Musical Expertise and Familiarity in the Perception of Modulation in Western and South Indian Classical Music

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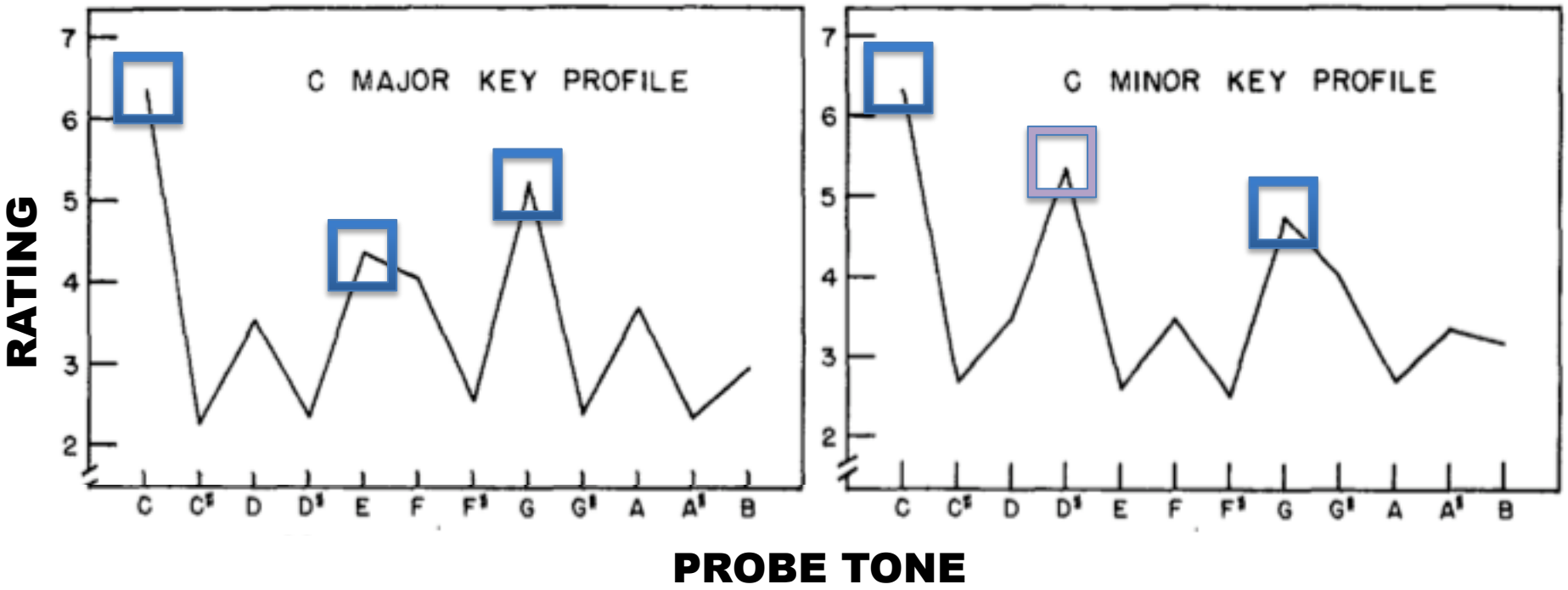
Melody & Pitch

The importance of tonal hierarchies

- Establish a set of 5-7 pitches (often out of 12 possible semitones)
- Establish a tonal center – “tonic” pitch – and a hierarchical pattern of importance of the other pitches
- Define a set of expectancies

Two Western Tonal Hierarchies

- Krumhansl & Kessler (1982)
- Key profiles
- Notice “in-scale” vs. “out-of-scale” pitches

