

# NORTH MIDLAND /U/-FRONTING AND ITS EFFECT ON HERITAGE SPEAKERS OF SPANISH

Laura D. Cummings Ruiz

University of Illinois at Urbana-Champaign  
ldcummi2@illinois.edu

## ABSTRACT

This study aims to determine if North Midland heritage speakers of Spanish produce a fronted /u/ when speaking English, and whether this fronted /u/ transfers onto the heritage speakers' Spanish. F2 values were collected to measure the /u/ production of nineteen Spanish-English bilingual heritage speakers, twenty monolingual English speakers, and twenty monolingual Spanish speakers. Results showed that the heritage speakers produced a more fronted /u/ in English than in Spanish; heritage /u/ in English was less fronted than that of monolingual English speakers. Heritage speaker /u/ in Spanish was more backed than that of monolingual Spanish speakers in both unstressed and stressed position. These results are discussed in terms of the interdependence hypothesis and cultural identity.

**Keywords:** heritage language acquisition, /u/-fronting, speech production

## 1. INTRODUCTION

The production of Spanish vowels is considered to be stable and minimally variable across native speakers [3, 4, 17]. Only some Spanish varieties have shown variation in the production of vowels, such as the raising of unstressed mid vowels in word-final position in Puerto Rican Spanish and the reduction of unstressed vowels in Central Mexican Spanish [17]. This vocalic stability, however, is not found in English. Specifically, the production of /u/ has been recorded as significantly more fronted in several English-speaking areas [5, 6, 7, 10, 11, 12, 14, 17, 20].

The growing Hispanic population in the United States has led to an increase in heritage language research. A heritage speaker is an individual "who is raised in a home where a non-English language is spoken, who speaks or understands the language, and who is to some degree bilingual in that language and in English" [19]. Although heritage speakers are assumed to sound native-like in both of their languages, research suggests that the phonetic production of heritage speakers lies somewhere be-

tween that of a native speaker and a second language learner [1]. Examples include the reduction of unstressed vowels, especially high and mid vowels, and the fronting of /u/ [8, 9, 10, 20].

Although previous studies have tested heritage /u/-fronting in the Midwest, no study has collected data from heritage speakers in both English and Spanish to evaluate the effects of transfer on either language [9, 12]. This study aims to determine the influence of English and Spanish on the production of /u/ by North Midland heritage speakers of Spanish.

## 2. THE PRESENT STUDY

Three research questions were presented to explore the possible effect of transfer on bilingual heritage speakers of Spanish:

1. Do heritage speakers produce a fronted /u/ when speaking English?
2. Do heritage speakers produce a fronted /u/ when speaking Spanish?
3. Does metrical stress affect the /u/ of heritage speakers when speaking Spanish?

Cultural identity has been found to correlate with /u/ production in the United States; previous research studies reported that participants who strongly identified with their Spanish-speaking identity produced a backed /u/ in English, despite living in areas where English speakers produce a fronted /u/ [9, 12]. Based on these results, it was predicted that the heritage participants would produce a backed /u/ in English if they strongly identified with their Spanish-speaking identity.

According to the interdependence hypothesis, bilingual speakers' language systems will generally remain separate; however, some transfer from the dominant language may affect the weaker language [16]. Because the English vowel system is more complex than that of Spanish, it was predicted that the heritage speakers would produce a fronted /u/ when speaking Spanish due to transfer from the English vowel system.

The third research question addresses the possible effect of metrical stress on the Spanish /u/. Although the Spanish vowel system is generally stable and does not display reduction, unstressed vowels produced by heritage speakers and native Spanish speakers in Puerto Rico and central Mexico have been found to reduce or centralize in word-final position [17]. Based on this research, it was predicted that the heritage participants would produce a more fronted /u/ when reading words with this vowel in unstressed position.

### 3. METHODOLOGY

#### 3.1. Participants

Nineteen adult bilingual Spanish-English heritage speakers from the Chicagoland area were recruited at two large Midwestern universities. All speakers reported acquiring Spanish before age five. Sixteen participants reported English to be their dominant language, while one participant reported Spanish as her dominant language and two participants reported to be equally dominant in both languages. The participants also reported using English more often than Spanish in their daily life. Information on the Spanish variety spoken by the participants was not collected.

Additionally, the heritage participants reported their speaking, listening, reading, and writing skills in English and Spanish. Paired samples t-tests showed that they reported significantly higher scores in English for speaking, reading, and writing. They also reported higher scores for listening in English, although this was not significant. To measure cultural identity, the participants also reported on how much they felt like themselves when using each language, how important it was to use each language natively, and how closely they identify to each language's culture. The differences according to cultural identity were not significant; however, participants reported feeling like themselves slightly more when using English than Spanish. Additionally, they reported it being somewhat more important to use English natively than Spanish but identified more closely with the Spanish-speaking culture than with the English-speaking culture.

