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Keeping a Critical Eye on Majority Language Influence: The Case of Uptalk in Heritage Spanish

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Abstract: The goal of this study is to highlight the importance of taking into account variations in monolingual grammars before discussing majority language influence as a possible source of heritage speakers' divergent grammars. In this study, we examine the production of uptalk in Spanish by heritage speakers of Mexican Spanish in Southern California. Uptalk (i.e., rising intonation contour at the end of a non-question utterance) is frequently associated with California English. Thus, heritage speakers' use of uptalk is often considered to be influenced from English intonation (i.e., the majority language). Although uptalk in Spanish is not well understood, it has been observed in Mexican Spanish, which calls attention to the importance of investigating uptalk in monolingual Spanish. Using a dyadic interaction task, we obtained spontaneous speech data of 16 heritage speakers and 16 monolingual speakers of Mexican Spanish and compared the phonological and phonetic properties of uptalks produced by the two groups. Our results demonstrated that the heritage speakers and the monolingual speakers produced uptalks with similar frequencies and mainly used L+H* HH% and L* HH% contours. However, the two groups had more differences than similarities. Specifically, heritage speakers' uptalks presented less dynamic contours and were produced with flatter rises than monolinguals' uptalks. Heritage speakers' divergent patterns showed close resemblance with patterns in English, suggesting majority language influence as a valid source of divergence. We discuss possible avenues for future research for a better understanding of the role of majority language influence on heritage Spanish uptalk.

Keywords: heritage language intonation; uptalk; heritage speakers; Spanish phonetics and phonology

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1. Introduction

Heritage speakers are a type of bilinguals whose home language (i.e., heritage language) is different from the majority language of the society. Heritage speakers acquire both the heritage language and the majority language during childhood. However, since the heritage language is a minority language and its use is generally limited to certain domains (e.g., familial settings), heritage speakers often become more dominant in the majority language as they grow up (Benmamoun et al. 2013; Polinsky and Kagan 2007). In the past decade, experimental research on the structure of heritage languages has increased exponentially. Regardless of the specific areas of interest, a consensus reached by researchers in heritage language studies is that heritage grammars are not the same as monolingual grammars. While some linguistic properties in heritage languages may follow the monolingual norms, others demonstrate divergence. According to Polinsky and Scontras (2020), heritage speakers perform similarly to monolingual speakers in their use of linguistic properties that provide direct reference to real world entities and events (e.g., determiner, tense), whereas they show divergence in dependencies at distance (e.g., agreement morphology, long-distance syntactic dependencies), absence of form (e.g., form-meaning association of null elements), and ambiguous structures (e.g., scope interpretation of ambiguous structures). Although heritage language phonology has received relatively less attention

compared to heritage language syntax and morphosyntax (Rao and Ronquest 2015), it also demonstrates areas of convergence and divergence. For instance, heritage speakers tend to maintain phonemic contrasts in their heritage languages even if the majority language does not have such contrasts (Amengual 2016; Chang et al. 2009, 2011; Einfeldt et al. 2019; Henriksen 2015). Einfeldt et al. (2019) examined the production of Italian singleton and geminate consonants by Italian heritage speakers in Germany, and found that the heritage speakers produced the Italian geminates (e.g., *palla* /ˈpal:a/ 'ball') significantly longer than the singletons (e.g., *pala* /ˈpala/ 'shovel'), although German does not have consonant gemination. Since loss of phonemic contrasts leads to ambiguity in meaning, Kupisch (2020) argued that heritage speakers' convergence to monolingual norms in this respect is an indication of their avoidance to ambiguity, which is a characteristic of heritage grammars proposed by Polinsky and Scontras (2020). Heritage speakers also show divergence from monolingual norms in several aspects, primarily in fine-grained phonetic details of speech sounds. For instance, they produce heritage language speech sounds similar to corresponding majority language phones (Amengual 2012; Elias et al. 2017; Godson 2004; Łyskawa et al. 2016; Mayr and Siddika 2018; Ronquest 2013, 2016), produce them past native targets (Chang et al. 2011; Cummings Ruiz 2019; Kim 2011), use different strategies or sets of strategies from monolingual speakers (Amengual 2016; Bullock 2009; Henriksen 2015; Kang and Nagy 2016; Kim 2019; Repiso-Puigdelliura and Kim 2020), exploit language-inherent allophonic variation (Kupisch 2020), or show linguistic archaism (Kang and Nagy 2016; Parodi 2014).

When heritage speakers behave differently from their monolingual peers, majority language influence is often regarded as the first candidate responsible for divergence (Polinsky and Scontras 2020). This is especially true if the feature of interest shows patterns that resemble those in the majority language. For instance, Spanish heritage speakers in the US often reduce Spanish vowels in unstressed positions (Elias et al. 2017; Ronquest 2013, 2016). In English, vowel quality is conditioned by stress, whereas Spanish vowels do not show such systematic variation. Thus, heritage speakers' divergent patterns found in these cases can be explained by assimilation to English (i.e., the majority language). Heritage speakers may also take a completely different trajectory in the same linguistic scenarios. Cummings Ruiz (2019) found that Spanish heritage speakers did not reduce the Spanish /u/ in unstressed condition and clearly distinguished the Spanish /u/ (lower F2) from the English /u/ (higher F2). Moreover, they produced the Spanish /u/ even more back (lower F2) than Spanish monolingual speakers. These findings indicate that, apart from assimilation to the majority language, heritage language phonology may also demonstrate dissimilation. According to Chang et al. (2011), some heritage speakers are successful at simultaneously maintaining language-internal and cross-linguistic contrasts, due to their exposure to two languages from an early age when acquisition of language-general fine-grained acoustic features takes place (Kuhl et al. 2012; Werker and Tees 1984). As the Speech Learning Model (Flege 1995) posits, bilinguals' L1 and L2 sound categories exist in a common phonological space. Thus, bilinguals strive to keep separate L1 and L2 phones that are close to each other, yet perceptually distinct, and in some cases the establishment of separate categories occurs to the point that they are further pushed apart than needed (Chang et al. 2011; Flege 1995).

While influence from the majority language is one of the main sources of heritage speakers' divergent grammars, an automatic linkage between the two should be taken with caution. Before discussing majority language influence, it is paramount that researchers confirm that the feature of interest is not present or is different in monolingual varieties. While this may seem obvious, many heritage language studies, especially those that examine linguistic features that are not well understood in monolingual varieties, tend to rely on prescriptive forms when setting the "target". Since monolingual speakers are seldom the focus of heritage language studies, variations in monolingual varieties are often overlooked. Therefore, we propose that heritage language studies should take an extra step confirming that heritage speakers show different patterns from monolingual speakers

(i.e., identify areas of divergence), before delving into the source(s) of heritage speakers' divergent grammars.

In this study, we examine heritage language intonation, specifically uptalk in Spanish produced by Spanish heritage speakers in Southern California. Uptalk (i.e., the use of rising intonation contours at the end of non-question utterances) is generally associated with English, especially with California English (Armstrong et al. 2015; Barry 2007; Ritchart and Arvaniti 2014; Tyler 2015). Thus, one may think that heritage speakers' use of uptalk in Spanish is due to influence from English. However, this phenomenon has also been observed in Spanish (Henriksen 2017; Holguín-Mendoza 2011; Martínez-Gómez 2018; Vergara 2015), although it is very little understood. The goal of this study is to examine whether uptalk is present in the Spanish of heritage speakers' homeland variety and, if so, whether the phonology and phonetics of uptalk in heritage Spanish are similar/different from those of the homeland variety.

1.1. Variability in the Intonation of Heritage Languages and Monolingual Varieties

The speech of heritage speakers is often described as having a slight accent (Polinsky and Kagan 2007) and prosody has been considered to be one of the most salient features leading to the perception of heritage accent (Kan 2020; Kupisch et al. 2014; Shin 2005; Stangen et al. 2015). Stangen et al. (2015) performed a foreign accent rating task for Turkish heritage speakers in Germany. In this task, apart from rating the degree of accentedness, monolingual listeners of Turkish and German commented on heritage speakers' accent. Results showed that there were more heritage speakers that sounded native in German (i.e., majority language) than in Turkish (i.e., heritage language). Crucially, among various linguistic features of foreign accent, prosody was the one that received the most comments for both Turkish (28%) and German (26.5%). The raters pointed out that the speech of heritage speakers demonstrated "something wrong with the musicality", "strokes [that] are wrong", strange intonation, or "staccato" (Stangen et al. 2015). The strong effect of prosody on heritage accent is also confirmed in Shin (2005). Using forced-choice identification tasks, Shin (2005) asked native Korean listeners to identify whether the speaker is a Korean or a foreigner solely based on prosody. Sentences produced by Korean heritage speakers and L2 learners of Korean were low-pass filtered in order to remove segmental information. Results showed that the heritage speakers were more often identified as Koreans than the L2 learners. Interestingly, according to some listeners' comments during a debriefing after the experiment, heritage speakers' speech was sometimes hard to judge, because it seemed like a "Korean speaker who fakes foreign accents" (Shin 2005). This finding suggests that heritage speakers are perceived as native speakers, but they have an accent (i.e., heritage accent) that is distinct from the foreign accent of L2 learners.

