

**DETECTION OF WRONG NOTES IN FAMILIAR  
PERSIAN MELODIES.**

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# WRONG-NOTE STUDY

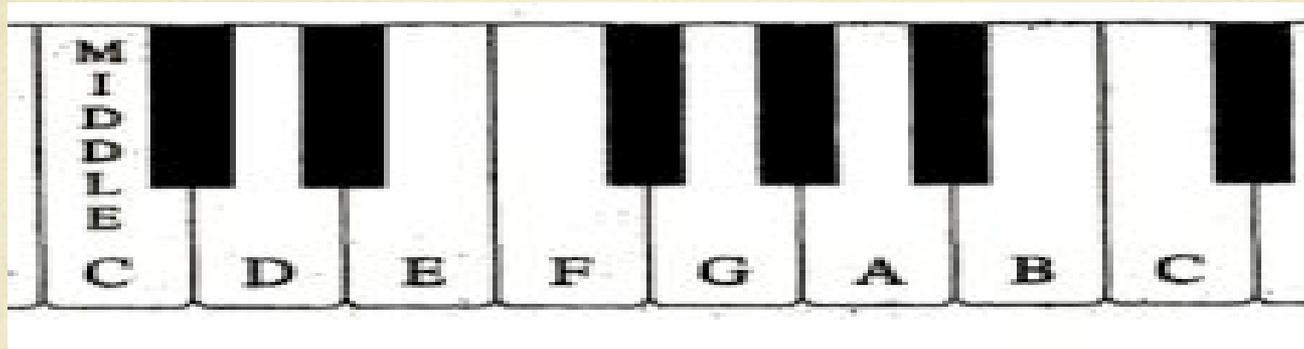
- Raman, Tillmann, & Dowling (Experiment - 1; under revision)
- **General Purpose**
  - Effect of key membership (violation of schematic knowledge)
  - Effect of interval size (violation of veridical knowledge)
  - Musical Experience

# CROSS-CULTURAL WRONG-NOTE STUDY - 1: CARNĀTIC MUSIC



# WHY STUDY CARNĀTIC MUSIC??

- 350 rāgams vs. 13 Western modal scales



- **C D<sup>b</sup> E F<sup>#</sup> G A<sup>b</sup> B C** (heptatonic)
- **C D E<sup>b</sup> F A B C** (hexatonic)
- **C E<sup>b</sup> F G B 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

