# The Lexical Encoding of Novel Phonological Features:
# Discrimination of Arabic Phonemes by Native English Speakers

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## Introduction

- Second language (L2) learners often exhibit difficulties perceiving novel phonemic contrasts
- It may be more difficult for learners to distinguish between novel contrasts when lexical access is required (Curtin et al. 1998, Hayes-Harb &Masuda 2008)
- On the other hand (Pater 2003), learners distinguished between novel contrasts equally well when lexical access was required as they did when not required
  - This was only the case when task was an AXB discrimination task consisting of sound-picture-sound (SPS) stimuli
  - When discrimination task consisted of picture-sound-picture (PSP) stimuli, discrimination was at-chance levels
  - This mixed finding suggests that the nature of the task is crucial
- Hayes-Harb & Masuda (2008) speculate that learners may not initially store the relevant features of novel phonemes but instead may store them as being "strange" versions of familiar L1 phoneme
  - If this is the case, then the "strangeness" of the phones could be used to distinguish between the two phones in an auditory task
  - This relative strangeness account may explain Pater's findings.
- When two auditory forms are presented the learner could compare them for strangeness
- When only one sound is presented, learners could not compare relative strangeness of the sounds
- First research question: To what extent does task type affect learners' ability to discriminate between novel contrasts?
  - When both phones are presented in the task, are learners able to more accurately distinguish between the phones than when only one phone is presented?
- This study utilizes the Arabic /t/- /tˤ/ phonemes as the novel contrast
- Vowel context has been found to affect learners' ability to perceive pharyngeal contrasts (Bolewicz et al. 2009)
  - The following vowel was found to have a significant effect on the perception of the contrast (i.e., tˤa> tˤi> tˤu)
  - Vowel context may affect learners' ability to perceive the contrast in PSP and SPS task types
- Second research question: Does vowel context interact with task type to facilitate learners' ability to perceive contrasts?

## Participants

- 30 native English speakers (15 per task condition)
- No prior knowledge of Arabic, 18+ years old, recruited from courses at the University of Utah
- Normal-hearing with no neurological disorders or medication affecting motor skills

## Stimuli

- Eighteen Arabic non-words consisting of six target and three filler minimal pairs
  - Each stimulus was associated with a distinct picture
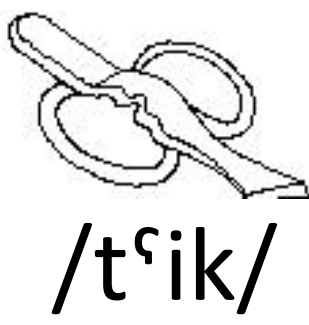
/tˤik/

- Six target pairs were distinguished only by pharyngealization (i.e. /tik/-/tˤik/)
- Three filler pairs distinguished by phonemes present in both Arabic and English (i.e. /baf/-/maf/)
- Three native Arabic speakers produced the stimuli
- 54 unique non-word stimuli (18 non-words x 3 talkers= 54 non-words)

## Procedure

- **SPS Task**
- Participants underwent a word learning phase: subjects learned to associate the Arabic non-words with pictures
  - Each word was presented six times
- Criterion task: Participants were presented with an AXB discrimination task consisting of a sound-picture-sound (SPS)
  - Sounds were not minimal pairs
  - Participants required to correctly associate word-picture pairings with at least 90% accuracy before proceeding with task
  - Participants registered their responses by pressing buttons on a keyboard

/tˤik/        /maf/
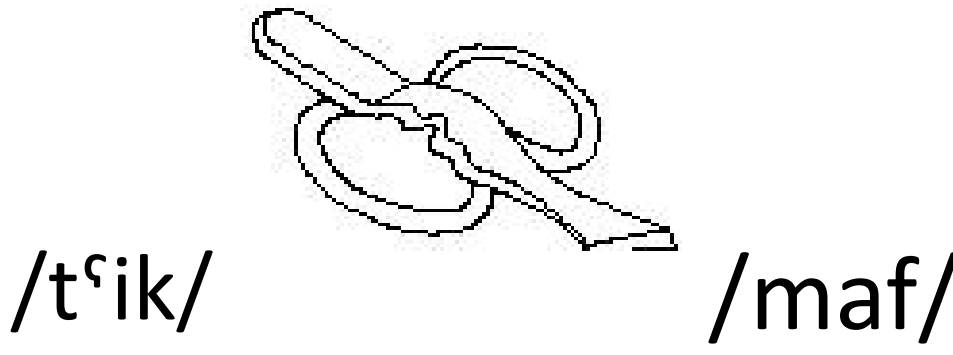
- Final task: Participants presented with an AXB task where A and B were minimal pairs and X was a picture associated with either A or B