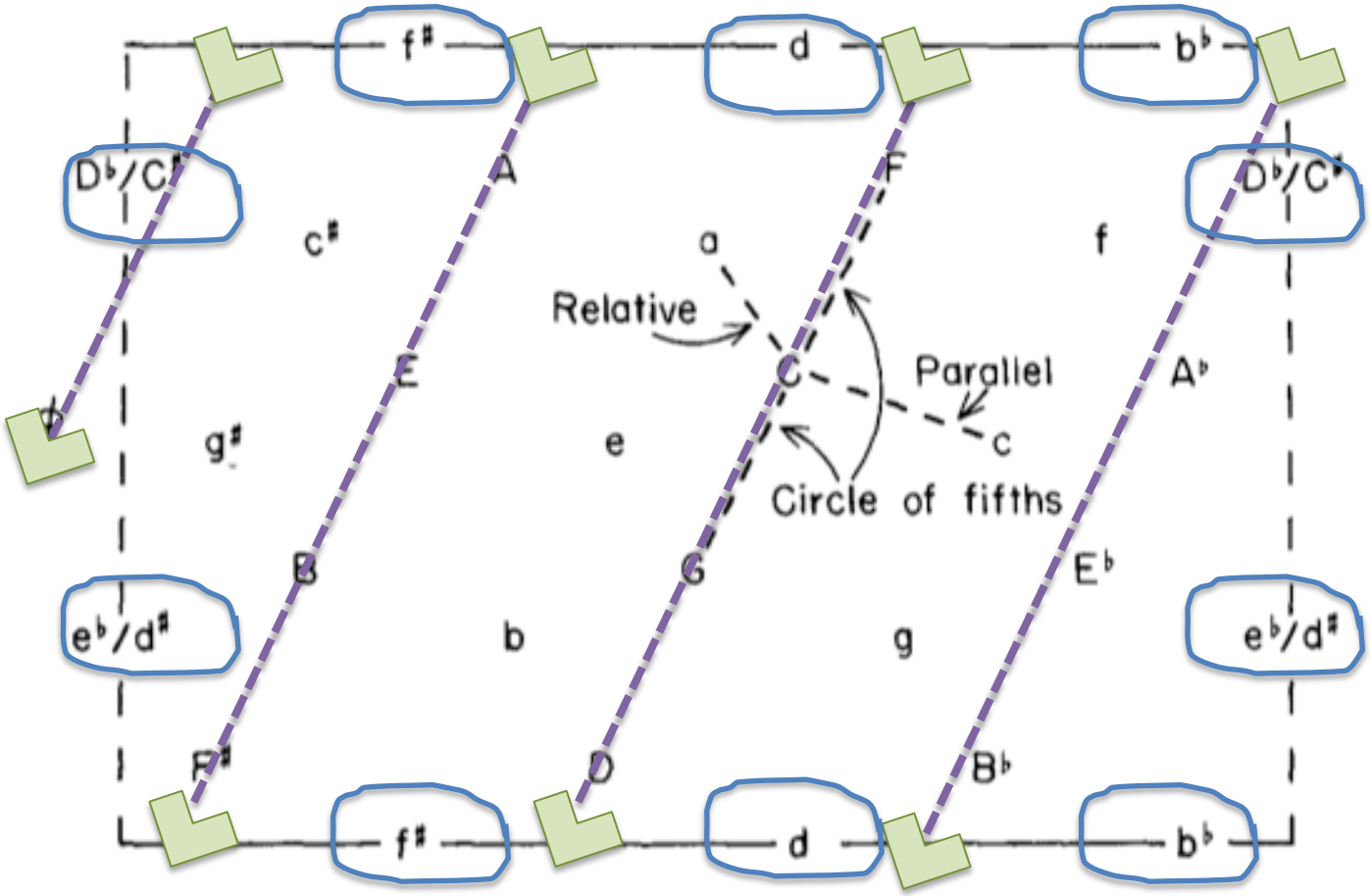


Modulation

- Modulation from one “key” to another involves replacing the tonal profile with a new one. This can involve:
  - Changing the set of pitches (eg, C major to C minor)
  - Changing the tonal center (eg, C major to A minor)
  - or both (eg, C major to A major)
- Modulation can take us to a closely related key that shares many pitches with the starting key (eg, C major to G major), or to a distant key that doesn’t (eg, C major to B major)

