The role of foreign film in non-native vowel production

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Background

- Previous research on the acquisition of non-native speech overwhelmingly supports the need for authentic, native-speaker input in that language in order to develop target-like linguistic competence (Flege, 2007; Flege & Liu, 2001; MacKay et al., 2001)
    - What constitutes as "native-speaker" input?
    - Only face-to-face interaction?

Main research question
Can foreign film contribute to more target-like non-native rounded vowel production?

Background

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Can foreign film contribute to more target-like non-native rounded vowel production?

Experiment #1: Imitation

Does foreign film affect acoustic imitation by non-native talkers?

Experiment #2: Native listener perception

Are acoustic adjustments made by non-native talkers perceptible to native listeners?

Methods

Experiment 1: Imitation

Participants

- 74 monolingual speakers of American English (15 male, 57 female, 1 non-binary, and 1 declined to answer; mean age 21.17 y.o., SD=3.27)

Materials

- Stimuli were recorded by a native speaker of French (male, 22 y.o.) in a sound-attenuated booth
- Stimuli were extracted and normalized for intensity in Praat
- Each stimulus item was a monosyllabic CV or CVC French word containing one of the target sounds: rounded vowels (**/y/** or **/u/**)
  - Ex: tu (/ty/), goût (/gu/)
  - Each target sound was represented across 6 stimulus items resulting in 12 total items

Methods

Experiment 1: Imitation

Procedures

- Prior to their lab visit, talkers completed a language background questionnaire online through Qualtrics

| P | Pre-/Post-test | Film intervention | Film intervention | est |

- Talkers heard a word through headphones and were asked to repeat it back into a microphone

- Each token was repeated three times per trial and trials were randomized

- Data collection took place in a sound-attenuated booth using PsychoPy

- Talkers watched Season 1, Episode 1 of Chef's Table: France

- Talkers watched the episode at a computer station in a quiet room equipped with a sound dampening tri-fold stall and listened using a pair of headphones

