Phonetic and Phonological Learning in Bilinguals

Laura Spinu[1] (lspinu@kbcc.cuny.edu), Jiwon Hwang[2], Nadya Pincus[3]

[1]City University of New York - Kingsborough, [2]Stony Brook University, [23]University of Delaware

Background

Bilingual "advantage"?

YES: cognitive development (Bialystok 1999), executive function (EF, Macnamara & Conway 2014), protection against dementia (Bialystok et al. 2007), subcortical encoding of speech sounds (Krizman et al. 2012), working memory (Bialystok et al. 2004).

NO: mainly wrt EF (Paap & Greenberg 2013, Dick et al. 2019)

Why so controversial?

Valian 2015: non-linguistic ways of improving EF

Bialystok 2018: no good operational definition of both executive function AND bilingualism

Plus: individual-difference factors (e.g. talent, Obler & Fein 1988), language-pair factors (Higby et al. 2013), age factors (Signorelli et al. 2013, Bialystok et al. 2012), task factors Valian 2015).

Is there any advantage consistently attributed to bilingual experience?

Bilingual individuals learn subsequent languages easier than monolinguals (Peal and Lambert 1962, Albert & Obler 1978, Bialystok 2001, Kaushanskaya & Marian, 2009).

Does this apply to phonetic & phonological learning?

- Consistent advantages found in perception and discrimination studies (Tremblay & Sabourin 2012, Antoniou et al. 2015), and longitudinal acquisition of novel sounds (Kopeckova 2016)
  - Modulated by **phonetic similarity** with L1/L2 and **universal difficulty** of the features learnt, but insufficient empirical evidence (Kopeckova 2016).

THIS STUDY

Naturalistic approach: extend findings to naturalistic, language-like tasks (beyond discrimination and isolated sound production)

Integration of PPL studies with EF (working memory) / possibly sensorimotor mechanisms (auditory sensory memory).

Predictions

Prediction 1: Bilinguals > monolinguals in PPL task.

Prediction 2: Bilinguals > monolinguals in digit span task.

Prediction 3: Positive correlation PPL - digit span scores

Stimuli

Artificial accent differing in 4 ways from standard NA English:

1. Diphthongization: /ɛ/ → [jɛ] e.g. 'bed' → [bjɛd]
2. Tapping: intervocalic /l/ → [ɾ] e.g. 'color' →[kʌɾəˠ]
3. Vowel epenthesis: sC̥ → səC̥ e.g. 'spy' → [səp^{h}aj]
4. Intonation change: tag questions realized with novel Mid-Low-High pattern.

Example: *He happidy offered his giyests su-cotch, didn't he?*

https://run.pavlovia.org/lspinu/model-speech-demo/html/
(works best in Chrome! May not work in Safari)

Participants & Procedure

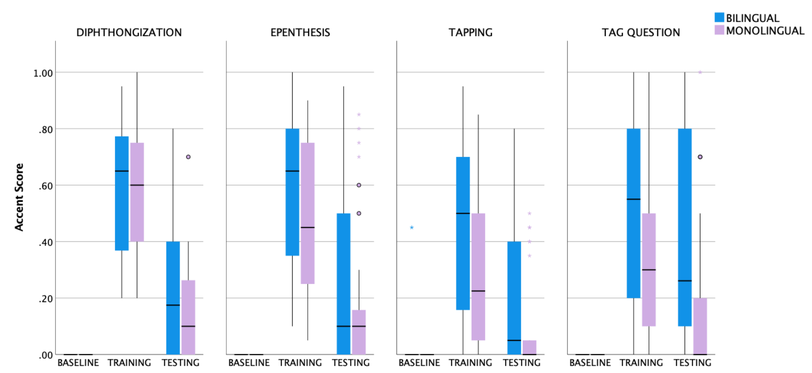
Monolingual: 9 M, 21 F, mean age 23.6, raised in NYC

