Regressive Cross-Linguistic Influence in Multilingual Speech Rhythm

The Role of Typological Similarity

Megan M. Brown & Charles B. Chang

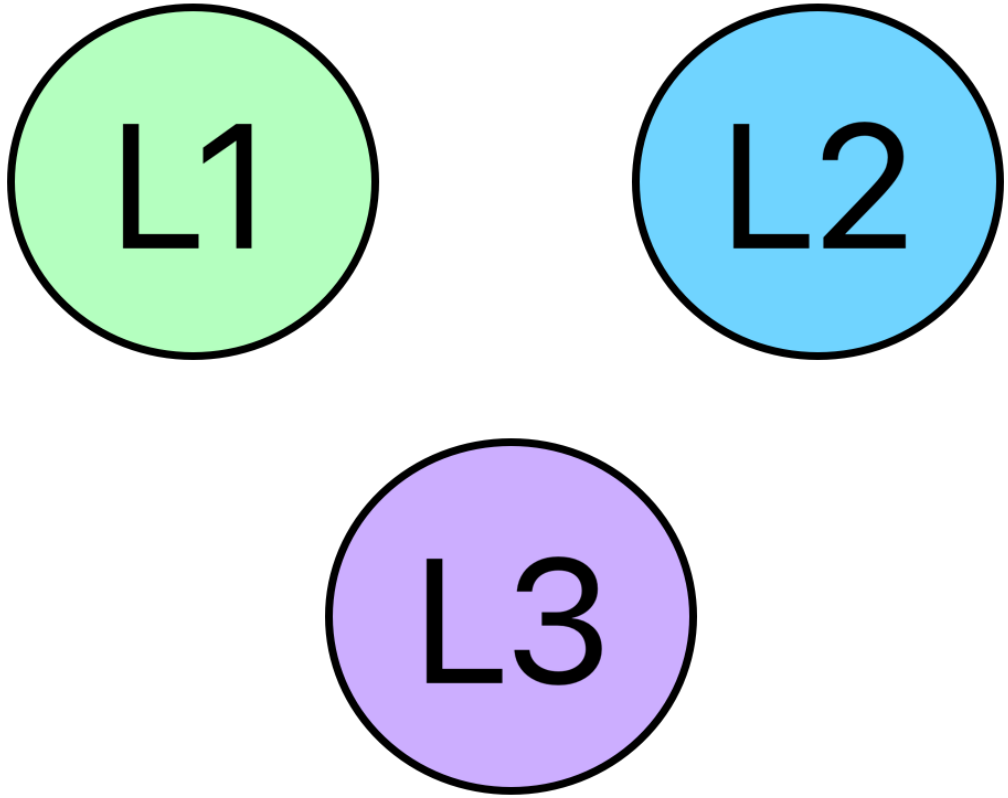
Boston University

Virtual Workshop on L3 Development After the Initial State
October 2nd, 2021

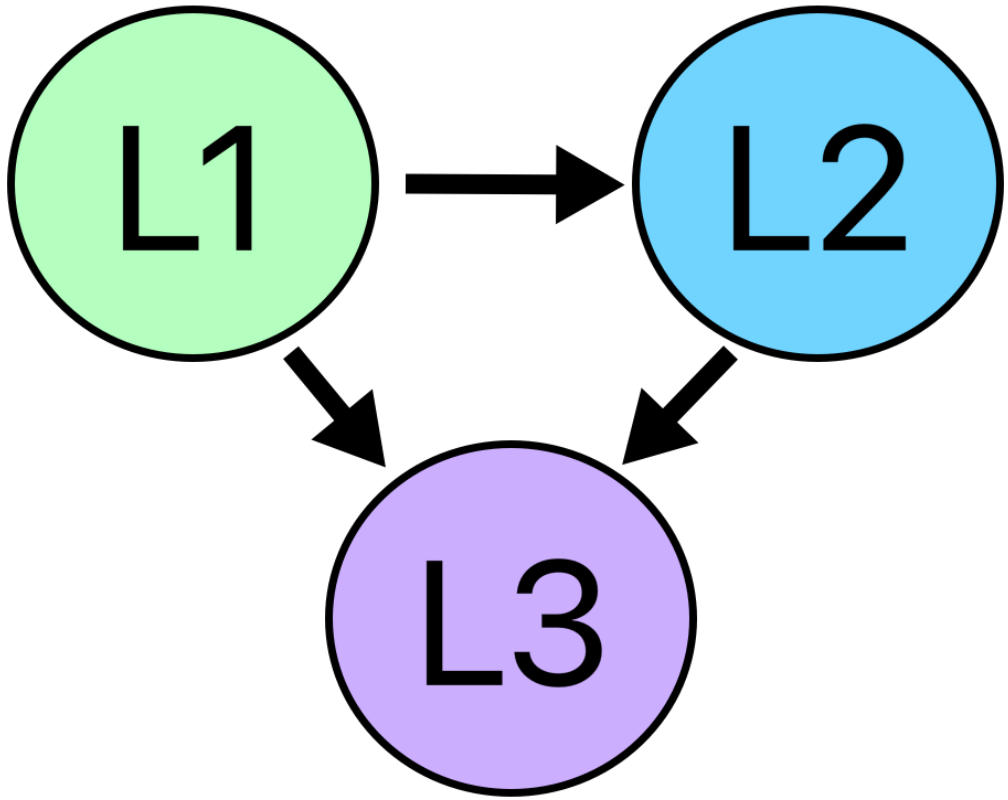
L3-AIS

BOSTON UNIVERSITY

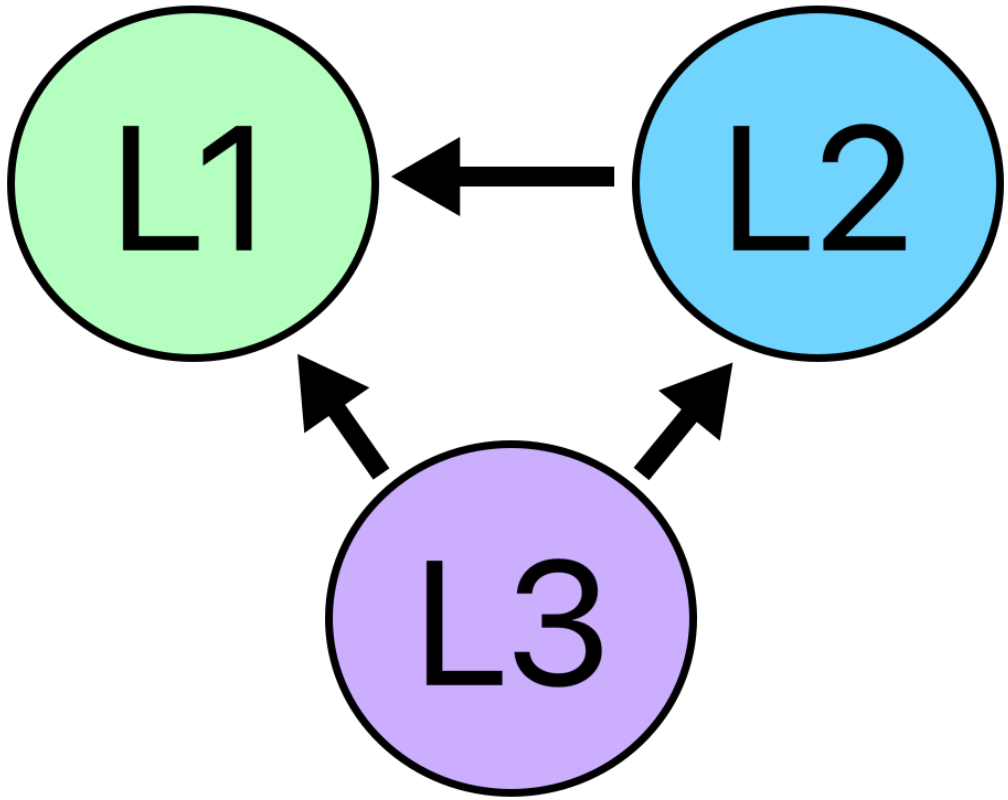
Cross-Linguistic Influence



Progressive Cross-Linguistic Influence (pCLI)



Regressive Cross-Linguistic Influence (rCLI)



Models of Trilingual rCLI

Models of Trilingual rCLI

Phonological Permeability Hypothesis
(PPH: Cabrelli Amaro and Rothman, 2010)

Models of Trilingual rCLI

Phonological Permeability Hypothesis
(PPH: Cabrelli Amaro and Rothman, 2010)

- Phonological systems developed in childhood more stable than those developed in adulthood.

Models of Trilingual rCLI

Phonological Permeability Hypothesis
(PPH: Cabrelli Amaro and Rothman, 2010)

- Phonological systems developed in childhood more stable than those developed in adulthood.
- **rCLI from an L3 is more likely to impact the L2 than the L1**

Typological Similarity in CLI

Typological Similarity in CLI

The overall similarity between a speakers languages has been found to significantly impact **bilingual rCLI**

- Schmid and Köpke (2017)

Typological Similarity in CLI

The overall similarity between a speakers languages has been found to significantly impact **bilingual rCLI**

- Schmid and Köpke (2017)

as well as **trilingual pCLI**

- Rothman (2010 et seq), Westergaard et al., (2017)

Research Quesitons

Does typological similarity play a role in rCLI from L3 to L1/L2?