- Talkers completed a while-watching activity

Methods

Experiment 1: Imitation

Audio-Only group (n=30):
watched the episode in French *without* subtitles

Subtitled group (n=29):
watched the episode in French *with* English subtitles

Control group (n=15):
watched an English-dubbed version of the episode

Experimental groups
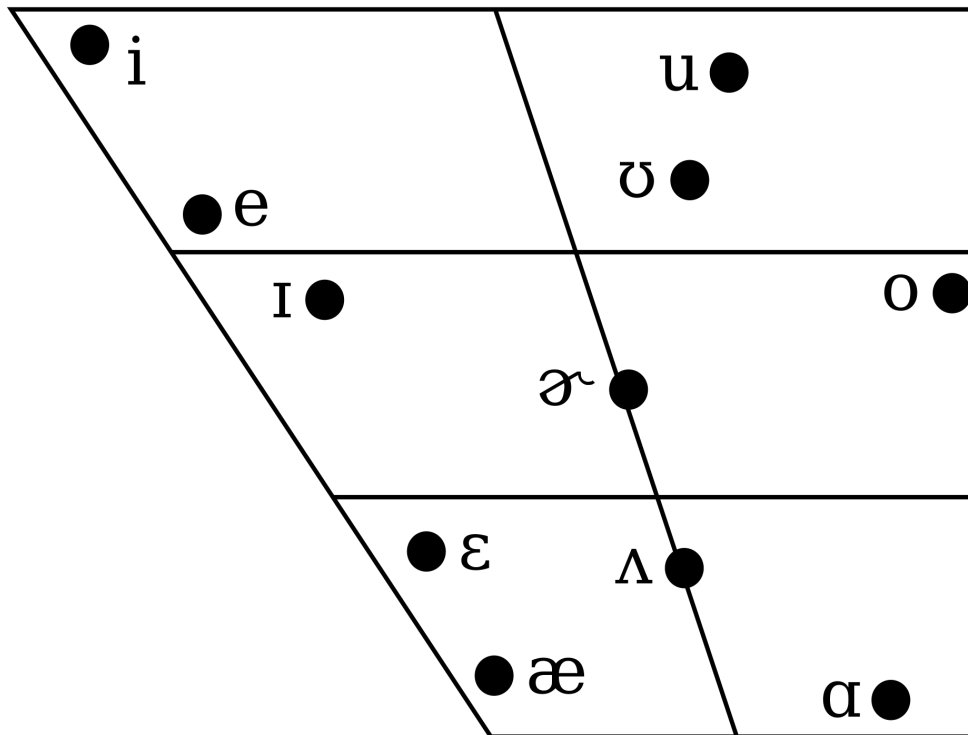
Methods

Data processing

- Annotated manually in Praat; vowels were identified using the onset and offset of periodicity
- Burg LPC-based algorithm extracted the first, second, and third formant at the midpoint of each vowel
- Formants were transformed to Barks using the PhonR package (McCloy, 2012) in R
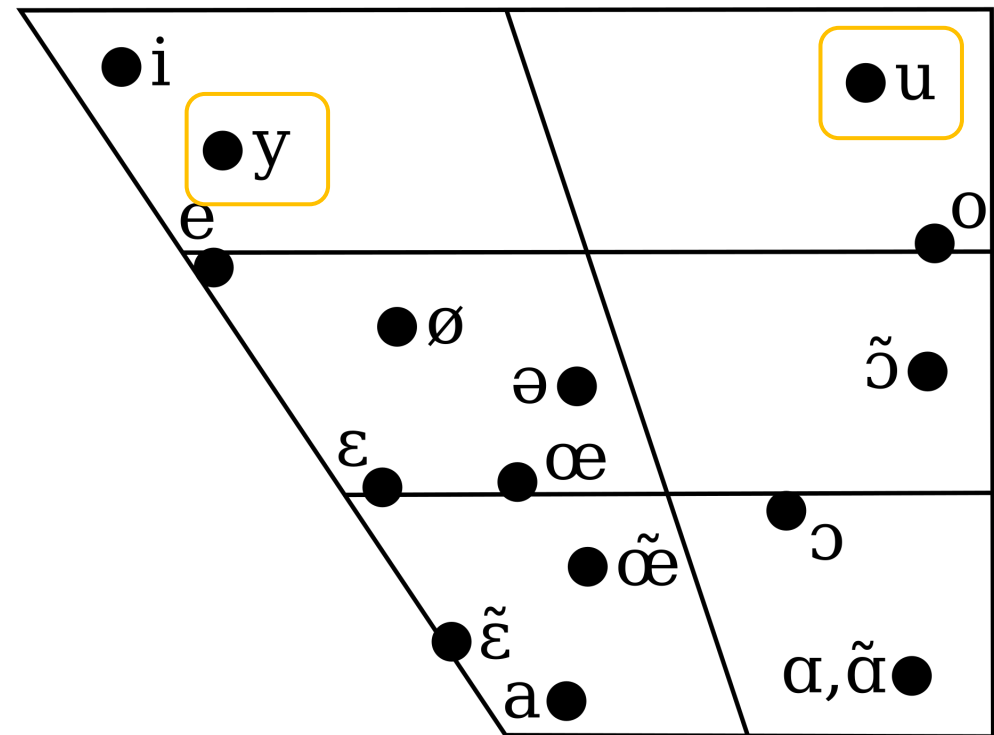
Analysis

