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Bilingual Spanish vowels: The case of heritage speakers

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Objective

- To contribute additional information about heritage speaker phonetic/phonological systems and, specifically, add to our understanding of Spanish heritage speaker vowels.

Definitions: Heritage speakers

- Heritage speakers =
 - “people raised in a home where one language is spoken who subsequently switch to another dominant language” (Polinsky & Kagan, 2007, p. 368)
 - Someone "who is raised in a home where a non-English language is spoken, who speaks or at least understands the language, and who is to some degree bilingual in that language and in English" (Valdés, 2001, p. 38)
 - “early bilinguals due to their upbringing because they are exposed to the heritage language and the majority language since birth or in childhood” (Montrul, 2012, p. 2)
- Present study:
 - Heritage speaker participants have varied experiences; all are early Spanish-English bilinguals raised since childhood (if not birth) in the US

Background:

Heritage Language Phonetics and Phonology

- Heritage phonetics/phonology remains underresearched as compared to other aspects of the linguistic system (e.g., Polinsky & Kagan, 2007)
 - Perhaps due to “the general impression...that even basilectal heritage speakers sound native like” (p. 378).
- Paucity of information on heritage speaker sound systems includes/extends to the study of Spanish as a heritage language (Rao & Ronquest, 2015)
 - Nevertheless, recent examples of work in area:
 - Henriksen (2015) on rhotics
 - Rao (2014, 2015) on /b/ and /b d g/, respectively
 - Ronquest (2012, 2013), Willis (2005) on vowels

Background:

Heritage Language Phonetics and Phonology

- Evidence of benefit of heritage speakers' early language exposure (as compared to adult L2 learners) (Au, Oh, Knightly, Jun, & Romo, 2002; Knightly, Jun, Oh, & Au, 2003)
- Significant differences from traditional accounts of monolingual and/or “homeland” native Spanish (e.g., Rao, 2015; Ronquest, 2012)

Background: Heritage Spanish vowels

- Willis (2005): Four Southwest Spanish speakers
 - Observes differences from accepted Spanish vowel triangle
 - Lowered and fronted /u/
 - Lowered /o/
 - Fronted /a/
 - No difference in quality of /a/ based on lexical stress
- Ronquest (2012): 16 heritage Spanish speakers in Chicago
 - Notable asymmetry in HS vowel system (as compared to standard symmetrical monolingual Spanish vowel system described in literature)
 - Fronted /u/
 - Condensed back vowel space (/o/ and /u/ not significantly different from each other along F2)
 - Centralization and reduction of atonic vowels as compared to tonic vowels

Background: Heritage Spanish vowels

- Ronquest (2013): further explored effect of stress on subset ($n = 13$) of these participants
 - Unstressed /e/, /a/, /o/ higher in vowel space (i.e., lower F1)
 - Unstressed /i/, /e/, /o/, /u/, move toward center on F2 dimension (i.e., lower for /i/, /e/, higher for /o/, /u/)
 - Atonic vowels significantly shorter than tonic vowels (across all 5 vowels)
 - Effect of English contact cannot be sole explanation; centralization observed not always in direction of neutral schwa
- All three studies refer to previous accounts of monolingual Spanish vowels for comparison purposes
 - Ronquest (2012) notes that some of the differences she observes between her HSs and the traditional, monolingual vowel space may have to do with an inadequate description of the “traditional” vowel space

Present study

- Present an additional acoustic analysis of heritage Spanish vowel quality and quantity
 - Incorporating our own comparison group from same university community, completing same tasks, and whose data undergo same analysis techniques (greater comparability)
 - Comparison group = late Spanish-English bilinguals (more fitting than monolingual group; Ortega, 2013; main difference in groups, thus, is not bilingual vs. monolingual but more about early vs. late exposure and subsequent experience)

Research Questions

1. How do the Spanish vowels of early Spanish-English bilinguals (heritage speakers) compare to those of late Spanish-English bilinguals ("homeland" native speakers)?
 - Vowel quality (formants)
 - Vowel quantity (duration)
2. Are there differences in early and late bilingual vowel productions by stress?
 - Vowel quality
 - Vowel quantity

Method: Participants

- Early bilinguals (Heritage speakers); $n = 10$
 - *M* age = 20.1 years (range: 18-27)
 - Gender: all female
 - Place of birth: 8 born in NYC, 1 born in Ecuador, 1 born in Dominican Republic
 - Variety of countries of heritage: Dominican, Mexican, Puerto Rican, Ecuadorian, Salvadoran, and mixture therein
 - Spanish: between birth and age 4
 - English: all exposed (and moved to US) before age 9
 - All enrolled in university Spanish for bilinguals course (except 1; enrolled in 3rd semester Spanish as foreign language)
 - All consider themselves "heritage" speakers of Spanish ("A heritage speaker of Spanish in the US is often considered to be someone who learned Spanish as their first language [or one of their first languages] in childhood, but who, as an adult, is dominant in English")

Method: Participants

- Late bilinguals (“homeland” native speakers); $n = 4$

Participant	Sex	Age	Country of origin	Age moved to US
N1	F	32	Mexico	14
N2	M	39	Colombia	32
N3	M	38	Puerto Rico	22
N4	F	54	Colombia	30

Method: Analysis (acoustic)

- All vowels between stop phonemes or stops and pauses were isolated and coded for
 - Lexical item
 - Vowel
 - Stress
- Given that stop phonemes could include /b d g/ → [β ð ɣ]
 - All vowels for which the boundary between the vowel and preceding/following consonant was not clear were excluded from duration analysis
- Formants normalized using Lobanov method in NORM (Thomas & Kendall, 2012)

Method: Analysis (statistical)