Early bilingual: 8 M, 22 F, mean age 22.3, learned two languages before 3, (near)native in both (self reported)

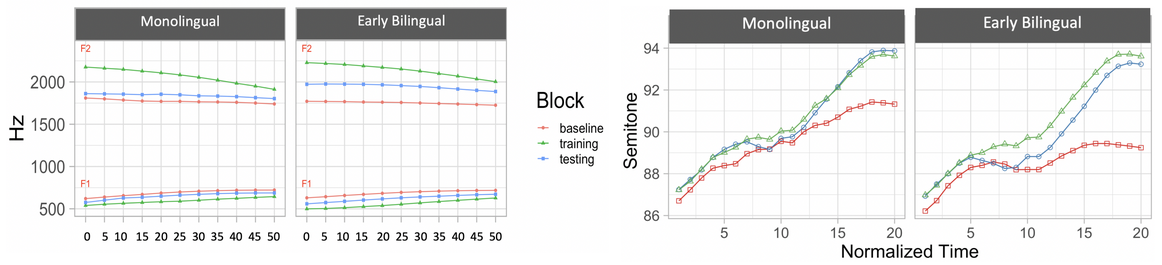
Adaptive Digit Span Task: with "recall" suffix.

Results

Categorical accent scores

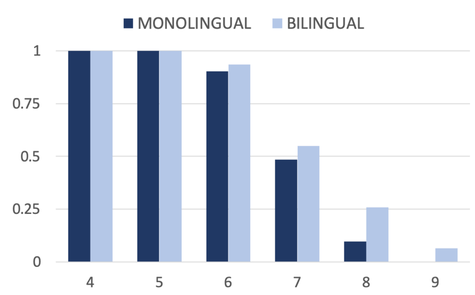


Acoustic results: diphthongization & tag questions

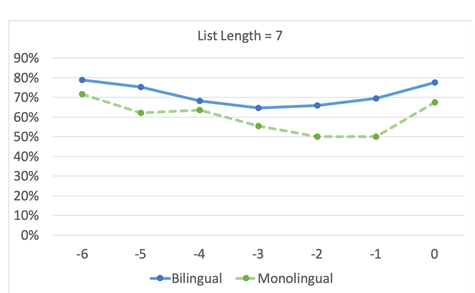


Digit span results

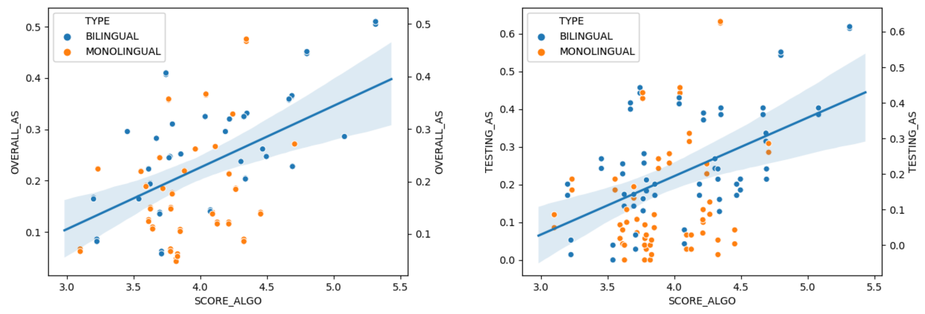
Max seq. length



Accuracy: 7-digit seq.



Correlation accent scores (overall left, testing only right) and digit span accuracy



Discussion and Conclusion

- Robust bilingual advantage in PPL and serial memory
- Some of the patterns observed may find (partial) explanation in memory mechanisms (WM and ASM)
- Sensorimotor component - important in retuning mechanism (Simmonds et al. 2011)
  - Better sensory feedback, better ability to extract relevant info for representing old articulatory configurations in new environments
  - Better motor skill, better ability to physically implement these configurations
- Also worth considering: automatic vs. conscious learning