Research Quesitons

Does typological similarity play a role in rCLI from L3 to L1/L2?

This project examines this question in regards to **speech rhythm**.

Speech Rhythm

- Rhythm is the sense of movement in speech

Speech Rhythm

- Rhythm is the sense of movement in speech
  - Syllable-timed (Spanish, French)
  - Stress-timed (English, German)

Speech Rhythm

- Rhythm is the sense of movement in speech
  - Syllable-timed (Spanish, French)
  - Stress-timed (English, German)
- Adult learners are unlikely to develop an L2 rhythmic system that is comparable to that of a native speaker,

Speech Rhythm

- Rhythm is the sense of movement in speech
  - Syllable-timed (Spanish, French)
  - Stress-timed (English, German)
- Adult learners are unlikely to develop an L2 rhythmic system that is comparable to that of a native speaker, **BUT...**

Speech Rhythm

- Rhythm is the sense of movement in speech
  - Syllable-timed (Spanish, French)
  - Stress-timed (English, German)
- Adult learners are unlikely to develop an L2 rhythmic system that is comparable to that of a native speaker, **BUT...**
- They are able to develop an L2 rhythmic system which is distinct from the L1
  (Guilbault, 2002; Ordin & Polyanskaya, 2015)

Research Questions

Research Questions

English

German

Spanish

Research Questions

English (Stress-timed)

German (Stress-timed)

Spanish (Syllable-timed)

Research Questions

English (Stress-timed)

German (Stress-timed)

Spanish (Syllable-timed)

Research Questions

English (Stress-timed)

German (Stress-timed)

Spanish (Syllable-timed)

Research Question

Which language is more susceptible to rCLI?

