Detection of wrong notes in familiar Persian melodies.

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26 July 2018
Wrong-Note Study

- Raman, Tillmann, & Dowling (Experiment - 1; under revision)

- General Purpose
  - Effect of key membership (violation of schematic knowledge)
  - Effect of interval size (violation of veridical knowledge)
  - Musical Experience
Cross-Cultural Wrong-Note Study - 1: Carnātic Music
Why Study Carnātic Music??

- 350 rāgams vs. 13 Western modal scales

- \[ \text{C D}_b \quad E \quad F^\# \quad G \quad A_b \quad B \quad C \] (heptatonic)

- \[ \text{C} \quad \text{D} \quad \text{E}_b \quad F \quad \text{A} \quad \text{B} \quad \text{C} \] (hexatonic)

- \[ \text{C} \quad \text{E}_b \quad F \quad G \quad \text{B} \quad \text{C} \] (pentatonic)
Central Question

To investigate effects of key membership and interval size cross-culturally

- A complex music system—rāgams
- Type of wrong note that will “pop out”
- Musical training
Participants

- 30 Indian Teachers
- Students Rasikās
- 17 – 63 years
Types of Wrong Notes

- **Key:**
  - In-key/Out-of-key

- **Interval:**
  - 1 ST/2 ST

- **Direction:**
  - Up/Down

- **Trials**
  - 3 practice trials
  - 48 total trials; 8 trials per 6 songs approx.

- **Counterbalance Carnatic vs. Western stimuli**
Task

- E.g., London bridge, Mary had a little Lamb

- Press spacebar as quickly as possible when you hear a wrong note

DV

- Hits, Response times
  - Within 3000 ms
Indian Participants – Carnātic vs. Western Melodies: Hits – K x N x I
Indian Participants – Carnatic vs. Western Melodies: RT (ms) – K x N x I
Current Study
Cross-Cultural Wrong-Note Study - 2: Persian Music
Why Study Persian Music??

- Gushe are derived from the 12 Dastgāh
- About 500 Persian gushe vs. 13 Western modal scales

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A Bp C D Ep F G A (Old Shur – Dastgāh)
A Bp C D E F (New Shur – Gushe)
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e.g., Ya Mola, Gole Pāmchal, Bahare Delkash

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A B Db D E Gb Ab A (Māhur– Dastgāh)
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e.g., Tavalodet Mobarak (Happy Birthday), Gole Goldoon
Central Question

To investigate effects of key membership and interval size cross-culturally

- A complex music system with quarter tones
- Type of wrong note that will “pop out”
- Musical training
Participants

- 36 Persian (17 – 85 years)
- 8 Highly trained ($M = 13.56$ years)
- 16 Moderately trained ($M = 2.81$ years)
- 12 Nonmusicians ($M = 0.00$ years)

- 53 Western (17 – 35 years)
- 18 Highly trained ($M = 8.58$ years)
- 13 Moderately trained ($M = 2.69$ years)
- 22 Nonmusicians ($M = 0.00$ years)
Stimuli

- 32 popular Persian melodies
- Most with lyrics
- MIDI stimuli
- Excerpt duration – 15 s approx.
**Types of Wrong Notes**

- **Key:**
  - In-key/Out-of-key

- **Interval:**
  - 1 ST/2 ST

- **Direction:**
  - Up/Down

- **Trials**
  - 3 practice trials
  - 64 total trials; 2 trials per 32 songs
  - Away from quarter tones
**Task**

- Example: Ey Iran

- Example: Morghe Sahar

- Press spacebar as quickly as possible when you hear a wrong note

- **DV**
  - Hits, Response times
    - Within 3000 ms
**Persian vs. Western Participants:**

**Hits — N x E x K**

**Main Effects:**
Nationality, Key Membership
Music Experience*

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**Diagram:**
- **Persian**
  - In-Key
  - Out-of-Key

- **American**
  - In-Key
  - Out-of-Key
Persian vs. Western Participants: Hits – N x K

Main Effects:
Nationality, Key Membership
Music Experience*
**Persian & Western Participants: RT (ms) − K x I**

**Main Effects:**
Music Experience, Key Membership
Nationality*, Interval Size*
Key membership important
- Out-of-key

Interval size “somewhat” important
- 2 ST away from the original note

Faster with out-of-key and 2 ST

Slowest with in-key
Trained musicians performed similarly and better than nonmusicians.
CONCLUSION – 3

- Hit rates about 30 - 50% (chance about 15%) for Persian participants
- Perhaps related to complexity of Persian music system??
- Familiarity of melodies??
FUTURE DIRECTIONS

- Investigate effects of familiarity
- Currently working on
  - Converging evidence from other cultures—Japanese melodies and participants
THANK YOU

- Vahid Montazeri
- Participants
QUESTIONS???
Prior Research

- Besson & Faïta (1995)
- Behavioral & ERP study
- Musicians vs. Nonmusicians
- Familiar vs. Unfamiliar Western melodies
- ALWAYS the last note
- 3 types of wrong notes:
  - in-key with no closure, out-of-key, rhythmic change
Besson & Faïta (1995)
Besson & Faïta (1995)

- Results – Hits/ERP
- **Musicians** vs. Nonmusicians
- **Familiar** vs. Unfamiliar melodies
- Type of wrong note:
  - rhythmic change, out-of-key, in-key with no closure
- Familiarity x Expertise x Type of wrong note
36 Carnātic & 37 Western popular melodies
All with lyrics
MIDI stimuli
Excerpt duration – 15 s approx.
Familiarity ratings from Indian participants
9-point Likert scale (“9”- highly familiar)
Pre-Test

- **Indian participants**
  - Highly familiar 6 Carnātic and 6 Western melodies
  - 6.7 to 8.6 (Carnātic)
  - 8.2 to 8.6 (Western)

- **Western participants**
  - 8.0 to 9.0 (Western)
Indian Participants – Carnatic vs. Western Melodies – Hits
Indian Participants – Carnātic vs. Western Melodies – RT (ms)
Indian vs. Western Participants – Western Melodies – Hits
Indian vs. Western Participants — Western Melodies — RT (ms)

![Graphs showing average response time for Indian and Western participants.](image-url)
CONCLUSION — 1

Carnātic vs. Western melodies

- Key membership important
- Out-of-key
- Interval size important
  - 2 ST away from the original note
- Faster with out-of-scale and 2 ST
- Slowest with in-scale and 1 ST away (Carnātic)
Carnātic vs. Western melodies

- Indian participants faster and more accurate on Western melodies
- related to complexity of Carnatic music system
CONCLUSION – 3

Indian vs. Western participants

- Key membership important
- Out-of-key
- Interval size important
- 2 ST away from the original note
Indian and Western participants equally fast on Western melodies

Western participants more accurate than Indian participants
Trained musicians performed similarly and better than nonmusicians.