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An Investigation of Second Language Perception of English Word-Boundary by Mandarin Learners of English

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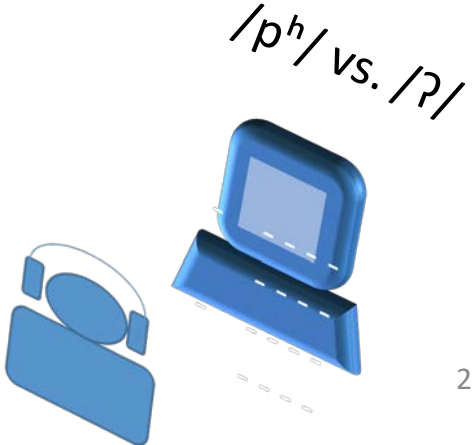
RESEARCH QUESTIONS

Can Mandarin L1-English L2 speakers use aspiration as a better cue than glottal stop in segmenting word boundaries of English speech?

Which of these acoustic cues do Mandarin speakers prefer for the task of word boundary segmentation in English?



THISSTUDYFURTHERASKSTHEQUESTIONOFWHETHERORNOTMANDARINL1ENGLISHL2SPEAKERSCANUSEASPIRATIONASABETTERCUETHANGLOTTALSTOPINSEGMENTINGWORDBOUNDARIESOFENGLISHSPEECHANDLOOKSATTHECHRONOLOGICALDEVELOPMENTOFINTERLANGUAGEOFTHESELEARNERSFROMTHEPERCEPTUALVIEWPOINT

L2 learners often complain about that native speakers speak too fast!

OVERVIEW

Native speakers rely on multiple cues:

- Lexical/semantic cues
- Syntactic/morphological cues
- Phonotactic cues
- Prosodic/rhythmic cues
- Acoustic-phonetic cues

e.g., word frequency, syllabic structure, stress placement and word intonation, phoneme duration, allphonic variations, vowel harmony, and etc (Nakatani & Dukes, 1997; Altenberg, 2005; Ito & Strange, 2009; Shoemaker, 2014; Alammar, 2016).

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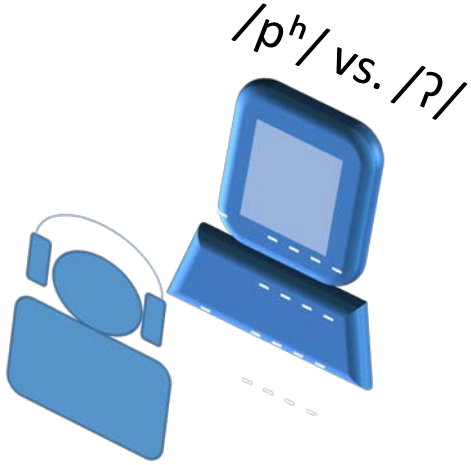


Do we prefer one over another?
In this study, we will focus on acoustic-phonetic cues.

OVERVIEW

/pʰ/ **'keeps [tʰ]alking' vs. 'keep s[t]alking**

- Stop aspiration can be either phonetic or phonemic cross languages (Cho & Ladefoged, 1999; Maddieson, 1984)
- Stop aspiration marks word boundaries in English for native speakers (Nakatani & Dukes, 1977; Bissiri et al., 2011)

'see nice‘ vs. 'seen [ʔ]ice' /ʔ/

• Glottal stop is one of the most often used phonation types in world's languages (Pennington, 2005), but it may be used differently in languages (Maddieson,1984: 47.9%).

BACKGROUND

- The studies of Word Boundary segmentation in L1 are abundant

- The knowledge of Word Boundary segmentation in L2 is limited
  - In production, evidence of L1 transfer, Inter-language, & UG shown (Major, 2001)
  - In perception, still unclear as Altenberg (2005) mentions that, to some extent, L2 learners might be "...functionally monolingual...(e.g.,Use of L1 system; c.f., Culter et al., 1992)".

Is L1 the primary system that operates for acoustic-phonetic perception and in segmentation routines for L2 (Altenberg, 2005)?