Twenty monolingual English and twenty monolingual Spanish speakers were recorded as controls. The English speakers were from the Chicagoland area with minimal to no previous knowledge of a second language. The Spanish speakers were from Madrid, Spain with minimal to no previous knowledge of a second language. While Peninsular Spanish speakers were chosen for this study, the pro-

duction of Spanish vowels is considered to be minimally variable, regardless of regional variety [4]. Thus, country of origin was not expected to affect the choice of Spanish speakers.

#### 3.2. Materials

100 Spanish and English sentences, including filler items, were created to elicit the production of /u/. Of the forty English sentences, ten contained one target word with the vowel /u/; the remaining sentences included filler words with the vowels /a i ae/. All English target and filler words were monosyllabic, given that change in stress has not been found to affect English /u/ frontedness.

**Table 1:** Sample target items.

English	Spanish Stressed	Spanish Unstressed
dude	felpudo	cubito
oop	barbudo	cubano
toot	picudo	bufanda

Sixty Spanish sentences were presented to the Spanish-speaking participants; twenty with the target word and forty fillers. All Spanish target and filler words within the sentences were three syllables long and varied in terms of where the stress was placed. Based on Ronquest's research on heritage /u/-fronting [17], ten target words contained an unstressed word-initial /u/. The remaining target words contained a stressed /u/ on the second syllable.

#### 3.3. Procedure

All participant groups were recruited via email or personal acquaintance and were paid for their participation. All participants completed a language background questionnaire, while the heritage participants also completed a Spanish proficiency test.

The participants were asked to sit in a sound-attuned booth or a quiet room; this depended on the location in which the study was conducted. They were given one of five versions of a randomized list of stimuli, split into an English list and a Spanish list. The participants were asked to read either the Spanish list, the English list, or both, while being recorded by a TASCAM DR-05 96k/24-bit Portable Stereo Recorder. Participants were asked to read the sentences slowly and clearly. Heritage speakers were recorded first in English.

Participant recordings were edited, annotated, and analyzed through Praat [2]. F1 and F2 frequencies at the temporal midpoint were extracted from each target word [12, 17]. Only the target vowel /u/ was an-

alyzed; the filler vowels were not analyzed. Outliers two-and-a-half standard deviations from the mean were removed from the data.

#### 4. RESULTS

A linear mixed effects model was run using R and the lmerTest package to determine the relationship between participant group and F2 value, with participant as a random effect and age, gender, and cultural identity as fixed effects [13, 18]. The participant groups were renamed for the analysis in the following way. The monolingual English speaker group was coded as ME and the heritage English speaker group was coded as HE. The monolingual Spanish speakers reading Spanish with /u/ in the unstressed position were renamed MSU, and the heritage speakers reading these same words were renamed HSU. Finally, the monolingual Spanish speakers reading words with /u/ in stressed position were coded as MSS, and the heritage speakers were named HSS. The results of the model, with the monolingual English participant group as the baseline, showed a significant difference between the English monolinguals and all other participant groups in terms of the F2 values ( $p < 0.001$ ). Pairwise comparisons were run to compare all participant groups using the estimated marginal means function in R [15]. The difference between the heritage speakers when producing /u/ in English and Spanish was found to be significant ( $p < 0.001$ ). However, the heritage English production and the Spanish monolingual productions in both stressed and unstressed position were not found to be significantly different ( $p > 0.05$ ). The heritage speakers did not produce a significantly more fronted production of /u/ when the vowel was in unstressed position ( $p > 0.05$ ). Finally, heritage speakers who reported feeling more strongly identified with the Spanish-speaking culture did not produce a significantly more fronted /u/ than the heritage speakers who identified more strongly with the English-speaking culture or who identified equally with both cultures ( $p > 0.5$ ).

The results of the linear mixed effects model also show a significant difference in /u/-fronting according to gender, with female participants generally producing a more fronted /u/ than the male participants. There was no significant difference between groups according to age ( $p > 0.05$ ).