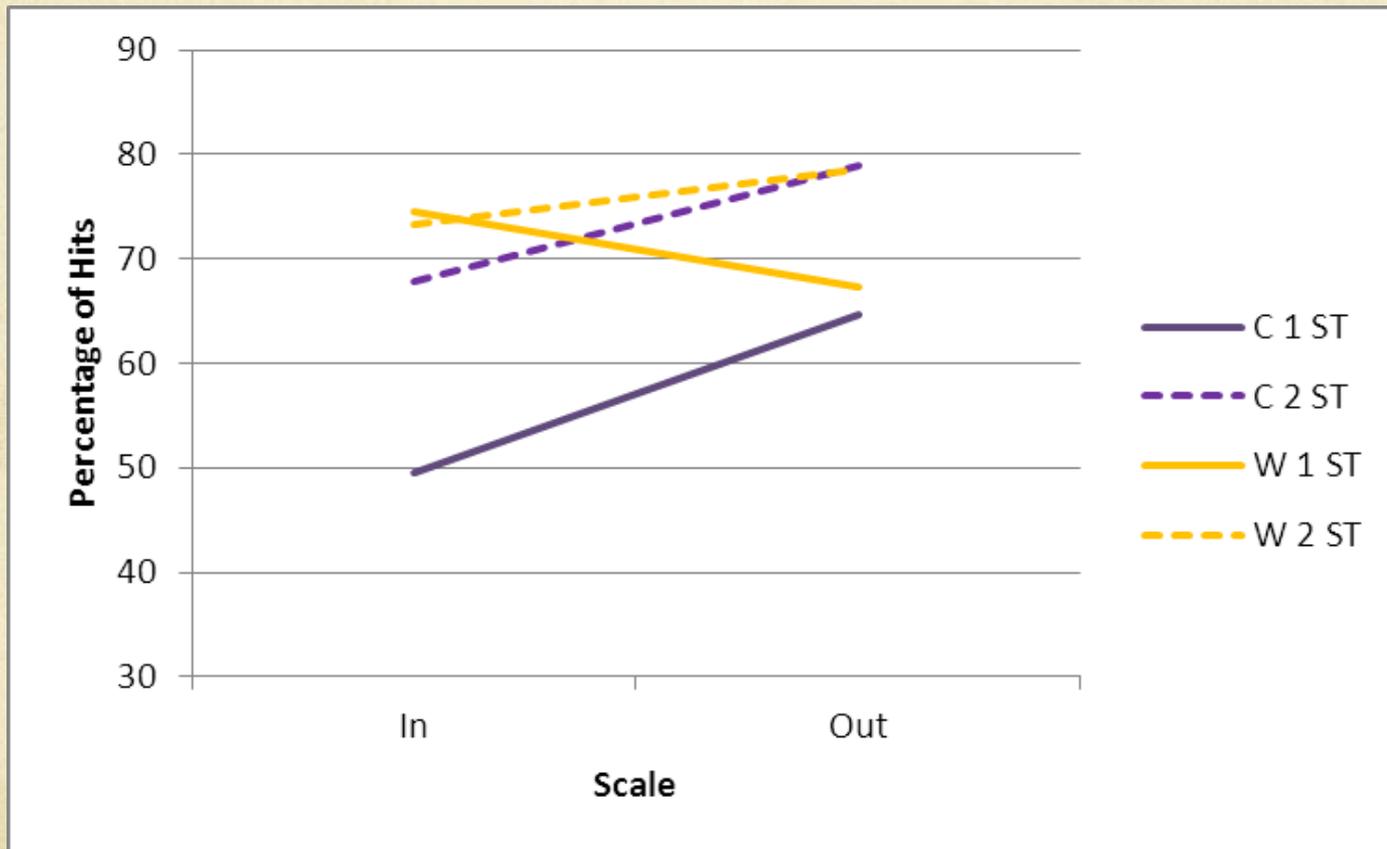
# TYPES OF WRONG NOTES

- **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 Carnātic vs. Western stimuli