Although research on heritage language intonation is scarce, studies have shown that heritage speakers are different from monolingual speakers in the distribution of pitch accents and boundary tones (Dehé 2018; Queen 2001; Rao 2016; Robles-Puente 2014), in the phonetic implementation of pitch accents (Colantoni et al. 2016; Kim 2020; Zuban et al. 2020), or in the use of prosody to express pragmatic functions (Bullock 2009; Hoot 2017; Kim 2019). Some possible explanations for heritage speakers' divergent intonation patterns are the emergence of new tonal categories due to hybridization of heritage and majority language categories (Queen 2001; Rao 2016), the mix of intonation patterns or prosodic strategies found in both heritage and majority languages (Bullock 2009; Kim 2019; Robles-Puente 2014), or the use of fine-grained acoustic cues similar to or approaching those in the majority language (Colantoni et al. 2016; Kim 2020; Zuban et al. 2020). That is, due to pressure from the majority language, heritage speakers may be forced to restructure their phonological grammars. While this is a valid explanation, as we proposed above, it should be preceded by extensive research on the variation of intonation patterns in monolingual varieties in order to rule out the possibility that heritage speakers' seemingly divergent patterns may in fact be present in monolingual varieties. For instance, Dehé (2018) examined the variation in the intonation of yes-no polar questions in

heritage Islandic of Canada, Icelandic of Iceland, and North American English produced by non-Icelandic Canadians. Results showed that low-rising contours typical of North American English were frequently found in heritage Icelandic, but these contours were also observed in Icelandic of Iceland. Similarly, the default rise-fall intonation of Icelandic were found in both heritage Icelandic and North American English. However, when comparing the frequency of these contours across groups, Dehé (2018) found that heritage Icelandic demonstrated significantly more low rises (56.7%) than Icelandic of Iceland (10.5%) and significantly fewer low rises than North American English (78.9%). Regarding the rise-fall contours typical of Icelandic, the opposite pattern was found; heritage Icelandic showed significantly fewer rise-falls (32.5%) than Icelandic of Iceland (65%) and significantly more rise-falls than North American English (6.3%). These findings suggest that the intonation of yes-no polar questions in heritage Icelandic demonstrates a different distribution of intonation patterns from those in Icelandic of Iceland. While this may be due to influence from North American English (i.e., majority language), Dehé (2018) also pointed out that longitudinal studies should be carried out to examine possible changes in the intonation of the two Icelandic varieties (i.e., Iceland and North America).

Intonation inherently shows variability even within the same linguistic variety (Bullock 2009), due to a lack of one-to-one relationship between form and meaning. On the one hand, the same tonal event can be associated with multiple meanings. For example, in Catalan a low boundary tone can encode new information in declarative sentences or evidentiality in yes-no questions (Vanrell et al. 2014). On the other hand, the same utterance type can be expressed with more than one tonal event. For instance, declarative sentences in English can be marked with both a low boundary tone or a high boundary tone (Armstrong et al. 2015; Barry 2007; Ritchart and Arvaniti 2014). Moreover, the variability of intonation can be conditioned by various extralinguistic factors (e.g., gender, social class, speech style, age). For instance, Enbe and Tobin (2008) found that, in the production of statements, female speakers of Buenos Aires Spanish have a preference for marked forms (i.e., the high rising contour in the subject and falling contour in the predicate), while male speakers tend to use unmarked forms (i.e., the rise-fall contour in subject and falling contour in predicate) more often. For wh-questions, however, age was a stronger predictor of the type of contour than gender. Young male speakers deviated more from the standard form (i.e., higher pitch accent in the wh-word) than older age groups. Aside from sociodemographic factors, intonation in monolingual varieties is also subject to stylistic variation (Henriksen 2013; Savino 2012; Yaeger-Dror 2002). For instance, Henriksen (2013) found that, when producing declarative questions, Manchego Spanish speakers preferred the standard Spanish tonemic late rises in a reading task (i.e., more monitored speech), while they preferred the Manchego Spanish vernacular tonemic early rises in an information-gap task (i.e., less monitored speech). The implication of this study is that informal speech styles elicit tonal contours of vernacular varieties, while in more formal styles there is an overall preference for intonation patterns of standard varieties. In short, variation in intonation commonly occurs in non-heritage varieties and sociodemographic factors or style-shifts can predict some of these changes.

1.2. Uptalk in English

Uptalk is the use of rising terminals in non-question utterances. Uptalk in English has attracted the attention of a great deal of scholarship, probably due to its widespread use among English speakers and its relationship with various pragmatic meanings (Armstrong et al. 2015; Barry 2007; Cruttenden 1997; Di Gioacchino and Jessop 2010; Hirschberg and Ward 1995; House 2007; Ritchart and Arvaniti 2014; Shepherd 2011; Shokeir 2008; Warren 2016; Wichmann and Caspers 2001). Although the use of uptalk has been reported across many varieties of English, it is frequently associated with Valley Girl speech in California English (Armstrong et al. 2015; Barry 2007; Ritchart and Arvaniti 2014; Tyler 2015). While uptalk is characterized by having rising terminals, it presents various nuclear configurations (i.e., the combination of nuclear pitch accent and boundary tone). For

California English, Ritchart and Arvaniti (2014) analyzed the rising terminals of a clip retelling task and a map task, and measured the scale of the rise and the alignment of the onset of the rise with respect to the last stressed syllable. The authors found that the most common nuclear configuration for statements was L* L-H% (i.e., low rise) and for questions it was L* H-H% (i.e., high rise). For floor holding, they found that the speakers used the L* H-L% configuration (i.e., high plateau) rather than rises. In addition, they found that female speakers produced more uptalks than male speakers. With regard to the phonetic realization of uptalk, statements were produced with later and smaller rises than questions. Moreover, the female speakers demonstrated greater pitch excursion and later alignment than the male speakers.

Armstrong et al. (2015) compared the use of uptalk in Southern California English to that of Massachusetts English in the production of narratives. Despite the popular stereotype that uptalk is used most frequently by female speakers of California English (Ritchart and Arvaniti 2014; Tyler 2015), Armstrong et al. (2015) did not find any gender or regional differences in the use of final rises. In fact, they found that the most common contour shape of non-question utterances was the level tone (H-L%) regardless of gender and region. With regard to the phonetic realization of uptalks, they found that only for the Southern California speakers, women overall produced uptalks with steeper rises than men, but at the same time they also produced the longest rises. While the different patterns regarding gender in Ritchart and Arvaniti (2014) and Armstrong et al. (2015) may be due to task effect (i.e., narrative and direction in Ritchart and Arvaniti (2014) and narrative in Armstrong et al. (2015)), these findings demonstrate that the association of uptalk with a particular gender or region may not be as strong as one would expect.

1.3. Uptalk in Spanish

Compared to English, uptalk has not been extensively studied in Spanish. English speakers' use of uptalk in Spanish has been considered as an indication of transfer from English phonology (Buck 2016; Henriksen et al. 2010; Méndez Seijas 2019; Trimble 2013; Zárate-Sández 2018). Longitudinal studies examining the effects of study abroad experience on L2 Spanish intonation have shown that, after completing study abroad programs in Spanish-speaking countries, some English L2 learners produced fewer uptalks in Spanish than they used to when they first started (Buck 2016; Henriksen et al. 2010; Trimble 2013). Given that these learners generally demonstrated high proficiency in Spanish (Henriksen et al. 2010) or more interactions with native speakers (Trimble 2013), it is likely that they developed native-like patterns. However, as Trimble (2013) noted, native Spanish speakers produce variable intonation patterns, especially in informal speech. Although Trimble (2013) did not specifically mention uptalk, the use of uptalk has been reported in Spanish.

Vergara (2015) analyzed the speech of monolingual speakers of Peninsular Spanish from a Spanish reality TV show and found that all speakers, both male and female, produced uptalks in Spanish to express various discourse functions (e.g., hold the floor, show camaraderie, soften a command). However, female speakers used uptalks more frequently than male speakers and only the female speakers used them to flirt (Sp. *coqueteo*) during romantic interactions. The two main melodies found were L* LH% and L+H* HH%. Henriksen (2017) also reported that uptalk is commonly used in Peninsular Spanish[1], but male speakers produced more rises than female speakers, with greater pitch excursion and rise duration. The discrepancy found in the two studies may be due to different analysis methods. Vergara (2015) reported the raw number of uptalks, whereas Henriksen (2017) presented the percentage of rises.

Uptalk has also been observed in Mexican Spanish, especially in the speech of *fresas* (Barranco Márquez 2015; Holguín-Mendoza 2011; Martínez-Gómez 2018). *Fresa* (i.e.,

[1] The report in Henriksen (2017) is based on the data from an ongoing research project in which he is collaborating with Meghan Armstrong-Abrami and Lorenzo García-Amaya.

'strawberry' in Spanish) is a popular term widespread in Mexico that is used to "designate a person, especially women, who are or try to appear from the upper class by behaving, dressing, and speaking in a manner perceived as snobbish towards other people" (Holguín-Mendoza 2011, p. 36). While *fresas* are generally associated with expensive lifestyles, they are also known for their distinctive ways of speaking (Córdova Abundis and Zenil 2002; Martínez-Gómez 2018).

Some of the linguistic stereotypes of *fresa*-style speech include the use of English words, excessive use of certain words or discourse markers (e.g., *güey* 'dude', *o sea* 'I mean', *tipo de que/así como* 'be like'), vowel lengthening, and question-like rising intonation in non-questions (i.e., uptalk) (Martínez-Gómez 2018). Holguín-Mendoza (2011) examined the speech patterns of young women in Juárez, Mexico, which borders El Paso, Texas. She found many instances of uptalk typical of *fresa*-style speech, which resemble the contours of yes-no questions (e.g., LH% and (H)H%) reported in Mexico City Spanish (De la Mota et al. 2010). These patterns were mostly found in a group of speakers who are from families with economic resources, live in the most affluent area in the city, conveniently cross the US-Mexico border by car, and have access to a bilingual lifestyle[2]. Interestingly, these speakers also used northern regional intonational patterns (e.g., H+L* followed by a level boundary tone), demonstrating a *fronterizo*/border identity.

In a study on *fresa*-style speech in Guadalajara, which is a city in western Mexico, Martínez-Gómez (2018) demonstrated that, regardless of gender, uptalk is commonly found in the speech of young speakers in the Guadalajara Metropolitan Area. Moreover, speakers who were perceived as less *fresa*-sounding produced more cases of uptalk. Martínez-Gómez (2018) examined the phonetic realization of uptalk and found that the uptalks in *fresa*-style speech were produced with greater pitch excursion (9.6 semitones) and rise slope (41.2 semitones per second) than those in non-*fresa*-style speech (pitch excursion: 8 semitones, rise slope: 25.4 semitones per second). Thus, Martínez-Gómez (2018) argued that a *fresa* persona is not indexed by a rising contour in declaratives per se, but by a specific type of rising contour, that is a sharp rise, which is often accompanied by other features such as IP-final lengthening and stop lenition. Thus, although uptalk in *fresa*-style speech is not as frequent as one would expect, its distinctive contour may be perceived as a marked form.

The findings of the above-mentioned studies demonstrate that uptalk is present in societies where Spanish is the majority language (i.e., Spain and Mexico). However, users of uptalk in these studies were either fluent English speakers (Holguín-Mendoza 2011) or no information on their English proficiency or use was reported (Henriksen 2017; Martínez-Gómez 2018; Vergara 2015). Thus, more research on the uptalk of Spanish monolingual varieties should be carried out.