TONAL MAP

showing the relationships of the 24 possible keys



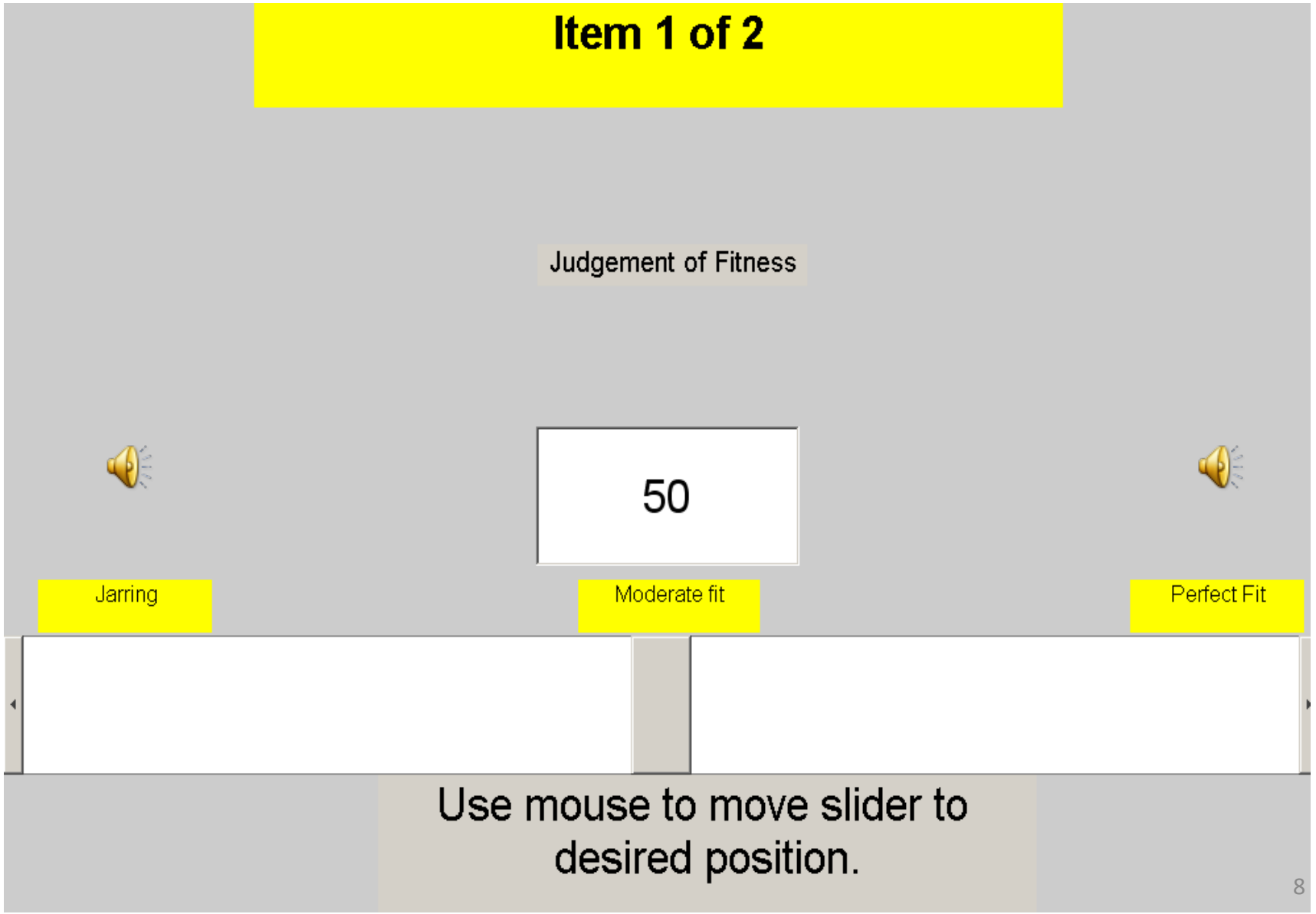
Memory for Melodies

- Melodies remembered as a contour pattern of relative pitches (with their rhythm) hung on a tonal scale (Dowling, 1978)
- When we hear a novel melody it takes the memory system measurable time (~ 10 sec) to attach the contour to the scale (Dowling & Tillmann, 2014)
- This operation requires a cognitive representation of the scale – hence our interest in the speed with which a new representation is formed

Experiment

- Listeners hear first 2 min of a Haydn String Quartet in one ear, along with a probe tone (one of the 12 possible semitones) in the other ear
- They rate the probe tone continually for how well it goes with the music (Toiviainen & Krumhansl, 2003):

TASK


Item 1 of 2
Judgement of Fitness
50
Jarring
Moderate fit
Perfect Fit
Use mouse to move slider to desired position.

