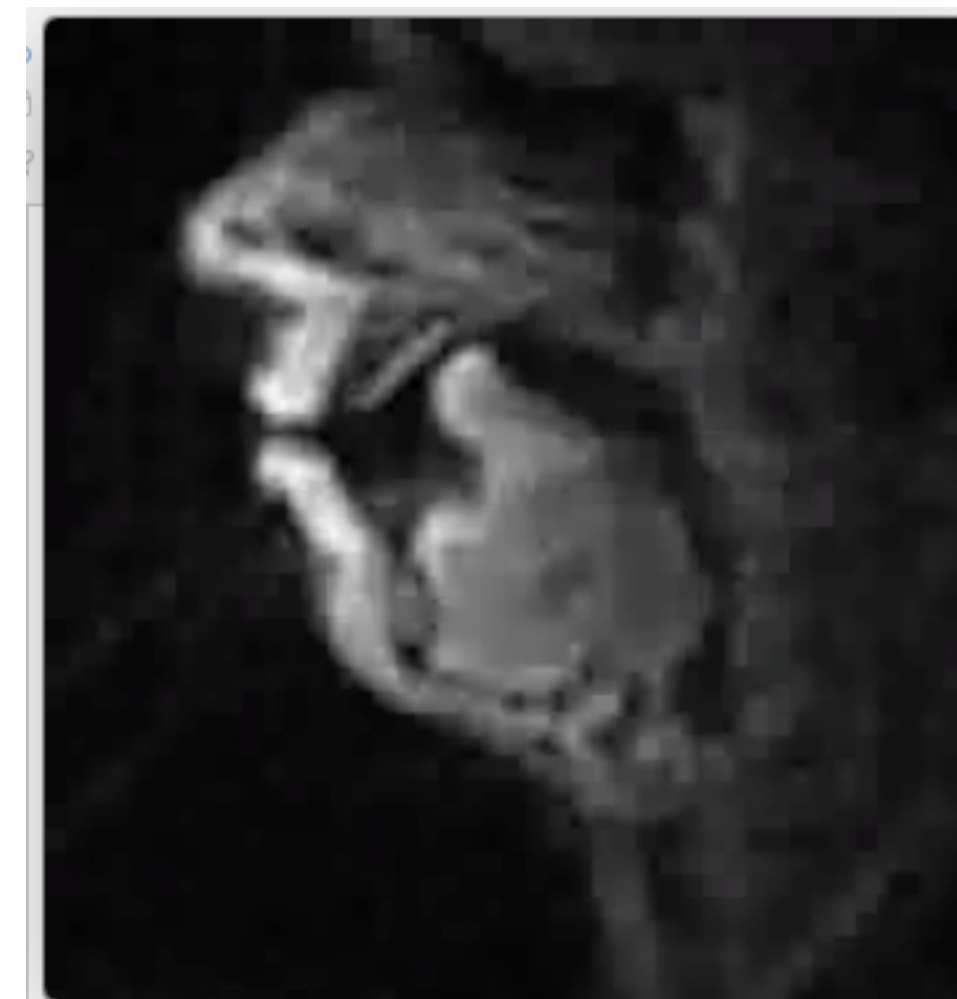


INTRODUCTION

- Rhotic consonants vary cross-linguistically in the presence and parametric specification of a pharyngeal gesture.



English rhotic /ɹ/:
Low pharyngeal gesture



French rhotic /ʀ/:
High pharyngeal gesture



Greek rhotic /r/:
No pharyngeal gesture

- Three supralaryngeal constrictions in American English rhotic consonant all contribute to characteristic F3 lowering
- Acquisition of the pharyngeal component of English /ɹ/ may pose significant perceptual and/or control issues to L2 learners

RESEARCH QUESTIONS

- To what extent do L2 English learners accurately acquire and produce the pharyngeal gesture in English /ɹ/?

Target-like Production:



Non-target-like Production:



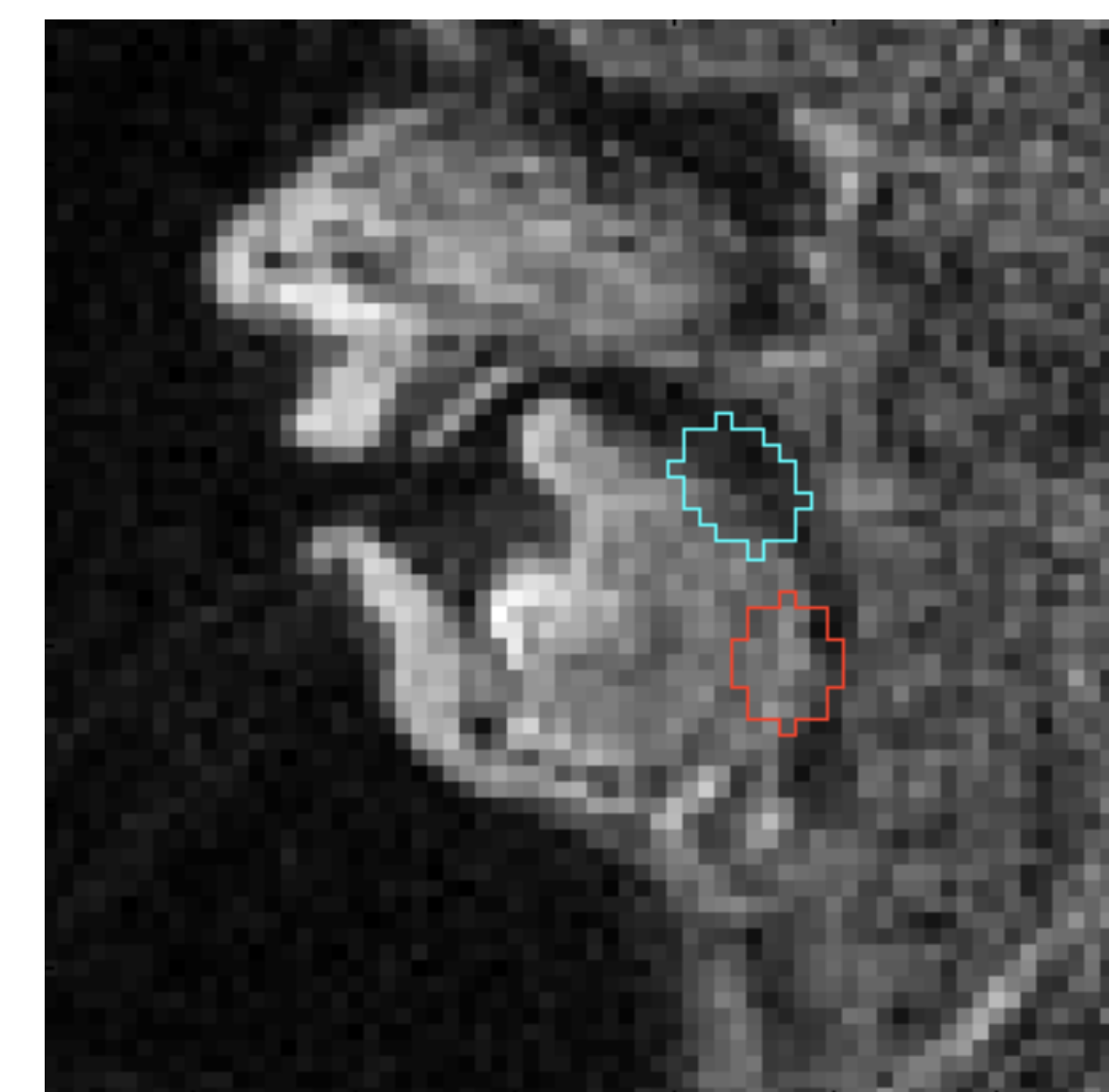
- Do the features of L2 English learners' L1 rhotic consonants influence their production of English /ɹ/?

PARTICIPANTS & MATERIALS

- Three Male Speakers: 1 L1 English (ENG), 1 L1 Greek/L2 English (GK), and 1 L1 French/L2 English
- Real-Time MRI recordings of participants reading "The North Wind and the Sun" in English and their native language.
 - Temporal Resolution: 23.18 frames per second
 - Spatial Resolution: 68 x 68 pixels (200 x 200 mm)
- 230 rhotic consonant tokens collected and analyzed (30 - 56 tokens per recording).