Research Question

Which language is more susceptible to rCLI?

Does **similarity** play a role?

Research Question

Research Question

- L1 English, L2 German, L3 Spanish

Research Question

- L1 English, L2 German, L3 Spanish
- L1 German, L2 English, L3 Spanish

Research Question

- L1 English, L2 German, L3 Spanish
- L1 German, L2 English, L3 Spanish
- L1 English, L2 German
- L1 German, L2 English

Research Question

- L1 English, L2 German, L3 Spanish
- L1 German, L2 English, L3 Spanish
- L1 English, L2 German
- L1 German, L2 English

Do linguistic similarity and/or order of acquisition influence the degree of rCLI to each langauge?

Participants

Language Background	Number of Participants
L1 English L2 German L3 Spanish	5
L1 German L2 English L3 Spanish	3
L1 English L2 German	6
L1 German L2 English	3

Participants

- 12 female, mean age = 35, age range = 18-58
- Sequenital trilinguals with L2/L3 AoA > 7
- Sufficient proficiency and fluency in all of the target languages
- No knowledge of other non-target languages

Procedure

Picture Description Task

Procedure

Picture Description Task

- 4 images per language
- 5-20 minutes of speech per language

Analysis

- Recordings annotated in TextGrids via Praat (Boersma & Weenink, 2009).

Analysis

- Recordings annotated in TextGrids via Praat (Boersma & Weenink, 2009).
- Duration of all vowels and consonants marked.

Analysis

- Recordings annotated in TextGrids via Praat (Boersma & Weenink, 2009).
- Duration of all vowels and consonants marked.
- $\approx$ 1 minutes of recorded speech per participant per language.

Speech Rhythm Measurements

Speech Rhythm Measurements

$$\%V = \frac{\text{sum of all vocalic interval durations}}{\text{total duration of vocalic and consonantal intervals}} \times 100$$

Speech Rhythm Measurements

$$\%V = \frac{\text{sum of all vocalic interval durations}}{\text{total duration of vocalic and consonantal intervals}} \times 100$$

Best for non-native speech analysis **between languages**
(White & Mattys, 2007)

Speech Rhythm Measurements

$$\%V = \frac{\text{sum of all vocalic interval durations}}{\text{total duration of vocalic and consonantal intervals}} \times 100$$

Best for non-native speech analysis **between languages**
(White & Mattys, 2007)

$$VarcoV = \frac{\text{SD of vocalic interval duration}}{\text{mean vocalic interval duration}} \times 100$$

Speech Rhythm Measurements

$$\%V = \frac{\text{sum of all vocalic interval durations}}{\text{total duration of vocalic and consonantal intervals}} \times 100$$

Best for non-native speech analysis **between languages** (White & Mattys, 2007)

$$VarcoV = \frac{\text{SD of vocalic interval duration}}{\text{mean vocalic interval duration}} \times 100$$

