

1. Introduction

- In second language (L2) acquisition, basic sounds (phonemes) not present in a learner's native language (L1) pose an extra challenge for speech production (Table 1) [2,3]
- When hearing one of these unfamiliar phonemes, the learner either maps it to a similar L1 phoneme, perceives it as a completely foreign sound, or does not perceive it as speech [2]
- In the first case, the learner is unable to perceive a difference between the unfamiliar phoneme and the native phoneme to which it is mapped [2]

Research question

- To what extent do English phonemes absent from the Mandarin phonological inventory impact the response time of native Mandarin speakers in an auditory lexical decision task?

2. Method

Sample

- 71 native Mandarin speakers with L2 English
 - 49 female; age 17 to 25 (M = 20.38, SD = 1.75); Age of Acquisition (AoA) 4 to 18 (M = 8.89, SD = 3.24); 1 to 22 years in Canada (M = 4.87, SD = 5.08)

Experiment

- Data from the Massive Auditory Lexical Decision (MALD) project [5]
 - Participants listened to audio recordings of a Western Canadian English speaker which differ in their proportion of unfamiliar phonemes
 - Participants decided whether recordings were of an English word or a pseudoword (Table 2)
 - Responses were recorded with a button box

Analysis

- Response time used as a proxy for processing difficulty
- Measured effects of proportion of unfamiliar phonemes, proportion of unfamiliar vowels, and proportion of unfamiliar consonants on reaction time using statistical techniques (Table 1)
- Real words responded to correctly were analyzed
- Reaction times longer than 500ms were analyzed

IPA	Sample Word	Mandarin Alternative(s)
ɪ	dip	i
æ	cat	an
ʊ	book	u
ɛ	net	ei
v	van	f or w
z	zoo	ts
ʒ	measure	ɹ or ts
θ	thin	s
ð	the	ts
dʒ	jam	tɕ or tʂ

Table 1. English phonemes absent from Mandarin and possible Mandarin alternatives (vary with dialectal differences) [1,3,4,6]