/tik/        /tˤik/
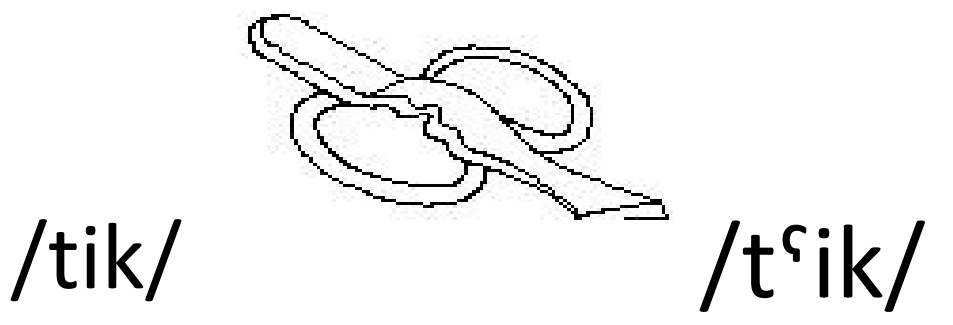
- In each of the AXB groups presented, A and B were produced by different talkers
- The AXB items presented in random order in a block
  - Each AXB group was presented twice in the block and the block was presented four times, for a total of 144 trials
- **PSP Task**
- Identical SPS task, except the AXB tasks consisted of picture-sound-picture (PSP) items instead of sound-picture-sound

/tˤik/

## Results

- Proportion correct calculated for each participant individually
- Participants were significantly more accurate at discriminating familiar /m/-/b/ contrasts than novel /t/-/tˤ/contrasts (Wilcoxon signed ranks test: z=-4.612 , p<.005)
- No significant difference was found between task conditions (F(1,28)=1.939, p=.175)
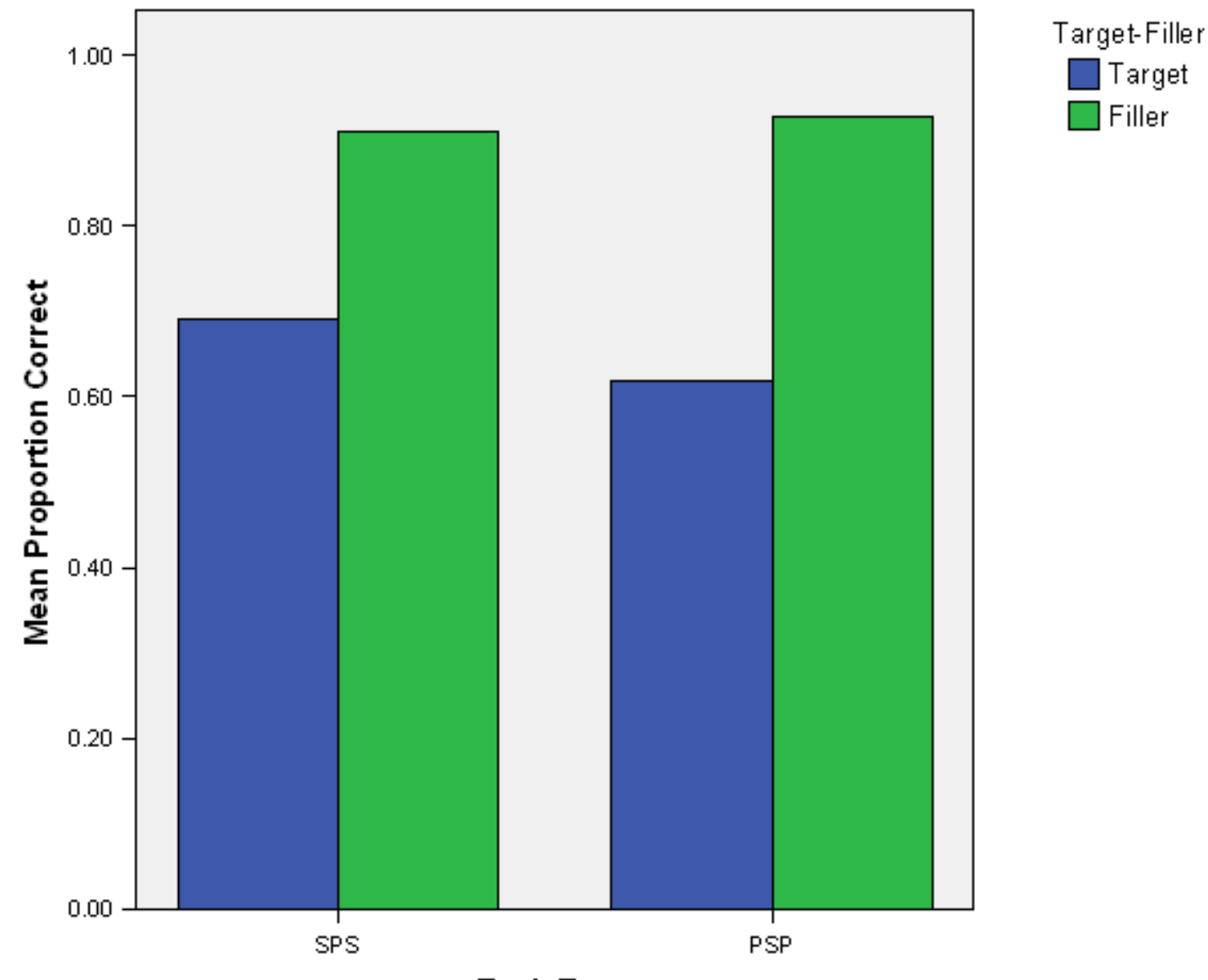