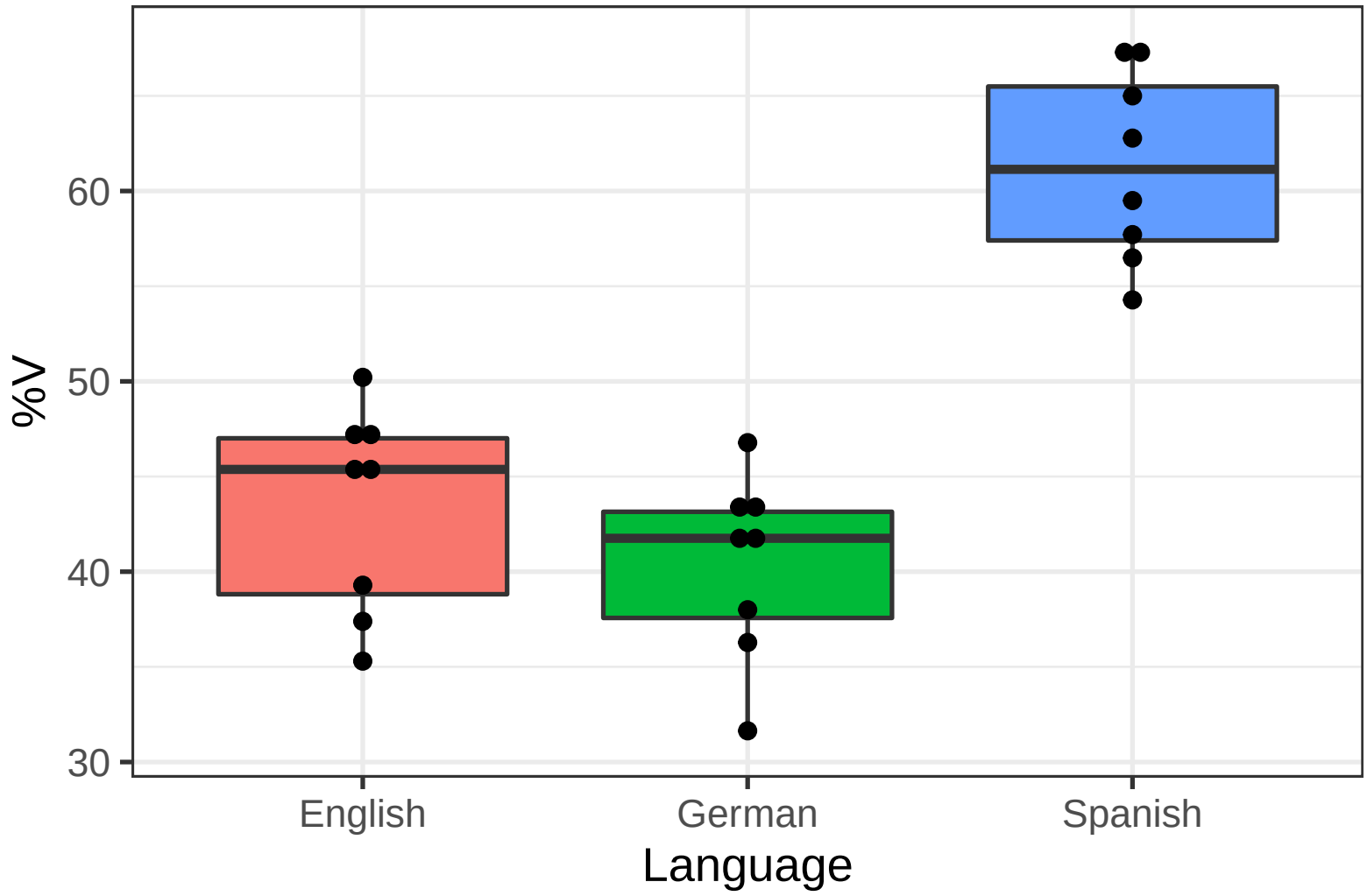
Best for non-native speech analysis **between speakers of the same langauge** (White & Mattys, 2007)

Results

L3 Spanish Rhythm

Results

L3 Spanish Rhythm



%V in L3 Spanish

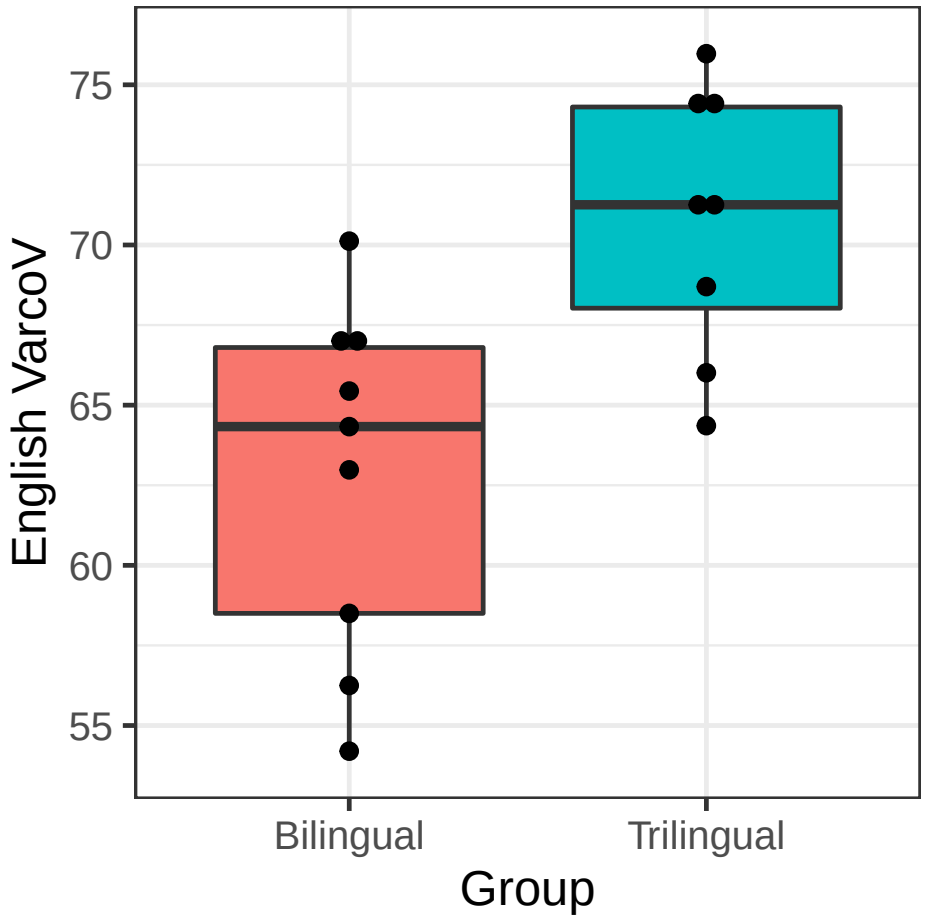
Rhythm By Language

English

Rhythm By Language

English

- VarcoV English
  - $p < .05$
- **Trilinguals have a higher (more Spanish-like) English VarcoV**