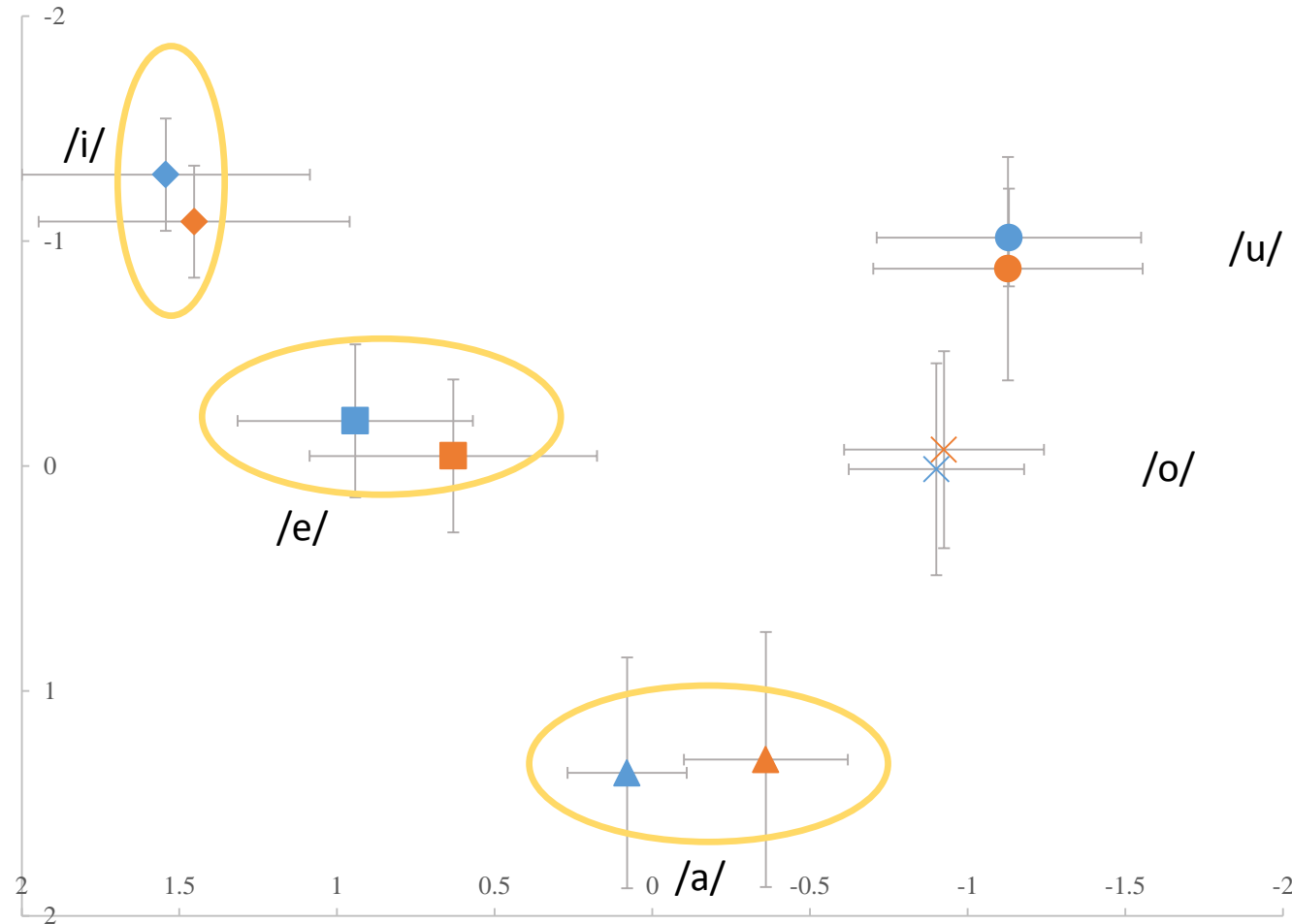
- Linear mixed models for each formant, each vowel
 - Speaker and token as random effects
 - Speaker group (Early/Late), Stress, and Speaker group x Stress as fixed effects
- Linear mixed model for duration
 - Speaker and token as random effects
 - Vowel, Speaker group, Stress, and Speaker group x Stress as fixed effects

Results: Formants

- $N_{\text{Early}} = 2,501$
 - 345 exclusions due to creak, devoicing, mic issues
- $N_{\text{Late}} = 817$
 - 172 exclusions due to creak, devoicing, mic issues

- $N = 2,801$ (Early bilinguals = 2,156; Late bilinguals = 645)

Results: Formants



F1 (normalized)