2. The Present Study

In this study we examine the phonology and phonetics (i.e., forms) of uptalk in heritage Spanish spontaneous speech. The use of uptalk by Spanish heritage speakers in the US has been reported in a few studies (Kim and Repiso-Puigdelliura 2018; Zárate-Sández 2018), but very little is understood on the nature of heritage Spanish uptalk. Zárate-Sández (2018) found that Spanish heritage speakers and English L2 learners of Spanish in Northeastern US produced final boundary tones of declarative sentences with pitch height that was between that of English monolinguals (highest) and Spanish non-heritage native speakers (lowest). Although no significant group difference was found, except for the two control groups, there was a moderate inverse relationship between Spanish proficiency and final boundary tone height (i.e., English monolinguals > intermediate proficiency L2 learners > high proficiency L2 learners > very high proficiency L2 learners > heritage speakers >

[2] While these speakers are fluent Spanish-English bilinguals, Holguín-Mendoza (2011) distinguishes them from Mexican Americans who are ethnic minorities in the US and corporate professionals whose use of both Spanish and English is limited to formal settings. The use of English by young women in Juárez is a speech style that "follows an emerging commodified social lifestyle of the upper classes in first world countries that are part of the cosmopolitan elite within this maximized capitalist global world" (Holguín-Mendoza 2011, p. 131).

Spanish non-heritage native speakers). While uptalk was not the main purpose of the study, Zárate-Sández (2018) suggested that heritage speakers' and L2 learners' higher boundary tone height compared to non-heritage native speakers may be due to their production of uptalks in some sentences.

In an earlier study (Kim and Repiso-Puigdelliura 2018), we also observed many instances of uptalk in the speech of heritage speakers of Mexican Spanish in Southern California. Using the MAE-ToBI (Mainstream American English Tone and Break Indices) annotation system (Beckman et al. 2005; Pierrehumbert 1980; Pierrehumbert and Beckman 1988), we compared the intonation contours of uptalks in heritage Spanish to those reported in California English (Armstrong et al. 2015; Ritchart and Arvaniti 2014). Results showed that the contours commonly found in California English (e.g., low rise L-H%, level boundary tone H-L%) were also observed in heritage Spanish. While heritage speakers' production of uptalk may be due to influence from English (i.e., majority language), a careful examination of heritage speakers' homeland varieties should take place beforehand to confirm whether similar patterns of uptalk occur in monolingual speech.

The objective of this study is to identify areas of divergence in heritage Spanish uptalk as a first step toward understanding the sources of divergence. In the remainder of this section, we present the experimental design of the study. In Section 3, we (1) confirm whether monolingual speakers of Mexican Spanish with little knowledge of English produce uptalk and (2) compare the phonology and phonetics of uptalk produced by heritage speakers and monolingual speakers of Mexican Spanish. In Section 4, we discuss the differences and similarities between the two groups and suggest avenues for future research to identify the sources of divergence. Lastly, in Section 5 we present the conclusion of the study.

2.1. Participants

In this study we collected speech data of 16 heritage speakers (12F, 4M) and 16 monolingual speakers of Mexican Spanish (8F, 8M). The heritage speakers were Mexican Americans born and raised in Southern California, whose parents (i.e., their primary caregivers) immigrated to the US as adults from various parts of Mexico[3]. All of the heritage speakers acquired both Spanish and English before age 5 and none of them had lived in a Spanish-speaking foreign country for more than 1 year. Heritage speakers' language dominance was evaluated using the Bilingual Language Profile (BLP) (Birdsong et al. 2012) which is a questionnaire that generates a continuous score from −218 to 218 based on participants' responses to questions regarding their language history, language use, language proficiency, and language attitudes in their two languages. Positive scores indicate dominance in English and negative scores indicate dominance in Spanish. A score of zero or close to zero indicates balanced bilingualism. Based on the BLP scores, 12 heritage speakers were English-dominant (M = 42.7, SD = 19.4) and 4 speakers were balanced bilinguals (M = −5.7, SD = 2.6). All of the heritage speakers were undergraduate students at the University of California, Los Angeles (UCLA).

The Spanish monolingual speakers were Mexicans born and raised in central Mexico. All of them, except for two speakers, were undergraduate students at the National School of Anthropology and History (ENAH). The other two speakers were undergraduate students at the National Autonomous University of Mexico (UNAM) and the National Polytechnic Institute of Mexico (IPN). All three universities are renowned public higher education institutions based in Mexico City and are either tuition-free or with low tuition, which makes their education and service easily accessible to students of low-income families. The monolingual speakers reported that they exclusively use Spanish on a daily basis (98.6%).

[3] The parents of seven heritage speakers were from central Mexico (e.g., Mexico City, Puebla, Morelos) and the parents of an additional seven heritage speakers were from the western region (e.g., Jalisco, Michoacán). The parents of the remaining two heritage speakers were from the southern region (e.g., Oaxaca, Guerrero). In this study, we only controlled for parents' country of origin (i.e., Mexico) and did not take into account possible regional variations of uptalk in Mexican Spanish. However, as one of the reviewers pointed out, parents' regional varieties may have an effect on heritage speakers' realization of uptalk. We further examined this factor in Section 3.3 and discuss the findings in Section 4.2.

Although some of the speakers learned a foreign language at school (i.e., English), they reported that they had little knowledge of it. None of them learned English before age 10 or have lived in a foreign country for more than a month.

Table 1 summarizes participants' language profile. As demonstrated in Table 1, the heritage speakers clearly differed from their monolingual peers in the age of acquisition of English and in their language use. As for Spanish proficiency, we conducted an oral picture-naming task to measure heritage speakers' lexical knowledge, which is a powerful diagnostic of heritage language proficiency (Polinsky and Kagan 2007), and compared their accuracy (i.e., percentage of correct responses) and response time (i.e., speed of lexical activation of correct responses in seconds) to those of the monolingual speakers. Results of independent samples *t*-tests in R (R Development Core Team 2020) showed that heritage speakers had significantly fewer correct responses (88.31%) than the monolinguals (98%) ($t(30) = -7.321$, $p < 0.001$) and they took significantly longer (0.96 s) in answering correct responses than the monolinguals (0.49 s) ($t(30) = 5.842$, $p < 0.001$). Heritage speakers' accuracy and response time did not show any significant correlation with their use of Spanish or English ($ps > 0.4$). These findings suggest that the heritage speakers in this study had lower proficiency in Spanish than the monolingual speakers and their proficiency was not related to the amount of Spanish/English use.

Table 1. Participant's language profile.

	Monolingual Speakers	**Heritage Speakers**
N	16 (8F, 8M)	16 (12F, 4M)
Age (year)	24.4 (2.1)	21.63 (2.47)
Spanish AOA (year)	0 (0)	0.38 (0.88)
English AOA (year)	15.57 (2.82)	3.56 (1.5)
Spanish Use	98.56% (2.85)	35.5% (20.72)
English Use	1.44% (2.85)	63.63% (20.41)
Spanish Prof: Accuracy	98% (0.89)	88.31% (5.22)
Spanish Prof: RT (second)	0.49 (0.12)	0.96 (0.3)

(AOA: Age of Acquisition; Prof: Proficiency; RT: Response Time).

2.2. Procedures

Before the study started, the participants read and signed a written informed consent form in the language they preferred (i.e., Spanish or English). After signing the consent form, the participants completed a dyadic interaction task in which they worked in pairs and discussed social issues of their respective cities (i.e., Los Angeles for the heritage speakers and Mexico City for the monolingual speakers) in Spanish. The topics included racism, undocumented immigrants, safety of women, maintenance of Spanish language, and housing. Spontaneous speech during the interactions was recorded using two AKG C520 head-mounted microphones and a Zoom H4n digital recorder with a sampling rate of 44.1 kHz and a sample size of 16 bits. After the dyadic interaction task, the participants completed a picture-naming task, the results of which were used as a proxy for Spanish proficiency (see Section 2.1), the BLP (Birdsong et al. 2012)[4], and a language background questionnaire. Heritage speech data were collected at UCLA by Mexican American research assistants who are native Spanish-English bilingual speakers and the monolingual speech data were collected at ENAH by the first author who is a fluent L2 speaker of Spanish. All instructions were provided in Spanish and data collection in both testing sites was conducted in sound-attenuated rooms.

2.3. Coding and Analysis

We analyzed the phonological and phonetic properties of rising intonation contours at the end of an Intonation Phrase (IP) regardless of the sentence type. IP-final boundary

[4] The Bilingual Language Profile was only administered to the heritage speakers.

corresponds to the level 4 break index (i.e., strong disjuncture with clear tonal and segmental evidence) in the Spanish Tones and Break Indices (Sp_ToBI) annotation system (Beckman et al. 2002; Prieto and Roseano 2010). Although there are various cues to intonational phrasing (e.g., pause, pitch reset, pre-boundary lengthening) (Frota et al. 2007), in this study we used pause at the right edge of the phrase as the main cue to IP-final boundary. Pauses often surface as a stretch of silence or glottalization in the speech signal, but we also included cases in which the pauses were clearly perceivable, although such acoustic manifestations were not present. These cases usually involved additional prosodic cues, such as pitch reset and pre-boundary lengthening. The utterance types were classified as either uptalk (i.e., non-questions) or questions, and the location of the rise onset was annotated by counting the number of words and syllables from the right edge of the IP (i.e., Nth word and Nth syllable from the end).

The intonation contours of IP-final rises were labeled using the Sp_ToBI labeling conventions (Beckman et al. 2002; De la Mota et al. 2010; Estebas-Vilaplana and Prieto 2009; Prieto and Roseano 2010). First, a limited set of possible nuclear configurations of rising contours were determined with special reference to the ones reported in monolingual Mexican Spanish (De la Mota et al. 2010) and heritage Mexican Spanish (Rao 2016; Robles-Puente 2014). Table 2 presents the nuclear configurations considered in this study. The description of each nuclear configuration is adapted from Aguilar et al. (2009).

Table 2. Types of nuclear configuration considered in the present study.