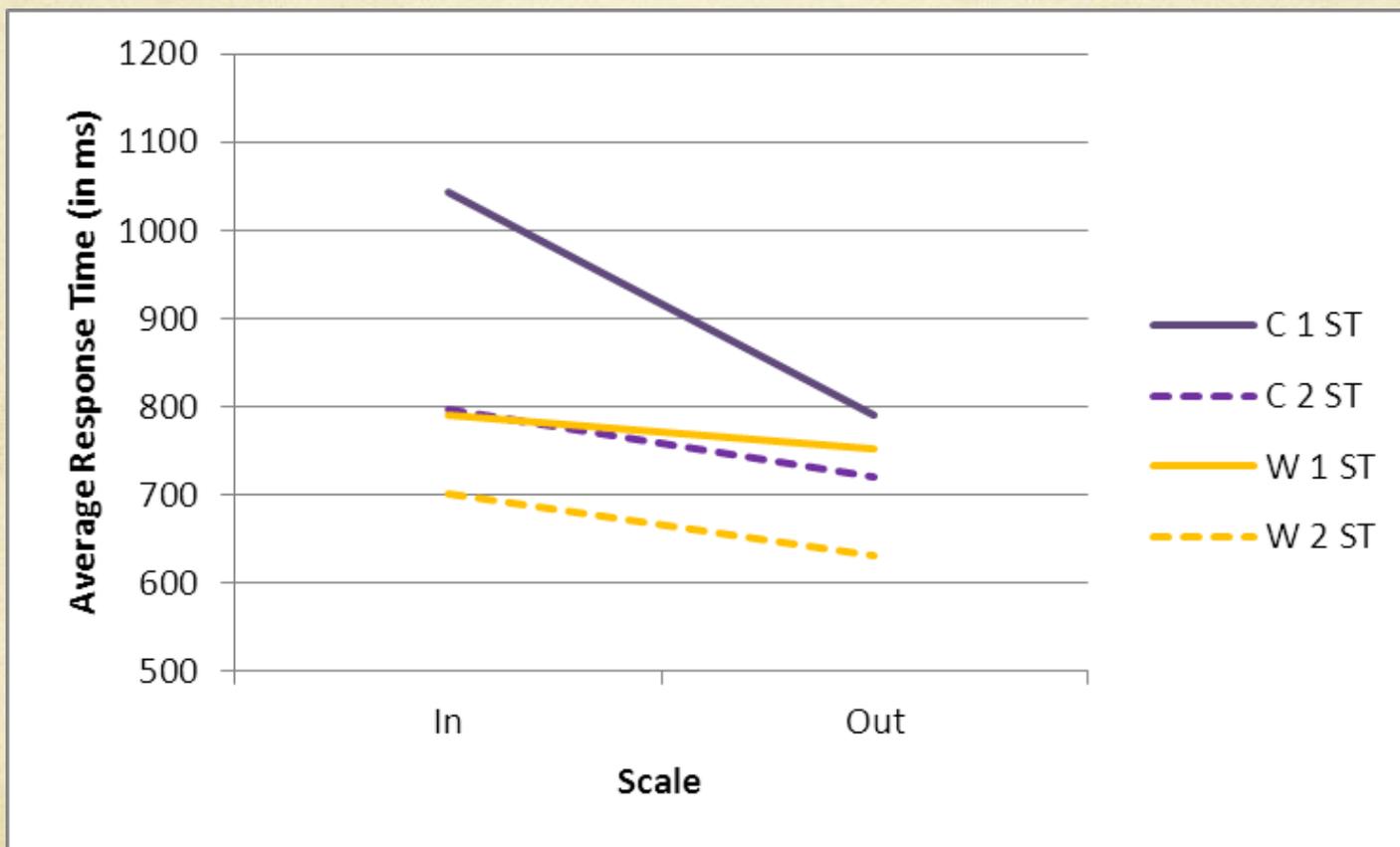
# TASK

- 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

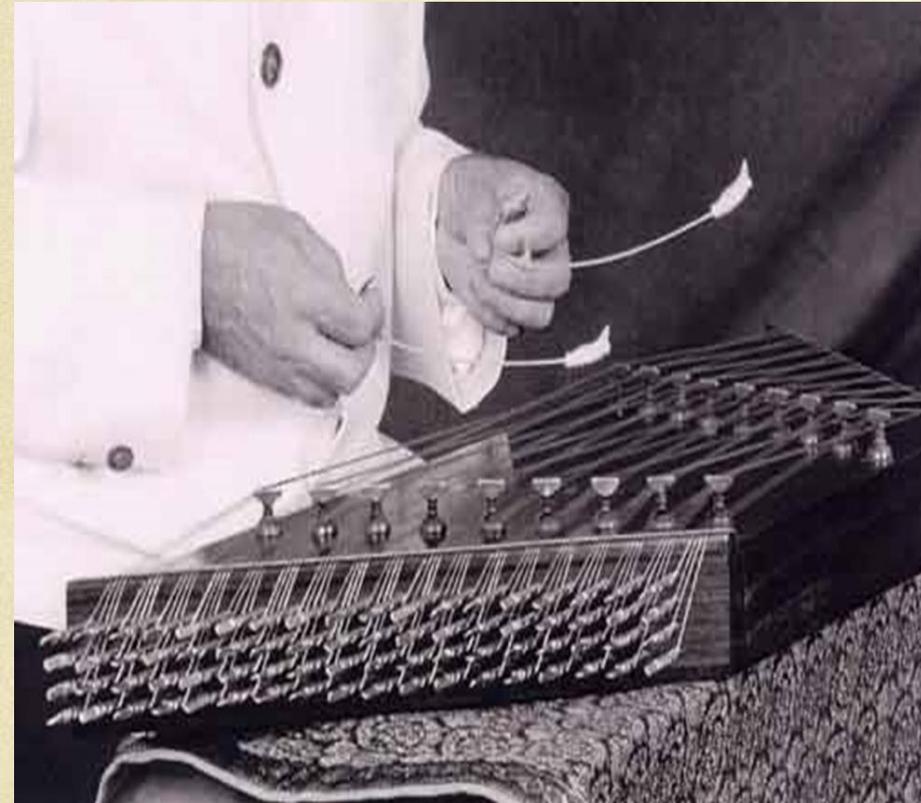


# INDIAN PARTICIPANTS – CARNĀTIC VS. WESTERN MELODIES: RT (ms) – K x N x I



# 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



**A B<sup>p</sup> C D E<sup>p</sup> F G A** (Old Shur - Dastgāh)

**A B<sup>p</sup> C D E F** (New Shur - Gushe)

e.g., Ya Mola, Gole Pāmchal, Bahare Delkash

**A B D<sup>b</sup> D E G<sup>b</sup> A<sup>b</sup> A** (Māhur- Dastgāh)

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

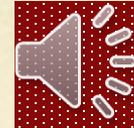
- 32 popular Persian melodies
- Most with lyrics
- MIDI stimuli
- Excerpt duration – 15 s approx.