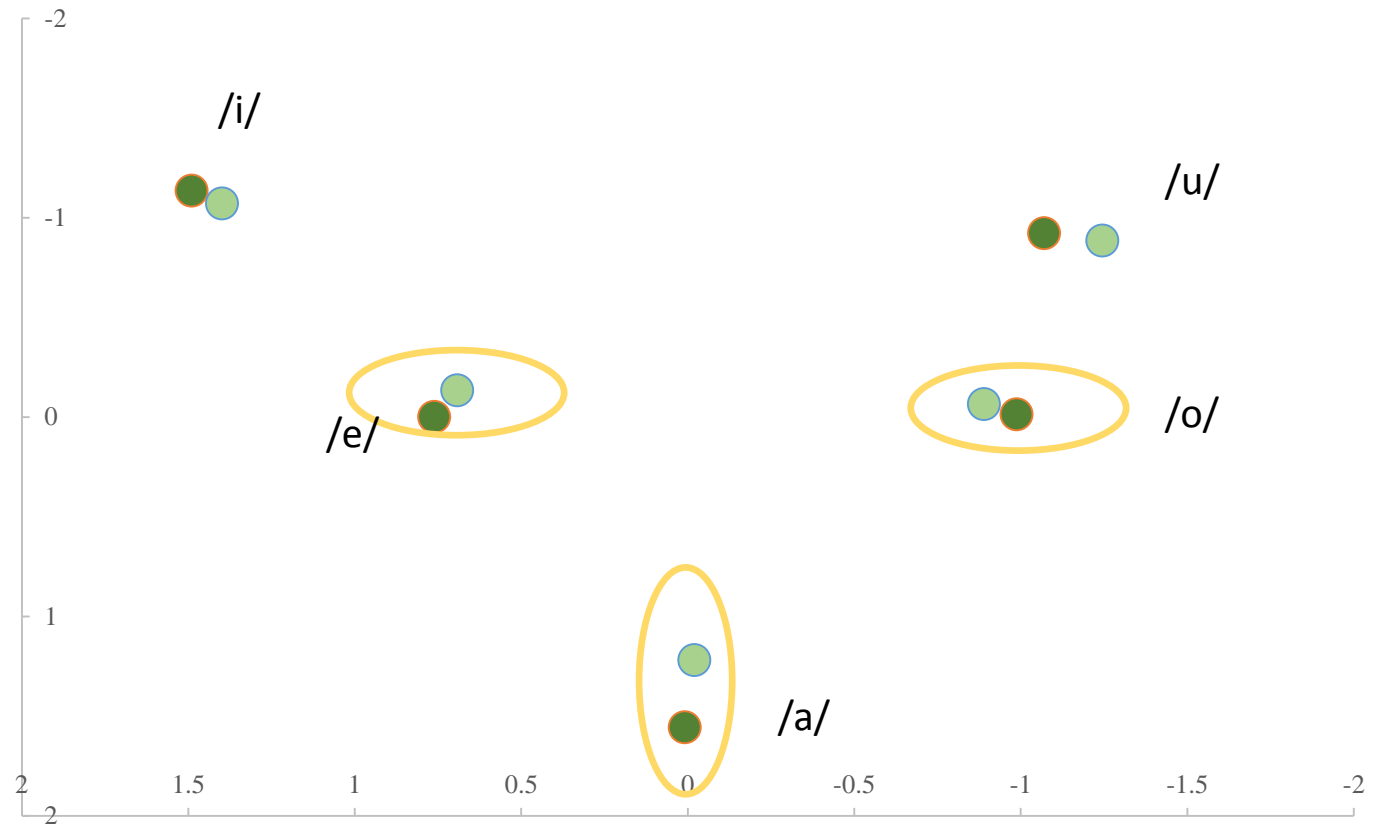
-No significant differences between speaker groups for any vowel
 -/i/, $p = .055$

F2 (normalized)

-/e/, $p = .004$
 -/a/, $p = .032$

- Early bilinguals
- Late bilinguals

Results: Formants by stress



F1 (normalized)

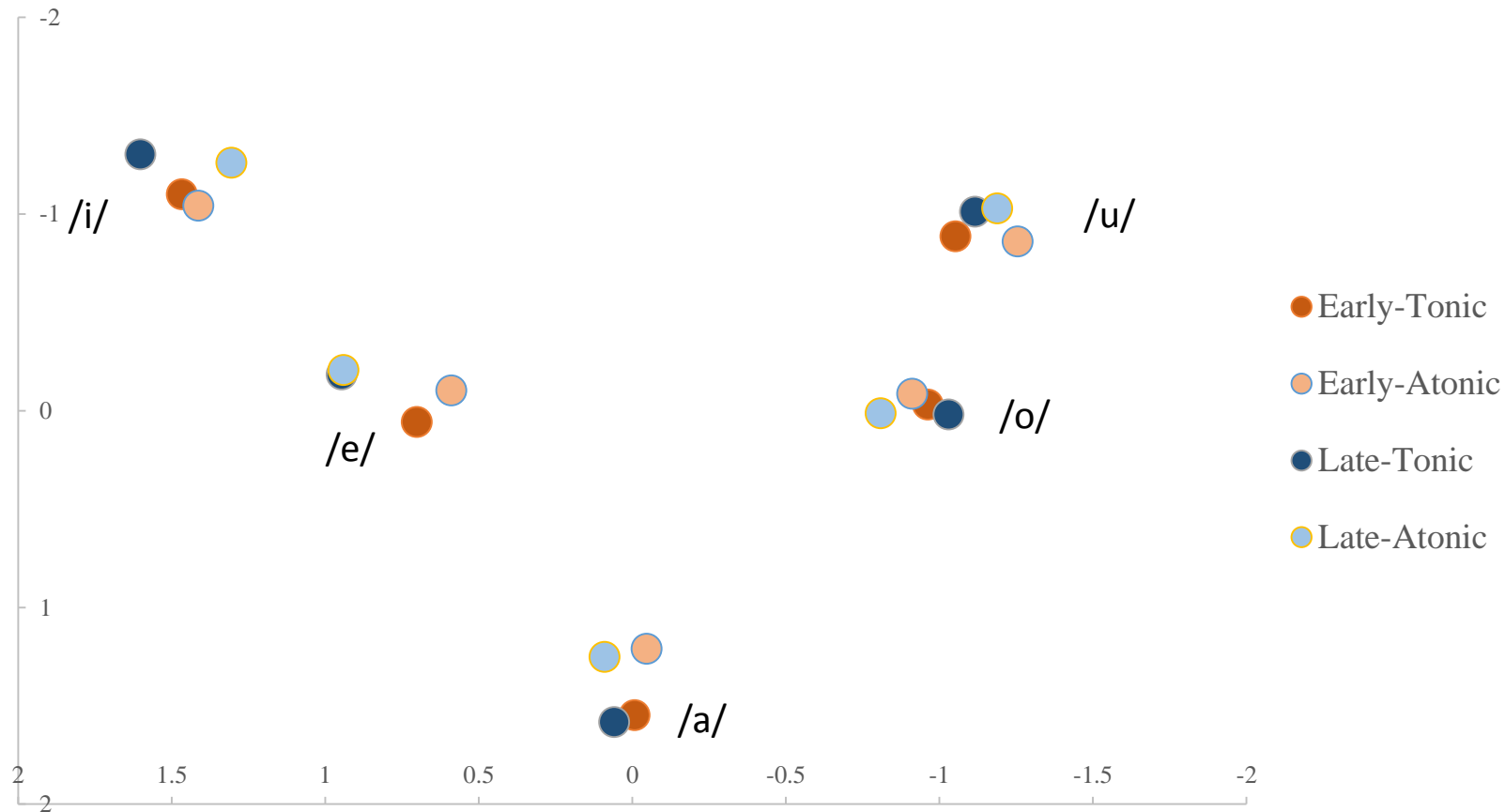
-/a/, $p = .038$

F2 (normalized)