BACKGROUND

- Nakatani & Dukes (English; 1977):
  15 NL high school students
- Altenberg (Spanish; 2005):
  29 Spanish college students + 20 NLs
- Ito & Strange (Japanese; 2009):
  30 Japanese ESLs + 10 NLs
- Shoemaker (French; 2014):
  25+25 French college students (1yr & 3yr)
- Alammar (Arabic; 2016):
  50 Arabic speakers + 20 NLs

BACKGROUND

a preference for a prevocalic glottal stop cue over word-initial stop aspiration.

'seen [ʔ]ice' vs. 'see nice'

>

'keeps [tʰ]alking' vs. 'keep s[t]alking'

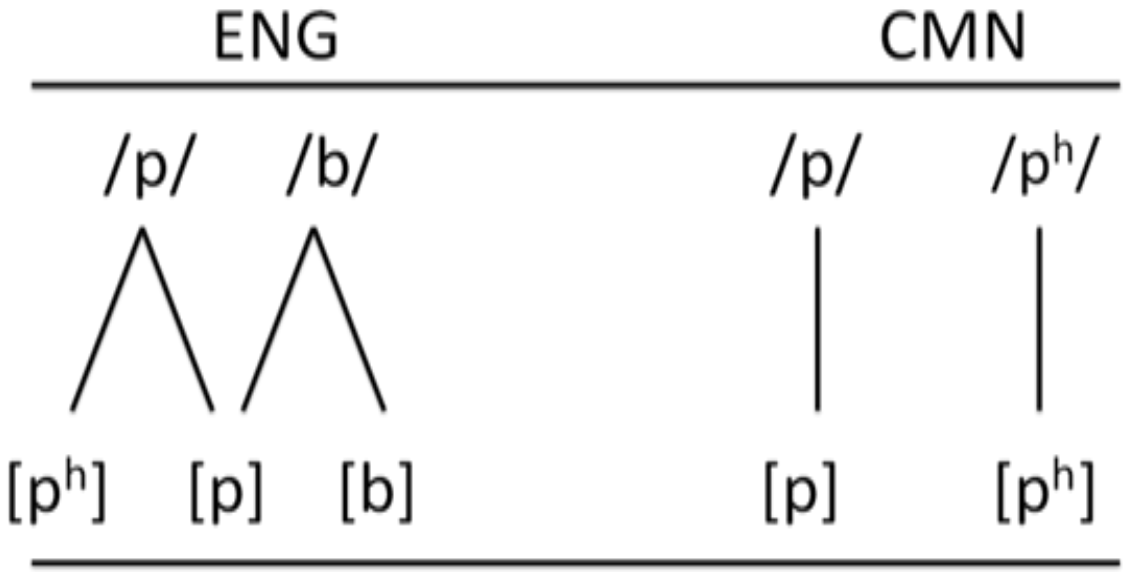
- English (Nakatani & Dukes, 1977)
- Spanish (Altenberg, 2005)
- Japanese (Ito & Strange, 2009)
- French (Shoemaker, 2014)
- Arabic (Alammar, 2016)
- Mandarin ?

Do not feature strong stop-aspiration!!!

TWO CUES IN ENGLISH & MANDARIN

- Aspiration stop and glottal stop are NOT phonemic in English, but aspiration is in Mandarin.

English stops vs. Chinese Mandarin stops



e.g., /paʊ/, “*to throw*” vs. /pʰaʊ/ “*to wrap*”

TWO CUES IN ENGLISH & MANDARIN

ENG /p^h/

- phonetic
- stress syllable
- 58~80 ms VOT

(Cho & Ladefoged, 1999)

CMN /p^h/

- phonemic
- 90 ~ 120ms VOT

(Cho & Ladefoged, 1999)

ENG /ʔ/

- Vowel initial word/syllable
- Emphatic speech

CMN /ʔ/

- Optional & Unpredictable
- Rarely used (Wu, 1992)

RATIONALE & PREDICTIONS

HYPOTHESES:

- Mandarin L1-English L2 speakers will prefer aspiration cue over glottal stop cue.
- English natives, the control group, will perform significantly better than L2 learners.