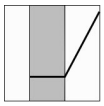
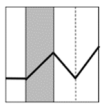
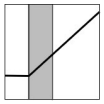
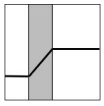
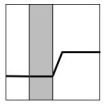
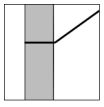
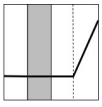
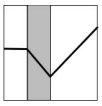
Nuclear Configuration	Schematic Representation	Description
L* (H)H%		Low plateau during the stressed syllable followed by a rise to a high level.
L+H* LH%		Rise during the stressed syllable followed by a fall to a low level and a rise to a high level.
L+H* (H)H%		Rise during the stressed syllable that continues into the following syllables.
L+H* !H%		Rise during the stressed syllable followed by a high plateau.
L* M%		Low plateau during the stressed syllable followed by a mid or a high plateau.
!H* H%		High plateau during the stressed syllable followed by a rise to a high level.
L* LH%		Low plateau during the stressed syllable which extends to the following syllable and then pitch rises to a high level.

Table 2. *Cont.*

Nuclear Configuration	Schematic Representation	Description
H+L* (H)H%		Fall during the stressed syllable followed by a rise to a high level.
H+L* LH%		Fall during the stressed syllable followed by a low plateau and then a rise to a high level.
Other		Intonation contours that are different from the classifications above or that are ambiguous.

The two authors independently annotated a subset of the data taken from both speaker groups (i.e., 229 tokens; 27.7% of the entire data). In order to avoid tonal crowding, which may result in temporal reorganization of the tonal gestures (Prieto 2002), we excluded tokens in which the syllable bearing the nuclear pitch accent coincided with that of the boundary tone, as in the cases of monosyllabic words (e.g., *más* 'more') and oxytones (e.g., *comunidad* 'community') at the end of an IP. Intercoder reliability of the classification of nuclear configurations was tested using Cohen's Kappa, which was performed using the *irr* package (Gamer et al. 2019) in R (R Development Core Team 2020). Results showed that there was a substantial agreement between the two coders ($\kappa = 0.761$, $p < 0.001$), according to Landis and Koch (1977) interpretation of the Kappa coefficient. Thus, we divided the annotation of the remainder of the data.

With regard to the phonetic properties of rising contours, we analyzed pitch excursion (i.e., magnitude of rise) and rise slope (i.e., steepness of rise). To measure the pitch excursion, we extracted the f0 (Hz) of the tonal peaks and valleys of the areas corresponding to the nuclear configurations using a script in Praat (Boersma and Weenink 2020). We then calculated the differences between the two points, and converted the values into semitones (st) (=12 * log2[F0max/F0min]), which is a logarithmic scale that is considered to best reflect listeners' intuitions about intonational equivalence (Nolan 2003; Pépiot 2014; Simpson 2009). The exact locations of the tonal peaks and valleys were determined semi-automatically by selecting the regions in which these points were identified. We excluded tokens in which the tonal peaks or valleys were located within a voiceless segment or if the segment was produced with a creak. For the rise slope, the pitch excursion (st) was divided by the duration in seconds (s) between the tonal peaks and valleys. All statistical analyses and plotting were performed using R (R Development Core Team 2020).

3. Results

In total, 828 cases of rising terminals were obtained from the dyadic discussion task. Among them, 795 tokens were uptalks and 33 tokens were questions. Due to the small number of question tokens (4%)[5], we will focus on the findings of uptalks. The heritage speakers produced fewer cases of uptalks (M = 17.2 times, SD = 7.2) than the monolingual speakers (M = 34.8 times, SD = 17.5), but their speech was also shorter (M = 307 s, SD = 163.1) than the monolinguals (M = 436.4 s, SD = 171.9)[6]. Thus, we calculated the number of uptalks per second (s) as a measure of normalization. According to the results obtained from an independent samples *t*-test, there was no significant difference between the normalized frequency of uptalks between the heritage speakers (M = 0.06 time/s, SD = 0.02) and the monolingual speakers (M = 0.08 time/s, SD = 0.03) ($t(30) = -1.708$, $p = 0.098$).

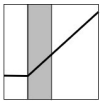
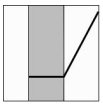
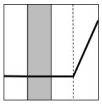
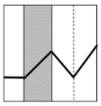
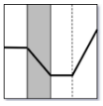
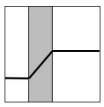
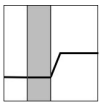
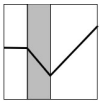
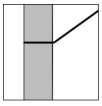
[5] The low number of question tokens obtained in our data is possibly due to the discussion nature of the task, in which the participants mainly conveyed their opinions and expressed agreement or disagreement to the interlocutor's opinions, rather than asking questions to each other.

[6] Here we only measured the duration of non-question speech where uptalks can appear.

3.1. Intonation Contours of Uptalk

Table 3 demonstrates the frequency of nuclear configurations in uptalks produced by the monolingual speakers and the heritage speakers. In the "other" category, we found H* LH% (N = 3) and L*+H HH% contours (N = 5), which we will not analyze further due to small sample size.

Table 3. Productions of nuclear configurations in uptalks.

Nuclear Configuration	Schematic Representation	Monolingual Speakers	Heritage Speakers
L+H* (H)H%		180 (33%)	78 (31.2%)
L* (H)H%		111 (20.4%)	85 (34%)
L* LH%		62 (11.4%)	15 (6%)
L+H* LH%		57 (10.5%)	4 (1.6%)
H+L* LH%		54 (9.9%)	7 (2.8%)
L+H* !H%		46 (8.4%)	32 (12.8%)
L* M%		10 (1.8%)	17 (6.8%)
H+L* (H)H%		10 (1.8%)	3 (1.2%)
!H* H%		9 (1.7%)	7 (2.8%)
Other		6 (1.1%)	2 (0.8%)
Total		545	250

For both speaker groups, the two most frequently used nuclear configurations when producing uptalks were L+H* (H)H% and L* (H)H%, which comprised more than 50% of the data. When comparing the nuclear configurations of the two groups, we observed that certain intonation contours were used more frequently in one group than the other. For instance, the monolingual speakers produced bitonal boundary tones (e.g., LH%) more frequently than the heritage speakers and the heritage speakers produced level boundary tones (e.g., !H%, M%) more frequently than the monolingual speakers (see Table 3). Similarly, the monolingual speakers produced bitonal pitch accents (e.g., L*+H, H+L*) more frequently than the heritage speakers and the heritage speakers produced monotonal pitch accents (e.g., L*, !H*) more frequently than the monolingual speakers. Since nuclear configurations are combinations of boundary tones and pitch accents, we

conducted Cochran-Mantel-Haenszel (CMH) tests using the mantelhaen.test function in the stats package (R Development Core Team 2020) to examine whether there is an association between speaker group and IP boundary tones while controlling for the pitch accents, and whether there is an association between speaker group and pitch accents while controlling for the boundary tones. Due to small cell counts in some nuclear configurations, we used simplified boundary tones (i.e., non-bitonal rising, bitonal rising, and level) and pitch accents (i.e., monotonal and bitonal). A three-way contingency table with group, simplified boundary tone, and simplified pitch accent is shown in Table 4.

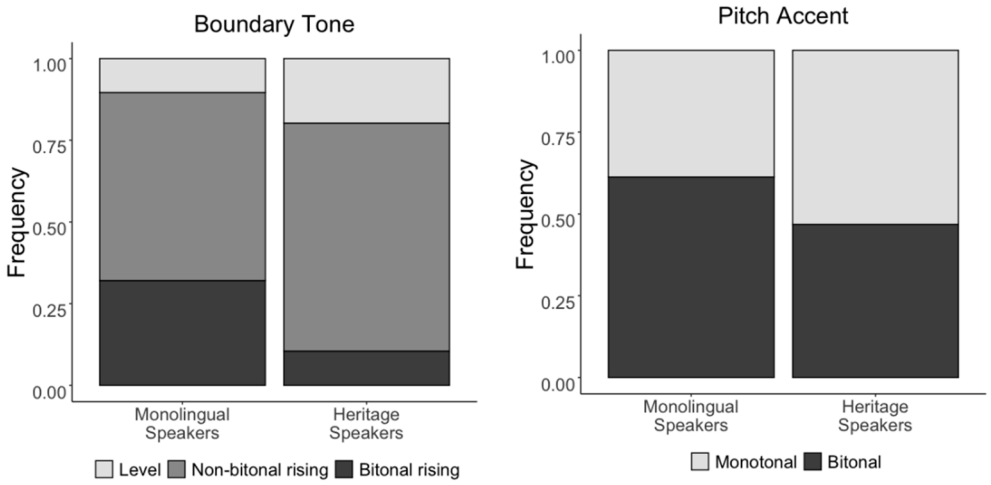
Table 4. Cross-tabulation of group, boundary tone (simplified), and pitch accent (simplified).

	Monolingual Speakers				**Heritage Speakers**			
	Boundary Tone				**Boundary Tone**			
	Level	Non-Bitonal Rising	Bitonal Rising	Total	Level	Non-Bitonal Rising	Bitonal Rising	Total
Pitch Accent: Monotonal	10 (5.2%)	120 (62.5%)	62 (32.3%)	192	17 (13.7%)	92 (74.2%)	15 (12.1%)	124
Pitch Accent: Bitonal	46 (13.3%)	190 (54.8%)	111 (32%)	347	32 (25.8%)	81 (65.3%)	11 (8.9%)	124

Results showed that there was a significant relationship between groups and boundary tones when controlling for the pitch accents (χ^2 (2, N = 787) = 49.459, $p < 0.001$). We conducted a post-hoc analysis with chi-square tests with the Bonferroni correction using the groupwiseCMH function in the rcompanion package (Mangiafico 2020), which revealed that the significant relationship between groups and boundary tones remained in both pitch accents (adj.*ps* < 0.001). Thus, we further compared the proportions of the boundary tones between the two groups in each pitch accent condition using Fisher's exact test with the Bonferroni correction. Results confirmed that, regardless of the pitch accent, the monolingual speakers produced significantly more bitonal rising boundary tones than the heritage speakers (monotonal pitch accent: 32.3% vs. 12.1%, adj.$p < 0.001$; bitonal pitch accent: 32% vs. 8.9%, adj.$p < 0.001$) and they produced significantly fewer level boundary tones than the heritage speakers (monotonal pitch accent: 5.2% vs. 13.7%, adj.$p < 0.05$; bitonal pitch accent: 13.3% vs. 25.8%, adj.$p < 0.01$). However, no significant difference was found between monolingual speakers' and heritage speakers' use of non-bitonal rising boundary tones (monotonal pitch accent: 62.5% vs. 74.2%, adj.$p = 0.185$; bitonal pitch accent: 54.8% vs. 65.3%, adj.$p = 0.246$).