- Significant effect of vowel context on subjects' ability to perceive the novel contrast (F(2,66)=6.239, p=.004)
- No significant interaction of vowel context with task conditions (F(2,66)<1)
  - Effect of vowels n.s. between task conditions (I<A<U, A:p=.100; I:p=.424; U: p=.533)
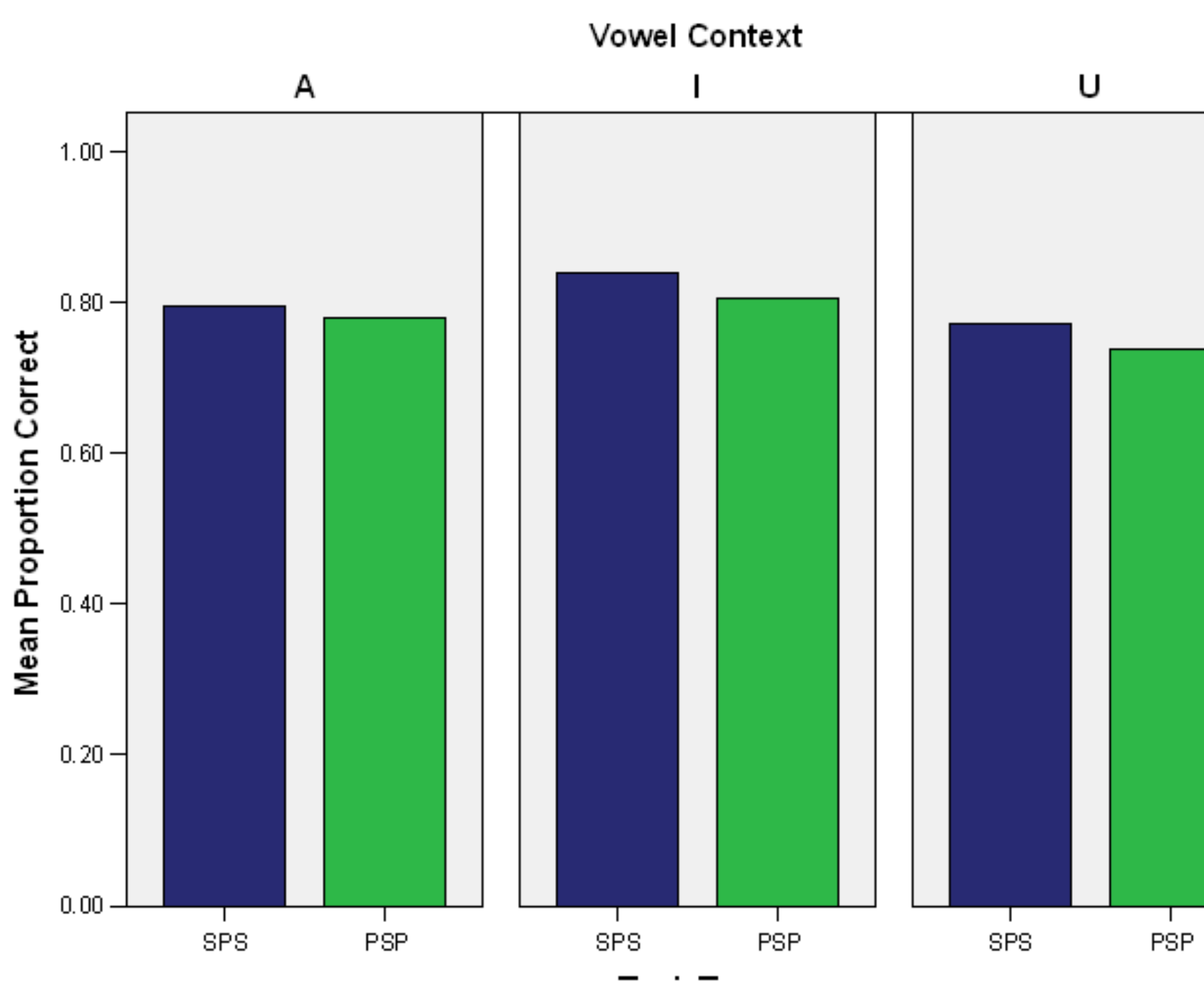


## Conclusions

- L2 learners did not replicate Pater's findings in PSP and SPS conditions
- Vowel context was not found to interact with task type
- More follow up is needed to see if Pater's results can be replicated

## Acknowledgments

## References

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