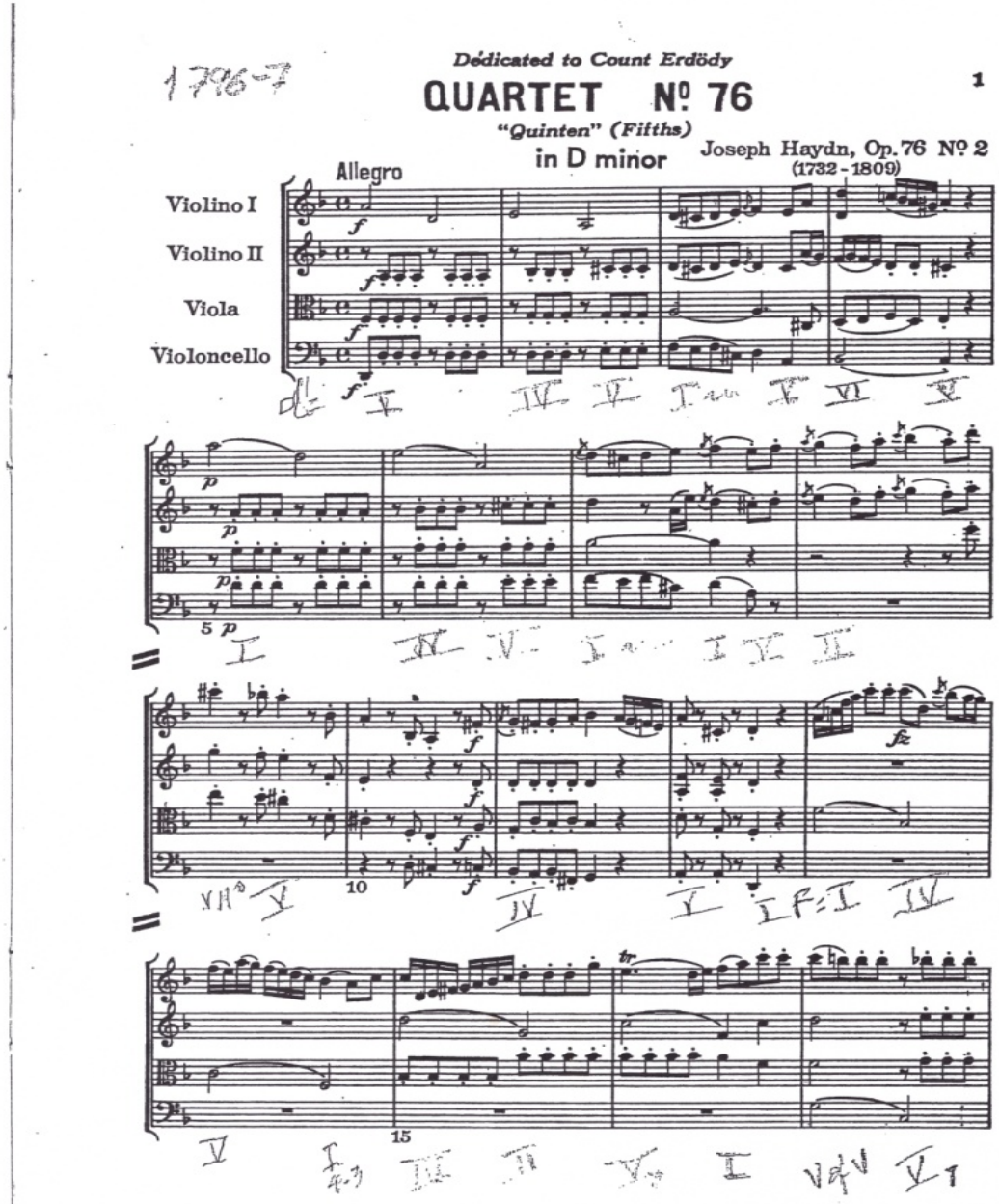
Method

- They go through the 2-min excerpt 12 times, each time with a different probe
- Blocks of 12 Ss with a common degree of musical training complete a Latin square, so that for each trial each of the 12 probes is represented
- 60 Ss (5 blocks) completed the task at each of 3 levels of training (None, 1-5 yr, > 5 yr)
- We use the ratings to put together tonal profiles that (we hope) will change as the listener progresses through the piece
- We correlate those profiles with the standard profiles for the possible keys that the listener will encounter