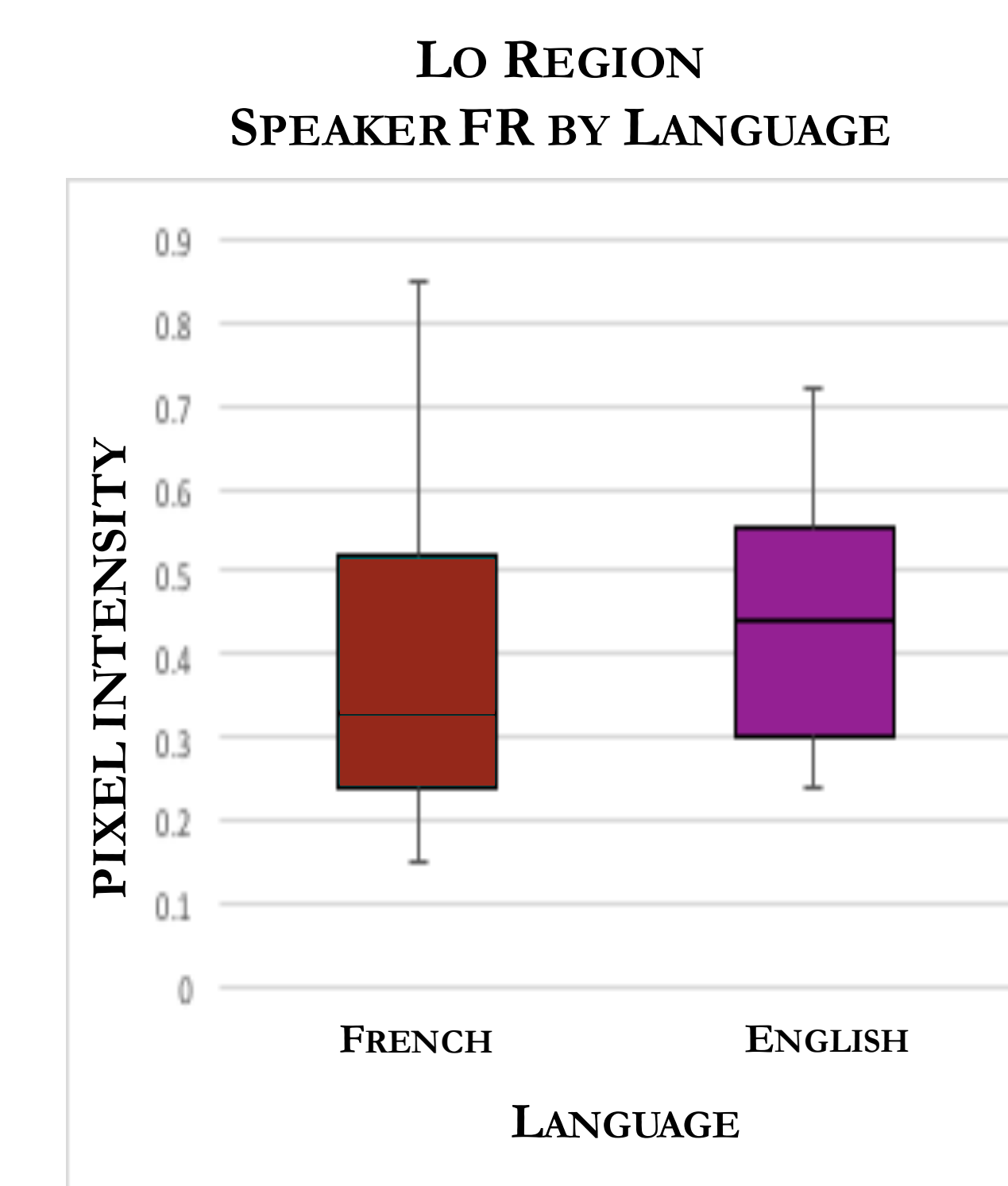