Regarding the association between groups and pitch accents, results showed that the relationship between these two variables was significant when controlling for the boundary tones (χ^2 (1, N = 787) = 17.062, $p < 0.001$). A post-hoc analysis with chi-square tests with the Bonferroni correction revealed that the significant relationship between groups and pitch accents held for non-bitonal rising boundary tones (adj.$p < 0.01$), but not for bitonal rising ($p = 0.166$) and level boundary tones ($p = 0.243$). We compared the proportions of the pitch accents between the two groups in non-bitonal rising boundary tones using Fisher's exact test with the Bonferroni correction. Results confirmed that, in non-bitonal rising boundary tones, the monolingual speakers produced significantly more bitonal pitch accents than the heritage speakers (61.3% vs. 46.8%, adj.$p < 0.01$) and they produced significantly fewer monotonal pitch accents than the heritage speakers (38.7% vs. 53.2%, adj.$p < 0.01$).

The higher proportions of bitonal rising boundary tones and bitonal pitch accents and the lower proportions of level boundary tones in monolingual speech suggest that the monolingual speakers produced uptalks with more dynamic contours than the heritage speakers. Figure 1 demonstrates the frequency of boundary tones and pitch accents in the two groups.



(**a**) (**b**)

Figure 1. (**a**) Frequency of boundary tones across pitch accents; (**b**) Frequency of pitch accents in non-bitonal rising boundary tones.

With regard to the questions, very few cases were obtained in our data (33 tokens, 4%), thus, we did not conduct statistical analysis on the question data. Nonetheless, we found a pattern that was similar to the case of uptalks; L* (H)H% and L+H* (H)H% were the two most frequently produced nuclear configurations by both the monolingual speakers (L* (H)H%: N = 6, 40%; L+H* (H)H%: N = 7, 46.7%) and the heritage speakers (L* (H)H%: N = 8, 44.4%; L+H* (H)H%: N = 6, 33.3%). Other nuclear configurations observed were H+L* (H)H% (N = 1) and L+H* LH% (N = 1) in the monolingual speaker data and !H* H% (N = 3) and L+H* !H% (N = 1) in the heritage speaker data.

3.2. Phonetic Realization of Uptalks

For the analysis of the phonetic properties of rising contours, out of the 828 cases, we excluded 340 tokens due to missing f0 peaks and f0 valleys (see exclusion criteria above). Moreover, we only considered paroxytones in nuclear position in order to control for the number of syllables between the f0 peaks and f0 valleys. In this process we additionally excluded 40 tokens in which the nuclear stress fell on proparoxytones (N = 41) or on non-IP-final words (N = 5). This left us with 443 tokens to analyze, among which 428 tokens were uptalks (monolingual speakers: 300 tokens, heritage speakers: 128 tokens) and 15 tokens were questions (monolingual speakers: 6 tokens, heritage speakers: 9 tokens).

Figure 2 demonstrates the pitch excursion and the rise slope of uptalks produced by the monolingual speakers and the heritage speakers. To examine the effect of group on these measures, we conducted linear mixed-effects modeling using the *lmer* function in the *lme4* package (Bates et al. 2015). The speaker groups (i.e., monolingual speakers vs. heritage speaker) were compared using simple coding in which each level is compared to the reference level and the intercept is the grand mean. For pitch excursion, the model included participant and item as random effects. The best fitting model through backward elimination of random-effect terms included random intercepts for participant and item without any random slope. Results showed that the monolingual speakers (i.e., the reference level) produced uptalks with greater pitch excursions (M = 8.4 st, SD = 4.3) than the heritage speakers (M = 7 st, SD = 4.7), a trend that approached significance ($\beta = -1.466$, SE = 0.786, t = −1.865, $p = 0.072$).

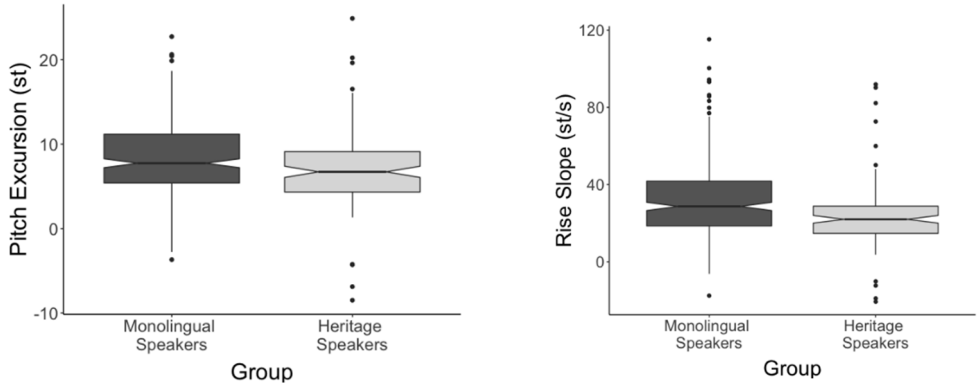


Figure 2. (**a**) Pitch excursion (st) of uptalks by group; (**b**) Rise slope of uptalks (st/s) by group.

With regard to the rise slope, due to extremely low item-level variation in this measure (=0.00), the inclusion of both participant and item as random effects resulted in a singular fit. Thus, in this model we only included participant as a random effect. The best fitting model included random intercept for participant without any random slope. Results showed that the monolingual speakers produced significantly steeper uptalks (M = 32.3 st/s, SD = 19.2) than the heritage speakers (M = 23.5 st/s, SD = 16.4) ($\beta = -8.891$, SE = 3.033, t = −2.932, $p < 0.01$)[7].

With respect to the questions, due to the small sample size (15 tokens, 3.4% of the data), we only present the results of descriptive statistics. The mean pitch excursion was 7.2 st (SD = 4.4) for the monolingual speakers and 5.7 st (SD = 1.5) for the heritage speakers. The mean rise slope was 23.3 st/s (SD = 14.7) for the monolingual speakers and 24.4 st/s (SD = 9.5) for the heritage speakers. While more data are needed to test the significance of the differences, these values were between the uptalks of monolinguals and those of heritage speakers.

3.3. Individual Variation in Heritage Spanish Uptalks

Since the heritage speakers varied in the degree of language dominance and parents' regions of origin, we further examined possible effects of these factors on the use of boundary tones and pitch accents that were found to be distinct from the monolingual speakers: bitonal rising boundary tones (monolingual speakers > heritage speakers), level boundary tones (monolingual speakers < heritage speakers), and bitonal pitch accents with non-bitonal rising boundary tones (monolingual speakers > heritage speakers). We performed logit mixed-effects modeling with BLP scores and parents' regions of origin (i.e., central vs. non-central) as fixed effects and participant as a random effect[8]. The best fitting models included random intercept for participant without any random slope. Results showed that language dominance did not have an effect on the frequency of bitonal boundary tones (see Figure 3a), while it did on the frequency of level boundary tones ($\beta = 0.033$, SE = 0.026, z = 2.625, $p < 0.01$; see Figure 3b) and bitonal pitch accents ($\beta = 0.037$, SE = 0.01, z = 3.718, $p < 0.001$; see Figure 3c). That is, the heritage speakers demonstrated conflicting patterns in that those who are more English-dominant (i.e., higher BLP scores) produced both level boundary tones (i.e., less monolingual-like) and bitonal pitch accents (i.e., more monolingual-like) more frequently than those who are less English-dominant.

[7] We additionally compared the rise duration between the two groups using linear mixed effects modeling with group as a fixed effect and participant and item as random effects. The best fitting model included random intercepts for participant and item without any random slope. Results did not show any significant difference between the heritage speakers (M = 0.315 s, SD = 0.096) and the monolingual speakers (M = 0.298 s, SD = 0.122) ($p = 0.3$), suggesting that both groups spent similar time in producing the uptalks.

[8] Similar to the case of rise slope in Section 3.2, in all three models the inclusion of both participant and item as random effects resulted in singular fits due to extremely low item-level variation (=0.00). This was also the case for the phonetic properties of uptalks (i.e., pitch excursion, rise slope). Thus, we only included participant as a random effect.

Parents' region of origin (i.e., whether they are from central Mexico or not) did not have an effect on any of the models.

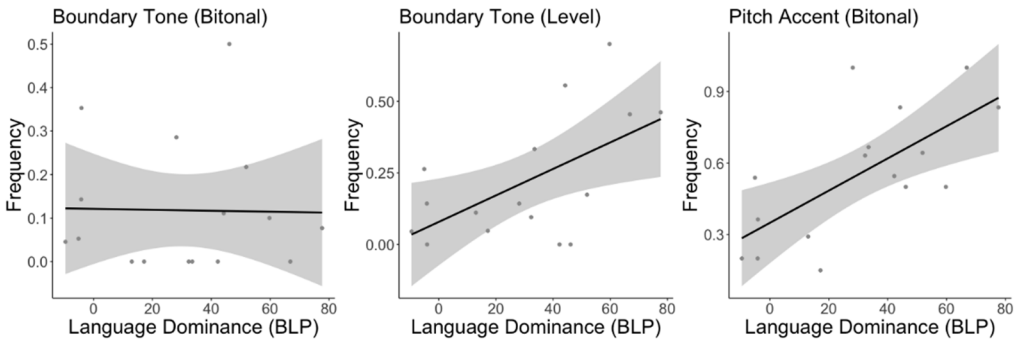


Figure 3. (**a**) Frequency of bitonal rising boundary tones by language dominance (BLP); (**b**) Frequency of level boundary tones by language dominance (BLP); (**c**) Frequency of bitonal pitch accents (with non-bitonal rising boundary tones) by language dominance (BLP).