# 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

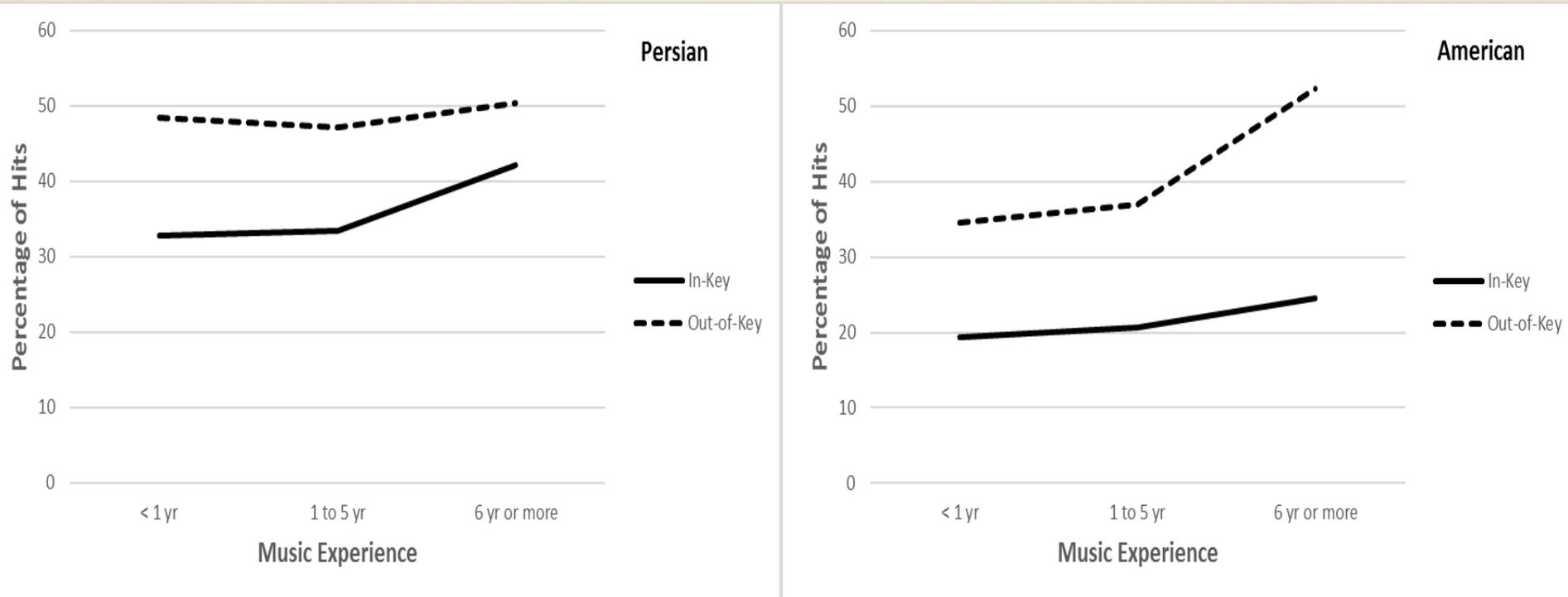


- Example: Morghe Sahar



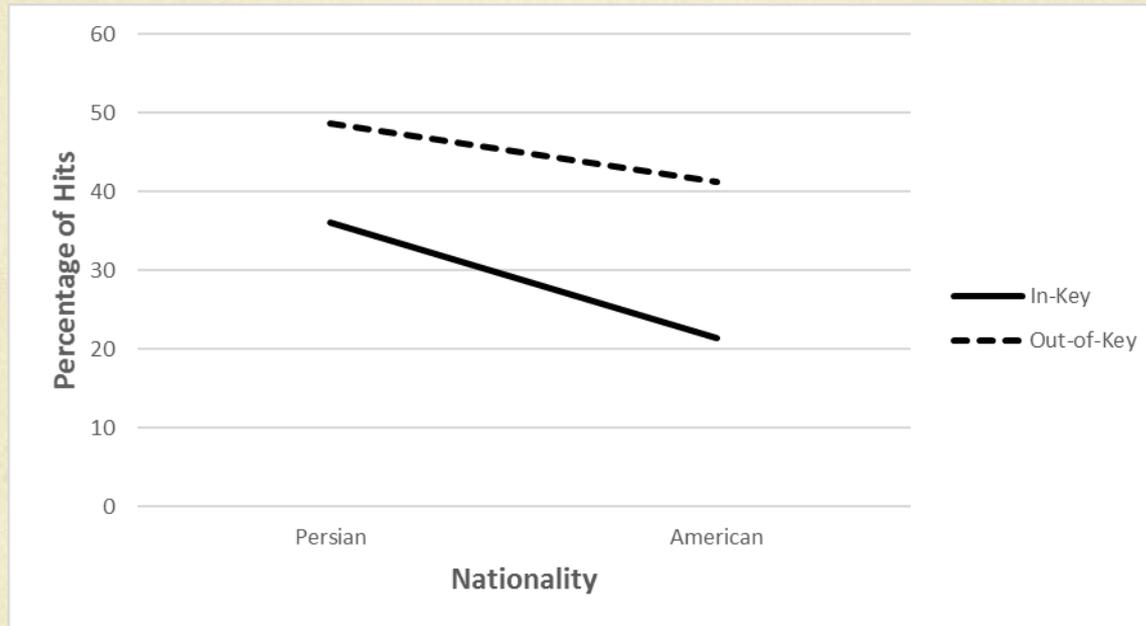
- Press spacebar as quickly as possible when you hear a wrong note
- DV
  - Hits, Response times
    - Within 3000 ms

# PERSIAN VS. WESTERN PARTICIPANTS: HITS – N x E x K



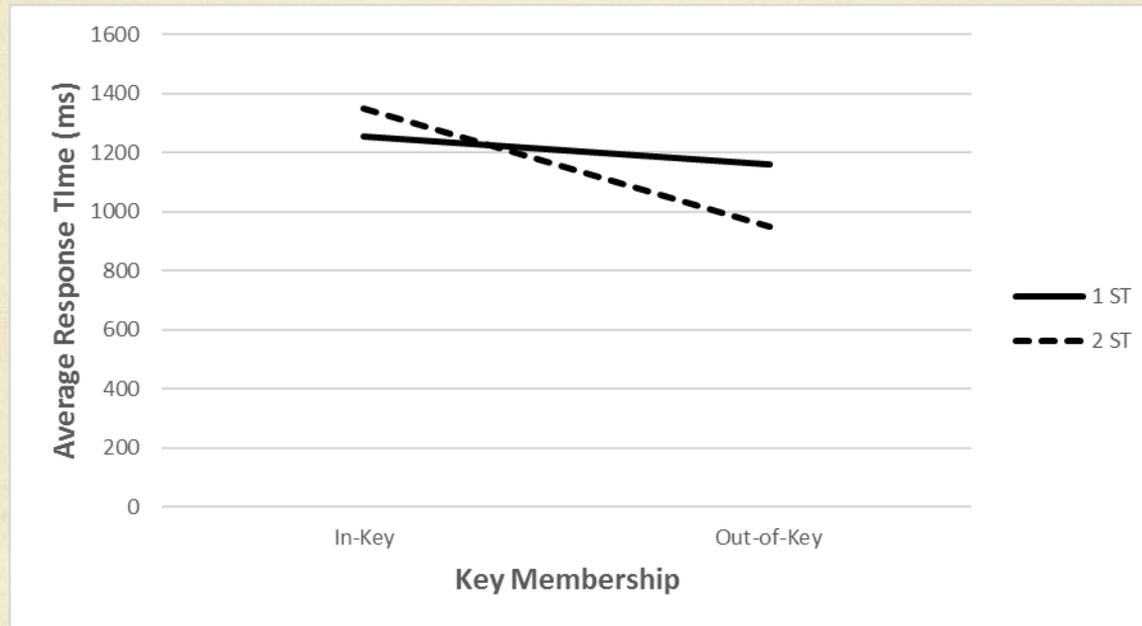
**Main Effects:**  
Nationality, Key Membership  
Music Experience\*