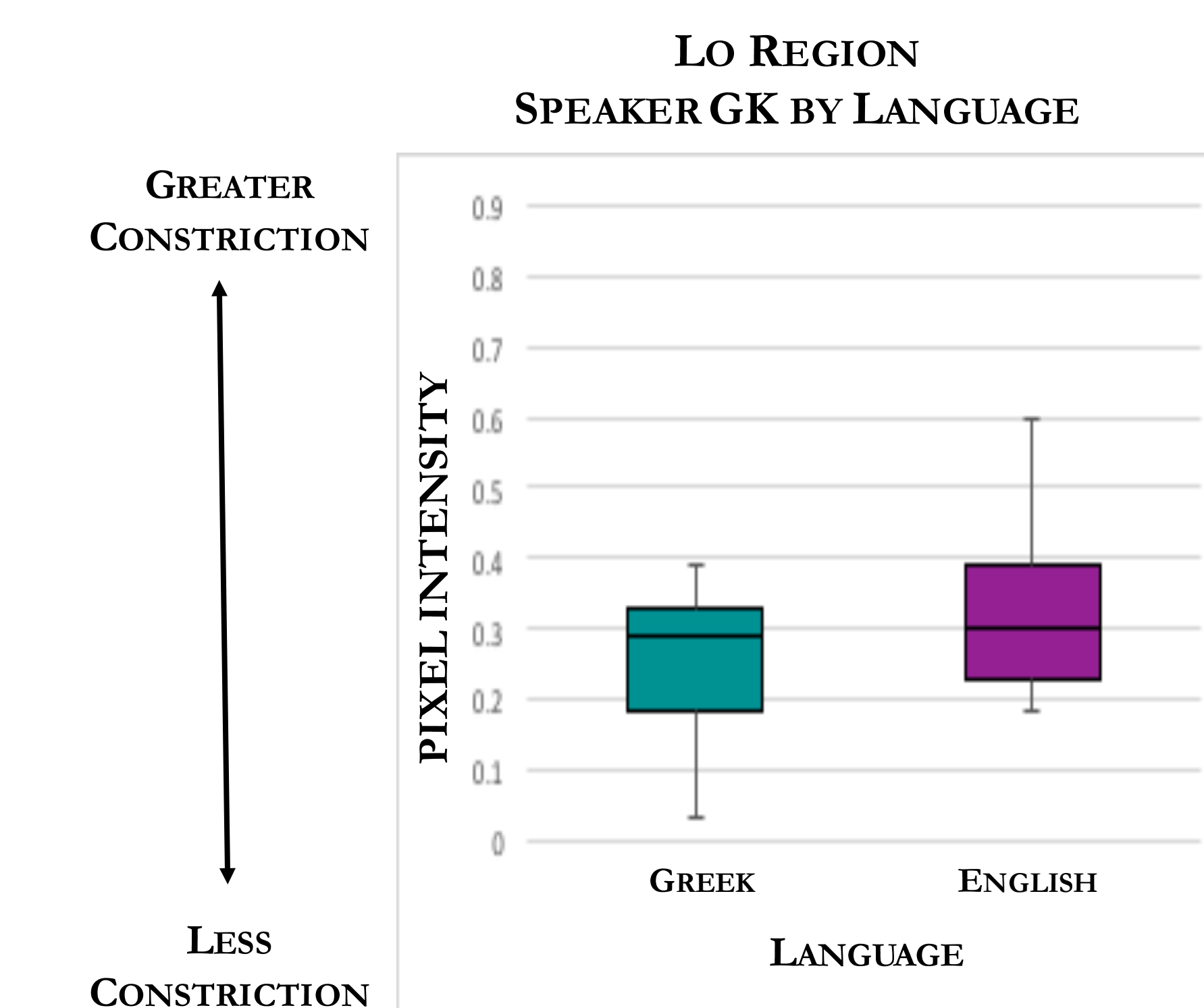
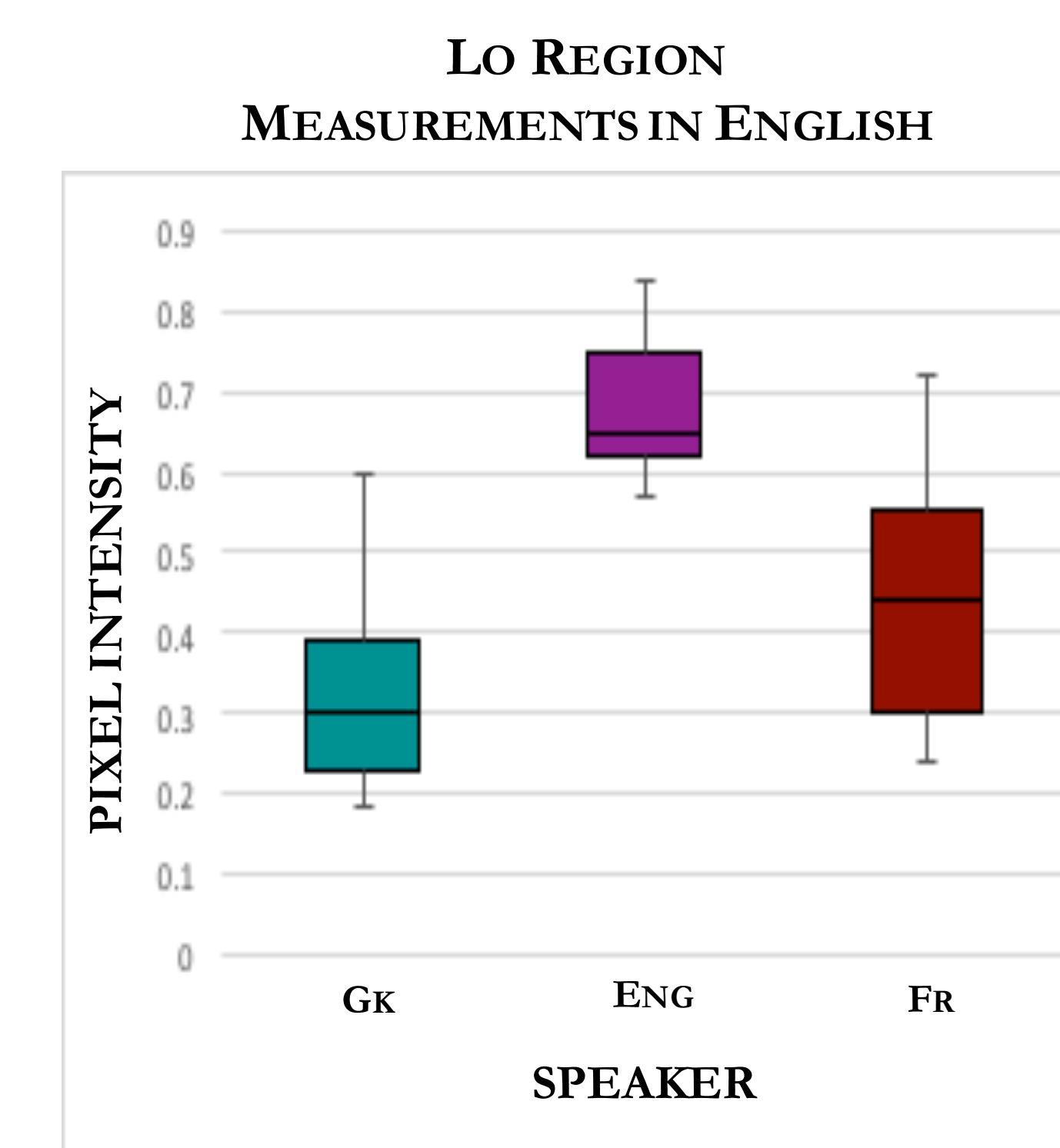