- Statistical analysis was completed using the *lme4* package (Bates et al., 2015) in R version 1.2.5033 (R Core Team, 2019)
- F1 and F2 values were each submitted to a linear mixed effects (LME) model with **Group** (Audio-Only, Subtitled, and Control) and **Session** (pre-test and post-test) as fixed factors
- **Pre-test** was set as the reference level and the random effects structure included **Subject** and **Item** as random intercepts
- T-values were used to determine significance ($|t| > 2.00$)
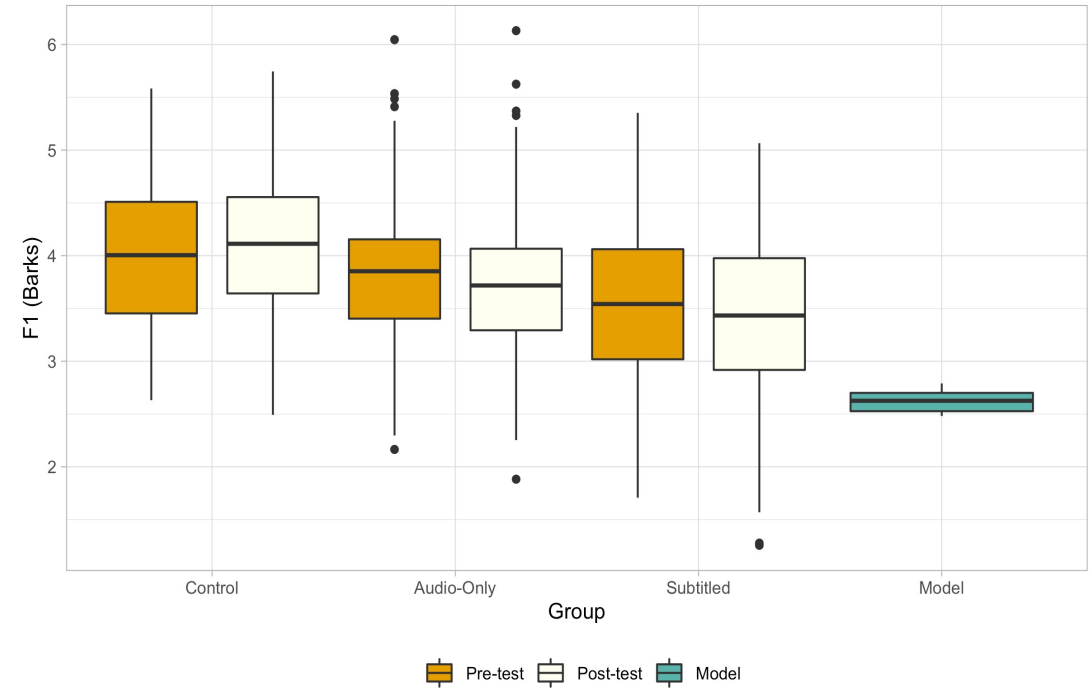
English and French vowel spaces

Results

Experiment 1: /y/ imitation (F1)

- The Audio-Only and Control group produced F1 in a similar manner prior to film intervention [β= -0.18, t= -1.12]

- The Subtitled group was more target-like in their F1 production in the pre-test when compared to the Control group [β= -0.43, t= -2.70]

Both experimental groups significantly lower their F1 following film intervention when compared to the Control group
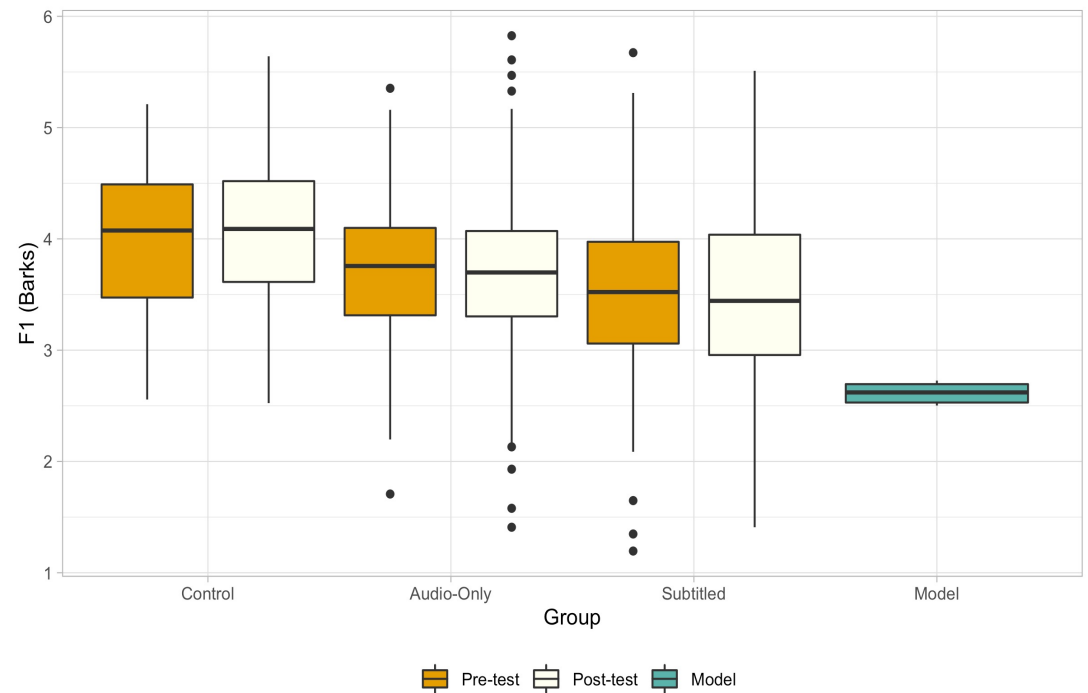[Control vs Audio-Only: β= -1.17, t= -4.10; Control vs Subtitled: β= -0.17, t= -4.15]