# 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\*

# CONCLUSION – 1

- 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

## CONCLUSION – 2

- 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

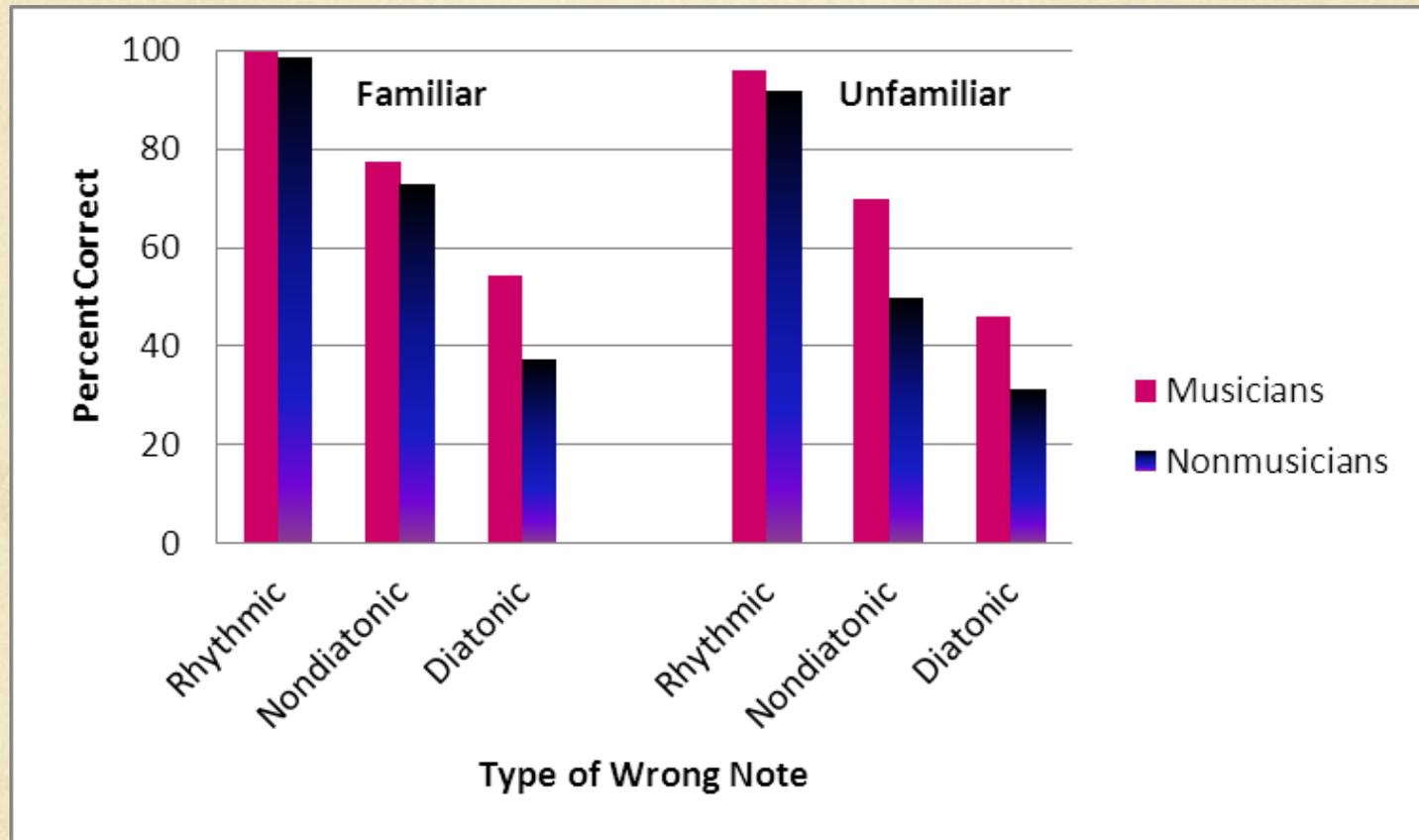
- Vahid Montazeri
- Participants