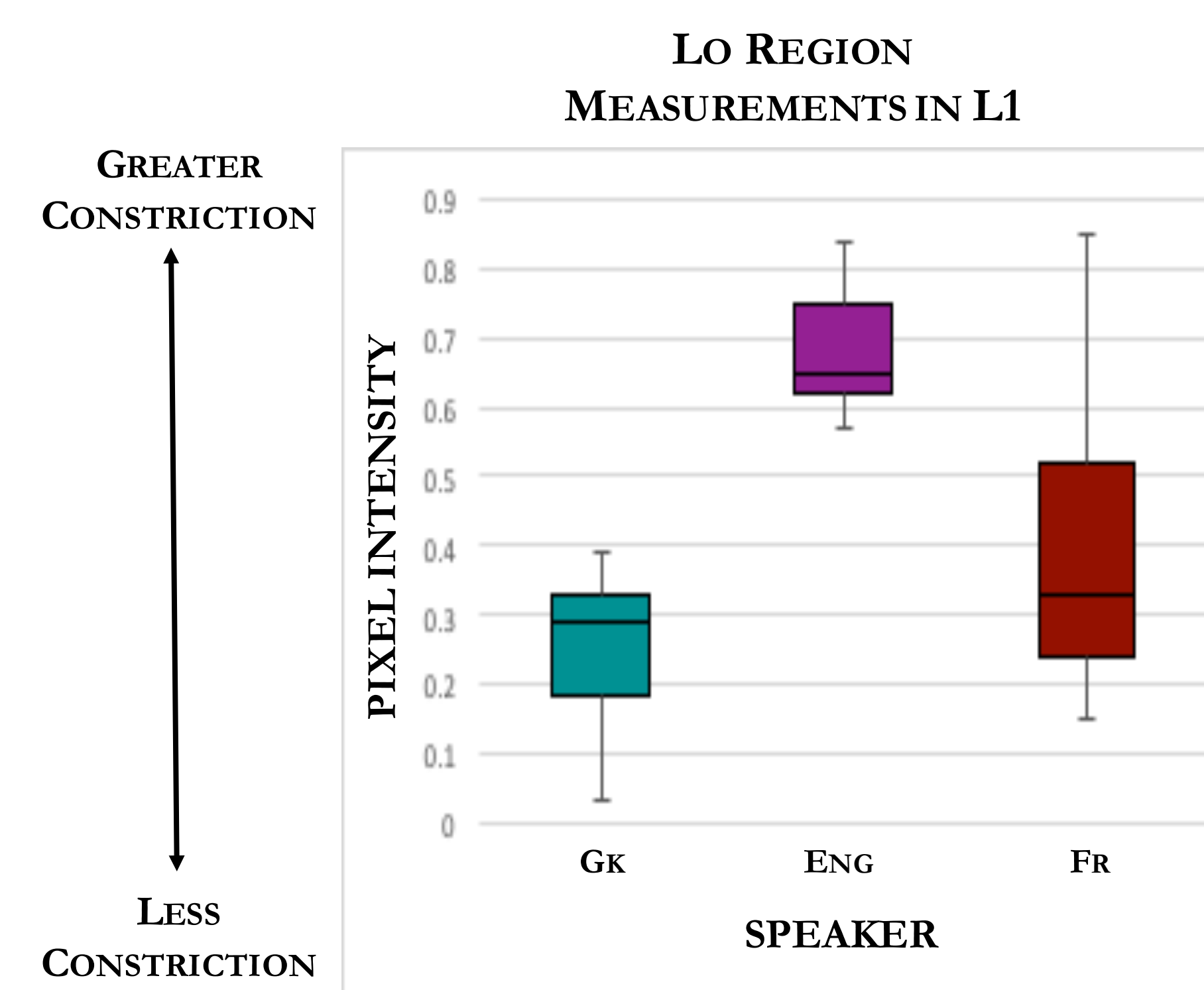
ANALYSIS