-/e/, $p = .010$

-/o/, $p = .032$

Results: Formants by stress and group



No significant interaction between speaker group (early vs. late bilingual) and stress for any vowel

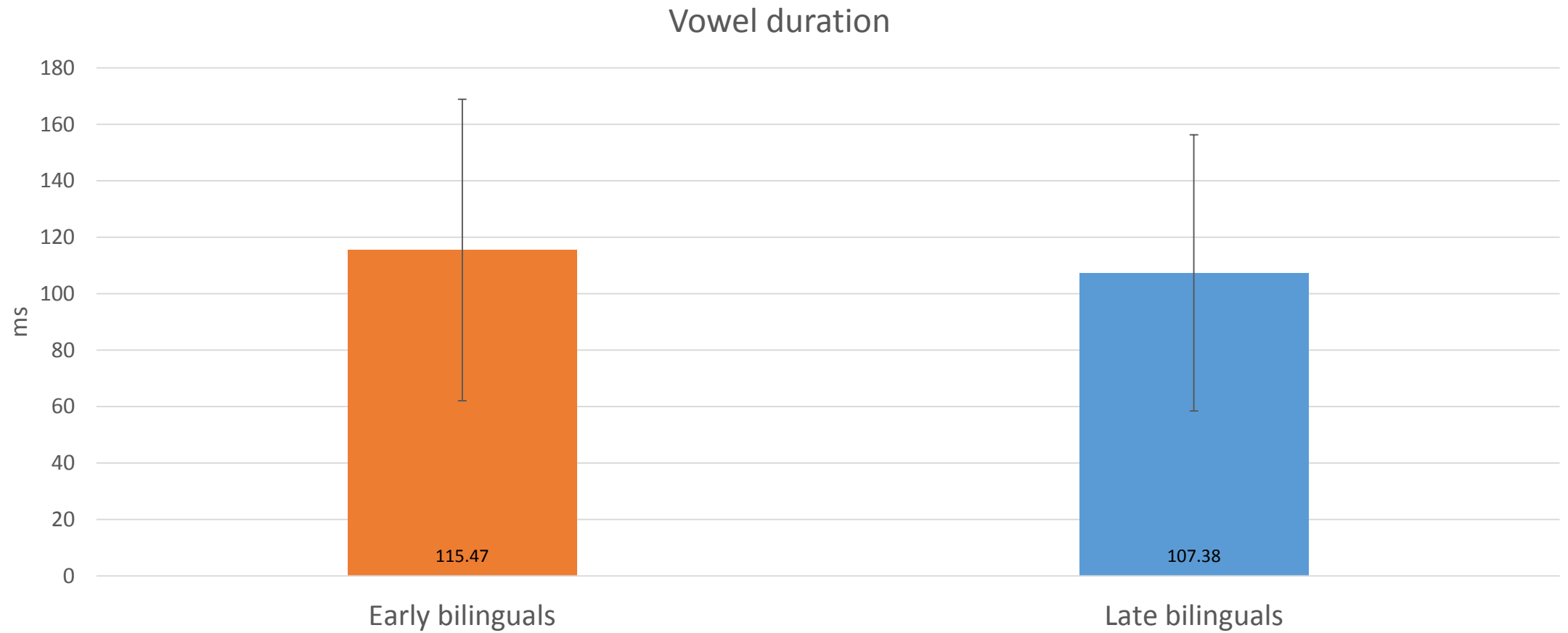
Results: Formants (Summary)

- No differences between early and late bilinguals in vowel height (F1)
- Early bilinguals' /e/ and /a/ significantly more backed (i.e., lower F2) than late bilinguals
- Both groups show differences in vowel quality by stress
 - /a/ raising
 - /e/ and /o/ move toward center along F2 dimension
 - No differences between groups