#### 5. DISCUSSION

Three research questions were presented to determine the possible /u/-fronting of bilingual heritage speakers of Spanish from the Midwest. The first

**Table 2:** Significant estimated marginal means (EMMs) of all participant groups.

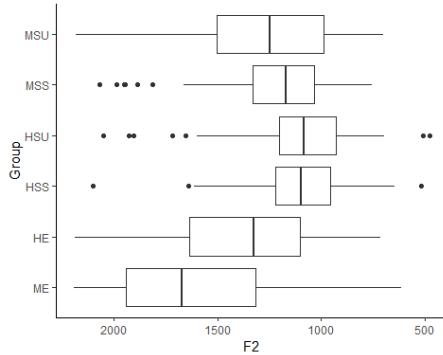
Group Contrast	Estimate	SE	t	p
<i>HE – ME</i>	-241.24	58.11	-4.151	.001
<i>HE – HSS</i>	275.23	26.35	10.445	<.001
<i>HE – HSU</i>	268.33	26.61	10.082	<.001
<i>ME – HSS</i>	516.48	57.89	8.922	<.001
<i>ME – HSU</i>	509.58	58.00	8.785	<.001
<i>ME – MSS</i>	416.99	74.26	5.615	<.001
<i>ME – MSU</i>	354.70	74.40	4.768	<.001

research question asked whether heritage speakers fronted their /u/ when speaking English. As is seen in Figures 1 and 2 and confirmed by the linear mixed effects model, the heritage speakers produced a more fronted /u/ when speaking English than when speaking Spanish. Heritage participants also fronted their /u/ more than the Spanish monolingual participants, although this was not statistically significant. Additionally, all but three participants reported English as their dominant language. Thus, the participant population in this study can be said to strongly identify with the English language and culture. This result also supports the interdependence hypothesis, given that the heritage speakers demonstrated two separate language systems or vowel spaces.

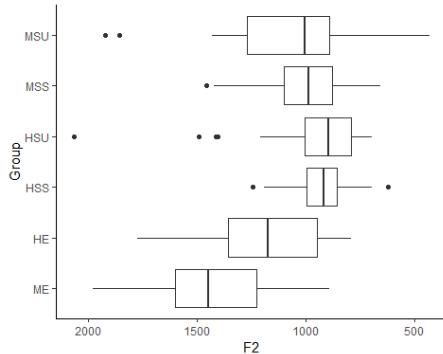
Although the heritage speakers fronted their /u/ when speaking English, this production was not as fronted as that of the monolingual English participants. Previous research on heritage /u/-fronting reported that heritage speakers of Spanish produced backed /u/ despite living in areas where fronting occurs due to their strong cultural ties to local Spanish-speaking communities [9, 12]. The participants in this study reported stronger linguistic abilities in English and equally strong attitudes about their Spanish and English cultural identities. At this point, more analysis of the heritage cultural identity is necessary to discuss these results.

The second research question asked whether heritage speakers produce a fronted /u/ when speaking Spanish. Based on the interdependence hypothesis, it was predicted that the English /u/-fronting found in Midwestern United States, and in the heritage speakers' English production, would transfer onto the Spanish /u/ due to the complexity of the English vowel system. The results showed that heritage speakers of Spanish did not front their /u/ more than monolingual Spanish speakers; in fact, the heritage speakers produced a more backed /u/ than the monolingual speakers. One possible explanation is

**Figure 1:** Female /u/-fronting in all participant groups.



**Figure 2:** Male /u/-fronting in all participant groups.



that the heritage speakers kept their two language systems (English and Spanish) separate without any phonetic transfer between them. The heritage Spanish production does not appear to be affected by transfer from the English language, given that the heritage /u/ is the most backed production found within all four groups. Furthermore, the moderately centralized production of the heritage English /u/ appears to be somewhere between the productions of monolingual English and monolingual Spanish speakers; this may be an example of what Benmamoun et al. [1] term the “heritage accent”. Another possibility is that the Spanish vowel system transferred onto the English /u/. As mentioned previously, the heritage English /u/ was not found to be significantly different from the monolingual Spanish /u/; as seen in Figures 1 and 2, the monolingual Spanish productions and the heritage English /u/ appear to overlap, suggesting that the English /u/ may have become more backed due to the influence of Spanish.

The third research question asked whether metrical stress affects the heritage production of /u/. The results of the linear mixed effects model showed that

the heritage speakers did not produce a fronted /u/ in unstressed position. According to Ronquest [17], the shift towards a centralized /u/ in unstressed position has been recorded in monolingual Spanish varieties and in heritage speakers of Spanish. However, the results of the present study showed that the heritage speaker /u/ was similar to that of the monolingual Spanish speakers. These contradicting results may be due to the difference in participants tested. Ronquest collected data from thirteen female participants between the ages of eighteen and twenty-two; for this study, fifty-nine male and female participants between the ages of eighteen and sixty were recorded. This varied participant group allows for a broader review of /u/-fronting. A range of F2 values can also be appreciated in Figures 1 and 2. Specifically, the heritage Spanish speakers and the monolingual Spanish speakers appear to demonstrate a wide range of F2 values when producing /u/ in unstressed position. Further analysis is needed to review both heritage speakers and monolingual Spanish speakers in terms of their /u/-fronting.