With regard to the phonetic realization of uptalks, we examined the effects of the same factors (i.e., language dominance, parents' place of origin) on pitch excursion and rise slope using linear mixed-effects modeling with participant as a random effect. The best fitting models included random intercept for participant without any random slope. Results showed that the effect of language dominance was significant or approached significance (pitch excursion: $\beta = -0.053$, SE = 0.022, t = −2.447, $p < 0.05$; rise slope: $\beta = -0.163$, SE = 0.083, t = −1.967, $p = 0.071$). As shown in Figure 4, heritage speakers who are more English-dominant (i.e., higher BLP scores) produced uptalks with a smaller pitch excursion and a flatter slope (i.e., less monolingual-like) than those who are less English-dominant. Parents' regions of origin did not have an effect on any of the models.

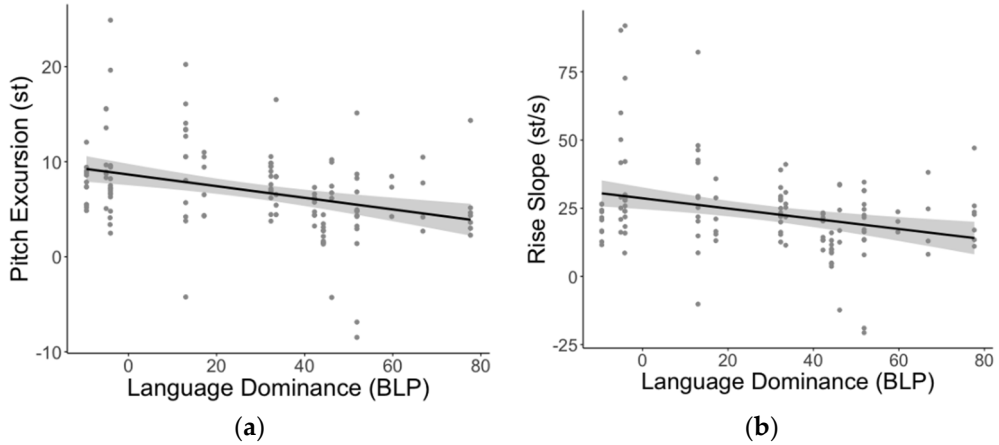


Figure 4. (**a**) Pitch excursion (st) of uptalks by language dominance (BLP); (**b**) Rise slope of uptalks (st/s) by language dominance (BLP).

4. Discussion

In this study, we examined the variation of uptalks produced by heritage speakers and monolingual speakers of Mexican Spanish. Spanish-English bilinguals' use of uptalk in Spanish has often been regarded as an indication of transfer from English intonation (Buck 2016; Henriksen et al. 2010; Méndez Seijas 2019; Trimble 2013; Zárate-Sández 2018). This is because uptalk is generally associated with English, especially the valley girl speech in California English (Ritchart and Arvaniti 2014; Tyler 2015). Although uptalk has

attracted little attention in Spanish intonation literature, some studies have reported the use of uptalk in spontaneous speech[9] (Henriksen 2017; Holguín-Mendoza 2011; Martínez-Gómez 2018; Vergara 2015). Particularly in Mexican Spanish, which is the dialect that the heritage speakers in this study use, uptalk is a stereotypical feature of *fresa*-style speech (Holguín-Mendoza 2011; Martínez-Gómez 2018), although it occurs in both *fresa*- and non-*fresa*-style speech (Martínez-Gómez 2018). Thus, in this study we compared heritage speakers' speech to that of monolingual speakers of Mexican Spanish with the goal to determine whether uptalk in heritage Spanish is a divergent feature. Here we would like to underline that the comparison with monolingual speakers was not to test whether heritage speakers successfully acquired target linguistic features, but to confirm whether heritage speakers diverge from monolingual speakers in these features. We believe that this is a preliminary step that heritage language research should take before discussing the source(s) of divergence, especially if the target linguistic features in monolingual varieties are not well understood.

One of the objectives of our study was to confirm whether monolingual speakers of Mexican Spanish with little knowledge of English produce uptalk. Using spontaneous speech data, we found that the monolingual speakers also used uptalks and they did so with similar (normalized) frequencies as the heritage speakers. While uptalk is generally associated with *fresa*-style speech in Mexico, we do not believe that the participants in our study used uptalk to express a *fresa* persona. Most of the heritage speakers and the monolingual speakers were from working class families, according to their parents' highest level of education and occupation. Moreover, all participants demonstrated activist views toward racism and classism during their interactions, which does not conform to the *fresa* identity that supports capitalism and expresses commodified upper class lifestyles (Holguín-Mendoza 2011; Martínez-Gómez 2018). Thus, the monolingual data in our study support Martínez-Gómez (2018) who demonstrated that uptalk is found in both *fresa*- and non-*fresa*-style speech.

4.1. Similarities and Differences between Heritage Speakers and Monolingual Speakers

We compared the phonological and phonetic properties of uptalks produced by heritage speakers and monolingual speakers. First we examined the nuclear configurations of the uptalks. For both the heritage speakers and the monolingual speakers the two most common patterns were L+H* (H)H% and L* (H)H%. However, when comparing the boundary tones, we found that, regardless of the pitch accents, the heritage speakers produced bitonal rising boundary tones (e.g., LH%) less frequently (10.5%) than the monolingual speakers (32.1%), and produced level boundary tones (e.g., !H%, M%) more frequently (19.8%) than the monolingual speakers (10.4%). With regard to the non-bitonal rising boundary tones (e.g., (H)H%), the heritage speakers produced them slightly more frequently (69.8%) than the monolingual speakers (57.5%), but the difference between the two groups was not statistically significant. We found a similar pattern when examining the pitch accents. That is, the heritage speakers produced bitonal pitch accents (e.g., L+H*, H+L*) less frequently (50%) than the monolingual speakers (64.4%) and produced monotonal pitch accents (e.g., L*, H*) more frequently (50%) than the monolingual speakers (35.6%). The group difference was statistically significant only with non-bitonal rising boundary tones. These findings suggest that the monolingual speakers produced uptalks with more dynamic contours than the heritage speakers.

Figure 5 presents the distribution of intonation contours that represent different combinations of simplified pitch accents (i.e., bitonal and non-bitonal) and boundary

[9] We believe that speech style has a large effect on the occurrence of uptalk. For instance, in the *Transcription of Intonation of the Spanish Language* (Prieto and Roseano 2010), which provides an extensive description of the intonation patterns across Spanish dialects, high rising terminals in statements were not found in any dialects, except for the Cibaeño variety of Dominican Spanish (Willis 2010), which demonstrated H+L* H% and L+H* H% contours for broad focus statements, L+H* H% for statements of the obvious, and L+H* LH% for narrow focus and exclamative statements. These studies used a guided questionnaire to elicit intonation patterns of specific discourse functions. In a pilot study, we applied the same methodology to heritage Spanish, but did not find any instances of uptalk. Thus, it appears that the use of uptalk is limited to spontaneous speech.

tones (i.e., bitonal, non-bitonal rising, and non-bitonal level). The colors in Figure 5 indicate intonation contours from the most complex (in black) to the simplest (in light grey). While the heritage speakers and the monolingual speakers showed similar distributions of mismatching pitch accents and boundary tones (in grey), they showed a clear distinction in the two extreme cases. That is, compared to the monolingual speakers, the heritage speakers produced the simplest contour (i.e., non-bitonal pitch accents with non-bitonal boundary tones) more frequently and produced the most complex contour (i.e., bitonal pitch accents with bitonal boundary tones) less frequently. This pattern suggests that the heritage speakers produced uptalks with less pitch movement than the monolingual speakers. Figure 6 demonstrates an example of the L+H* LH% nuclear configuration (i.e., complex contour) of a monolingual speaker and an example of the L* M% nuclear configuration (i.e., simple contour) of a heritage speaker. Here only the tones associated with the nuclear configurations are annotated.

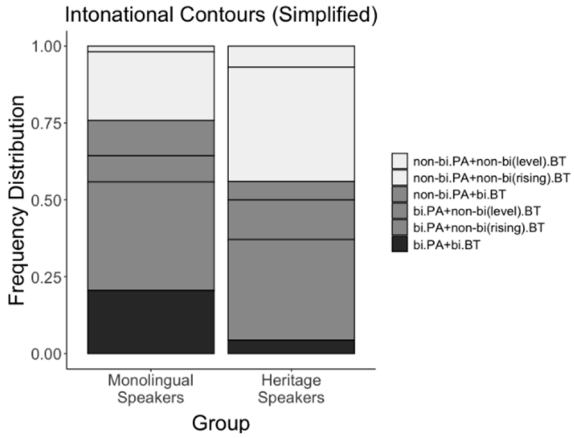
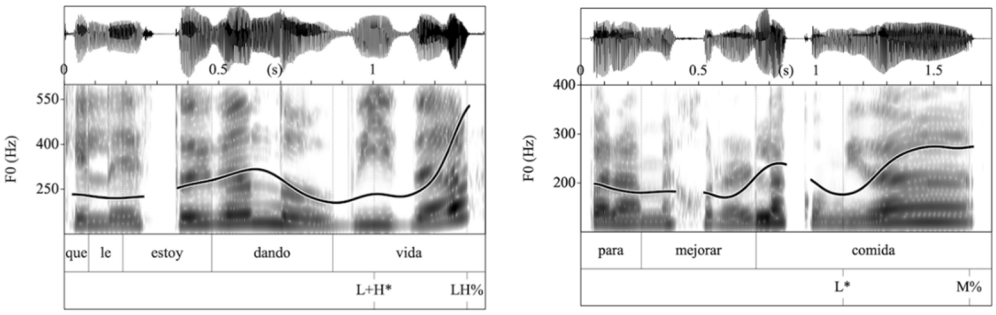


Figure 5. Frequency of simplified intonation contours (PA: Pitch accent; BT: Boundary tone; non-bi: Non-bitonal; bi: Bitonal).



(**a**) (**b**)

Figure 6. (**a**) Example of the L+H* LH% nuclear configuration (i.e., complex contour) of a monolingual speaker. *que le estoy dando vida* 'to whom I am giving life'; (**b**) Example of the L* M% nuclear configuration (i.e., simple contour) of a heritage speaker. *para mejorar la comida* 'to improve the food').

Heritage speakers' preference for simple intonation contours is very similar to the patterns found in North American English. In North American English, the three main variants of uptalk boundary tones that have been reported are high rising (H-H%), low rising (L-H%), and level tones (H-L%), which are followed by monotonal pitch accents (L*, H*) (Di Gioacchino and Jessop 2010; Prechtel and Clopper 2016; Ritchart and Arvaniti 2014). To our knowledge, no study has reported productive usage of bitonal pitch accents or bitonal boundary tones in the uptalks of North American English that resemble the ones found in our study.