Results: Duration

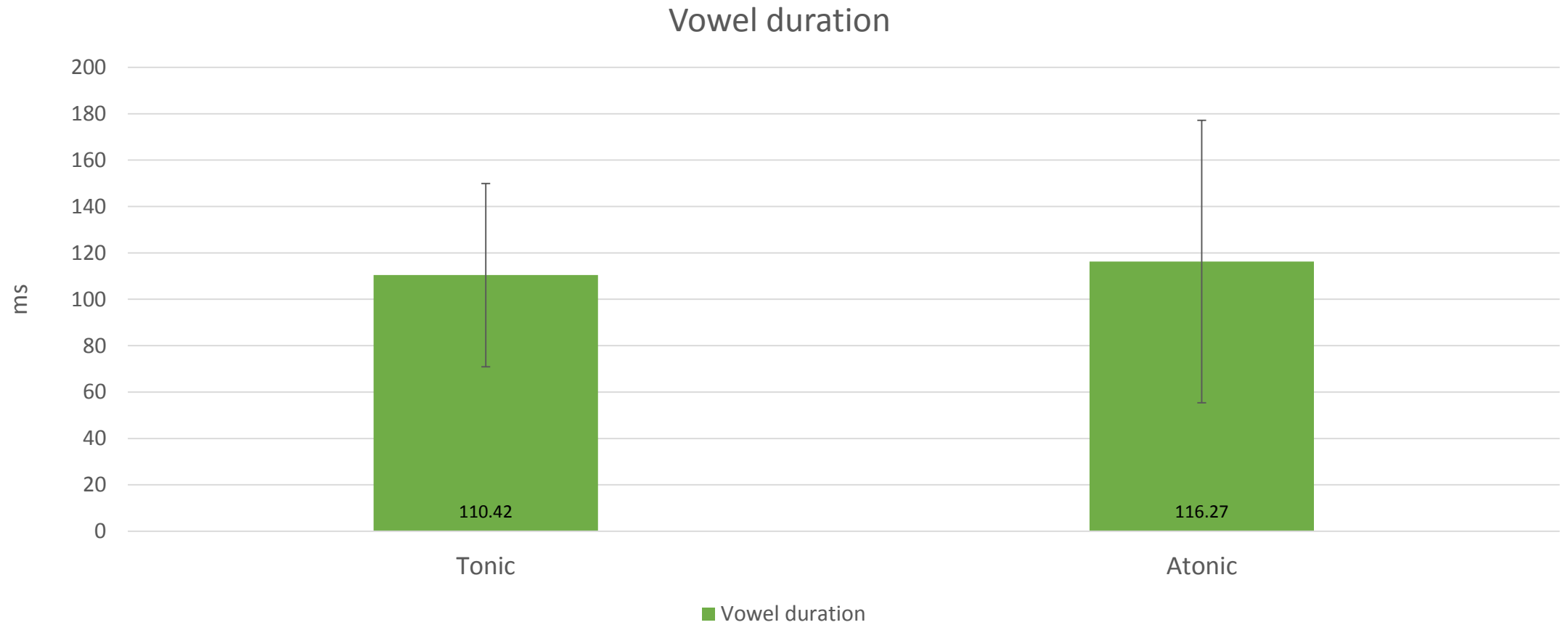
- An additional 78 tokens excluded from duration analysis due to difficulty in precisely determining boundary
 - Especially between approximants and vowels
- $N = 2,723$ (Early bilinguals = 2,117; Late bilinguals = 606)

Results: Duration



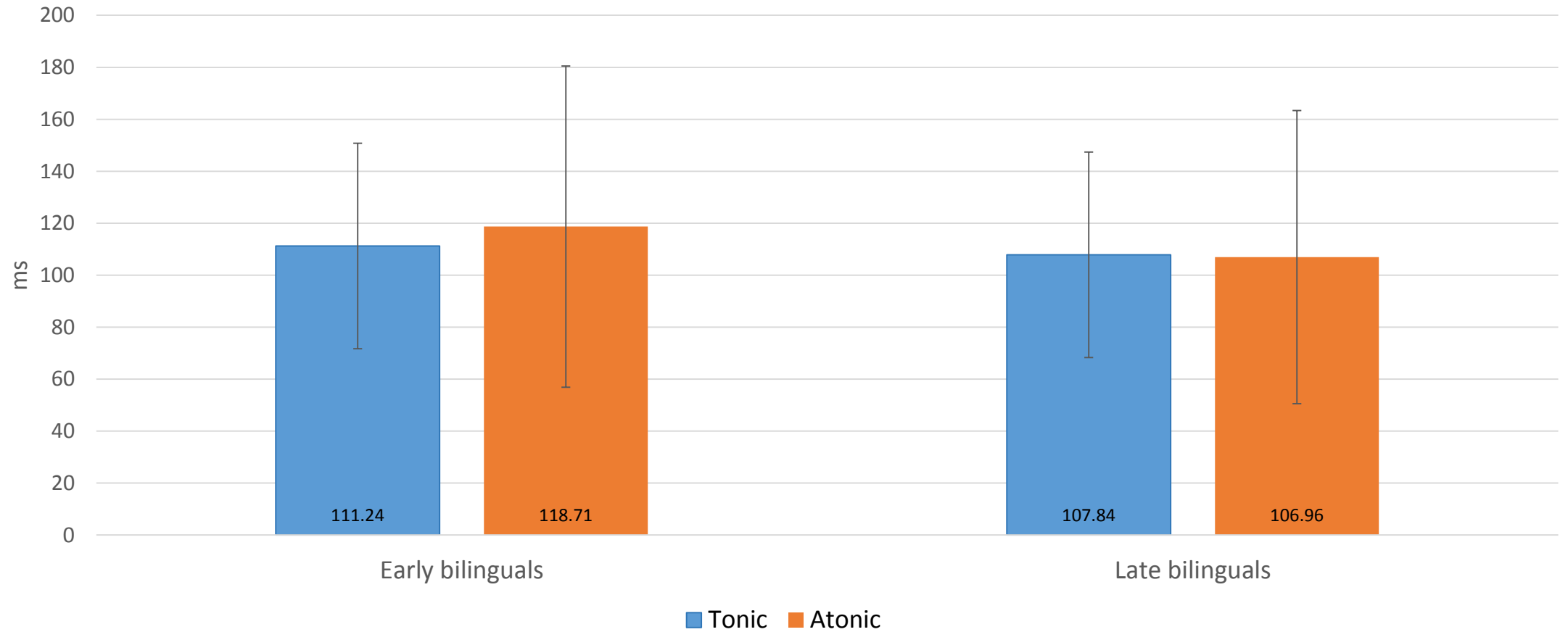
	β	<i>SE</i>	<i>t</i>	<i>p</i>
Speaker group	-10.68	11.18	-0.96	.354

Results: Duration by stress



	β	<i>SE</i>	<i>t</i>	<i>p</i>
Stress	3.52	4.36	0.81	.420

Results: Duration by speaker group and stress



	β	<i>SE</i>	<i>t</i>	<i>p</i>
Speaker group x Stress	-2.93	6.35	-0.46	.644

Results: Duration (Summary)

- No differences between early and late bilinguals in vowel duration
- No overall duration differences between tonic and atonic vowels
- No interaction between speaker group (early vs. late bilinguals) and stress

