The neurocognitive correlates of talker-specific adaptation to Spanish-accented speech

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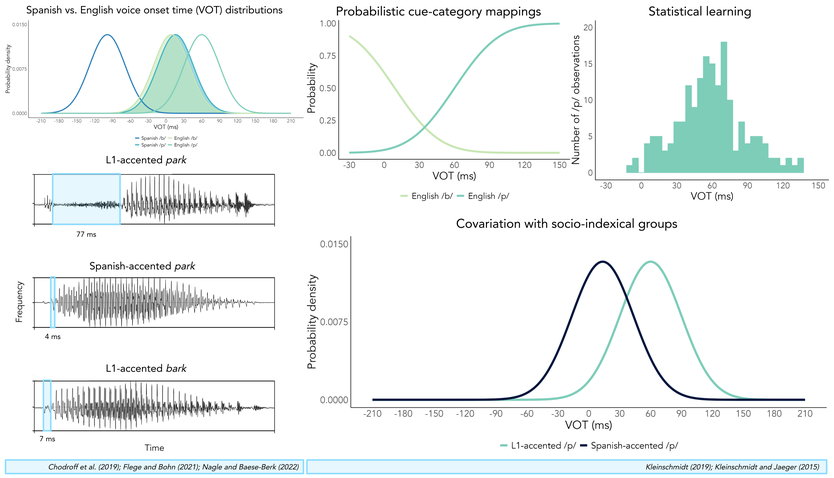
Background

L2 speech production is influenced by L1 phonetic categories

High-level accent adaptation is grounded in low-level acoustic-phonetic processes

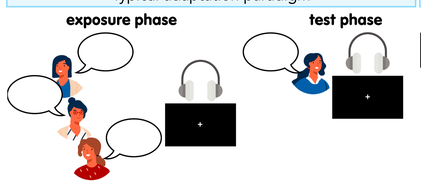


Chodroff et al. (2019); Flege and Bohn (2021); Nagle and Baese-Berk (2022) | *Kleinschmidt (2019); Kleinschmidt and Jaeger (2015)*

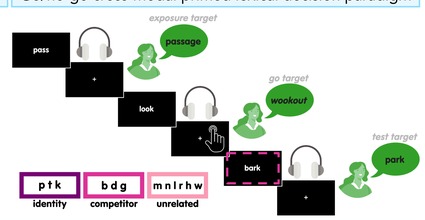
- Talker-specific adaptation: Participants who train on Talker A during exposure tend to perform better on Talker A during test than participants who train on Talker B
- Adaptation to L2-accented talkers in **behavior**: Higher transcription accuracy during sentence comprehension (e.g., Clarke & Garrett, 2004) and faster reaction times during cross-modal priming (e.g., Xie et al., 2017)
- Adaptation to L2-accented talkers in **ERPs** has not been targeted systematically; rather, studies have compared mean ERPs between experiment halves (Gosselin et al., 2021; Hanulíková et al., 2012; Romero-Rivas et al., 2015)

Methods

Typical adaptation paradigm



Go/no-go cross-modal primed lexical decision paradigm



Stimuli

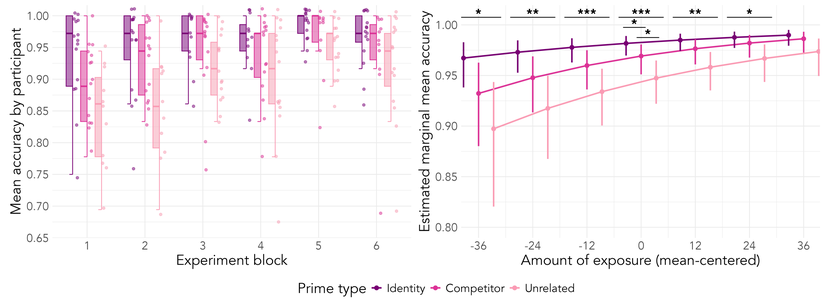
Trial type	*Target onset*	*Target type*	*Target properties*	*Prime type*	*Number of trials*	*Prime-target examples*
No-go	/p/, /t/, or /k/	Exposure	Multisyllabic real word	Match (first syllable)	72	pass-passage
		Test	Monosyllabic real word	Identity, Competitor, or Unrelated	216 (72 items x 3 prime types)	park-park bark-park wand-park
	/m/, /n/, /l/, /ɹ/, /h/, or /w/	Filler	Multisyllabic real word	Majority match (first syllable)	144	rue-rhubarb
Go		Response	Multisyllabic pseudoword	Majority match (base word first syllable)	144	look-wookout

Overall prediction: Identity <> Competitor = Unrelated → Identity = Competitor <> Unrelated

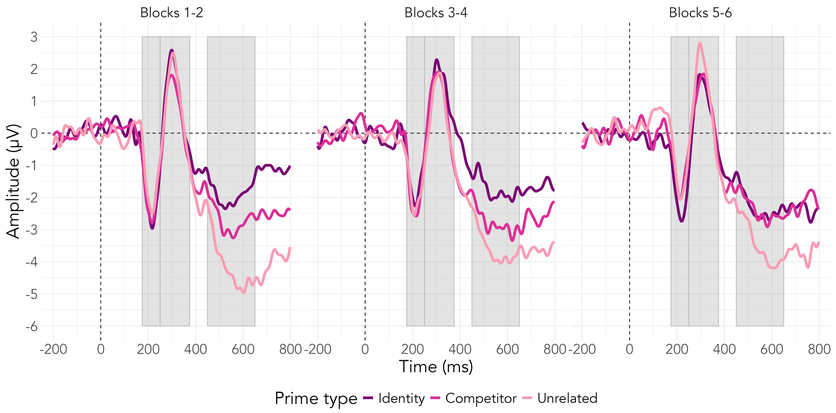
Component	*Typical peak (ms)*	*General linguistic process*	*Specific correlates*	*Time window (ms)*
N1	100	Acoustic	Gradiency in speech perception; engagement of selective attention	175-250
P2	200	Phonetic	Perceptual learning performance	250-375
N200/PMN	200	Phonetic/phonological	Accented speech normalization	250-375
N400	400	Lexical/semantic	Lexical access during accented speech processing	450-650