Heritage speakers' use of monotonal pitch accents in Spanish is in line with the findings of previous studies on heritage speakers of Mexican Spanish (Colantoni et al. 2016; Robles-Puente 2014). Robles-Puente (2014) found that, while heritage speakers produced the typical English H* pitch accent in Spanish in both nuclear and prenuclear positions, this pitch accent rarely appeared in the speech of long-term and recent immigrants from Mexico. Similarly, Colantoni et al. (2016) found that, although the most commonly used prenuclear pitch accent in Spanish was L+H* for both heritage speakers and long-term immigrants, the heritage speakers produced H* more often than the long-term immigrants. With regard to the boundary tones, we found that the heritage speakers produced significantly more level boundary tones than the monolingual speakers. Several studies on uptalks in North American English have shown that level boundary tones are used as productively as rising boundary tones (Armstrong et al. 2015; Di Gioacchino and Jessop 2010; Henriksen 2017; Podesva 2011; Prechtel and Clopper 2016).

In line with the dynamicity of pitch movement, another noteworthy difference between the uptalks in heritage speakers' and monolingual speakers' speech was that in some cases the heritage speakers initiated the rise in non-final words. Unlike the monolingual speakers whose rise onset always occurred in the last word of the IP, some heritage speakers produced uptalks with the rise starting from a non-IP-final word, ranging from the second to the fourth word from the end. Figure 7 shows an example of uptalk with early rise produced by a heritage speaker, in which the nuclear pitch accent falls on the second to the last content word of the IP (*raíces* 'roots') and the last content word (*español* 'Spanish') is deaccented. Here, only the tones associated with the nuclear configuration are annotated.

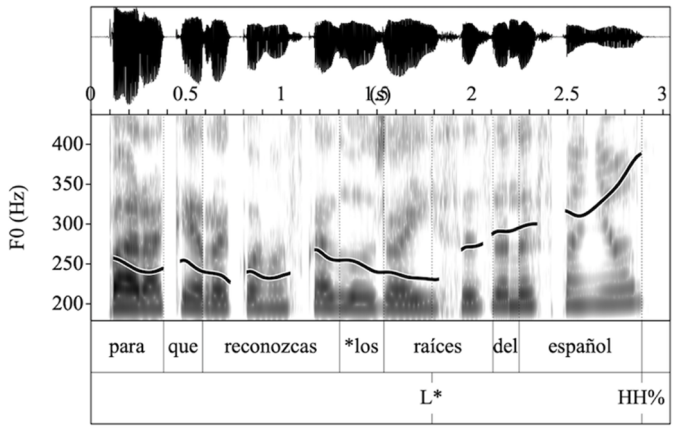


Figure 7. Example of an early rise produced by a heritage speaker. *para que reconozcas *los raíces del español* 'so that you recognize the roots of Spanish'.

Although uptalks with early rise occurred in only 3.2% of the heritage speaker data (i.e., 8 out of 248 cases), this finding merits attention. According to Jun (2014), both Spanish and English are head-prominence languages, but Spanish is more macro-rhythmic than English in that the domain of pitch accent in Spanish is approximately one content word, whereas in English it is often larger than a word. That is, unlike Spanish, in which each content word bears a pitch accent (i.e., more regular interval), not every content word carries a pitch accent in English (i.e., less regular interval). Moreover, as mentioned above, compared to English phrase-medial pitch accents that are most commonly level tones (e.g., H*, L*), Spanish frequently employs rising tones (e.g., L+<H*), demonstrating greater alternation of low and high tones (Jun 2014). Thus, heritage speakers' more frequent use of simple intonation contours compared to the monolingual speakers may be due to influence from English macro-rhythm.

With regard to the phonetic realization of uptalk, we examined the magnitude and the steepness of the rise. In order to control for the number of syllables between the start and the end of the rise, we only analyzed paroxytones. Our data showed that the rise in heritage

speakers' uptalks was flatter (23.5 st/s) and, to some extent, smaller (7 st) compared to the uptalks produced by the monolingual speakers (steepness: 32.3 st/s, magnitude: 8.4 st). Since the heritage speakers produced more cases of level boundary tones, which tend to be lower in pitch compared to rising boundary tones, we further analyzed the group difference only in rising boundary tones using linear mixed effects modeling. Results showed that while the magnitude of the rise was not different between the two groups ($p = 0.149$), the difference in slope remained significant ($\beta = -8.141$, SE = 3.238, $t = -2.514$, $p < 0.05$). Although we did not make a distinction between high and low rises, it is possible that the heritage speakers produced the uptalks with a low rising tone similar to the English L-H% boundary tone[10].

4.2. Toward an Understanding of the Sources of Divergence in Heritage Speakers' Uptalks

Based on our findings, the heritage speakers showed more differences from the monolingual speakers than similarities when producing uptalks. While in this study we identified some areas of divergence in the phonology and phonetics of heritage Spanish uptalk, we would like to emphasize that our findings alone do not account for the exact sources of divergence. Although they appear to be pointing toward influence from English intonation, majority language influence can occur in various forms. In this section, we suggest avenues for future research toward the identification of the sources of divergence in heritage Spanish uptalk.

First, it is important to determine whether majority language influence occurs speaker-internally or speaker-externally. That is, heritage speakers may diverge from monolingual speakers because of cross-linguistic influence between their two language systems (i.e., effect of bilingualism) and/or because they are exposed to a different linguistic variety that is contact-induced (i.e., effect of the type of input). One way to test the effect of bilingualism is to see whether more English-dominant heritage speakers demonstrate more English-like patterns (i.e., stronger cross-linguistic influence) and diverge more from monolingual speakers. In this study, we operationalized the degree of language dominance using the Bilingual Language Profile (BLP; Birdsong et al. 2012). Our data demonstrated that the heritage speakers who are more English-dominant (i.e., higher BLP scores) indeed produced uptalks with more level boundary tones (i.e., less monolingual-like) than those who are less English-dominant. However, at the same time, these speakers did not produce fewer cases of bitonal rising boundary tones, which would have been the case had they diverged more from the monolingual speakers. Moreover, they produced more cases of bitonal pitch accents (i.e., more monolingual-like). In other words, more English-dominant speakers demonstrated more variable intonation contours than those who are less English-dominant. With regard to the phonetic realization of uptalks, we found a positive relationship between English dominance and divergence from monolinguals. That is, more English-dominant speakers produced uptalks with smaller and, to some extent, flatter rises. Based on these findings, it appears that cross-linguistic influence may occur when heritage speakers produce uptalk in Spanish, but in a gradient manner. As for the English-like tonal categories observed in our data (e.g., level boundary tones), it is unclear whether they are replicas of English categories or, as Kupisch (2020) argued, an artifact of heritage speakers' exploitation of language-inherent variation as a way to avoid complex intonation contours (i.e., marked forms). If the latter was the case, cross-linguistic influence may serve as a catalyst reinforcing the variation of intonation contours that already exist in Spanish. Although in the present study we found that more English-dominant heritage speakers demonstrated more variable intonation contours, we acknowledge that our data do not present a comprehensive picture of the effect of bilingualism, since the heritage speakers in this study ranged between English-dominant (12 speakers) and balanced bilinguals

[10] Note that the L-H% boundary tone in English is based on the Mainstream American English (MAE)_ToBI annotation system and it is different from the LH% boundary tone of the Sp_ToBI system. While the MAE_ToBI L-H% boundary tone represents a low rise irrespective of the alignment of the rise onset, the Sp_ToBI LH% boundary tone represents a late rise in the post-tonic syllable that reaches a high level in the speaker's pitch range.

(4 speakers). Thus, future research should examine the patterns of uptalk produced by heritage speakers of a wide spectrum of language dominance, including those who are Spanish-dominant.

Another way to test whether heritage speakers' divergent patterns of uptalk are due to cross-linguistic influence is to examine their production of uptalk in English. This process will be helpful in determining whether English-like patterns in heritage speakers' uptalk in Spanish are indeed present in their uptalk in English. As presented in Section 1.1, heritage speakers may create new tonal categories through hybridization of heritage and majority language categories (Queen 2001; Rao 2016), take intonation patterns or prosodic strategies from both languages (Bullock 2009; Kim 2019; Robles-Puente 2014), or demonstrate fine-grained acoustic properties that are similar to or approaching those in the majority language (Colantoni et al. 2016; Kim 2020; Zuban et al. 2020). Thus, by comparing heritage speakers' uptalks in Spanish and English, we would be able to explain whether heritage speakers share the same categories in their two languages, add some English categories to the Spanish uptalk inventory, or maintain separate categories, but the Spanish categories show phonetic assimilation to the ones in English. As different annotation systems are used to transcribe intonation contours in English (MAE-ToBI) and in Spanish (Sp_ToBI), cross-linguistic comparisons should be accompanied by the application of a unified annotation system such as the International Prosodic Alphabet (IPrA) (Hualde and Prieto 2016; Jun et al. 2015).

With regard to the effect of the type of input, heritage speakers' use of Spanish generally occurs during interactions with family members, especially those of older generations, in informal settings (Pires and Rothman 2009). Therefore, it is likely that their main source of Spanish input comes from these speakers. Although in this study we controlled for the country of origin of heritage speakers' parents (i.e., Mexico), we did not take into account possible regional variations of uptalk within Mexican Spanish (see Section 4.3 below). The parents of the heritage speakers came from different states in Mexico and the majority of them (87.5%) were either from the central or the western regions. In Section 3.3, we examined the phonological and phonetic properties of heritage speakers' uptalks based on their parents' regions of origin (i.e., central vs. non-central). However, we did not find any differences between heritage speakers whose parents were from central Mexico (i.e., same as the monolinguals) and those whose parents were from other regions. Compared to the other group (6.3 st), the pitch excursion of the central Mexico group (8.05 st) was closer to that of the monolingual speakers (8.4 st), but their rise slope was still much flatter (26.1 st/s) than the monolingual speakers (32.3 st/s). Although we cannot completely rule out the effects of parents' regional varieties of Mexican Spanish, it appears that factors other than these may have a greater role in heritage speakers' realization of uptalk.

