**Introduction**

- Foreign language learning is extremely challenging for adults.
- But some learners are more successful than others.

Research Questions:

- Do the neural substrates underlying novel speech sound perception predict holistic usage of a novel language (Mandarin) in individuals?
- How does Mandarin training affect the representation of pitch information for Mandarin speech in the brain?

**Behavioral Results**

- Pre-training vs. Post-training
- Accuracy in speech (magnelli sinewave) vs. sinewave
- Association with Learning Success

- Main effect of sound types (Sinewave > Speech)
- Main effect of sessions (Post-training > Pre-training)
- Marginal interaction of sound types and sessions (Increase of accuracy only in speech, but not in sinewave)
- Behavioral accuracy in discriminating Mandarin tones
  - Predicts individual’s HSK exam total score.
  - Predicts individual’s final exam total score.
- Post-training accuracy in both conditions were also positively associated with exam scores (r’s > .40, p’s < .05).

**Conclusion**

- Native English speakers who were more sensitive to tonal difference in Mandarin speech showed greater potential as successful language learners.
- Successful learners showed a dramatic switch of neural recruitment from right IFG before training to left IFG after training.
- Mandarin training induced increased activation in the left dorsal and ventral stream of speech processing.

**fMRI Results (Speech vs. Sinewave)**

- Pre-training vs. Post-training
- Increased activation in the left IFG after training.
- Decreased activation in bilateral anterior MTG and default-mode network after training: less explicit acoustic analysis, but more engagement in task.

**Association with Learning Success**

- Pre > Post: Cluster-wise FDR-corrected p < .05, voxel-wise p < .05
- Post > Pre: Cluster-wise FDR-corrected p < .05, voxel-wise p < .05

**Reference**


**Participants**

- 24 native English speakers (8 females and 16 males)
- Age: 18 - 33, Mean: 23.1
- Handedness: 20 right-handers and 4 left-handers
- Post-training Proficiency tests:
  - Final Exam
  - Official standardized Chinese language test HSK (Level 1)

**Listening, Speaking, Total**

- Final Exam: 73 (12.1) 76 (14.6) 81 (8.8) 77 (10.9)
- HSK Exam: 64 (13.8) 76 (10.9) - 70 (10.7)

Mean scores of post-training proficiency tests (Standard deviation)