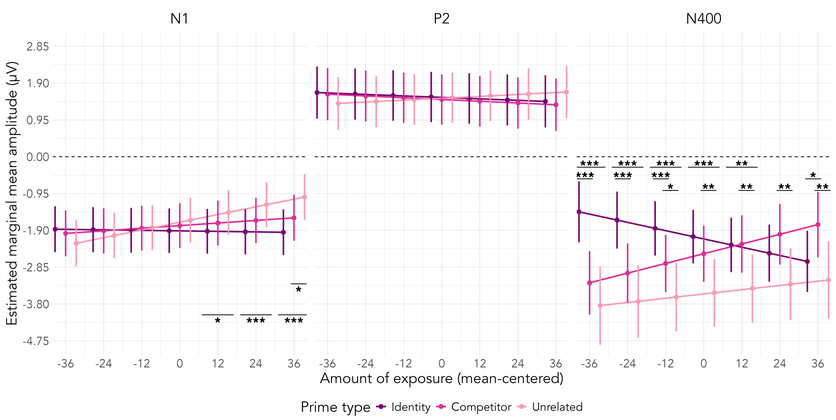
Key results

Target accuracy by prime type



ERP responses by prime type



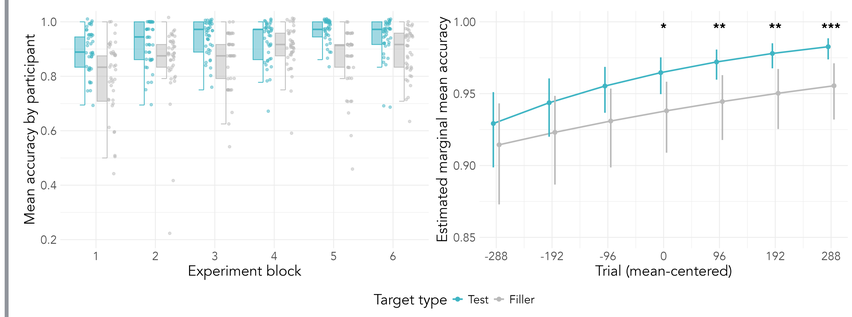


Key take-aways

- Differential sensitivity to prime type emerged on the N1 as differences in priming decreased on the N400
- N1 modulation may reflect a shift in selective attention toward acoustic information (Joos et al., 2014)
- N400 modulation may reflect a concomitant shift away from lexical information
- Accent adaptation may involve a shift from top-down to bottom-up word recognition mechanisms

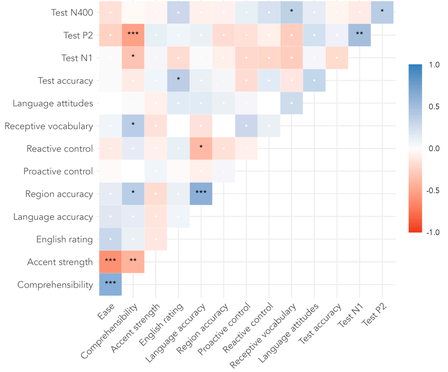
Additional results

Target accuracy comparison



Correlation analysis

Measure	*Instrument*	*Calculation*	*M (SD)*	*Range*
Ease	Talker judgments	Raw selection	2.90 (0.93)	1.00 - 5.00
Comprehensibility			3.20 (0.91)	
Accent strength			3.73 (0.78)	2.00 - 5.00
English rating			3.25 (0.72)	
Language accuracy		Proximity to correct option	3.45 (1.63)	1.00 - 5.00
Region accuracy			1.22 (1.44)	0.00 - 5.00
Proactive control	AX-CPT	Ratio of AY to AX mean RT	1.34 (0.18)	0.94 - 1.97
Reactive control		Ratio of BX to BY mean RT	0.97 (0.29)	0.19 - 2.29
Receptive vocabulary	LexTALE	Weighted mean accuracy	86.55 (7.69)	67.50 - 100.00
Language attitudes	Debriefing questionnaire	Mean selection	3.59 (0.44)	2.59 - 4.47
Test accuracy	Task	Difference between Identity and Mismatch (Competitor and Unrelated) mean accuracy	0.04 (0.05)	-0.09 - 0.15
Test N1		Absolute value of difference between Identity and Mismatch (Competitor and Unrelated) mean ERPs	0.59 (0.48)	0.01 - 2.17
Test P2			0.82 (0.67)	0.01 - 2.76
Test N400			1.04 (0.91)	0.03 - 4.04



Additional methods

- Participants: 41 Penn State undergrads, grad students, and community members
  - Mean age of 20 (18-35)
  - One excluded from ERP analyses (head injury)
  - All grew up speaking English at home
    - Four identified as bilingual (self-rated proficiency less than 3/5)
    - Four grew up in multilingual households
    - Three indicated a dialect background other than American English (British, Canadian, Caribbean)
- Talker: Spanish-English bilingual from Mexico City, Mexico; age 31 at time of recording; moved to US at age 28; began acquiring English in school (age 5)

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