METHOD

Following

Previous studies, but modified stimuli; i.e.,

additionally control for pitch level and word frequency.

STIMULI

Previous studies used two-word phrases;
e.g. “keep stalking” vs. “keeps talking’

ARC nonword database (Rastle, K., Harrington, J., & Coltheart, M., 2002)

- 152 pairs similar to the previous studies; chosen from 309,999 non-words based on Bigram frequency position-specific and position-nonspecific

- Vetted by native English speakers, and acceptable to native ears.

TASK PROCEDURES

- The participant has 8 practice trials before the main task.
- Each pair is displayed for 2 seconds before the audio, '*I now say*' + *'loy spafes'* + '*again*' is replayed.
- The participant is forced to choose A or B by pressing the response box.

TASK PROCEDURES

loy spafes loice pafes

Choice A   Choice B

PARTICIPANTS

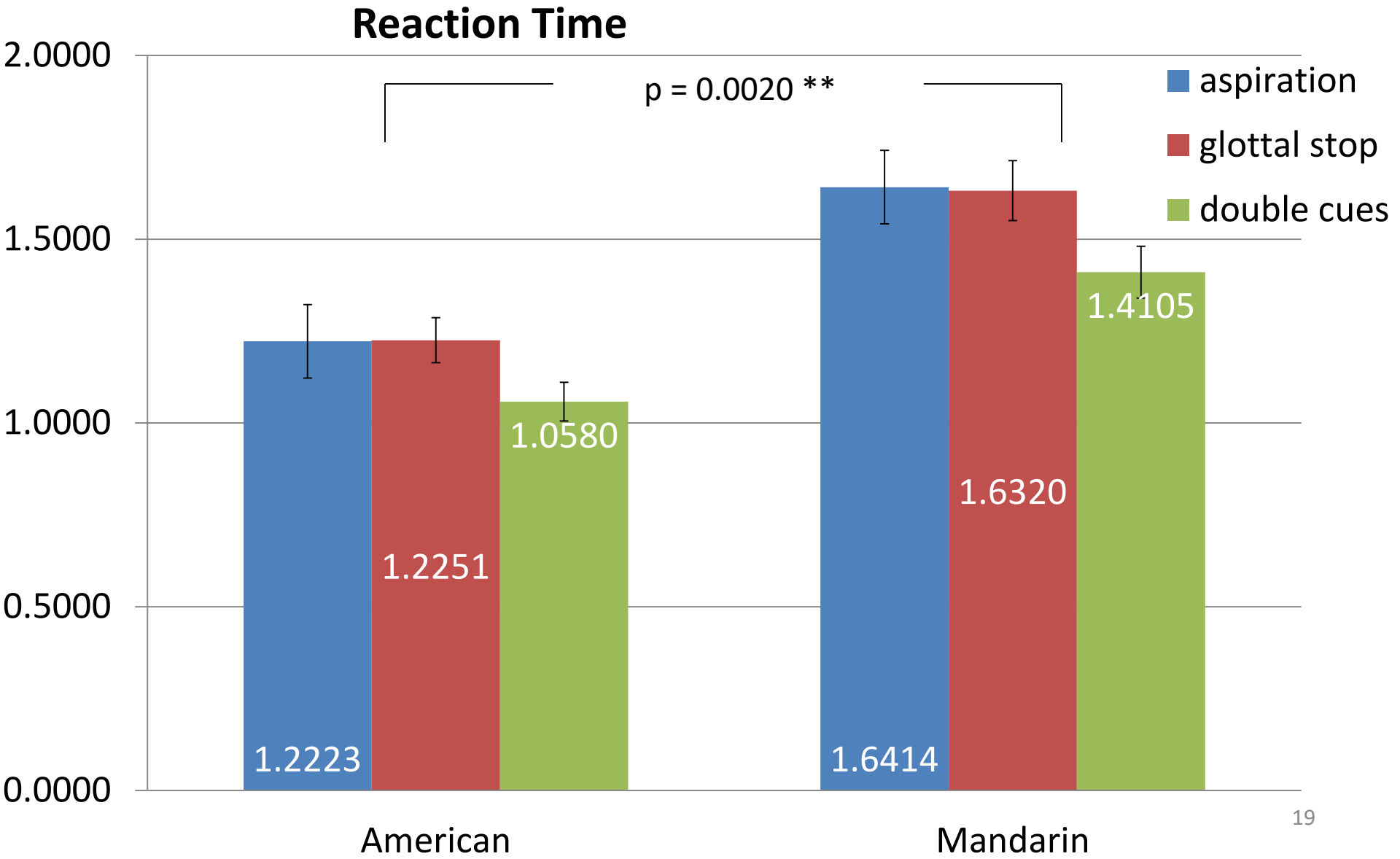
- 28 English speakers (mean age=34.04; m:6, f:22) were functional monolinguals.
- 38 Mandarin speakers (mean age=24.99; m:16, f:22) were born and resided in China/Taiwan for at least 15 years before came to the US
  - Age of Arrival = 22.78 years old
  - Length of Residence = 30.9 months (2.6 years)
    - 18 beginners (0-11 months; M=2.57, SD=2.89)
    - 10 intermediates (12-24 months; M=18.6 (1.5 years), SD=5.66)
    - 10 advanced learners (25+ months; M=94.2 (7.5 years), SD=77.4)