Polinsky and Scontras (2020) put forth that heritage language input is both quantitatively and qualitatively different from the input of monolingual speakers. Apart from receiving less input (i.e., reduced input quantity), heritage speakers are exposed to fewer registers and fewer speakers than monolingual speakers (i.e., narrower input breadth). Gollan et al. (2015) found that in some aspects the size of heritage speakers' speech community resulted to be a stronger predictor of heritage language proficiency than the frequency of heritage language use. This finding suggests that speech community size is just as important, if not more so, than the amount of input when identifying the sources of heritage speakers' divergent grammars. The heritage speakers in our study were raised in neighborhoods in which the majority of the residents are Latinos (e.g., East LA, South Central, San Fernando Valley). In these neighborhoods, Spanish is used productively across registers thanks to the large speech community size. Thus, although heritage speakers' main source of Spanish input may be from their family members, it is likely that they are also largely exposed to varieties other than their family's regional varieties.

It is noteworthy to mention that heritage speakers are not only exposed to Spanish of older generations, but also to Spanish of their peers, which often involves code-switching with English. Research on heritage language phonetics and phonology has shown that the

effect of peer groups during (pre-)adolescence becomes a key aspect in bilingual language development (Morris 2017; Nance 2015, 2020). For instance, Nance (2020) investigated the speech of Gaelic-English child bilinguals between 7 and 11 years of age and found that heritage language input at home was not a predictor of their production of Gaelic stops and laterals. Regardless of the amount of home language exposure, bilinguals' production of these consonants leveled out by pre-adolescence, suggesting that heritage language phonological systems orient toward peer models.

According to Queen (2012), heritage speakers are able to use resources available in their two languages and capitalize on the cross-linguistic differences by conventionalizing them into a novel intonation system. Bullock (2009) also argued that, although prosody in language contact situations is prone to change over a short period of time due to its malleable nature, there are "clear tendencies in the manner in which speakers perceptually map intonational structure to intonational meaning (Bolinger 1978; Vaissière 2005)" (Bullock 2009). Since uptalk is mainly observed in spontaneous speech, it is possible that English-like uptalk patterns in informal registers have permeated the vernacular Spanish, especially the speech of Latino youth. Future research should examine whether the same patterns are shared across members of heritage speakers' speech communities, especially among their peers. If the variability found in heritage Spanish uptalk shows systematicity within and across speakers and if such variability is recognized and understood by other members of the speech community, we can assume that these speakers have a shared set of grammars that are distinct from the grammars of homeland speakers.

4.3. Importance of the Study on Monolingual Varieties in Heritage Language Research

As mentioned above, heritage speakers do not receive the same input as monolingual speakers. Therefore, comparisons with monolingual speakers do not inform us whether heritage speakers successfully acquired the heritage language. However, if the goal is to understand the sources of heritage speakers' divergent grammars, it is paramount to first identify areas of divergence from monolingual grammars, which requires research on monolingual varieties. Uptalk in Spanish is very little understood. Thus, as a first step we analyzed the phonological and phonetic properties of uptalk in Spanish produced by monolingual speakers of Mexican Spanish to compare them with those of heritage speakers of Mexican Spanish. This by no means suggests that the uptalk patterns observed in our monolingual data (i.e., Central Mexican Spanish) are applicable to other regional varieties of Mexican Spanish. Although we did not find an effect of parents' regions of origin on heritage Spanish uptalk, it is important to further examine possible regional variations. In this section, we compare our findings to previous research on the intonation of Mexican Spanish.

One of the clearest distinctions that we found between the monolingual speakers and the heritage speakers was that the monolingual speakers produced more dynamic intonation contours than the heritage speakers. The contours with the most dynamic pitch movement were found in the forms of L+H* LH% (rise-fall-rise) and H+L* LH% (fall-rise). While these contours only comprised approximately 20% of the monolingual data, their presence was much more noticeable in monolinguals' speech than in the speech of the heritage speakers who rarely used them (4.4%). Although we interpreted this distinction as an area of divergence, one may think that the complex intonation contours in the monolingual data are specific to Central Mexican Spanish. For instance, the rise-fall-rise contour of L+H* LH% resembles that of the L+¡H* LH% circumflex contour typical of Central Mexican Spanish (Martín Butragueño 2004). According to Martín Butragueño (2004), this contour is observed more in male than in female speech and it is generally associated with low social class. While the monolingual speakers in our study shared similar backgrounds with the speakers in Martín Butragueño (2004), it does not appear that the L+H* LH% configuration in our study represents the same contour as the L+¡H* LH% configuration in Martín Butragueño (2004). In Martín Butragueño (2004), the L+¡H* LH% configuration was produced with a heightened rise across the stressed syllable (hence the upstepped ¡H*), in

which the f0 peaks (4 st) were higher than the final boundary tones (2.7 st). However, in our study the boundary tones were produced with much higher pitch. We used the same semitone scale as in Martín Butragueño (2004) and found that the peaks of the pitch accents were on average 2.8 st (SD = 1.3) and the boundary tones were on average 8.8 st (SD = 4.1). Without an exception all speakers produced the boundary tones with higher pitch than the pitch accents. Moreover, the female speakers produced this contour slightly more (13.5%) than the male speakers (6.4%). Thus, the L+H* LH% contour in our data is a clear case of uptalk which does not seem to index the same social meanings as the L+¡H* LH% circumflex contour in Mexico City Spanish (Martín Butragueño 2004). With regard to H+L* LH%, this contour has been frequently observed in the Juarez variety of Mexican Spanish (Holguín-Mendoza 2011), thus, we do not believe that it is specific to Central Mexican Spanish.

When comparing our results to the acoustic properties of uptalk of non-*fresa*-style speech in Guadalajara Spanish (Jalisco) reported in Martínez-Gómez (2018) (see Section 1.3), we did not find a noticeable difference in pitch excursion between the two varieties (Central Mexican Spanish: 8.4 st, Guadalajara Spanish: 8 st), whereas the rise slope was steeper in Central Mexican Spanish (32.3 st/s) than in Guadalajara Spanish (25.4 st/s). However, direct comparisons between the two studies, especially the rise slope, should be interpreted with caution due to different data analysis methods (e.g., number of syllables between tonal peak and valley).

To our knowledge, no study has compared the realization of uptalks across Mexican varieties using the same methods in data collection and analysis. Thus, with the assumption in mind that there may be regional variations, heritage language research should take a microscopic perspective and either include monolingual speakers of the regional varieties of heritage speakers' caregivers or control for the regional variety. Moreover, it is important to further address the social meanings of uptalk. In this study we did not examine the effects of social factors (e.g., gender, social class, age) on the production of uptalk. As uptalk in Mexican Spanish is generally associated with *fresa*-style speech (Holguín-Mendoza 2011; Martínez-Gómez 2018), future research should examine sociolinguistic variation of uptalk.

As "intonation is simultaneously connected to multiple levels of linguistic structure, meaning, and types of affect" (Queen 2012), the study of uptalk in heritage Spanish should be accompanied by the analysis of discourse function. The discourse functions of uptalk in North American English has been extensively studied (uncertainty, continuation, enthusiasm, solidarity, among many others) (Armstrong et al. 2015; Hirschberg and Ward 1995; Cran and MacNeil 2005; McLemore 1991; Ritchart and Arvaniti 2014). With regard to Mexican Spanish, to our knowledge, Holguín-Mendoza (2011) is the only study that discusses the discourse functions of uptalk[11]. Holguín-Mendoza (2011) found that upper-class female speakers in Juárez, Mexico, used uptalk to express politeness and affiliation, similar to Texas sorority girls reported in McLemore (1991). However, the speakers in Holguín-Mendoza (2011) frequently visit Texas for school and for leisure, and are fluent Spanish-English bilinguals. Thus, it is unclear whether these functions are applicable to monolingual varieties of Mexican Spanish. In order to understand whether the form-meaning association in heritage Spanish uptalk is subject to influence from English, future research should first examine whether the discourse functions of uptalk in heritage Spanish are distinct from those in monolingual varieties of Mexican Spanish.

5. Conclusions

Heritage speakers demonstrate both convergence to and divergence from monolingual speakers. Identifying the source of divergence has been the focus of many heritage language studies and majority language influence is often brought up as the strongest candidate. This is especially the case when the linguistic feature of interest shows patterns that

[11] Vergara (2015) also discusses the discourse functions of uptalk in Peninsular Spanish. He found that Peninsular Spanish speakers use uptalk to hold the floor, to show camaraderie, to soften a command, and as a flirting gesture (in the case of women).

resemble those in the majority language. While the general assumption is that the same patterns are not present in monolingual grammars, many studies do not go through the process of confirming this assumption, given that variation in monolingual grammars are seldom the focus of heritage language research. However, like bilingual speakers, monolingual speakers show variability that is conditioned by multiple linguistic and extralinguistic factors. Thus, investigation of monolingual grammars should be of interest to heritage language research, not to set them as the baseline to see whether heritage speakers successfully acquired target linguistic features, but to answer the question of whether heritage speakers diverge from monolingual speakers. This extra step is even more important if the linguistic feature of interest is not well understood in monolingual varieties.

In this study we examined the production of uptalk in Spanish by heritage speakers of Mexican Spanish in Southern California. Uptalk is frequently associated with English, especially with California English (Armstrong et al. 2015; Barry 2007; Ritchart and Arvaniti 2014; Tyler 2015), but it has also been observed in Mexican Spanish (Holguín-Mendoza 2011; Martínez-Gómez 2018). Since very little is known about uptalk in Spanish, we examined spontaneous speech of both heritage speakers and monolingual speakers to confirm whether uptalk in monolingual Spanish is as productive as in heritage Spanish and, if so, whether they show different intonation patterns. Our findings showed that there were more differences than similarities between the two groups. Overall heritage speakers produced uptalks with less dynamic intonation contours and produced them with flatter rises than monolingual speakers. The divergent patterns observed in heritage speakers' speech shared some similarities with the patterns in English. While our findings invite majority language influence as a reasonable explanation to heritage speakers' divergence from monolingual speakers, there are various forms that majority language influence takes, which should be teased apart. Thus, future research should approach heritage Spanish uptalk from various angles to have a better understanding of the source(s) of divergence.

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