hispanic and Lusophone Linguistics* 10(2).225–257.

Hualde, José I. 2005. *The Sounds of Spanish*. Cambridge: Cambridge University Press.

Kireva, Elena and Christoph Gabriel. 2015. Rhythmic properties of a contact variety: Comparing read and semi-spontaneous speech in Argentinean Porteño Spanish. In Elisabeth Delais-Roussarie, Mathieu Avanzi, and Sophie Herment (eds.), *Prosody and Languages in Contact: L2 Acquisition, Attrition, Languages in Multilingual Situations*. Berlin: Springer, 149–168.

Lipski, John M. 2016. Spanish vocalic epenthesis: the phonetics of the mora. In Rafael Núñez-Cedeño (ed.), *The Syllable and Stress: Studies in Honor of James W. Harris*. Boston: Mouton de Gruyter, 245–270.

Loporcaro, Michele. 2015. *Vowel Length from Latin to Romance*. Oxford: Oxford University Press.

Low, Ee. L., Esther Grabe, and Francis Nolan. 2000. Quantitative characterizations of speech rhythm: Syllable-timing in Singapore English. *Language and Speech* 43.377–401.

Mennen, Ineke. 2004. Bi-directional interference in the intonation of Dutch speakers of Greek. *Journal of Phonetics* 32(4).543–563.

Montrul, Silvina A. 2008. *Incomplete Acquisition in Bilingualism: Re-Examining the Age Factor*. Amsterdam: John Benjamins.

Montrul, Silvina A. 2016. *The Acquisition of Heritage Languages*. Cambridge: Cambridge University Press.

Ortega, Lourdes. 2016. Multi-competence in second language acquisition: Inroads into the mainstream? In Vivian Cook and Li Wei (eds.), *Cambridge Handbook of Linguistic Multi-Competence*. Cambridge: Cambridge University Press, 50–76.

Ortega-Llebaria, Marta and Pilar Prieto. 2010. Acoustic correlates of stress in Central Catalan and Castilian Spanish. *Language and Speech* 54.73–97.

Peterson, Gordon E. and Ilse Lehiste. 1960. Duration of syllable nuclei in English. *The Journal of the Acoustical Society of America* 32.693–703.

Pettorino, Massimo and Elisa Pellegrino. 2014. Age and rhythmic variations: a study on Italian. *INTERSPEECH 2014 -Conference Proceedings, the 15th Annual Conference of the International Speech Communication Association*, Singapore, 1234–1237.

Pouplier, Marianne. 2012. The gestural approach to syllable structure: Universal, language- and cluster-specific aspects. In Susanne Fuchs, Melanie Weirich, and Pascal Perrier (eds.), *Speech Planning and Dynamics*. New York: Peter Lang, 63–96.

Rao, Rajiv. 2010. Final lengthening and pause duration in three dialects of Spanish. In Marta Ortega-Llebaria (ed.), *Selected Proceedings of the 4th Conference on Laboratory Approaches to Spanish Phonology*. Somerville, MA: Cascadilla, 69–82.

Robles-Puente, Sergio. 2014. *Prosody in Contact: Spanish in Los Angeles*. Doctoral dissertation, University of Southern California, Los Angeles, CA.

Sancier, Michele L. and Carol A. Fowler. 1997. Gestural drift in a bilingual speaker of Brazilian Portuguese and English. *Journal of Phonetics* 27(4).421–436.

Thomas, Erik R. and Phillip M Carter. 2006. Prosodic rhythm and African American English. *English World-Wide* 27.331–355.

Toribio, Jacqueline Almeida. 2004. Convergence as an optimization strategy in bilingual speech: Evidence from code-switching. *Bilingualism: Language and Cognition* 7(2).165–173.

Trapman, Mirjam and René Kager. 2009. The acquisition of subset and superset phonotactic knowledge in a second language. *Language Acquisition* 16(3).178–221.

Turk, Alice E. and Stefanie Shattuck-Hufnagel. 2000. Word-boundary-related duration patterns in English. *Journal of Phonetics* 28.397–440.

Turk, Alice E. and Stefanie Shattuck-Hufnagel. 2007. Multiple targets of phrase-final lengthening in American English words. *Journal of Phonetics* 35.445–472.

van Schalkwyk, Rhoda. 1989. *Afrikaans in Argentinië: 'n Linguistiese en Sosiolinguistsiese Beskrywing*. [*Afrikaans in Argentina: a Linguistic and Sociolinguistic Description*.] Masters thesis, Rand Afrikaans University, Johannesburg, South Africa.

Virkel, Ana E. 2004. *Español de la Patagonia. Aportes para la definicón de un perfil sociolingüístico*. Buenos Aires: Academia Argentina de Letras.

Wissing, Daan. 1982. *Algemene en Afrikaanse Generatiewe Fonologie*. Johannesburg: Macmillan.

Wissing, Daan. 2007. Basiese akoestiese korrelate van klemtoon in Afrikaans. *Southern African Linguistics and Applied Language Studies* 25.441–458.