STATISTICAL MODELING

Linear mixed effects model:

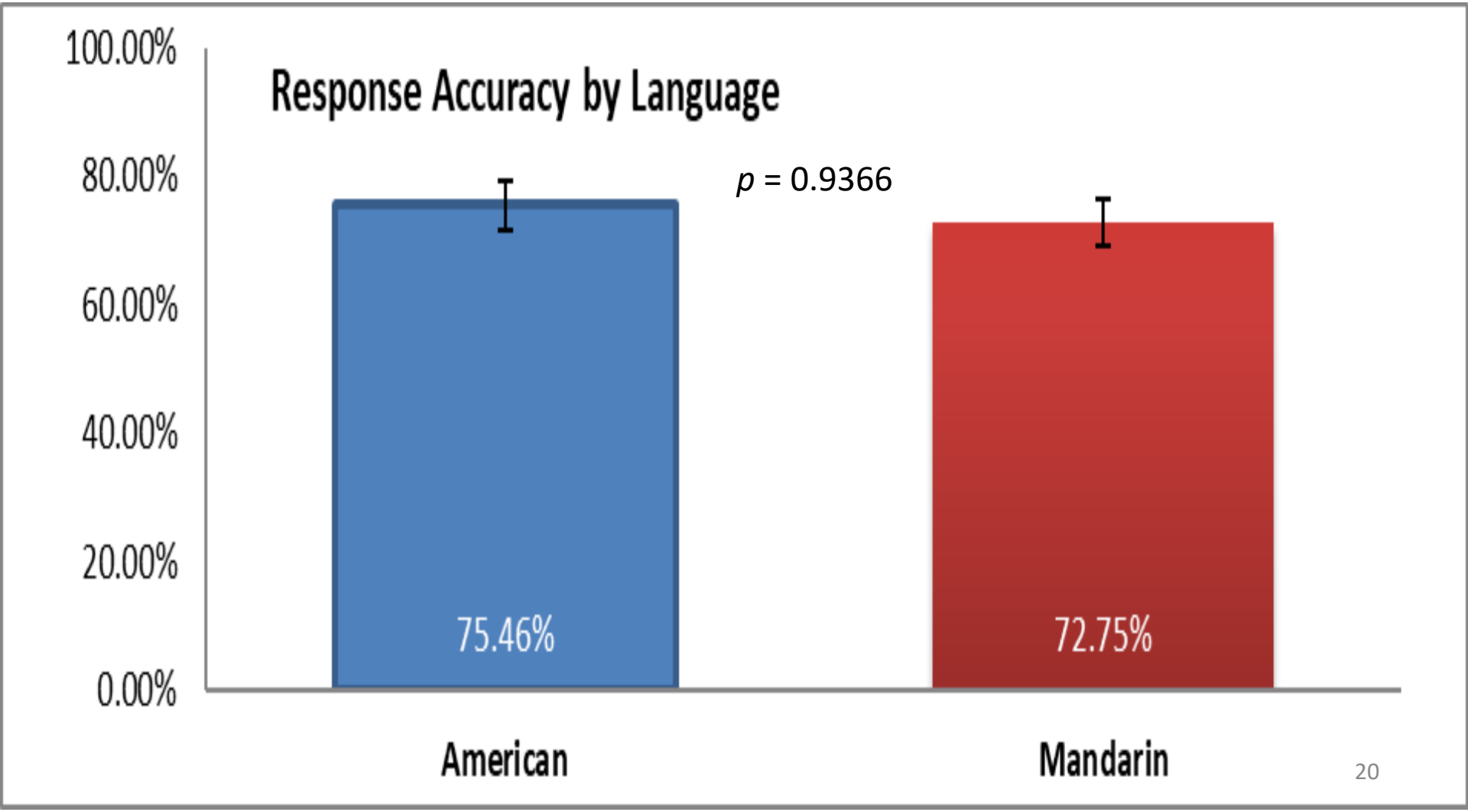
- glmer & lmer in *lme4* package(Bates, Maechier, Bolker,& Walker, 2015) in R (R Core Team, 2018).
- The pairwise comparisons were conducted using Tukey's HSD tests implemented in *emmeans* (Lenth, 2018) package.