- Two pseudo-circular regions (radius of three pixels) manually defined along an automatically derived vocal tract midline

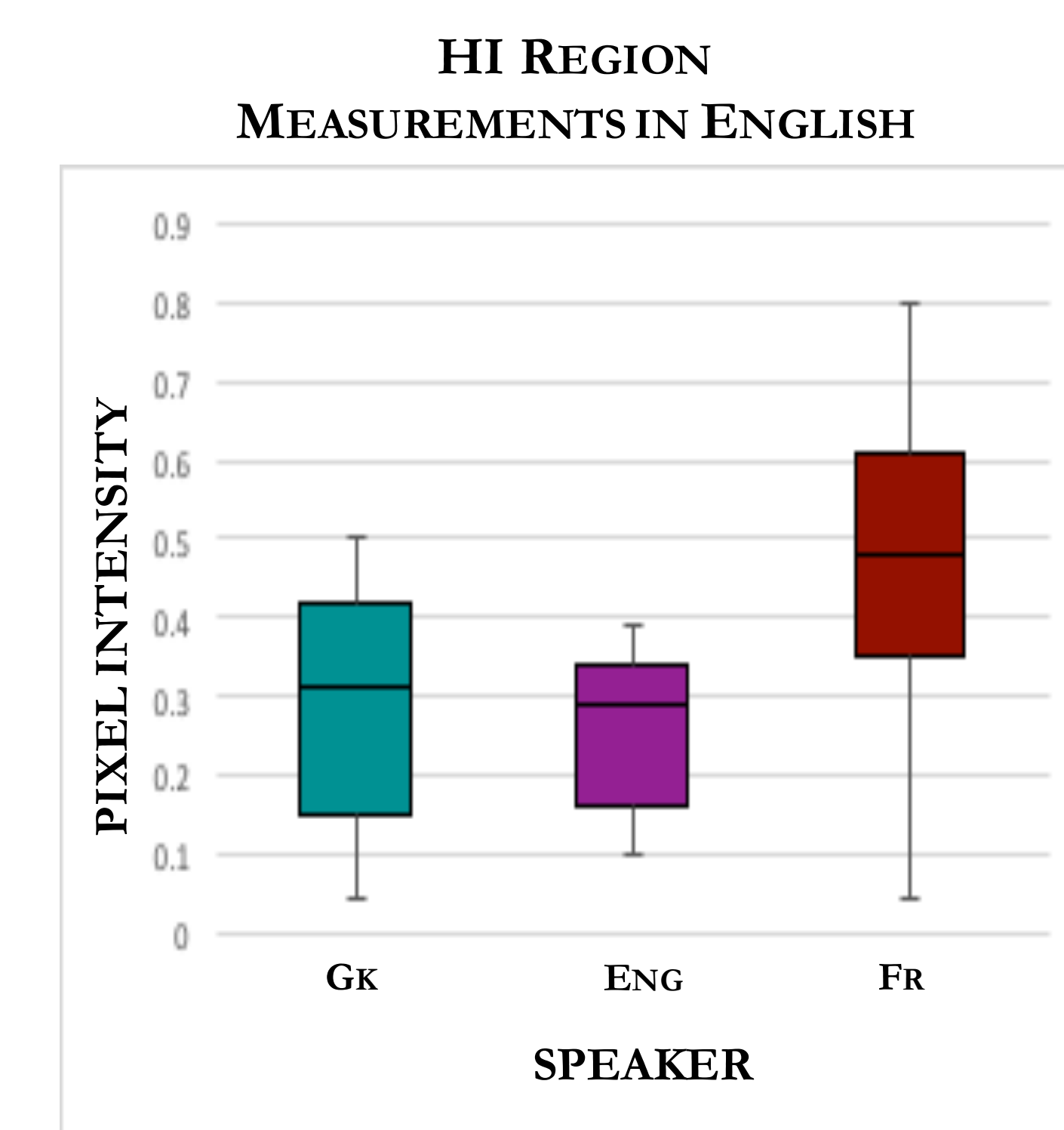
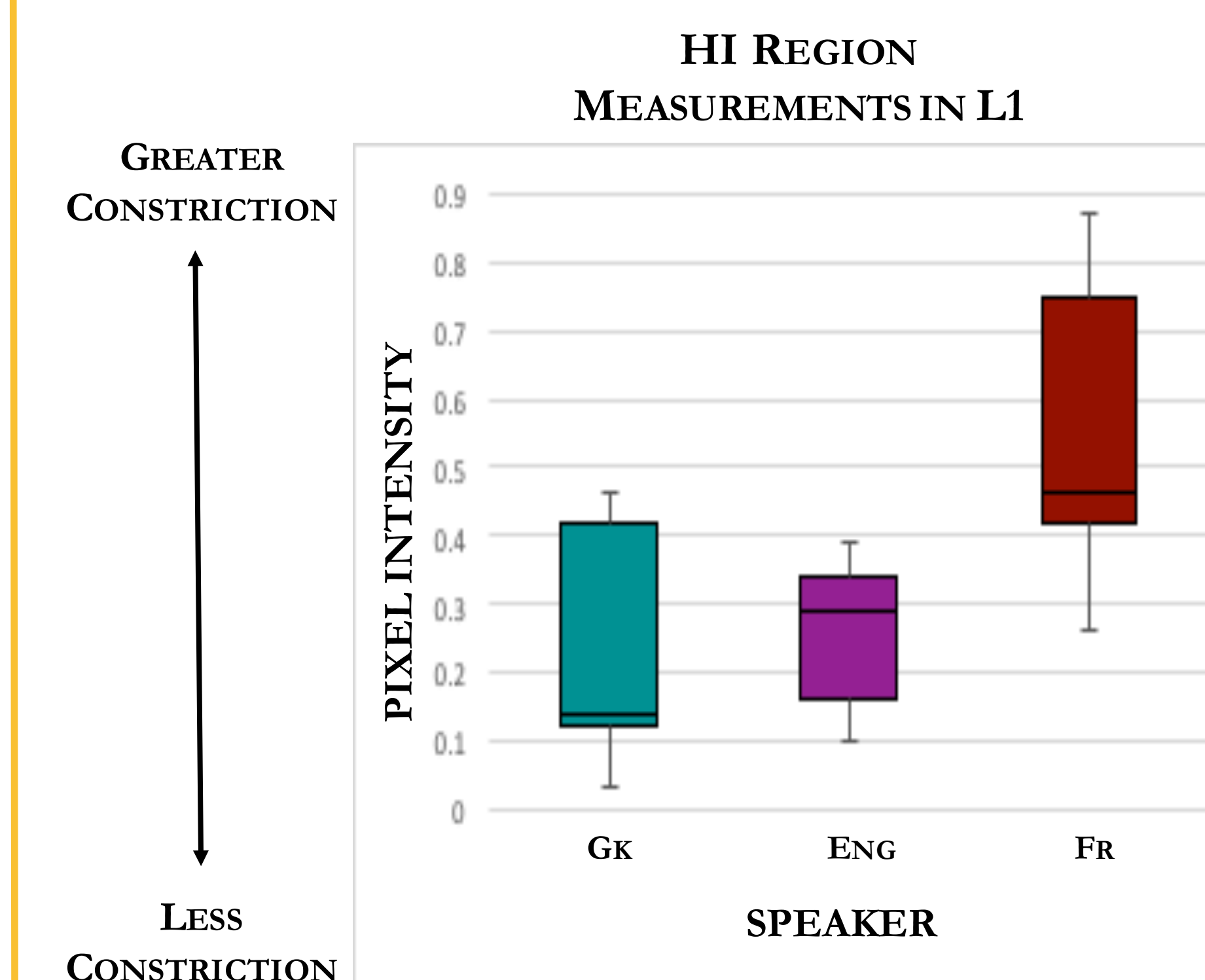


