The effects of stress/accent on VOT depend on language (English, Spanish), consonant (/d/, /t/) and linguistic experience (monolinguals, bilinguals)

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Introduction

English vs. Spanish /p t k b d g/:

- English and Spanish contrast *fortis* with *lenis* stops
- One acoustic correlate of contrast is VOT

	Lead	Short-lag	Long-lag
English		bdg	ptk
Spanish	bdg	ptk	

- English uses [spread glottis] while Spanish uses [voice].

Stress effects on VOT:

- For English *fortis* stops, stress *lengthens* long-lag VOT (Lisker & Abramson, 1967; among others)
- Effects not straightforward for English *lenis* stops:
  - Stress *shortens* VOT [1]
  - Stress *lengthens* VOT [2]
  - Effects small compared to *fortis* stops
- Studies of Spanish stops do not examine stress effects
- Other languages: Stress lengthens short-lag VOT of Dutch /t/

Present study:

- Consider the literature on speech rate effects on VOT:

	Lead	Short-lag	Long-lag	Reference
English		t	t^h	[3]
French	d	t		[3]
Thai	d	t	t^h	[3]
Swedish	d		t^h	[4]

  - Speech rate affects 'marked' or 'specified' consonants
- Present study examines effects of stress on:

English		[spread glottis]
Spanish	[voice]	
Spanish-English	[voice]	[spread glottis]

Method

Materials

- Word-initial **consonant** (/d t/) × **Language** (English, Spanish) × **Stress** (stressed, unstressed) ['σ.σ] vs. [σ.'σ]
  5 items × 2 × 2 × 2 = 40 words
- Auditory stimuli. 6 'talkers' (3 Eng., 3 Sp.) each word produced 3 times. 40 words × 3 iterations = 120 different stimuli.

Speakers (N = 47)

Spanish monolingual (Majorca, Spain)	N = 22
English monolingual (Arizona, US)	N = 7
Spanish-English bilingual (Arizona, US)	N = 19

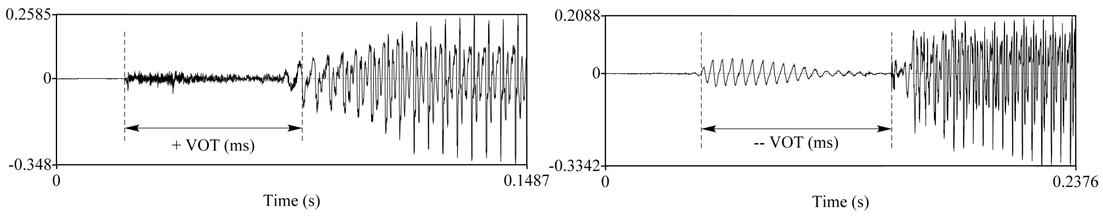
Procedure

- Delayed repetition "–is the word" "–es la palabra"

Spanish monolingual	Spanish block
English monolingual	English block
Spanish-English bilinguals	Spanish/English block

Analysis

- 4,020 tokens (420 English, 1,320 Spanish, 2,280 bilingual)



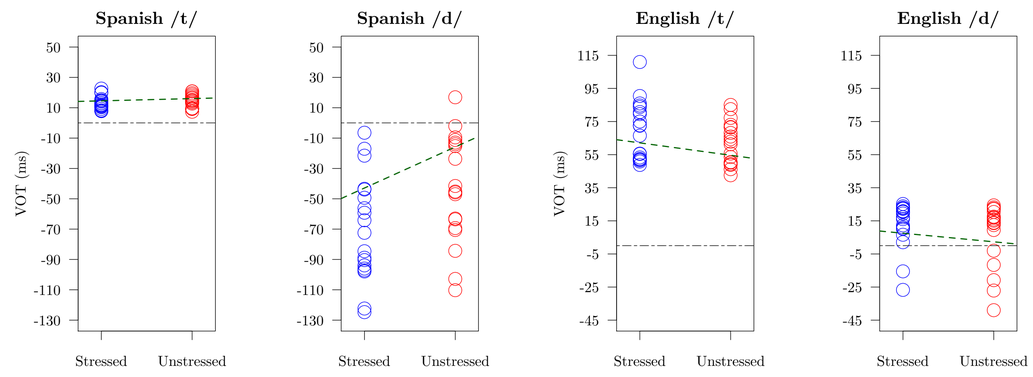
Results

Monolinguals	Spanish /d/	Spanish /t/	English /d/	English /t/
stressed	-70.2 (14.7)	14.6 (4.4)	23.1 (7.6)	76.1 (16.6)
unstressed	-53.7 (14.4)	15.8 (5.5)	25.7 (10.3)	69.3 (16.3)
effect	16.5 ✓	NS	NS	6.8 ✓

Bilinguals	Spanish /d/	Spanish /t/	English /d/	English /t/
stressed	-73.3 (36.6)	12.2 (3.5)	19.5 (3.8)	69.1 (19.0)
unstressed	-43.7 (41.4)	13.2 (3.3)	16.7 (14.8)	62.3 (13.3)
effect	29.6 ✓	NS	2.8 ✓	6.8 ✓

Group	Language	Stress effects	
Spanish	Spanish	d ✓	t
English	English	d	t ✓
Bilinguals	Spanish	d ✓	t
	English	d ✓	t ✓

Figure 1: Effects of lexical stress on VOT in Spanish (left) and English (right) /t/ and /d/ in the **bilingual** productions.



Conclusion

Summary

- Spanish: stress affects /d/, but not /t/ (anchor is /t/)
- English: stress affects /t/, but not /d/ (anchor is /d/)
- Bilinguals:
  - Stress affects all but Spanish /t/ (anchor is Spanish /t/)
  - Sp. /d/ (-58) : Sp. /t/ (12) : En. /d/ (18) : En. /t/ (65)

Conclusion

- One anchor per individual system
- Anchor is category closest to VOT of 0
- Strict featural account of stress effects not adequate [4]

Selected references

[1] Lisker, L and Abramson, A. Some effects of context on Voice Onset Time in English stops. *Language and Speech*, 10:1–28, 1967.

[2] Cole, J and Choi, H and Kim, H and Hasegawa-Johnson, M. The effect of accent on the acoustic cues to stop voicing in Radio News Speech. In *Proc. of the International Congress of Phonetic Sciences*. 2003.

[3] R Kessinger and S Blumstein. Effects of speaking rate on voice-onset time in Thai, French and English. *Journal of Phonetics*, 25:143–168, 1997.

[4] Beckman, J and Helgason, P and McMurray, B and Ringen, C. Rate effects on Swedish VOT: Evidence for phonological overspecification. *Journal of Phonetics*, 39:39–49, 2011.