RESULTS

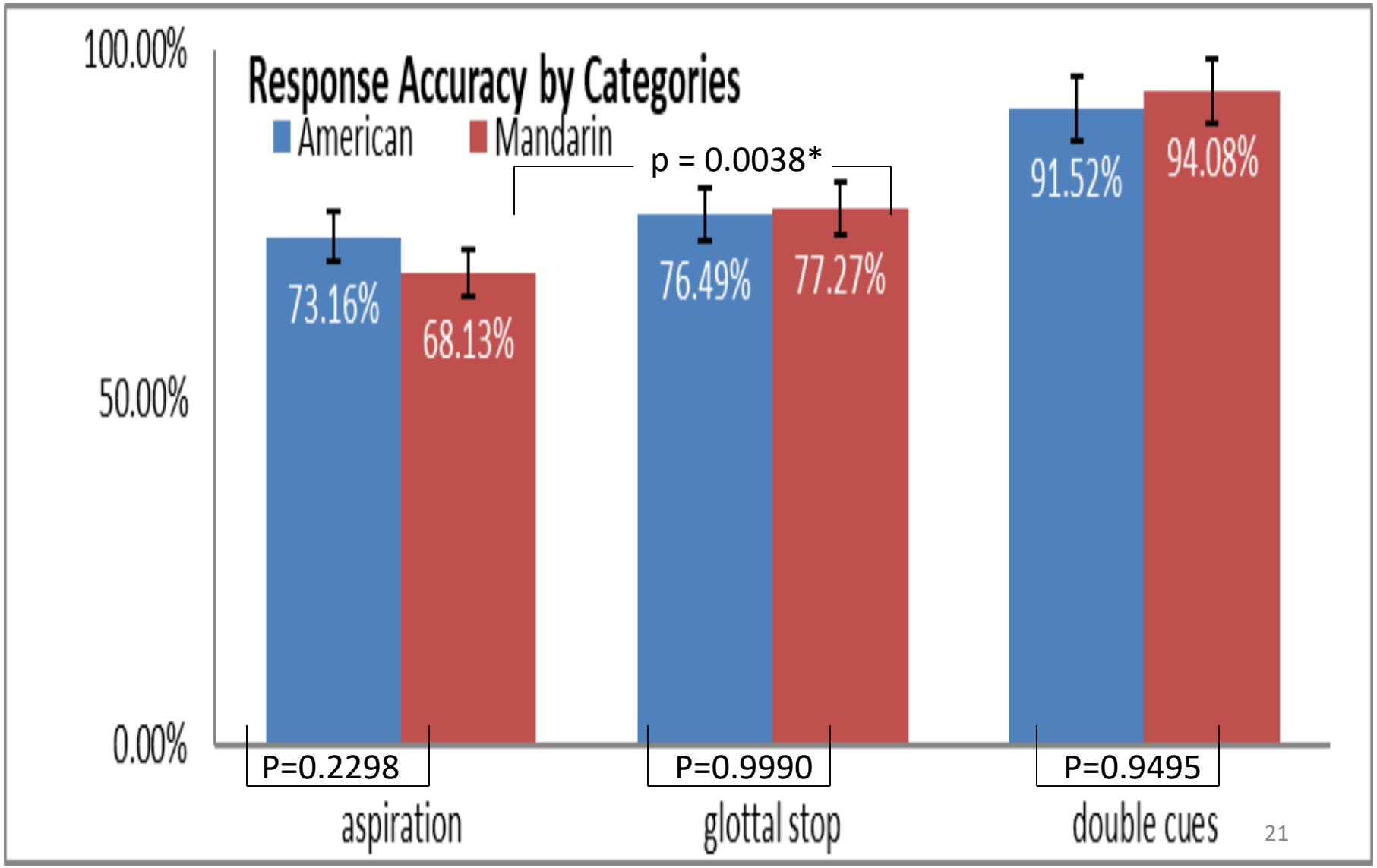

Reaction Time
2.0000
1.5000
1.0000
0.5000
0.0000
p = 0.0020 **
aspiration
glottal stop
double cues
1.2223