**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)

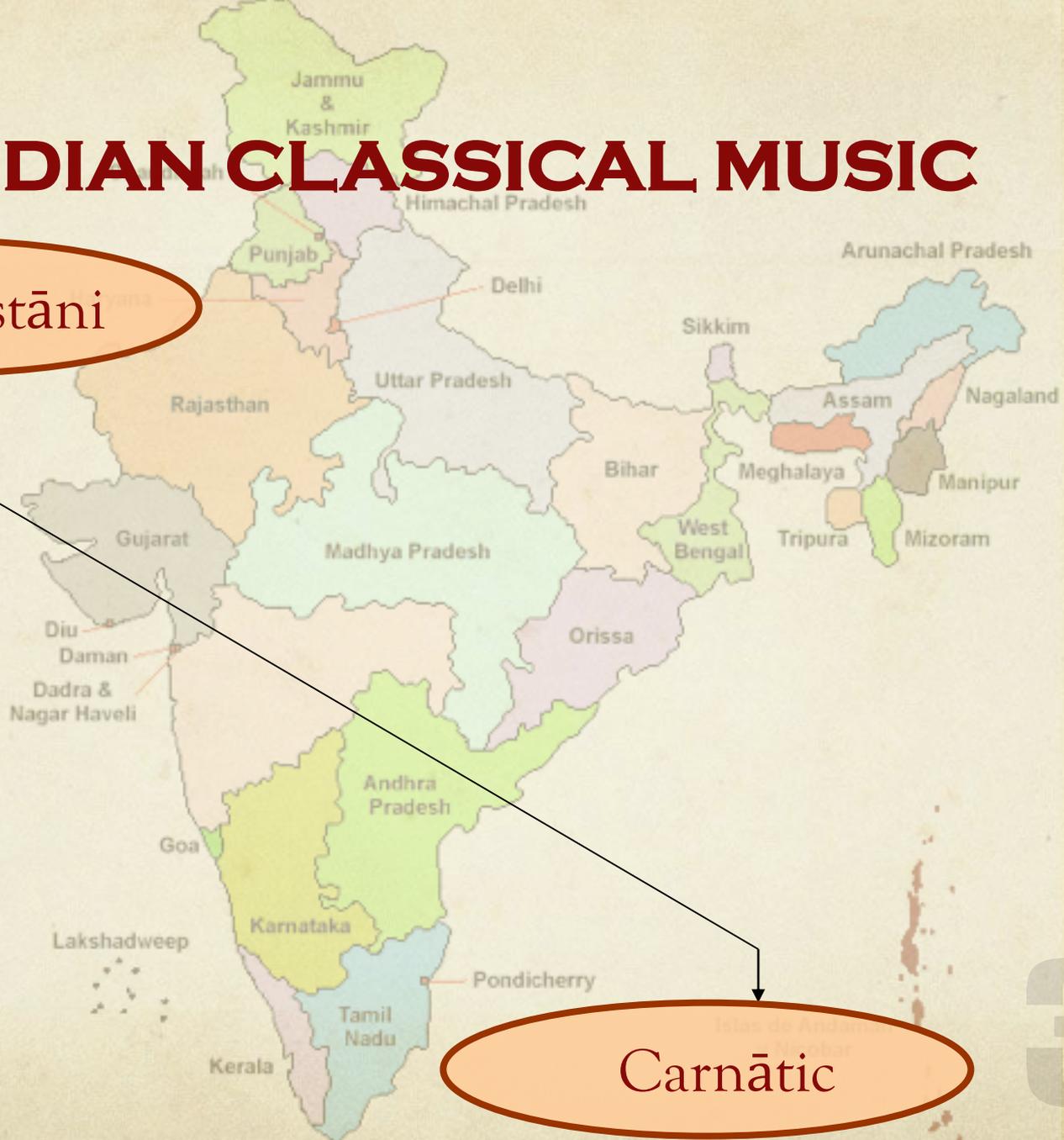


# BESSON & FAÏTA (1995)

- 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

# INDIAN CLASSICAL MUSIC

Hindustāni



Carnātic

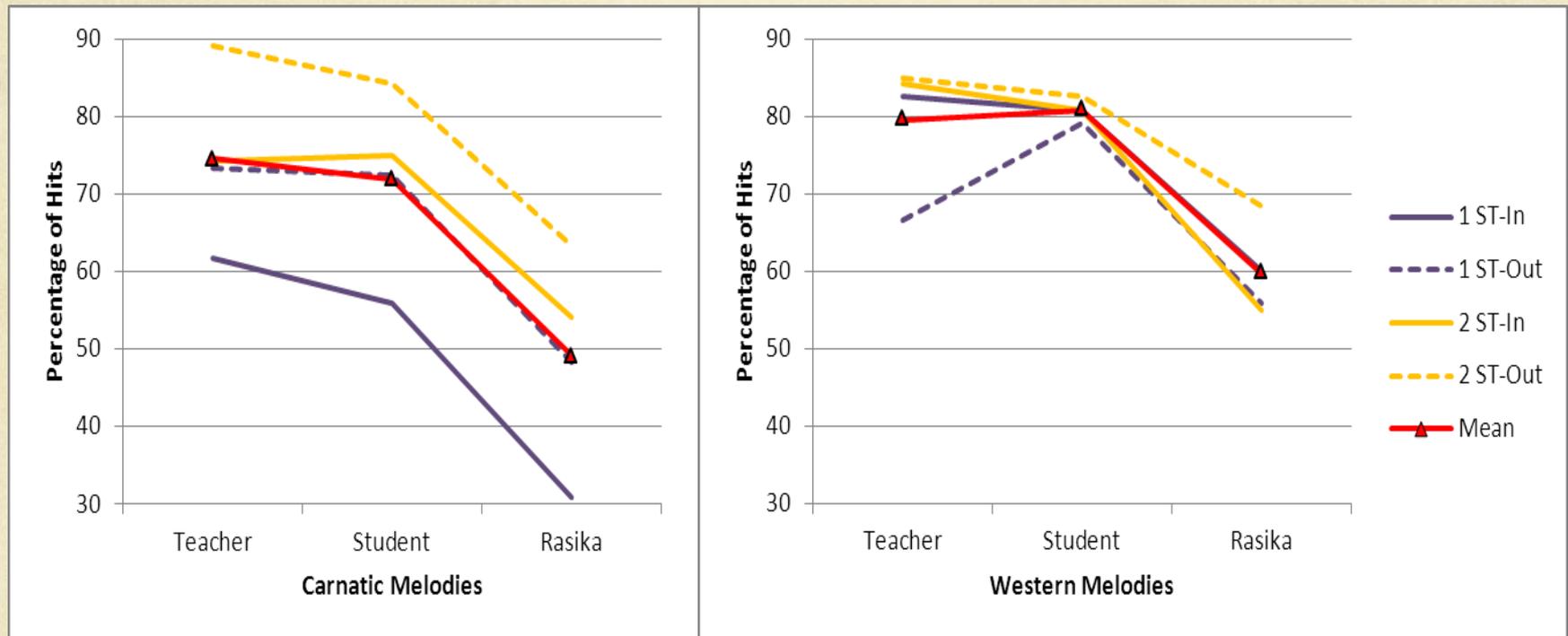
# PRE-TEST

- 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)