VarcoV in Bilingual vs. Trilingual English

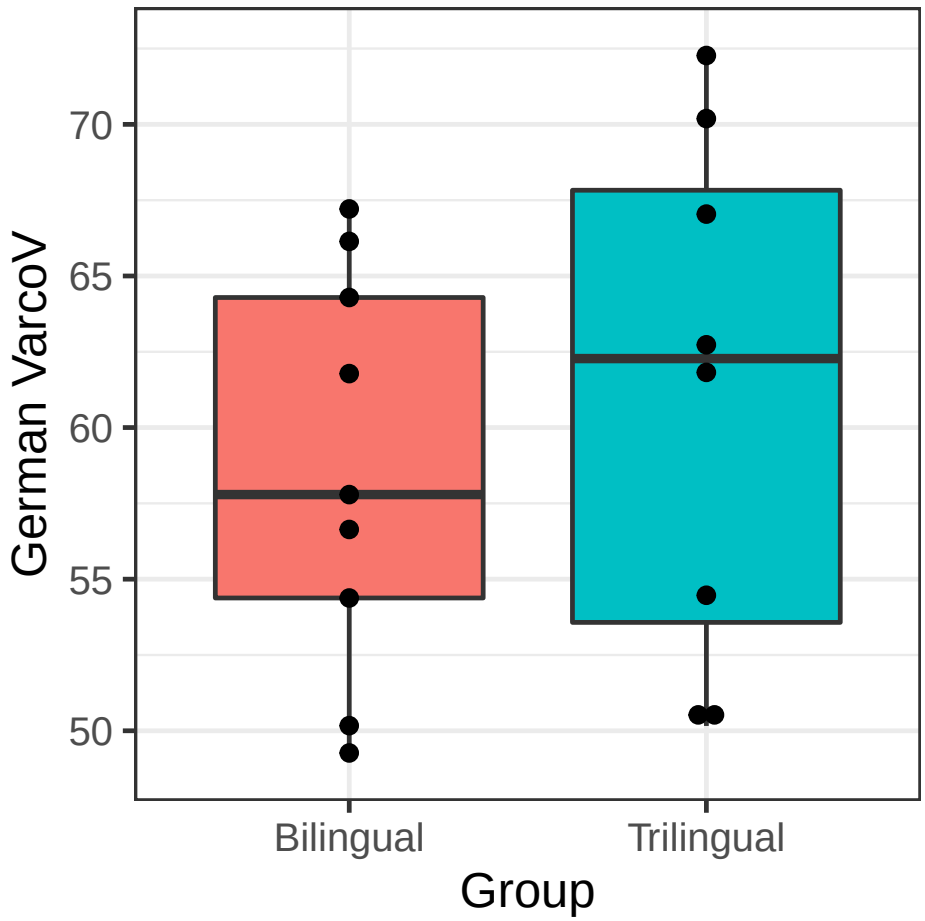
Rhythm By Language

German

Rhythm By Language

German

No significant differences were found between bilingual and trilingual German rhythm.



Discussion

- Trilinguals had a higher VarcoV in **English** than bilinguals, suggesting rCLI from L3

Discussion

- Trilinguals had a higher VarcoV in **English** than bilinguals, suggesting rCLI from L3
  - German does not shows this trend

Discussion

- Trilinguals had a higher VarcoV in **English** than bilinguals, suggesting rCLI from L3
  - German does not shows this trend
  - English is more **similar** to Spanish than German is.

Discussion

- Trilinguals had a higher VarcoV in **English** than bilinguals, suggesting rCLI from L3
  - German does not shows this trend
  - English is more **similar** to Spanish than German is.
  - English rhythm is shifting to become more like Spanish rhythm

Discussion

Discussion

Typological Convergence Hypothesis (TCH)

Proficient trilinguals are most likely to experience rCLI in a previously known language which is most **similar** to the L3 source language. This rCLI will occur in a direction which makes the previously known language **converge with** the newly acquired language.

Conclusions

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps
  - Recruitment of additional participants

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps
  - Recruitment of additional participants
  - Interaction between language similarity and **age/order of acquisition**

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps
  - Recruitment of additional participants
  - Interaction between language similarity and **age/order of acquisition**
  - Typology vs. psychotypology