- Blue region = High Pharyngeal (HI)
Red region = Low Pharyngeal (LO)
- Average pixel intensity inside each region calculated for each frame
 - Higher pixel intensity = greater amount of tissue in the region
- Onset and maximum constriction of gestures found using algorithm developed in [1].

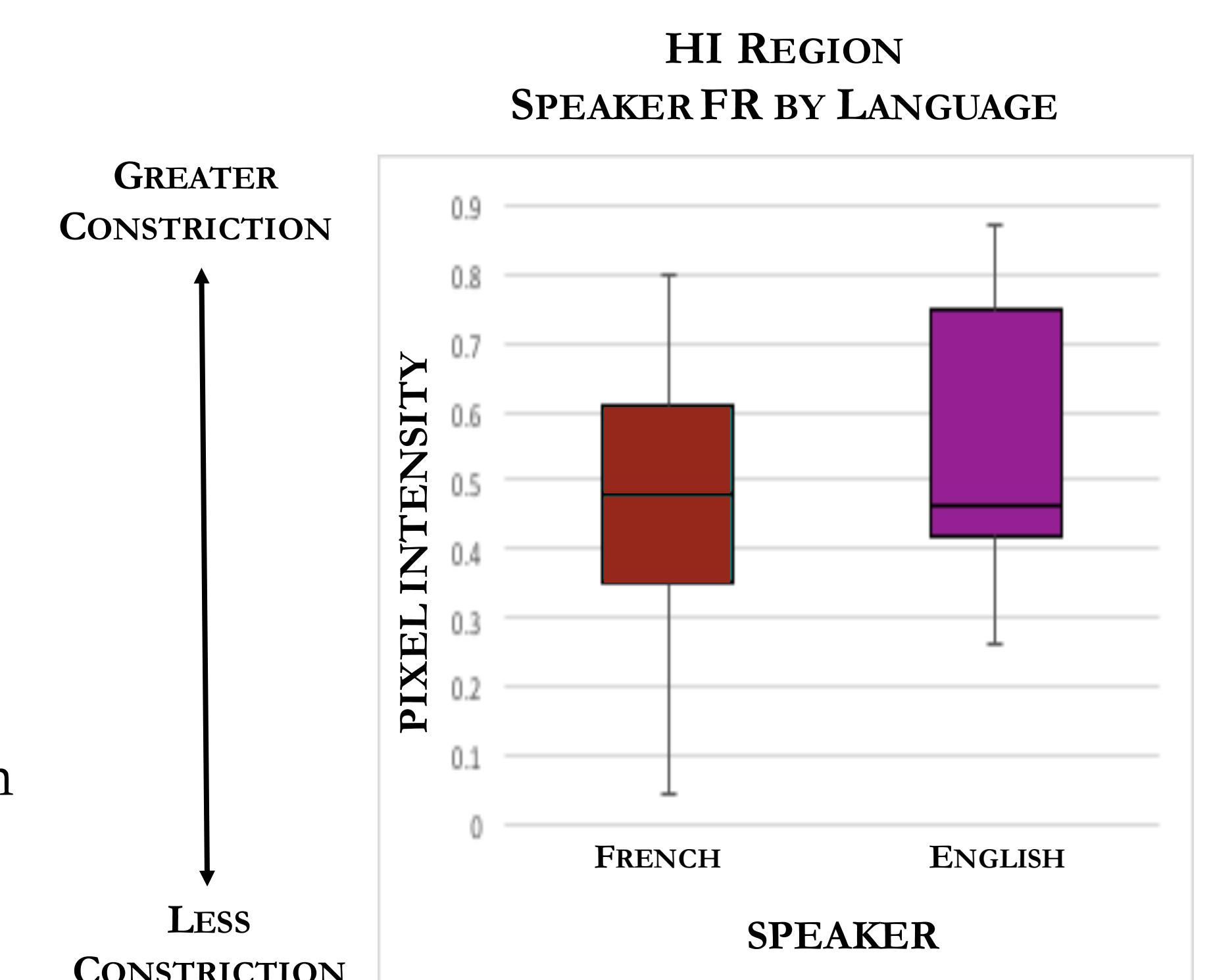
RESULTS: LOW PHARYNGEAL REGION



RESULTS: HIGH PHARYNGEAL REGION



- Mean pixel intensity significantly higher in the HI region in both L1 and L2 for FR than for either of the other speakers
- Indicates presence of expected French rhotic high pharyngeal gesture in both languages
- Mean pixel intensity in HI region not significantly different between French and English for FR



SUMMARY & IMPLICATIONS

- Neither FR nor GK consistently exhibited a native-like low pharyngeal gesture in their production of /ɹ/.
 - Significantly higher pixel intensity observed in LO region for ENG than for FR or GK.
- Both FR and GK demonstrated similar production patterns in the production of their L1 and English rhotics, as gauged by mean pixel intensity within HI and LO regions.
- Production similarities between L1 and their L2 for these speakers suggests influence of native language rhotic production on acquisition of English rhotic.
 - Evidence for transfer of high pharyngeal gesture from French to English for speaker FR.
 - Speaker GK's lack of constriction in LO region consistent with L1 transfer, but may also reflect general acquisitional difficulty of pharyngeal gesture.