“ha–ḥa!”

A LONGITUDINAL STUDY OF ADULT FOREIGN LANGUAGE LEARNING

Bias in Auditory Perception
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NATIVE DANISH LANGUAGE OFFICER CADETS LEARNING EITHER ARABIC OR DARI
WHY

Foreign speech learning in the lab: 10-30 days
(e.g. Bradlow et al., 1997; Chandrasekaran et al., 2010; Lively et al., 1994; Logan et al., 1991;
Perrachione et al., 2011; Wang et al., 1999; Wong & Perrachione, 2007)

Models of foreign language speech learning: perceptual adaption relatively early in the learning process
(Best, 1995; Best & Tyler, 2007; Flege, 1995)

But how about “IRL”? 
WHY

Also, immersion studies: differences between 1.5-7 yrs
(Flege, Bohn, & Jang, 1997; Flege & Liu, 2001)

Can we show adaptation to foreign speech sounds
during intensive foreign learning?

And if so, how does this unfold in time?
PARTICIPANTS

20 language officer cadets in total
learning either

Dari (Afghan Farsi): \( n = 12 \)
or
Arabic (al-misr/MSA): \( n = 8 \)
PARTICIPANTS

Highly select group

Very intensive training: 8 hr school, 8 hr homework, 8 hr sleep

18 mos of training: high level of proficiency ("fluent" speakers)
STIMULI

**DARI** (fricative voicing)
“near common”: [ʃa] ("sh")
Dari-only: [ʒa] ("zh") (1 l and 3 levels)

**ARABIC** (emphasis - laryngeal fricative)
“near common”: [ḥa] ("ha")
Arabic-only: [ḥa] ("hha") (1 l and 3 levels)
PARADIGMS

IDENTIFICATION TASK:
2AFC (incl. short exposure)

DISCRIMINATION TASK:
AX (same-different)
PARADIGMS

- EEG MMN: ~70 mins
- Behav ID: ~15 mins
- Behav Discrim: ~20 mins
- Total: ~120 mins
TIME PLAN

**T0:** Nov 12-15, 2012

**T1 (3 wks):** Dec 8-10, 2012

**T2 (6 mos/24 wks):** May 4-6, 2013

**T3 (18 mos/81 wks):** June 2-4 2014
HYPOTHESES

ID-slopes of Dari learners to Dari stimuli: STEEPENING
ID-slopes of Arabic learners to Arabic stimuli: STEEPENING
ID-slopes of all learners to non-target stimuli: no change
RESULTS - IDENTIFICATION

Arabic learners (n = 8)

Dari learners (n = 12)

Frication

Voicing

Time

Slope of ID functions

0 wks 3 wks 24 wks 81 wks

Arabic stimuli: /hæ/ vs. /ħæ/

Dari stimuli: /ʃa/ vs. /ʒa/
RESULTS - ID

A native Arabic speaker

Arabic stimuli: /hæ/ vs. /ħæ/

Arabic learners (n = 8)

Dari learners (n = 12)

Identification, ha−hha (Arabic native, pilot study)
RESULTS - ID

Arabic learners (n = 8)
Dari stimuli: /ʃa/ vs. /ʒa/

A native Dari speaker

Dari learners (n = 12)

Continuum from voiceless to voiced fricative

Percentage identified as zha

Identification, sha−zha (D3)

Continuum from voiceless to voiced fricative
RESULTS - ID

**Arabic learners (n = 8)**

- **T0 to T1**
  - Arabic learners T1 vs. T0

- **T0 to T2**
  - Arabic learners T2 vs. T0

**Dari learners (n = 12)**

- **T0 to T1**
  - Dari learners T1 vs. T0

- **T0 to T2**
  - Dari learners T2 vs. T0

DARI LEARNERS’ SLOPE CHANGES WERE POSITIVELY CORRELATED WITH THEIR SPEAKING GRADES

\[ r_s(10) = 0.60^* \]
\[ p < 0.05 \]

\[ r_s(10) = 0.71^* \]
\[ p < 0.05 \]
RESULTS - DISCRIM

Arabic learners (n = 8)

“Arabic” stimuli: /hæ/ vs. /ħæ/

Dari learners (n = 12)

“Arabic” stimuli: /hæ/ vs. /ħæ/

“Dari” stimuli: /ʃa/ vs. /ʒa/
DISCUSSION

Arabic contrast also includes RTR on subsequent high vowels

Voicing contrast in Arabic for the alveolar fricative (/s/ vs. /z/)

Effects from other L2s (e.g. English or French)
DISCUSSION

Large individual differences: learning biases in a very homogenous sample?
Arab learners’ ID functions | ha-hha | T0 to T3

Continuum from less to more aspirated (90 ms to 160 ms)

Percentage identified as /hha/

Identification, ha−hha (arab1, T0−T1−T2−T3)

T0
T1
T2
T3

Identification, ha−hha (arab2, T0−T1−T2−T3)

T0
T1
T2
T3

Identification, ha−hha (arab3, T0−T1−T2−T3)

T0
T1
T2
T3

Identification, ha−hha (arab4, T0−T1−T2−T3)

T0
T1
T2
T3

Identification, ha−hha (arab5, T0−T1−T2−T3)

T0
T1
T2
T3

Arab learners’ ID functions | ha-hha | T0 to T3

Continuum from voiceless to voiced fricative

Percentage identified as /zha/

Identification, sha−zha (arab3, T0−T1−T2−T3)
Arab learners’ ID functions | sha-zha | T0 to T3
Dari learners’ ID functions | sha-zha | T0 to T3
CONCLUSION

HYPOTHESES:

ID-slopes of Dari learners to Dari stimuli: STEEPENING ✔

ID-slopes of Arabic learners to Arabic stimuli: STEEPENING %

ID-slopes of all learners to non-target stimuli: no change %
CONCLUSION

Early adaptation to the Dari voiced fricative (sh-zh) (for Dari learners)

No adaptations to the Arabic emphatic pharyngeal fricative (h-hh)

Large individual differences despite homogeneity
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