Method

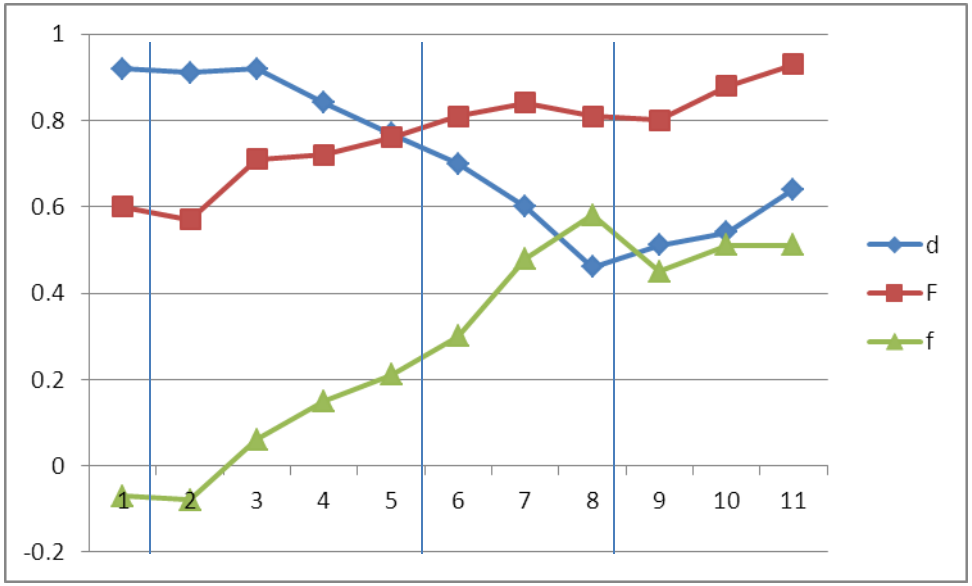
- The pieces were the first 2 min of Haydn's Quartets op. 76, no. 2 ("Quinten") and op. 76, no. 3 ("Emperor")
- Each excerpt started at the beginning and stopped at the end of the exposition section (the first repeat sign)
- The excerpts contained 3 or 4 modulations:
  - d minor, F major, f minor, F major
  - C major, G major, g minor, E^b major, G major