	Word	Pseudoword
Sample	negative	muhlbaend
Phonemes	nɛgetɹv	mʊlbænd

Table 2. Sample MALD word and pseudoword with unfamiliar phonemes

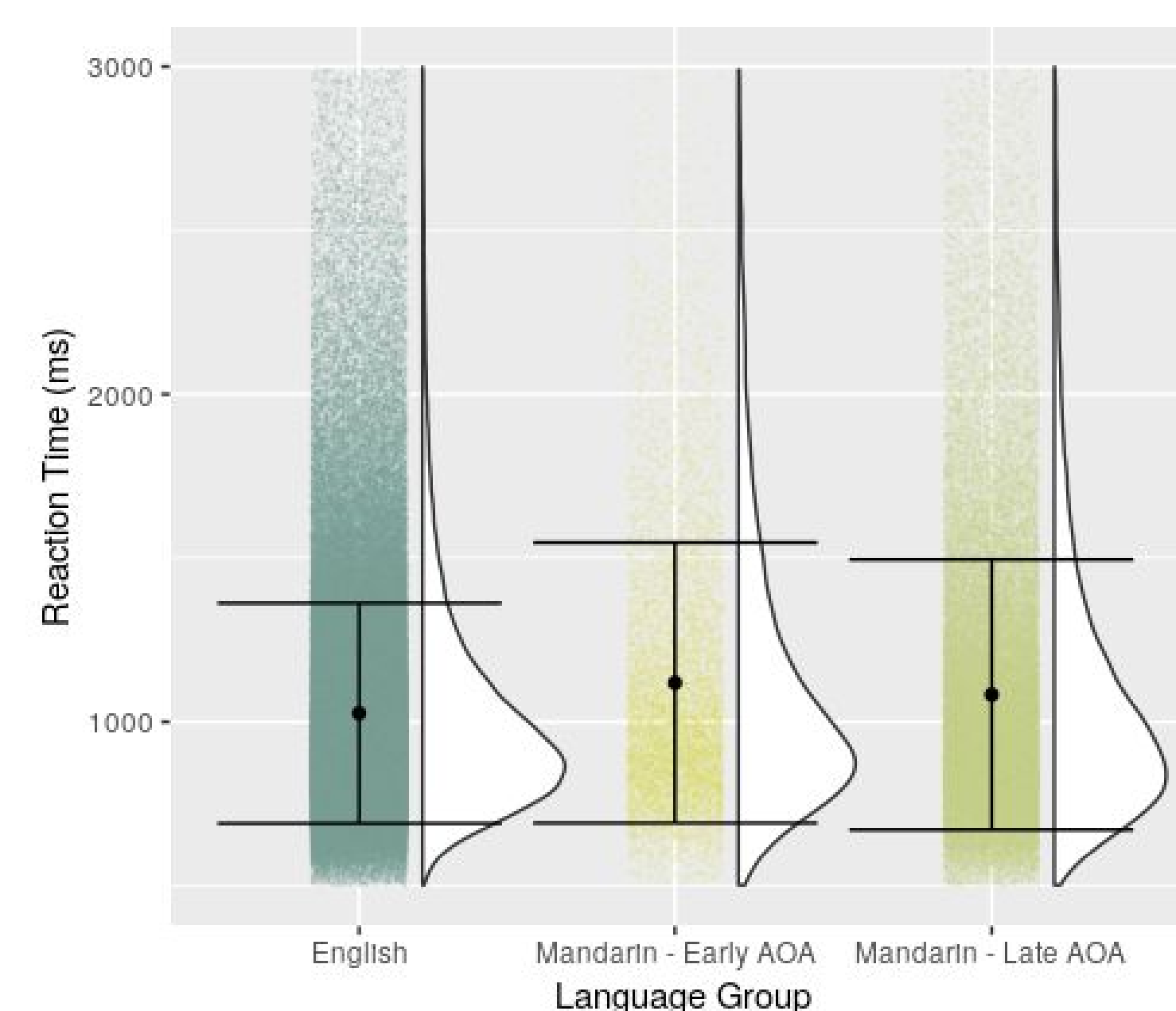


Figure 1. Mean reaction times by AoA group

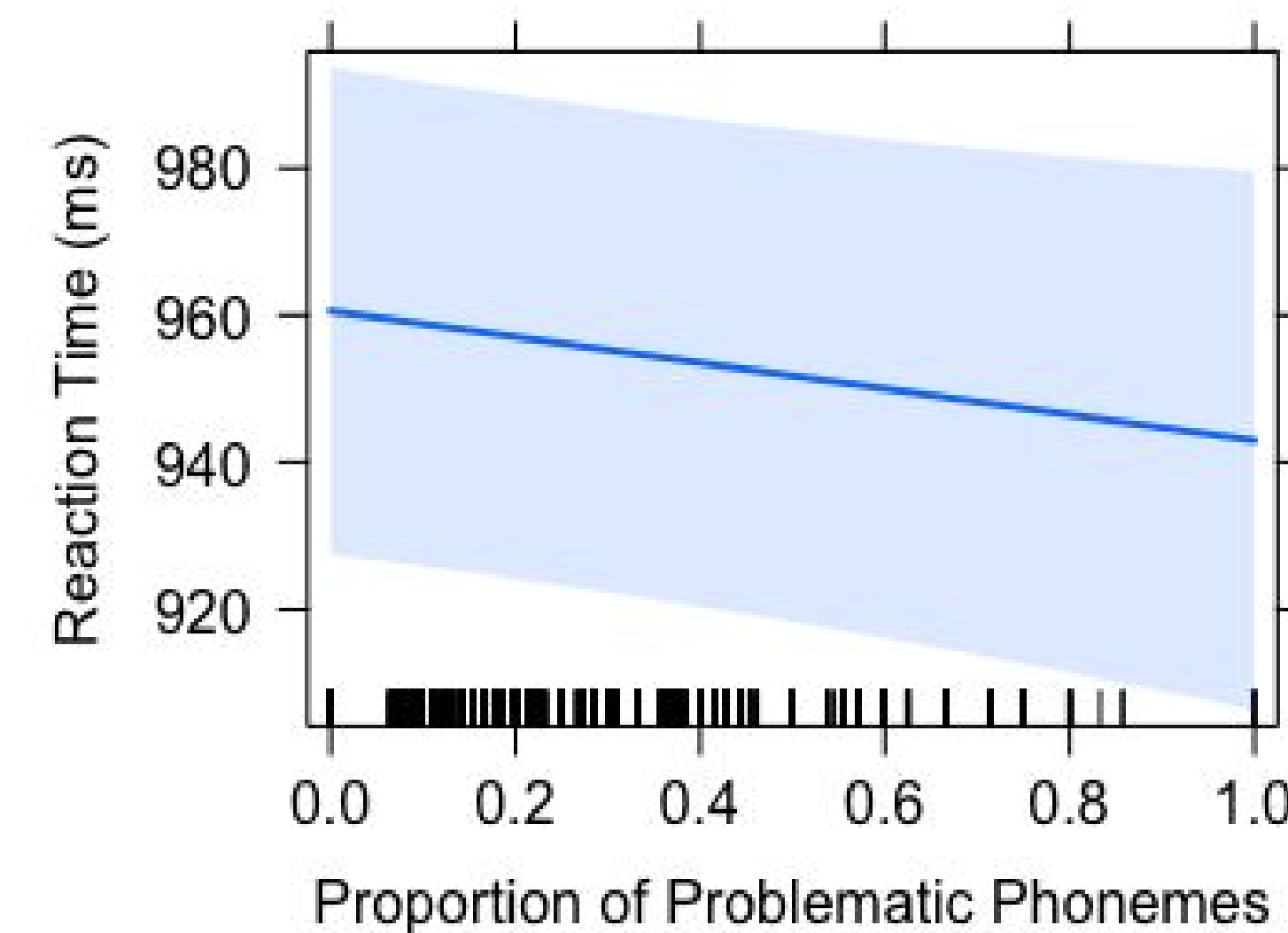


Figure 2. Effect plot of proportion of all unfamiliar phonemes on reaction time

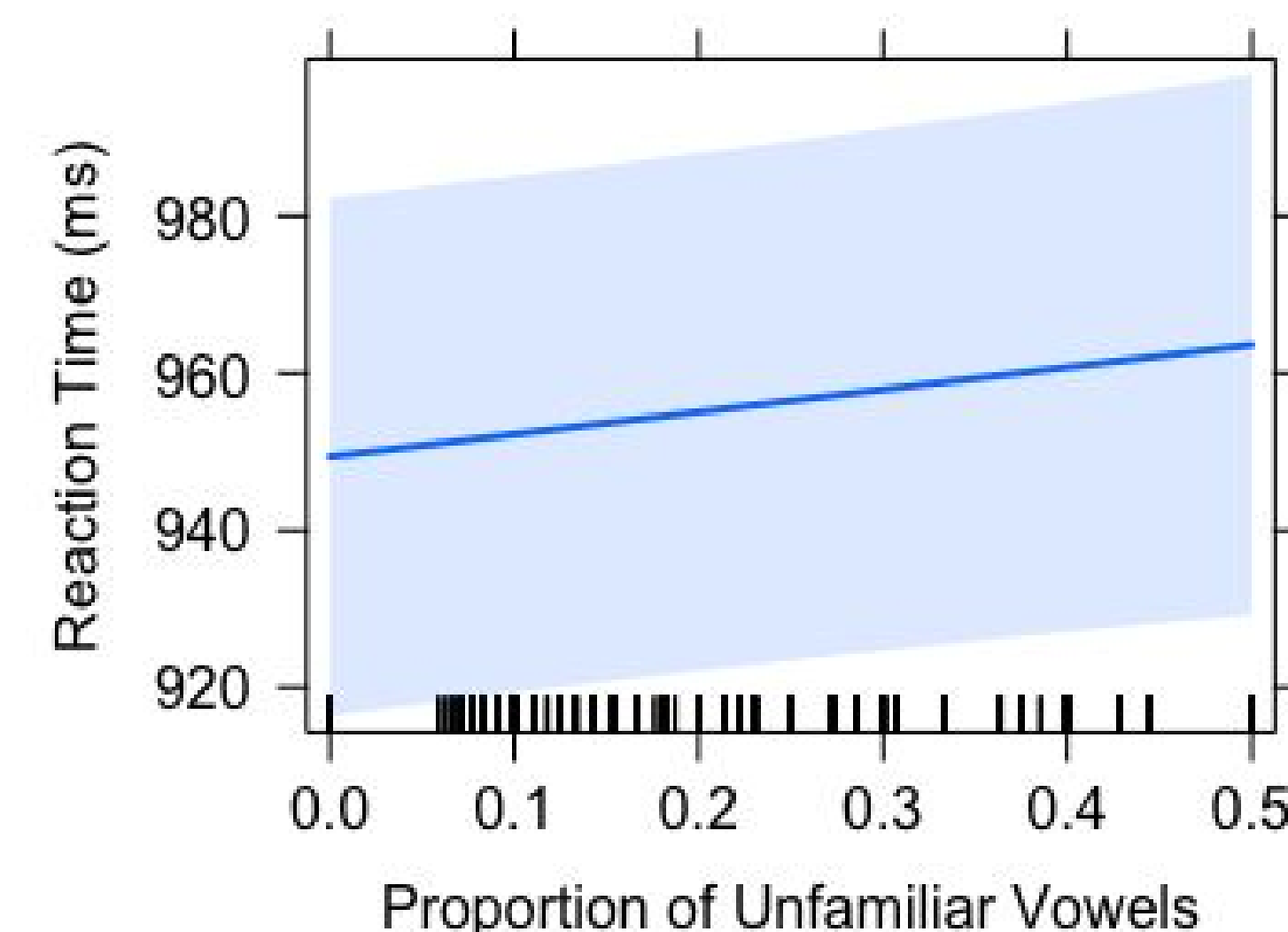


Figure 3. Effect plot of proportion of unfamiliar vowels on reaction time

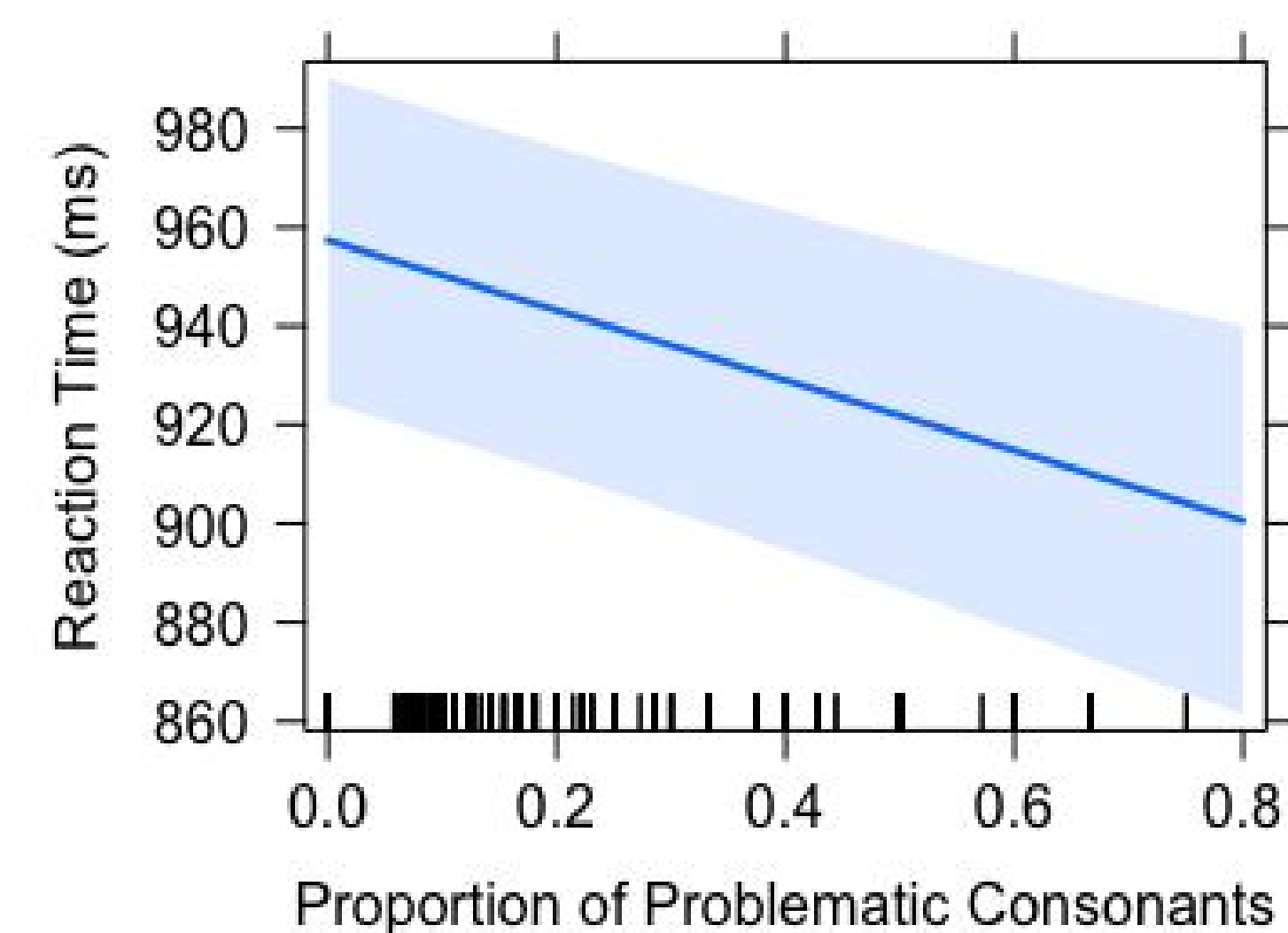


Figure 4. Effect plot of proportion of unfamiliar consonants on reaction time

3. Results

Overall (Figure 1):

- Reaction time of native Mandarin speakers is slower and more variable than native English speakers
- Age of acquisition and self-rated English proficiency do not have a significant effect on response time

Unfamiliar phonemes

- All** (Figure 2): proportion of all unfamiliar phonemes has no significant effect on reaction time (t -value of -1.639)
- Vowels** (Figure 3): greater proportion of unfamiliar vowels increases (slows down) reaction time (t -value of 2.408)
- Consonants** (Figure 4): greater proportion of unfamiliar consonants decreases (speeds up) reaction time (t -value of -4.954)

4. Discussion

- Experiment was largely exploratory
- Limited effects of an unfamiliar phoneme may be because the closest Mandarin alternative does not occur in English, or the phoneme is different enough to be perceived as unlike any known phonemes, therefore difficulties are limited to speech production and not perception
- Age of acquisition and English proficiency may not be accurate as they are not discrete, objective measurements
- Mandarin English L2 speakers process English similarly to native English speakers

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