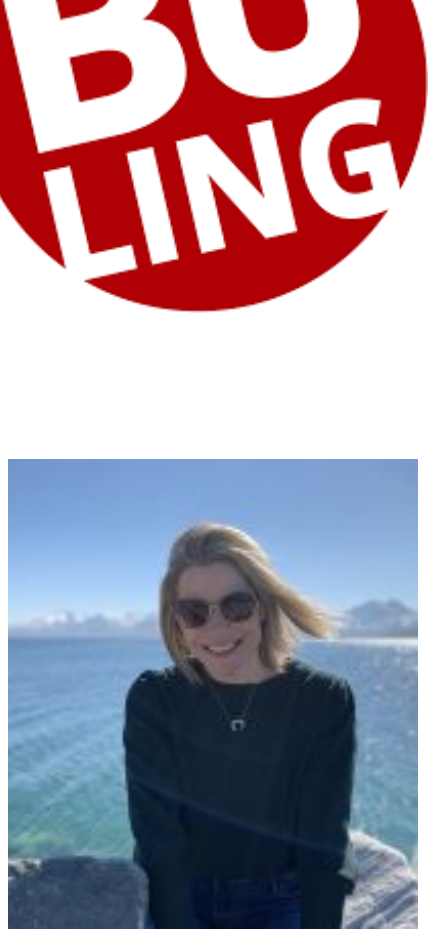
Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps
  - Recruitment of additional participants
  - Interaction between language similarity and **age/order of acquisition**
  - Typology vs. psychotypology
  - Consideration of other phonological features

Conclusions

- Preliminary findings that English is more vulnerable than German to rhythmic rCLI from L3 Spanish.
- Typological Convergence Hypothesis (TCH)
- Next Steps
  - Recruitment of additional participants
  - Interaction between language similarity and **age/order of acquisition**
  - Typology vs. psychotypology
  - Consideration of other phonological features
  - The role of additional factors such as proficiency and frequency of use.

Special Thanks



Thank You!

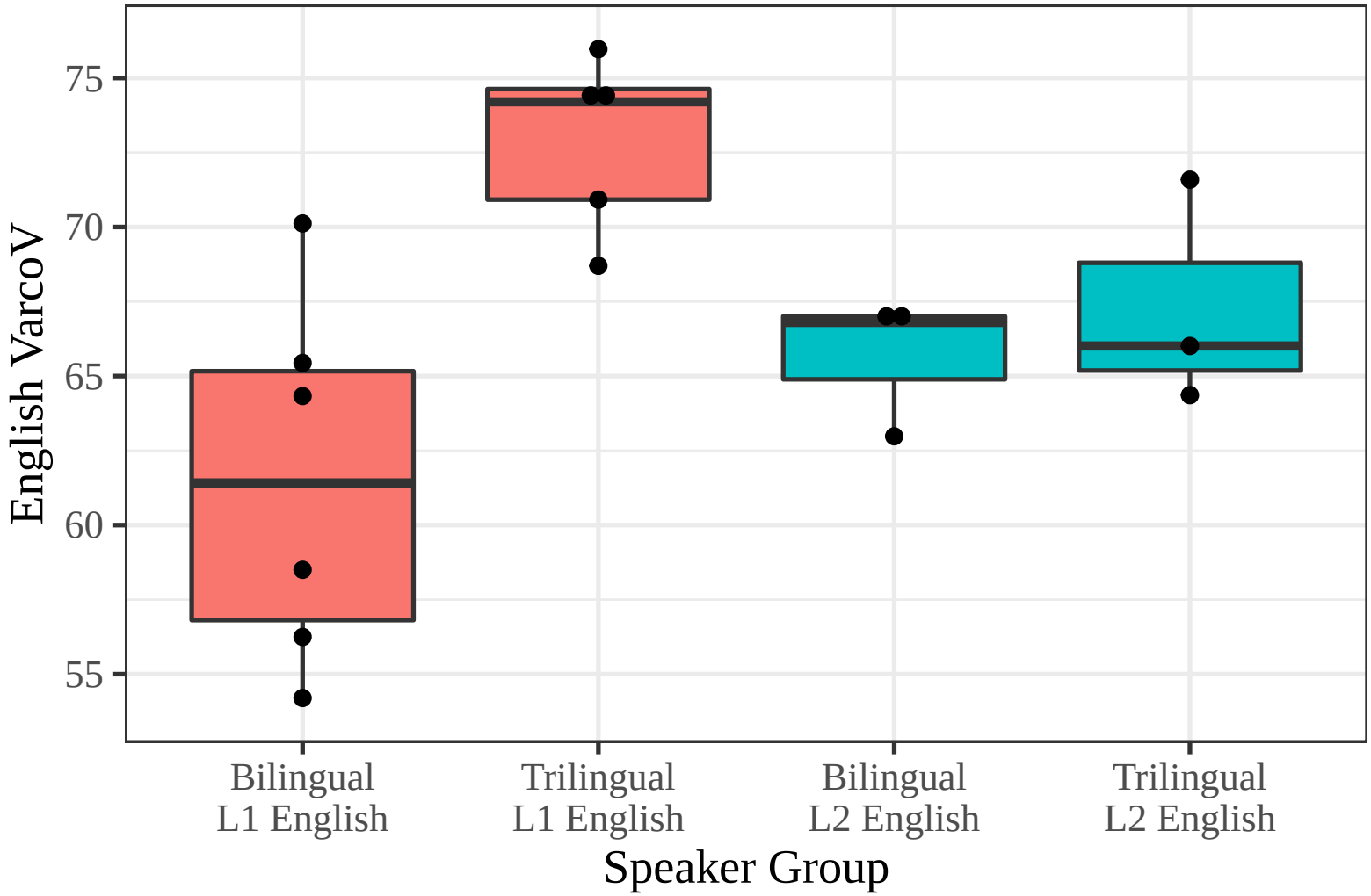
These slides can be found at https://www.meganmbrown.com

Questions?