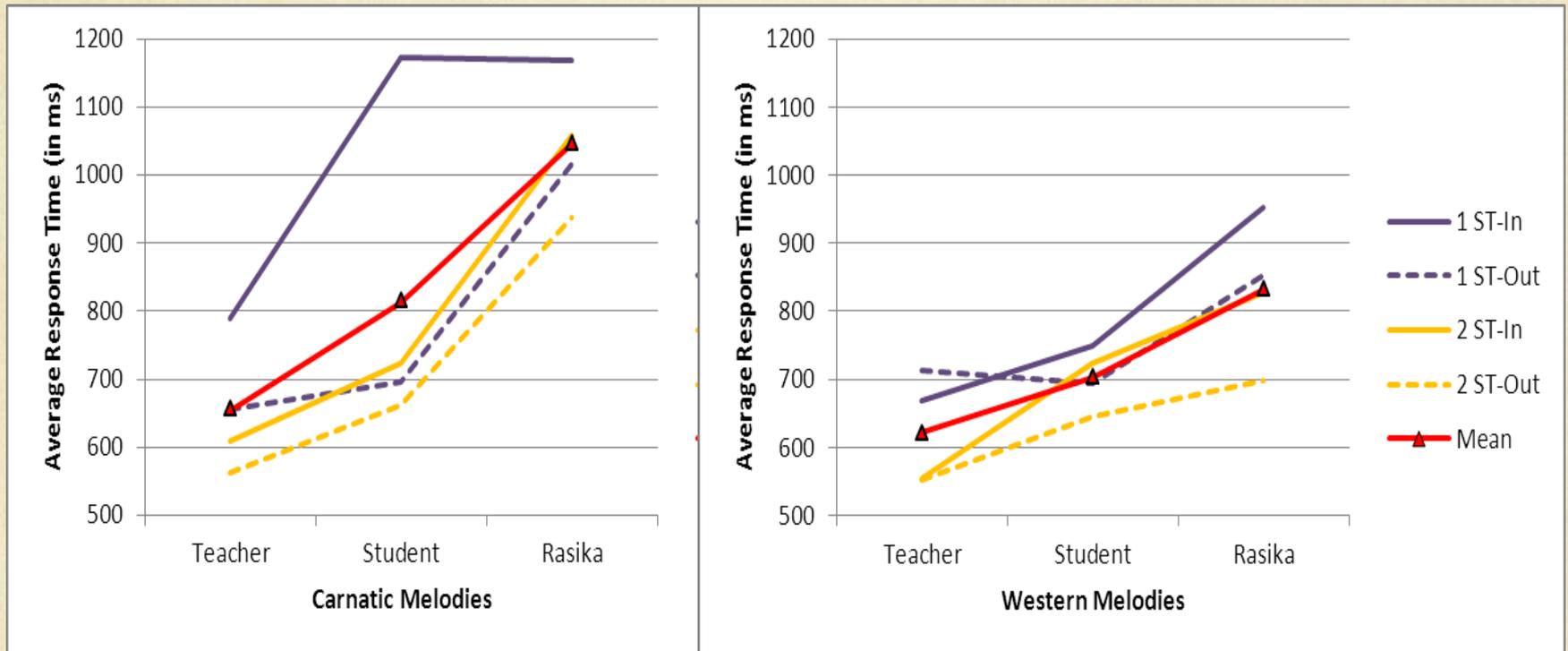
# PRE-TEST

- 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)