Discussion

1. How do the Spanish vowels of early Spanish-English bilinguals compare to those of late Spanish-English bilinguals?

-Vowel quality: **Difference along F2 dimension (backed /e/ and /a/ in early as compared to late bilinguals)**

-Vowel quantity: **No differences**

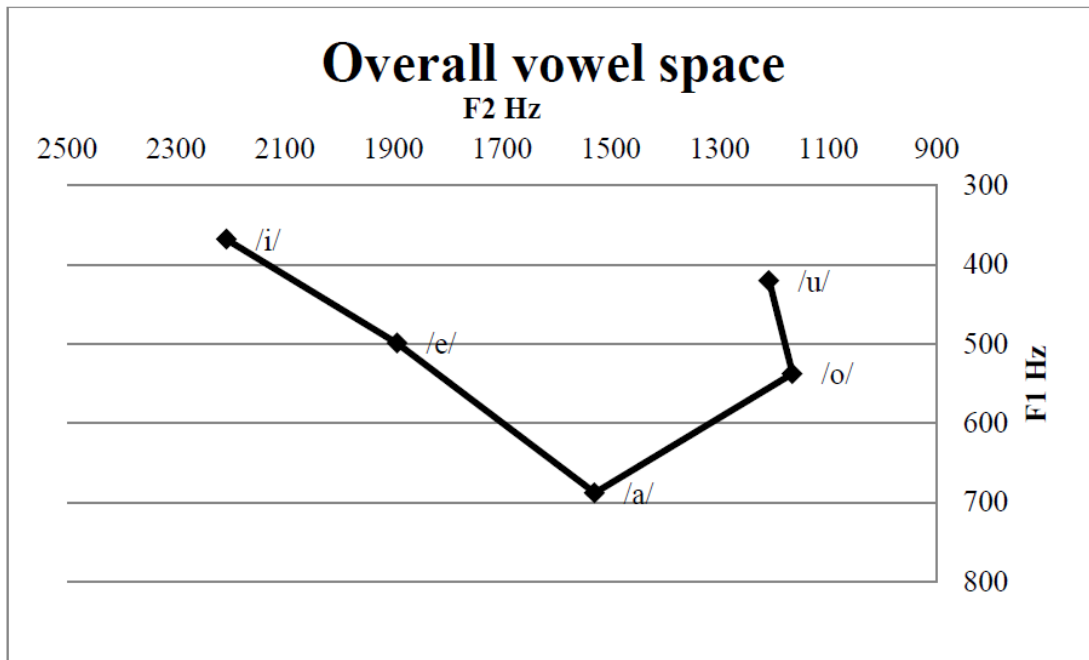
2. Are there differences in early and late bilingual vowel productions by stress?

-Vowel quality: **Both groups show centralization of atonic /e/, /a/, /o/; no differences between groups**

-Vowel quantity: **No differences by stress for either group**

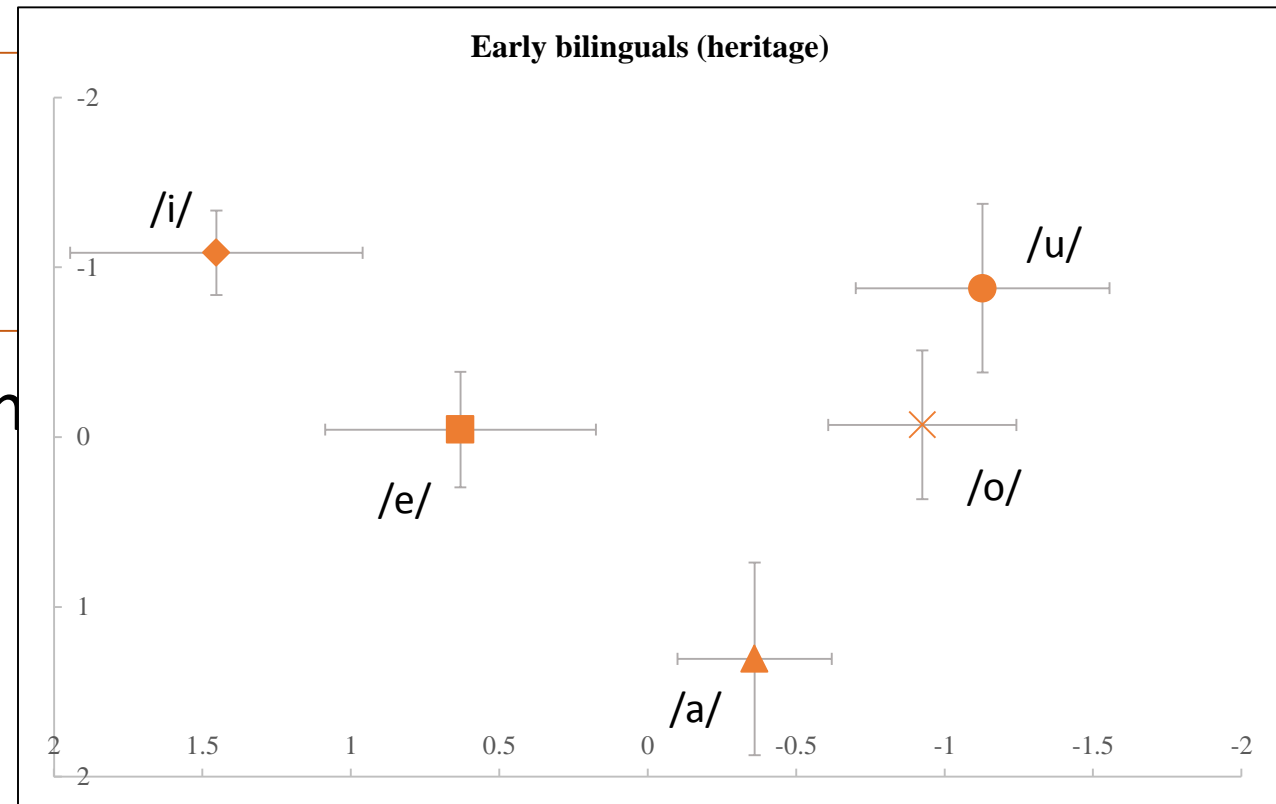
Discussion

- How do our results compare to the speaker vowels? (Formants)



Ronquest (2012)

Figure 4-1. Overall acoustic distribution of HS vowels averaged across all speakers, stress contexts, syllable types, and tasks (N = 3,342).