Results

Experiment 1: /u/ imitation (F1)

- The Audio-Only and Control group produced F1 in a similar manner prior to film intervention [β= -0.25, t= -1.51]

- The Subtitled group was more target-like in their F1 production in the pre-test when compared to the Control group [β= -0.24, t= -2.90]

Both experimental groups demonstrate convergence towards native-like norms following film intervention, but **only the Audio-Only group is significant** [Control vs Audio-Only: β= -0.09, t= -2.44 ; Control vs Subtitled: β= -0.06, t= -1.41]
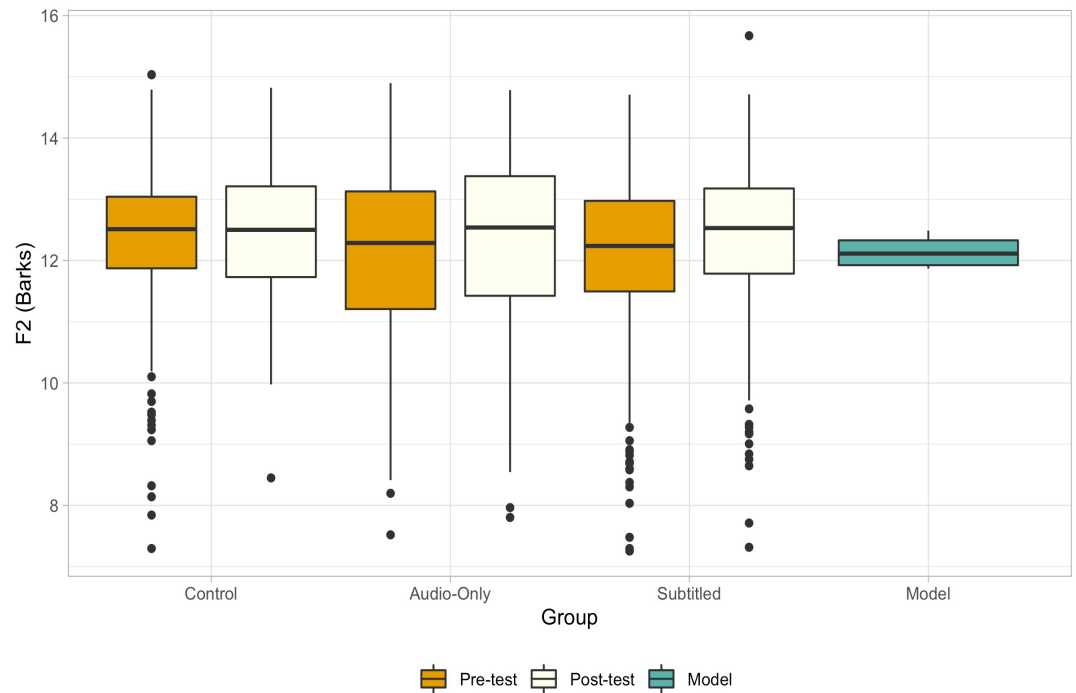
Results

Experiment 1: /y/ imitation (F2)

- Both experimental groups produced /y/ F2 values in a similar manner to the intercept (Control group) prior to film intervention [Control vs Audio-Only: β= -0.25, t= -1.03; Control vs Subtitled: β= -0.21, t= -0.853]