1.2251
1.0580
1.6414
1.6320
1.4105
American
Mandarin

RESULTS

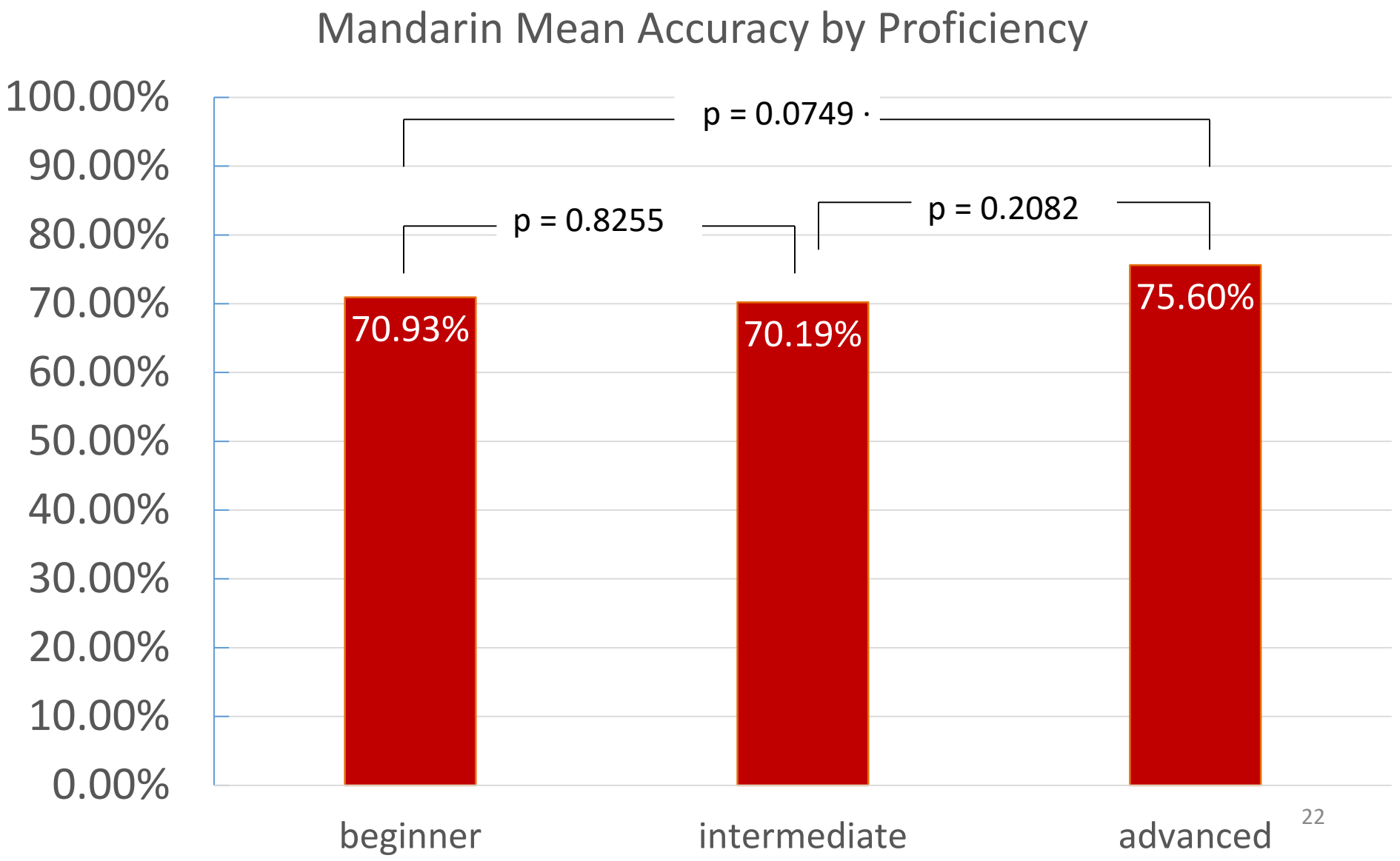
Overall mean accuracy for American & Mandarin Groups:



RESULTS


Response Accuracy by Categories
American
Mandarin
100.00%
50.00%
0.00%
p = 0.0038*
73.16%
68.13%
76.49%
77.27%
91.52%
94.08%
P=0.2298
P=0.9990
P=0.9495
aspiration
glottal stop
double cues

RESULTS


Mandarin Mean Accuracy by Proficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
p = 0.0749 ·
p = 0.8255
p = 0.2082
70.93%
70.19%
75.60%
beginner
intermediate
advanced

PREVIOUS FINDINGS & CURRENT STUDY

results of previous studies and present study with respect to response accuracy

	L2 speakers	American	Stimuli	Pitch ctrl.	L2 language
Altenberg (2005)	76.0% asp < gl ≈ dc	97.0% asp ≈ gl ≈ dc	Real word	×	Spanish
Ito & Strange (2009)	74.6% asp < gl ≈ dc	96.8% asp ≈ gl ≈ dc	Real word	×	Japanese
Shoemaker (2014)	74.6% asp < gl < dc	--- ---	Real word	×	French
Alammar (2016)	66.0% asp < gl	80.0% asp < gl	Non-word	×	Arabic
Present study	72.75% asp < gl < dc	75.46% asp ≈ gl < dc	Non-word	√	Chinese Mandarin

---: not tested

<, =, ≈: “worse than”, “equal to”, and “approximately equal to”

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RESULTS & DISCUSSION

/pʰ/ < /ʔ/

When lexical & prosodic information are controlled,

L1 speakers = L2 speakers

With respect to acoustic-phonetic signal processing,

L1 transfer < Uni. Grammar

- Glottal stop may indeed be a universal WB cue (Altenberg, 2005) while aspiration is specific to English for WB segmentation.

CONCLUSION

- This study suggests that native perceptual performance will reduce due to limited cues, which makes it comparable to NN performance.
- Lexical knowledge and pitch/intonation information are important.
- In word-boundary perception, L1 knowledge is not as helpful here.

FUTURE PLAN

- Continue this study with other languages.
  - Languages with phonemic stops & complex coda

- Test with pitch-manipulated real-word.
  - Pitch/intonation vs. lexical knowledge

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THANK YOU!

COMMENT AND SUGGESTION?

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