Appendix: stimulus materials

Set A sentences (Spanish and Afrikaans)

Spanish sentences (identical to Arvaniti 2012)

CV	1.	*Mañana iré al mercado para comprar una papaya*. 'Tomorrow I will go to the market to buy a papaya.'
	2.	*El muchacho le da una rosa a su hermana cada sábado*. 'The boy gives his sister a rose every Saturday.'
	3.	*La casa de la profesora no parece pequeña*. 'The professor's house does not seem small.'
	4.	*Sara dice que la playa es muy bonita durante el verano*. 'Sara says that the beach is very beautiful during the summer.'
CVC	1.	*Un zoólogo estaba inspeccionando unos especímenes nuevos*. 'The zoologist was inspecting some new specimens.'
	2.	*Daniel, Enrique y Juan van a viajar a Japón por un mes*. 'Daniel, Enrique, and Juan are going to Japan for a month.'
	3.	*A los doctores les gusta caminar por el parque central de La Paz*. 'The doctors like to walk in La Paz's central park.'
	4.	*El ingeniero siempre parecía bastante amable*. 'The engineer always seemed rather nice.'
Uncontrolled	1.	*Esto es pecado quemarlo, con tanta gente que no tiene ni que comer*. 'This is a sin to burn it, with so many people that don't have anything to eat.'
	2.	*Se había ido sin escándalo, de común acuerdo del esposo*. 'He had left without scandal, by mutual agreement with his/her husband.'
	3.	*Es la primera vez que te oigo decir algo que no debías*. 'It's the first time that I hear you say something that you shouldn't.'
	4.	*Las oficinas estaban cerradas y a oscuras por el día feriado*. 'The offices were closed and dark because of the holiday.'

Afrikaans sentences (modeled after the Arvaniti 2012 Spanish sentences)

CV	1	*Jannie Venter sê dat die sestien boeke in sy tas sal pas*. 'Jannie Venter says that the sixteen books will fit in his suitcase.'
	2	*Bennie de Lange sê dat die kos in die pot nie lekker is nie*. 'Bennie de Lange says that the food in the pot is not tasty.'
	3	*Die wit kat sit op die kar se dak, en die swart kat sit onder die kar*. 'The white cat sits on the car's roof, and the black cat sits under the car.'
	4	*Die man op die stoel is die pa van die kind met die swart hare*. 'The man on the chair is the father of the child with the black hair.'
CVC	1	*Die onderwyser vra die kinders om na die skool toe te gaan*. 'The teacher asks the children to go to the school.'
	2	*Hierdie dorp lê aan die Atlantiese oseaan, en dit is daarom koud hier in die winter*. 'This town lies on the Atlantic Ocean, and it is therefore cold here in the winter.'
	3	*Ons voorouers het met groot skepe oor die see gevaar na Argentinië toe*. 'Our forefathers sailed with large ships over the ocean to Argentina.'
	4	*Voordat olie ontdek is, was ons mense almal skaapboere gewees*. 'Before oil was discovered, all our people were sheep farmers.'
Uncontrolled	1	*Sy was nog besig om dit te sê toe haar ma ook uitasem daar aankom*. 'She was still busy saying it when her mother also arrived there, out of breath.'
	2	*Sy het die hek heen en weer geskud sonder om te weet hoekom sy dit doen*. 'She shook the gate to-and-fro without knowing why she was doing it.'
	3	*Op die stoep moes sy eers'n bietjie stilstaan sodat haar asem kon bedaar*. 'On the porch, she first had to stand still for a while, so that her breath could calm down.'
	4	*Eers het hy vir haar gewag en later het hy na haar gaan soek*. 'At first, he waited for her, and later he went looking for her.'

Set B sentences (Afrikaans only)

1	*Drie plus sewe is tien*. 'Three plus seven is ten.'
2	*My ma se verjaarsdag is op die tiende*. 'My mother's birthday is on the tenth.'
3	*Tien plus vier is veertien*. 'Ten plus four is fourteen.'
4	*My pa se verjaarsdag is op die veertiende*. 'My father's birthday is on the fourteenth.'
5	*Ons vakansie begin oor 'n week*. 'Our vacation starts in a week.'
6	*Die skool begin weer oor twee weke*. 'The school starts again in two weeks.'
7	*Ons gaan melktert bak hierdie naweek*. 'We will bake milk tart this weekend.'
8	*Die kinders speel voetbal op die naweke*. 'The children play football on the weekends.'
9	*Ek wil die fliek weer sien*. 'I want to watch the movie again.'
10	*Ek wil ook die fliek sien*. 'I also want to watch the movie.'
11	*Die kar sal in die straat moet bly*. 'The car will have to remain on the street.'
12	*Die president sal die wet teken*. 'The president will sign the legislation.'
13	*Ek het vier seuns en twee dogters*. 'I have four sons and two daughters.'
14	*Die seuns speel voetbal*. 'The boys play football.'
15	*Jy mag nie hier sit nie*. 'You are not allowed to sit here.'
16	*Die vrou sit op die bank*. 'The woman is sitting on the couch.'