There did not appear to be an effect of film intervention on either experimental group when compared to the Control group (Control vs Audio-Only: β= 0.10, t= 1.03; Control vs Subtitled: β= 0.17, t= 1.70)
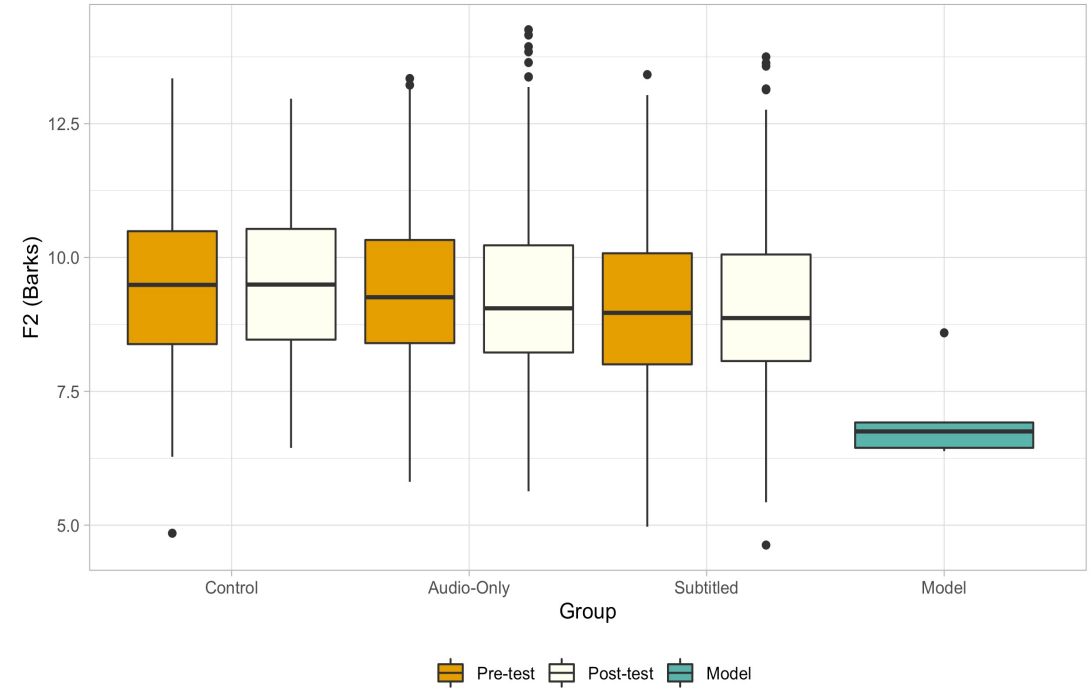
Results

Experiment 1: /u/ imitation (F2)

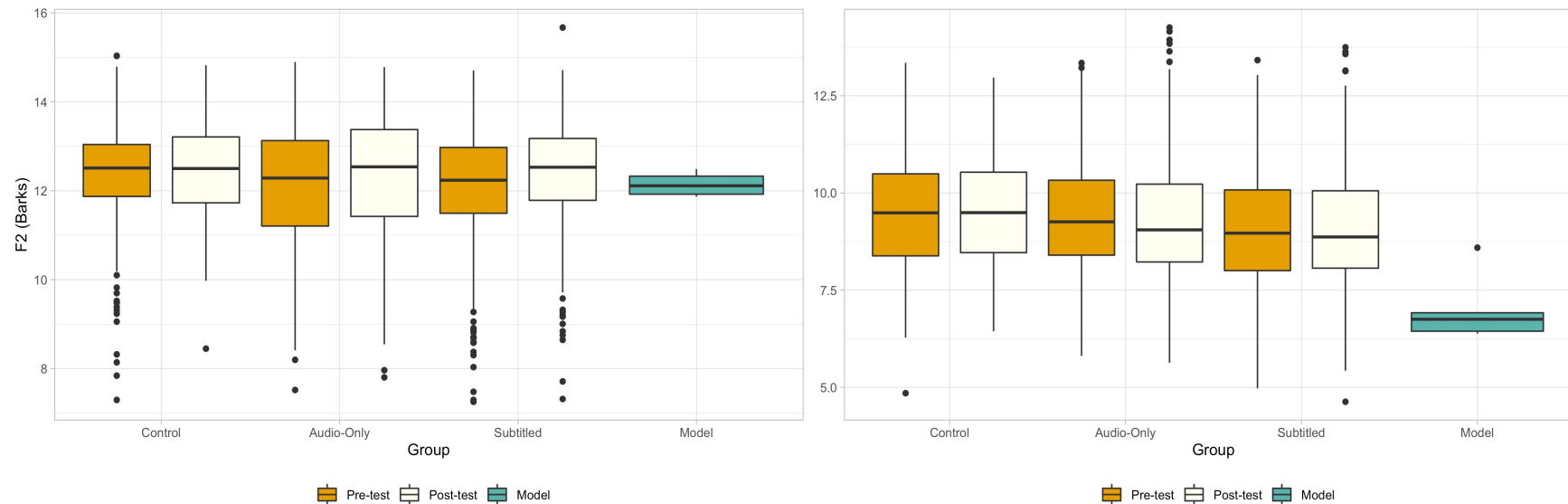- Experimental group F2 values of /u/ were produced similarly to the intercept (Control group) prior to film intervention (Control vs Audio-Only: β= -0.17, t= -0.63; Control vs Subtitled: β= -0.40, t= -1.46).