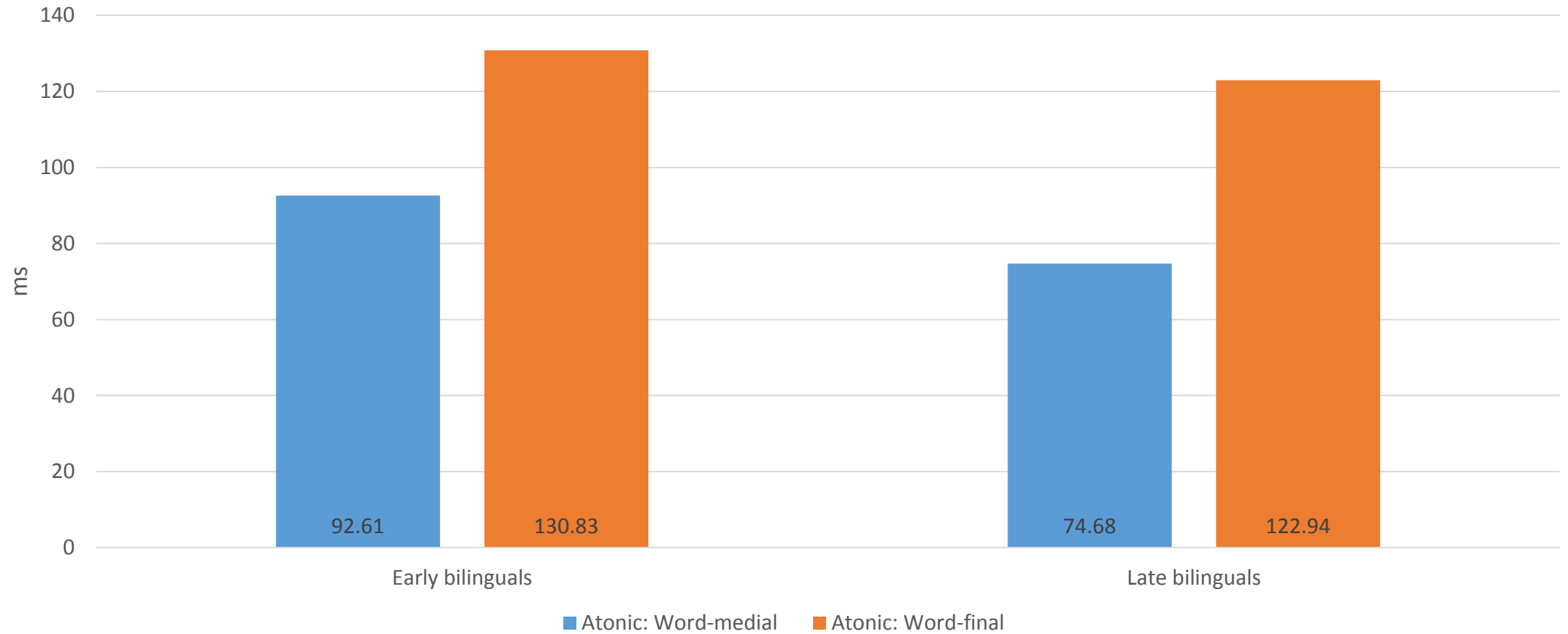
red to previous studies come in with
 ɹp
 and /a/

- Asymmetry
- Condensed back vowel space

Discussion

- How do our results compare to those of other studies of heritage speaker vowels? (Duration)
 - Ronquest (2012, 2013) found clear reduction of atonic vowels
 - Not found here for either speaker group
- Effect of task (dialogic, with L2 learner) and atonic syllable position

Discussion



Conclusions

- Limitations
 - Varied heritage speaker group (heritage, experience)
 - Task– both a positive (spontaneous and meaning focus) and a limitation (dialogic, interacted with L2 learner)
 - Duration: not speech-rate normalized
- Contribute additional acoustic evidence to our knowledge and understanding of heritage speaker vowel systems
 - Important addition of comparable late bilingual group

Thank you!