References

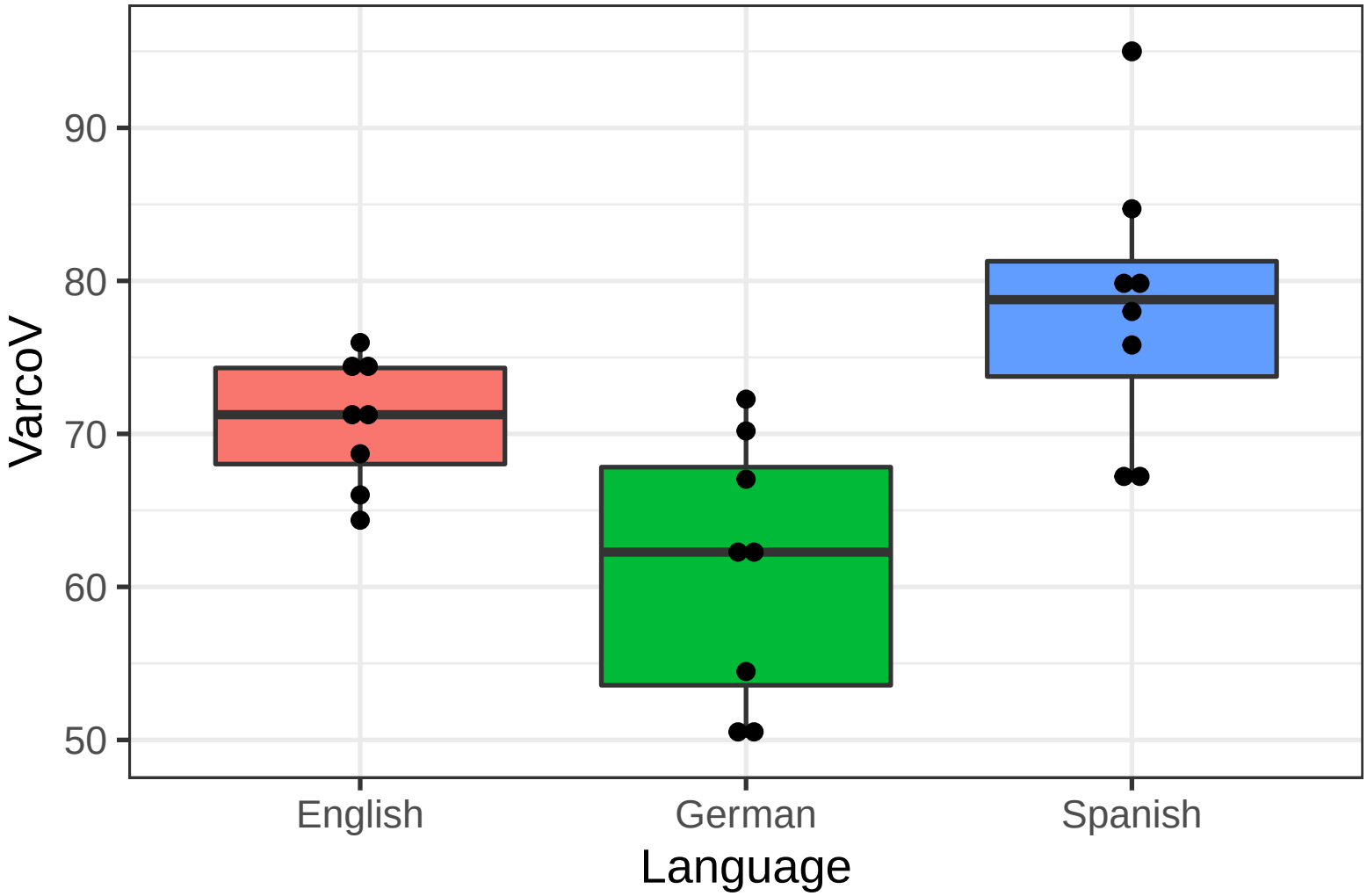
- Boersma, P., & Weenink, D. (2009). *Praat: doing phonetics by computer (version 5.1.13).* Retrieved from http://www.praat.org
- Cabrelli Amaro, J., & Rothman, J. (2010). On L3 acquisition and phonological permeability: A new test case for debates on the mental representation of non-native phonological systems. *International review of applied linguistics in language teaching, IRAL, 48*(2-3), 275. doi: 10.1515/iral.2010.012
- Guilbault, C. P. G. (2002). *The acquisition of French rhythm by English second language learners* (Unpublished doctoral dissertation). University of Alberta.
- Izura, C., Cuetos, F., & Brysbaert, M. (2014). LexTALE-Esp: A test to rapidly and efficiently assess the Spanish vocabulary size. *Psicologica: International Journal of Methodology and Experimental Psychology, 35*(1), 49-66. Retrieved from https://www.redalyc.org/articulo.oa?id=16930557004
- Lemhöfer, K., & Broersma, M. (2012). Introducing LexTALE: A quick and valid Lexical Test for Advanced Learners of English. *Behavior Research Methods, 44*(2), 325-343. doi: 10.3758/s13428-011-0146-0
- Ordin, M., & Polyanskaya, L. (2015). Perception of speech rhythm in second language: the case of rhythmically similar L1 and L2. *Frontiers in Psychology.* doi: doi.org/10.3389/fpsyg.2015.00316
- Rothman, J. (2010). On the typological economy of syntactic transfer: Word order and relative clause high/ low attachment preference in L3 Brazilian Portuguese. *International Review of Applied Linguistics in Language Teaching (IRAL), 48*, 245–273. doi: 10.1515/iral.2010.011
- Schmid, M., & Köpke, B. (2017). The relevance of first language attrition to theories of bilingual development. *Linguistic Approaches to Bilingualism, 7*(6), 637–667.
- Westergaard, M., Mitrofanova, N., Mykhaylyk, R., & Rodina, Y. (2017). Crosslinguistic influence in the acquisition of a third language: The Linguistic Proximity Model. *International Journal of Bilingualism, 21*(6), 666-682. doi: 10.1177/1367006916648859
- White, L., & Mattys, S. (2007). Calibrating rhythm: First language and second language studies. *Journal of Phonetics, 35*, 501-522. doi: 10.1016/j.wocn.2007.02.003