Results suggest that there was no change in the experiential groups' F2 production from pre- to post-test when compared to the Control group (β= -0.06, t= -0.52; Control vs Subtitled: β= 0.01, t= 0.08)

Results

Experiment 1: F2 comparison across vowels

- Talkers' produce near native-like F2 values for /y/, averaging 12.16 Barks in the pre-test and 12.37 Barks in the post-test across all groups (model talker F2: 12.14 Barks)

- Across all groups, talkers produce /u/ F2 values at an average of 9.33 Barks in the pre-test and 9.28 Barks in the post-test across all groups and there is quite a large distance between talkers' and the model (model talker F2: 6.97 Barks)

Discussion

Experiment 1: Imitation (F1)

- Results from an analysis of F1 (both /y/ and /u/) appear to converge with the model talker at higher rates across sessions
    - Further exploration into extralinguistic factors that have previously been shown to affect imitation capability would need to be completed in order to make conclusions as to why this effect was found
- Statistical analysis revealed a significant positive effect of film intervention on both experimental group's F1 productions' of /y/
    - This pattern demonstrates that watching a film in French, with or without subtitles, causes greater convergence towards target-like French norms by non-native talkers
- Regarding F1 productions of /u/ film intervention only appeared to significantly affect talkers in the Audio-Only group
    - This could be because the Subtitled group began the experiment with significantly higher rates of native-like convergence
    - If /u/ is more strongly influenced by L1 transfer than /y/ due to its pre-existing status in the English vowel inventory (Flege 1995, 2002), it is possible that it is more subject to plateau effects

Discussion

Experiment 1: Imitation (F2)

- The approximation of target-like norms in pre-test productions of /y/ ultimately creates a ceiling effect for both experimental groups, potentially preventing significant improvement following film intervention

- F2 values for /u/ also do not appear to be influenced by film intervention for either experimental group, though talkers exhibit a large degree of distance between their productions and target-like norms

  - The existing L1 category might be preventing talkers' from producing F2 values for /u/ in a target-like manner, while talkers imitate /y/ F2 values at ceiling in both sessions (Flege 1995, 2002)

Methods

Experiment 2: Native listener perception

Participants

- 222 native French listeners (135 male, 84 female, and 3 non-binary; mean age 28.18 y.o., SD=9.40) were recruited using Prolific
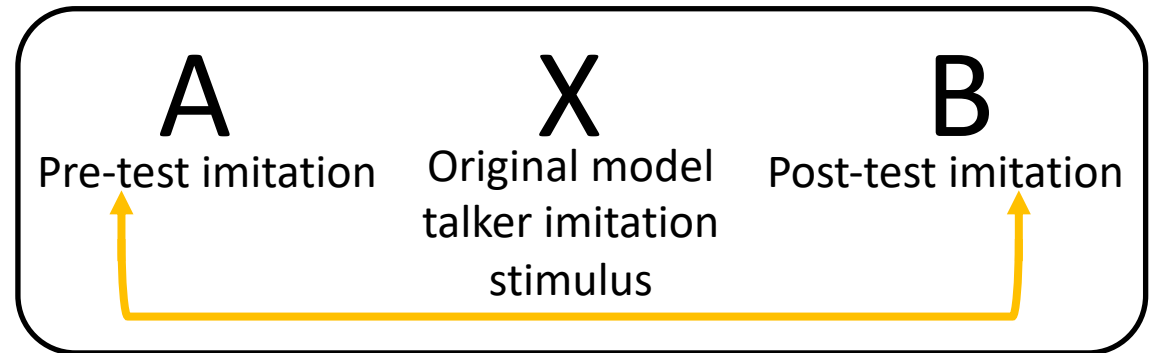
Materials

- Materials used for Ex 2 consisted of the words that were collected during the pre- and post-test sessions in Ex 1 (second repetition)
- Words were extracted at zero-crossings in Praat and were normalized for amplitude (70 dB)

Methods

Experiment 2: Native listener perception

Procedures

- AXB paradigm
  - Listeners were asked to determine whether A or B was a better representation of X
  - A and B were counterbalanced for order
    - Each word was presented four times total (twice in each order)
  - Each listener only heard items from a single talker
  - Each talker was presented to three listeners
  - Experiment was presented using Gorilla

A   X   B

Pre-test imitation   Original model talker imitation stimulus   Post-test imitation