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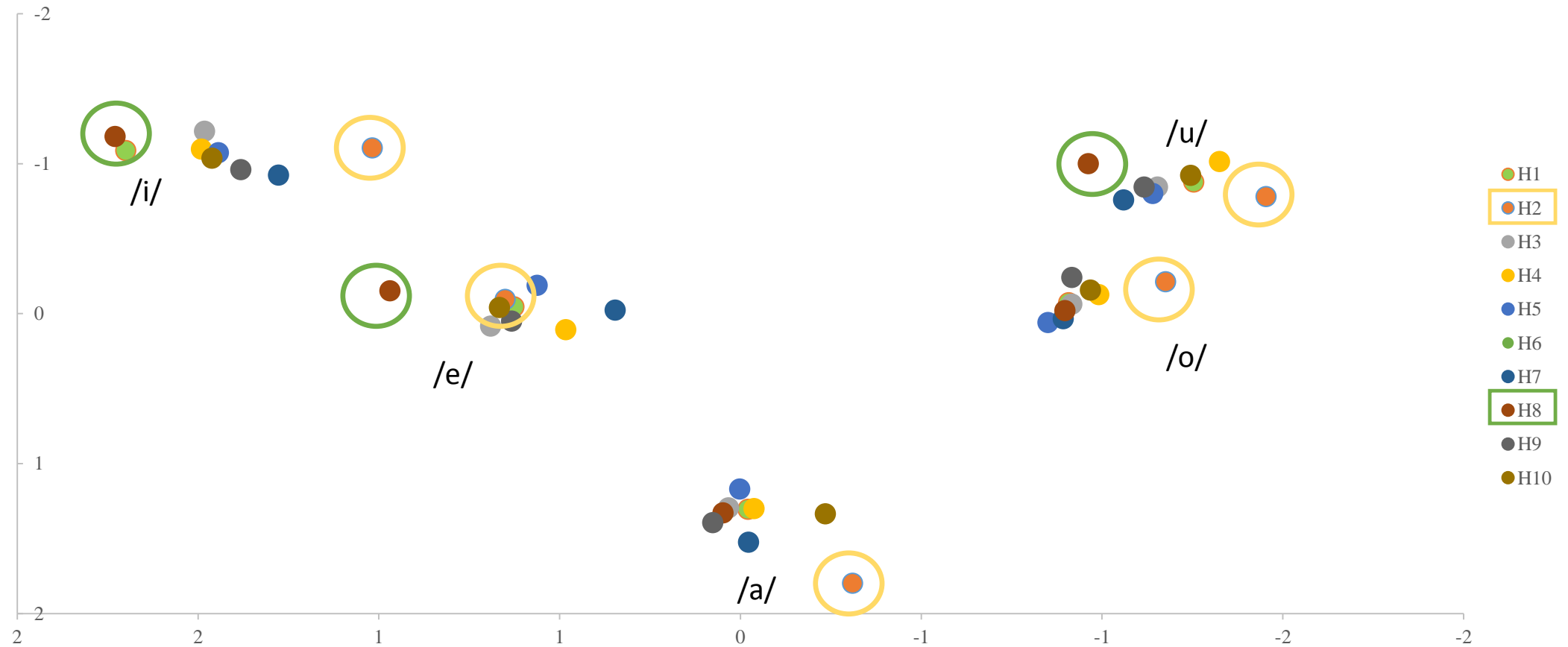
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- Our participants
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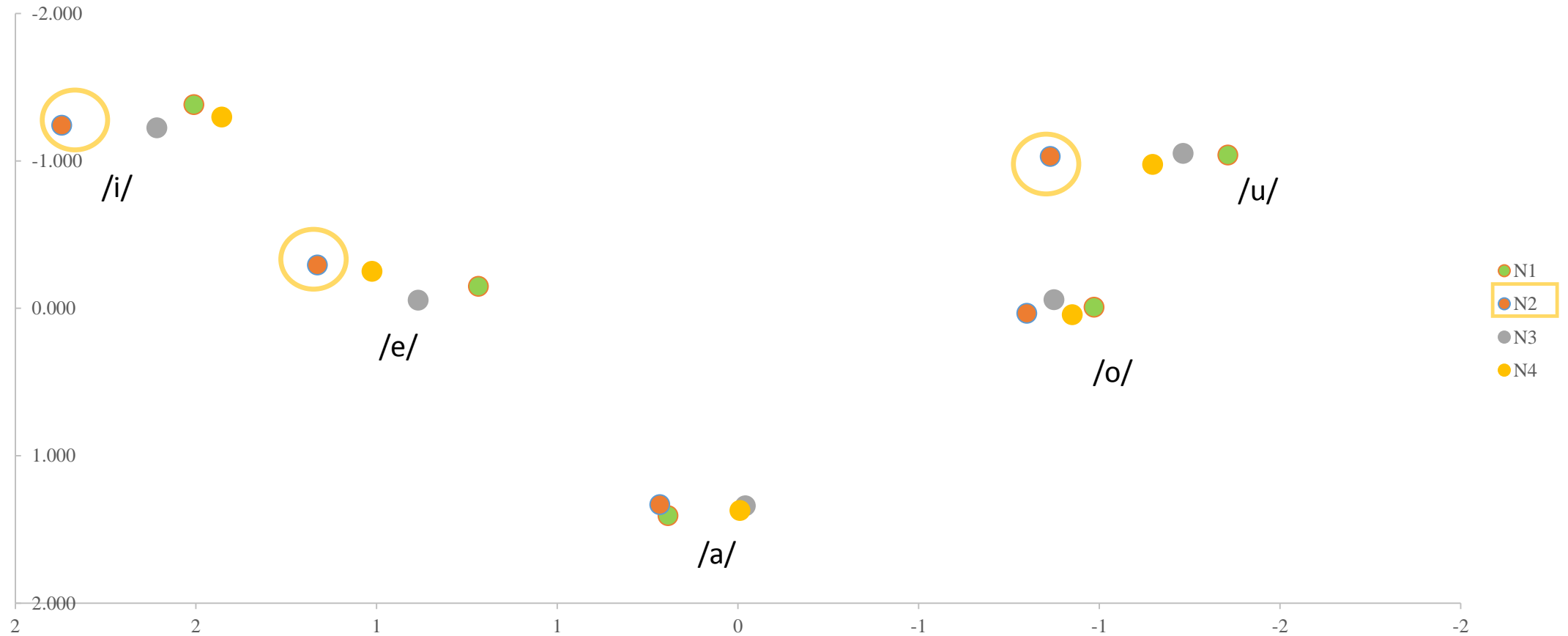
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Results: Formants by individual (early bilinguals)



Results: Formants by individual (late bilinguals)



Participant	Age	Place of birth	Moved to US	Age of Spanish
H1	20	NY		4
H2	27	NY		birth
H3	20	Ecuador	1.5 yrs	birth
H4	19	NY		birth
H5	18	NY		birth
H6	20	NY		birth
H7	20	NY		birth
H8	21	NY		birth
H9	18	Dominican Republic	9 yrs	birth
H10	18	NY		birth