## 6. CONCLUSION

The current study aimed to determine whether bilingual heritage speakers of Spanish in Midwestern United States demonstrate an effect of transfer when producing /u/ in English and Spanish. Results showed that heritage speakers produced a fronted /u/ when speaking English, although this /u/ was not as fronted as the production of the monolingual English participants. The heritage speakers did not produce a fronted /u/ when speaking in Spanish in either unstressed or stressed position. The present study requires more research on heritage cultural identity to determine whether this backed /u/ in Spanish and English occurs due to the heritage speakers’ identity, or whether this result was due to confounding factors.

## 7. REFERENCES

- [1] Benmamoun, E., Montrul, S., Polinsky, M. 2010. White paper: Prolegomena to Heritage Linguistics. *Harvard University*.
- [2] Boersma, P., Weenink, D. 2019. Praat: doing phonetics by computer (Version 6.0.49) [Computer program]. Retrieved from <http://www.praat.org>.
- [3] Bradlow, A. R. 1995. A comparative acoustic study of English and Spanish vowels. *The Journal of the Acoustical Society of America* 97(3), 1916–1924.
- [4] Campos-Astorkiza, R. 2012. The phonemes of Spanish. *The Handbook of Hispanic Linguistics* 69, 89.
- [5] Clopper, C. G., Pisoni, D. B., De Jong, K. 2005.

- Acoustic characteristics of the vowel systems of six regional varieties of American English. *The Journal of the Acoustical Society of America* 118(3), 1661–1676.
- [6] Cole, J., Hualde, J. I., Blasingame, M., Mo, Y. 2010. Shifting Chicago vowels: Prosody and sound change. *Speech Prosody 2010-Fifth International Conference*.
  - [7] Cox, F. 1999. Vowel change in Australian English. *Phonetica* 56(1-2), 1–27.
  - [8] Fought, C. 1999. A majority sound change in a minority community:/u/-fronting in Chicano English. *Journal of Sociolinguistics* 3(1), 5–23.
  - [9] Godinez, M., Maddieson, I. 1985. Vowel differences between Chicano and general Californian English? *International Journal of the Sociology of Language* 1985(3).
  - [10] Hagiwara, R. 1997. Dialect variation and formant frequency: The American English vowels revisited. *The Journal of the Acoustical Society of America* 102(1), 655–658.
  - [11] Harrington, J., Kleber, F., Reubold, U. 2008. Compensation for coarticulation,/u/-fronting, and sound change in standard southern British: An acoustic and perceptual study. *The Journal of the Acoustical Society of America* 123(5), 2825–2835.
  - [12] Konopka, K., Pierrehumbert, J. 2008. Vowels in contact: Mexican heritage English in Chicago. *Proceedings from The Sixteenth Annual Symposium about Language and Society-Austin. Austin, TX: University of Texas*. Citeseer.
  - [13] Kuznetsova, A., Brockhoff, P. B., Christensen, R. H. B. 2017. lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software* 82(13), 1–26.
  - [14] Labov, W., Ash, S., Boberg, C. 2008. *The atlas of North American English: Phonetics, phonology and sound change*. Walter de Gruyter.
  - [15] Lenth, R. 2018. Emmeans: Estimated marginal means, aka least-squares means. *R package version 1(1)*.
  - [16] Paradis, J., Genesee, F. 1996. Syntactic acquisition in bilingual children: Autonomous or interdependent? *Studies in second language acquisition* 18(1), 1–25.
  - [17] Ronquest, R. 2013. An acoustic examination of unstressed vowel reduction in heritage Spanish. *Selected proceedings of the 15th Hispanic linguistics symposium* 151–171.
  - [18] Team, R. C., others, 2013. R: A language and environment for statistical computing. *R Foundation for Statistical Computing, Vienna, Austria*. Retrieved from <http://www.R-project.org>.
  - [19] Valdés, G. 2014. Heritage language students: Profiles and possibilities. In: *Handbook of heritage, community, and native American languages in the United States*. Routledge 41–49.
  - [20] Willis, E. W. 2005. An initial examination of southwest Spanish vowels. *Southwest Journal of Linguistics* 24(1-2), 185–199.