74 talkers (experiment 1) x 3 listeners each =
222 total listeners

Methods

Experiment 2: Native listener perception

Procedures cont.
- Prior to completing the task, listeners completed a headphone screener (Woods et al, 2017) and a short practice trial
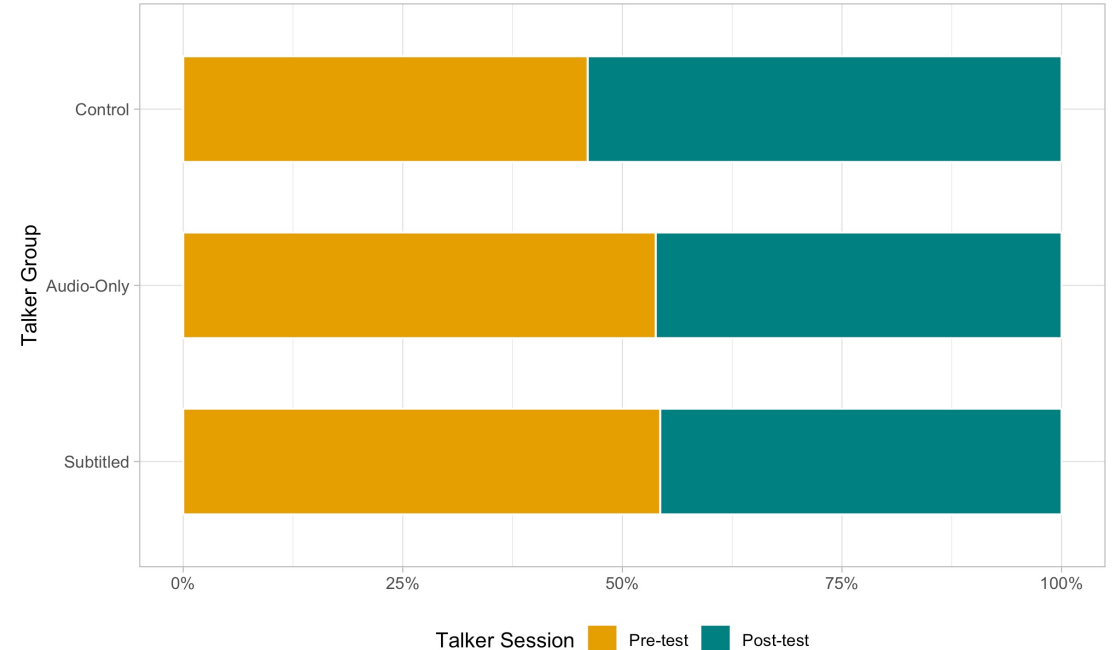- Four attention checks were included throughout the task

Analysis
- A mixed effects binomial logistic regression was completed using the *lme4* package (Bates et al., 2015) in R version 1.2.5033 (R Core Team, 2019)
- **Listener Response** (A or B, corresponding to pre- or post-test talker recordings) was submitted as the binary dependent variable with **Talker Group** (Audio-Only, Subtitled, and Control) as a fixed effect
- **Talker**, **Item**, and **Listener** variables were included in the model's random effects structure as intercepts
- **Control group** was submitted as the reference category