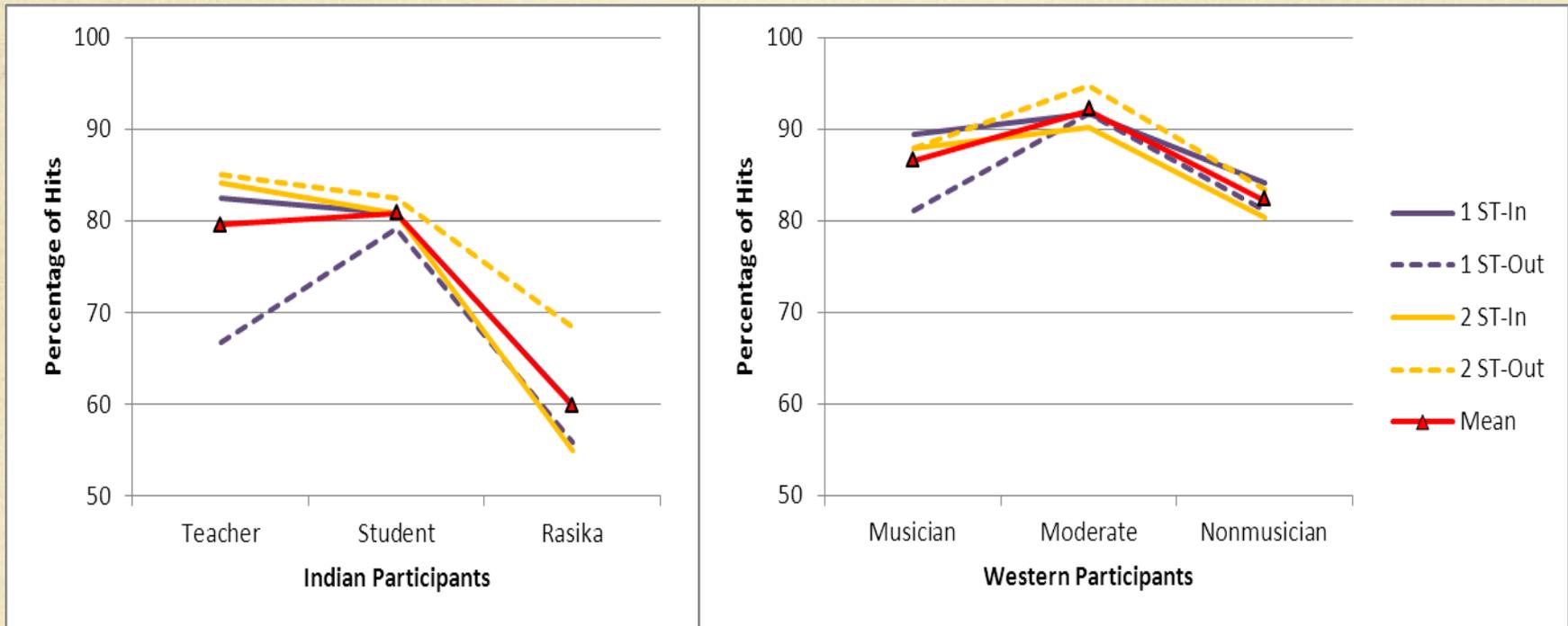
# INDIAN PARTICIPANTS – CARNĀTIC VS. WESTERN MELODIES – HITS



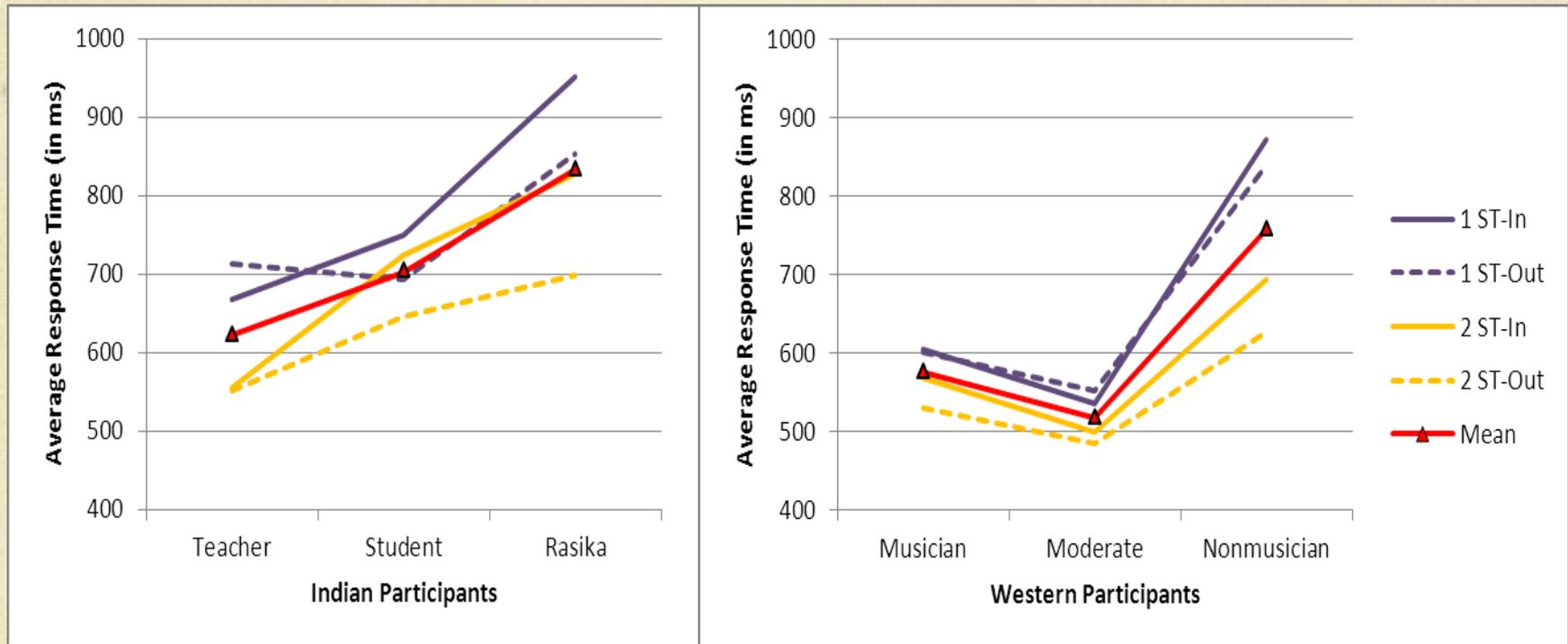
# INDIAN PARTICIPANTS – CARNĀTIC VS. WESTERN MELODIES – RT (ms)



# INDIAN VS. WESTERN PARTICIPANTS – WESTERN MELODIES – HITS



# INDIAN VS. WESTERN PARTICIPANTS – WESTERN MELODIES – RT (ms)



# 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)

# CONCLUSION – 2

## 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

## CONCLUSION – 4

- Indian and Western participants equally fast on Western melodies
- Western participants more accurate than Indian participants

## CONCLUSION – 5

- Trained musicians performed similarly and better than nonmusicians