Additional Results



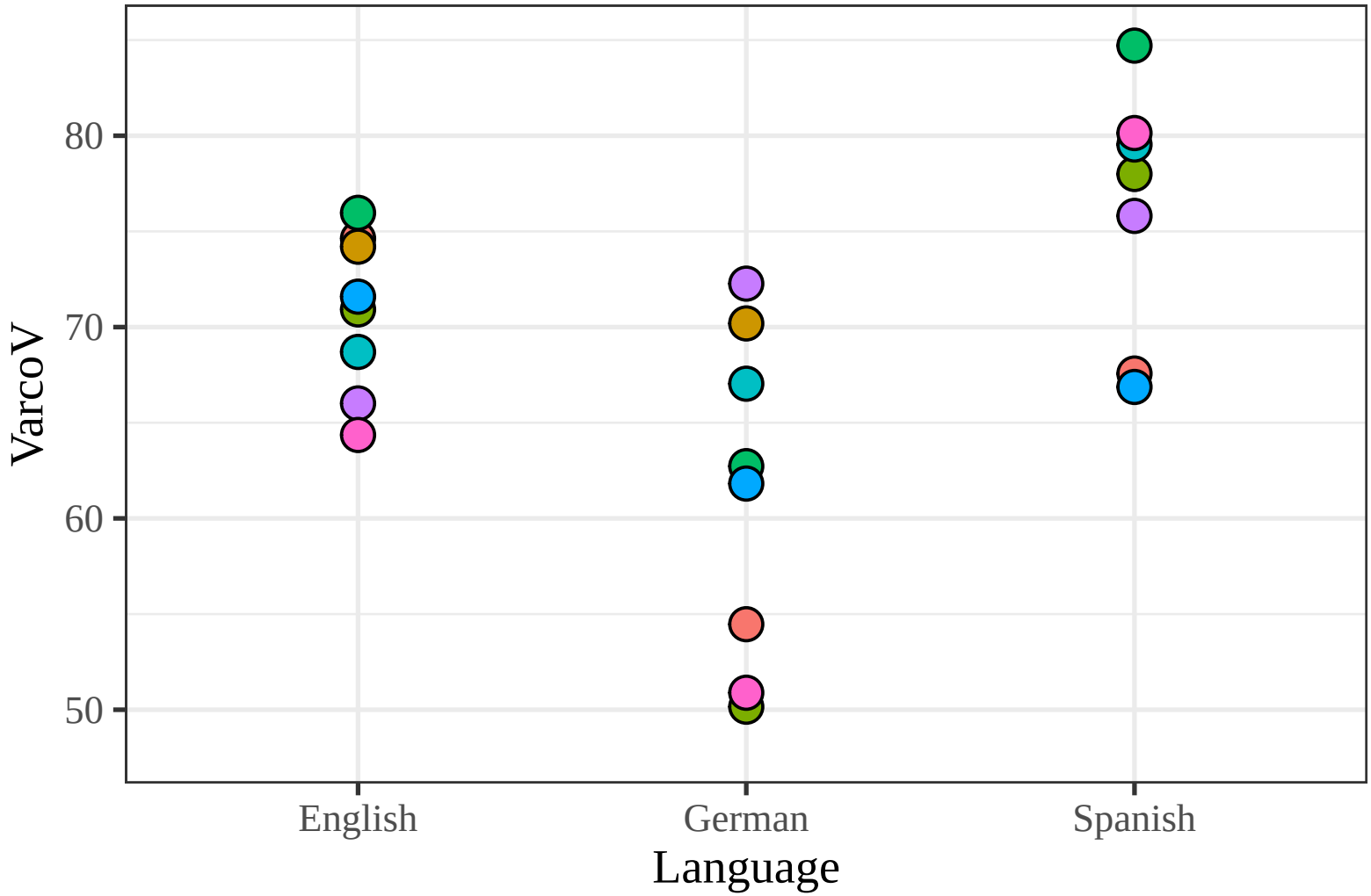
English VarcoV Scores By Order of Acquisisition

Additional Results



Trilingual VarcoV in Scores in all 3 languages

Additional Results



Trilingual VarcoV in Scores in all 3 languages by participant