Results

Experiment 2: Native listener perception of /y/

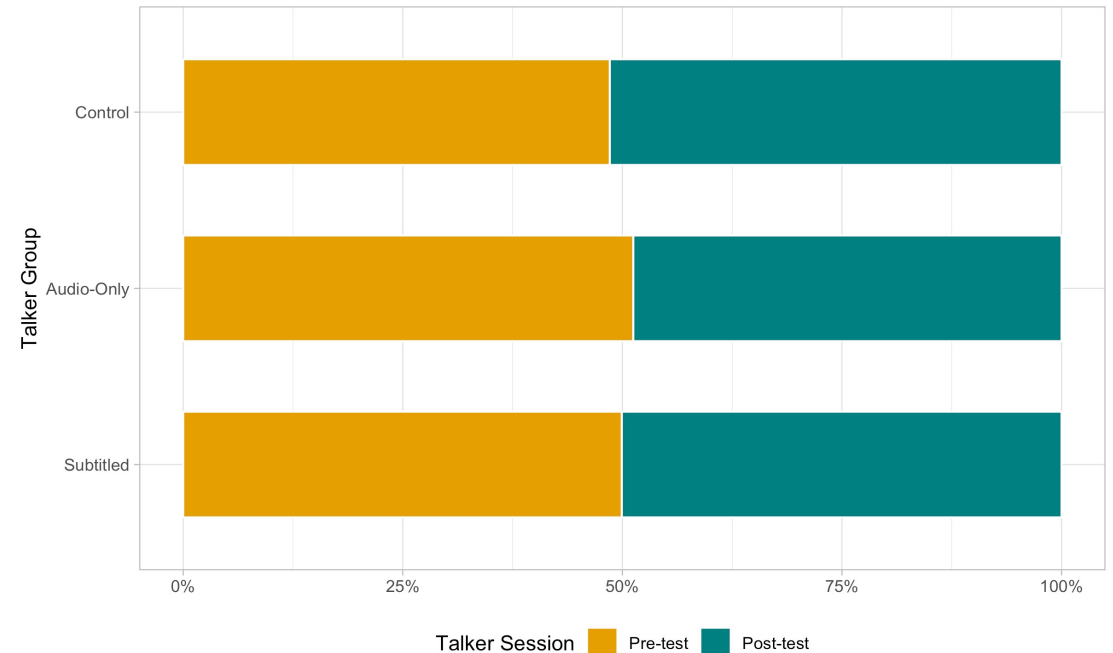- Talkers from the Audio-Only group and the Subtitled group were more likely to select post-test items than listeners who heard Control group talkers
  [Control vs Audio-Only: log odds= 1.38 +/ 0.16 standard errors, z= 2.04, $p < 0.05$; Control vs Subtitled: 1.41 +/ 0.16 standard errors, z= 2.16, $p < 0.05$]

- Native listeners found items from the post-test more similar to the model when talkers had received film intervention

Results

- Listeners who heard talkers from the Audio-Only group or the Subtitled group did not select Post-test items at significantly higher rates when compared to listeners who heard Control group talkers [Control vs Audio-Only: log odds= 1.11 +/- 0.13 standard errors, z= 0.81; p = 0.41 ; Control vs Subtitled: 1.05 +/- 0.13 standard errors, z= 0.43; p = 0.67]

- Native listeners appear to select Pre- and Post-test items at relatively equal rates across all groups

Discussion

Experiment 2: Native listener perception

- Perceptual judgements provided by native French listeners demonstrate that the acoustic adjustments made by experimental group talkers when producing /y/ following film intervention are perceptually salient and selected at higher rates than pre-test productions

- There is no evidence that the effect of film intervention on /u/ was apparent to native listeners
  - Possibly due to the ceiling effect that occurred when experimental group talkers produced F2 values of /y/
  - Post-test F1 improvement is more perceptually salient to French native listeners
  - L1 transfer of French /u/ F2 values prevent French listeners from perceiving acoustic modifications of F1 following the film intervention

Discussion

Overall takeaways/Future directions

- Film intervention appears to affect some aspects of non-native speech imitation, as demonstrated by acoustic analysis and native listener perception

- Though these effects are minor and only perceptible for some vowels (i.e., /y/), further research on the effect of film should be completed in order to determine if longer and/or more frequent sessions compound benefits found in the current study
    - Apply "treatment" to current L2 learners

Thank you!

Questions?

Contact:

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Appendix: Stimuli List

Experiment 1: Imitation

Stimulus items containing /y/			Stimulus items containing /u/		
Item	Transcription	English Definition	Item	Transcription	English Definition
puce	/pys/	flea	pouce	/pus/	thumb
bulle	/byl/	bubble	boule	/bul/	ball
bu	/by/	to drink (past tense)	bout	/bu/	tip
vu	/vy/	to see (past tense)	toute	/tut/	all
pull	/pyl/	sweater	cou	/ku/	neck
tu	/ty/	you (pronoun)	goût	/gu/	taste

Appendix: Country of birth/residence

Experiment 2: Native listener perception

Country of birth	Number of listeners
France	163
Canada	21
Belgium	15
Switzerland	4
Democratic Republic of the Congo	3
United Kingdom	3
United States	3
Ireland	2
Morocco	2
Australia	1
Cameroon	1
Haiti	1
Mauritius	1
Monaco	1
Somalia	1

Country of current residence	Number of listeners
France	136
Canada	24
United Kingdom and Ireland	24
Belgium	17
Portugal	3
Spain	3
Australia	2
Chili	2
South Africa	2
Switzerland	2
United States	2
Germany	1
Greece	1
Finland	1
Norway	1
Poland	1