https://www.youtube.com/watch?v=wp2x0YKI7QE

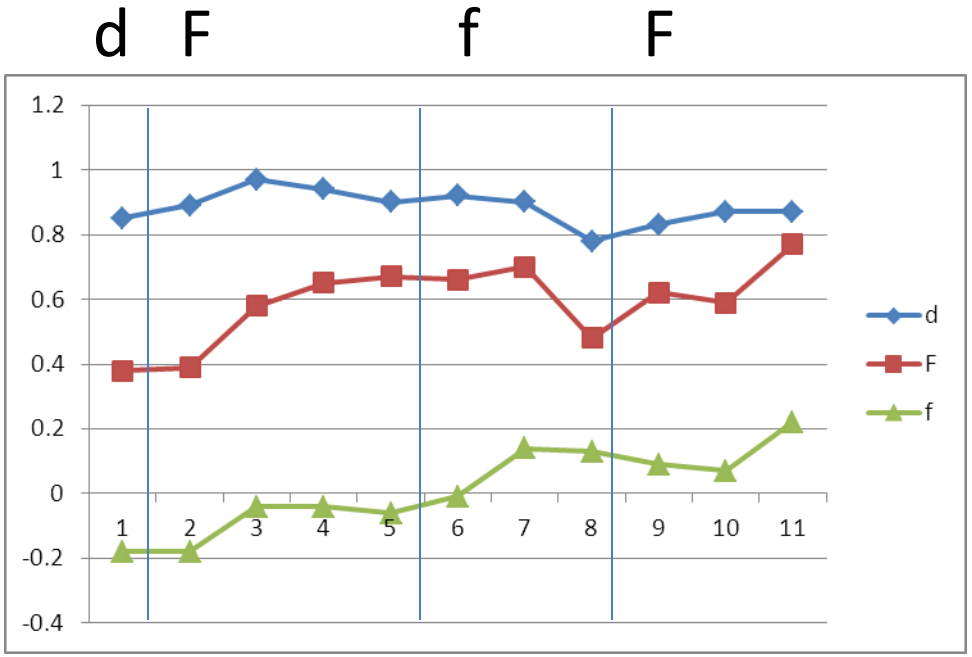


76/2 Exp trials 1-3

d F f F

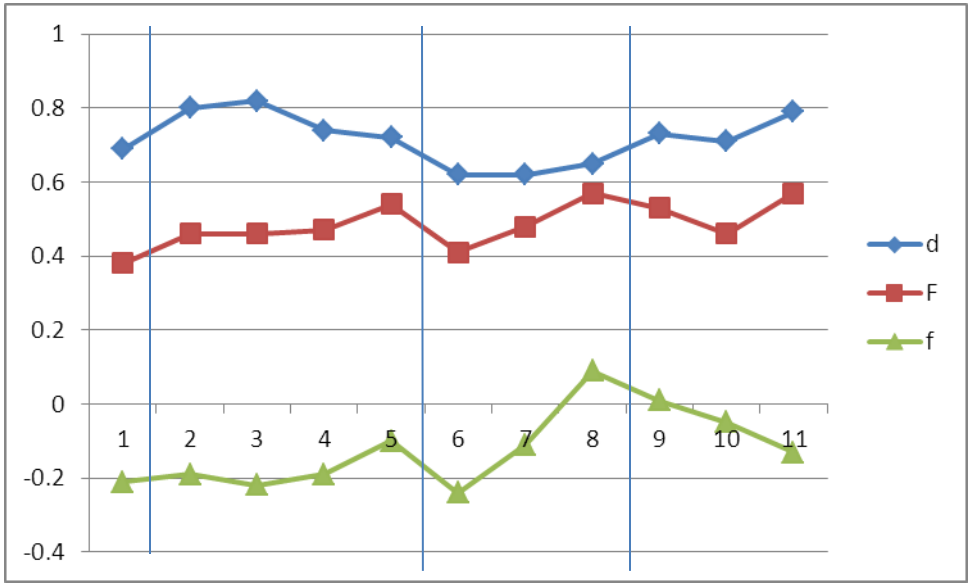


76/2 Exp trials 10-12

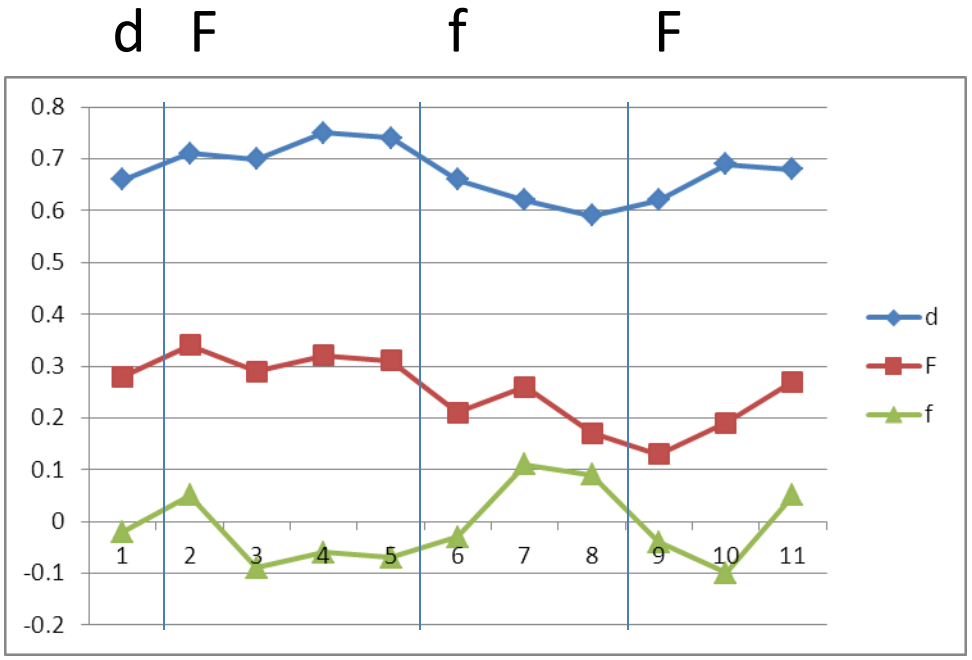


76/2 Inexp trials 1-3

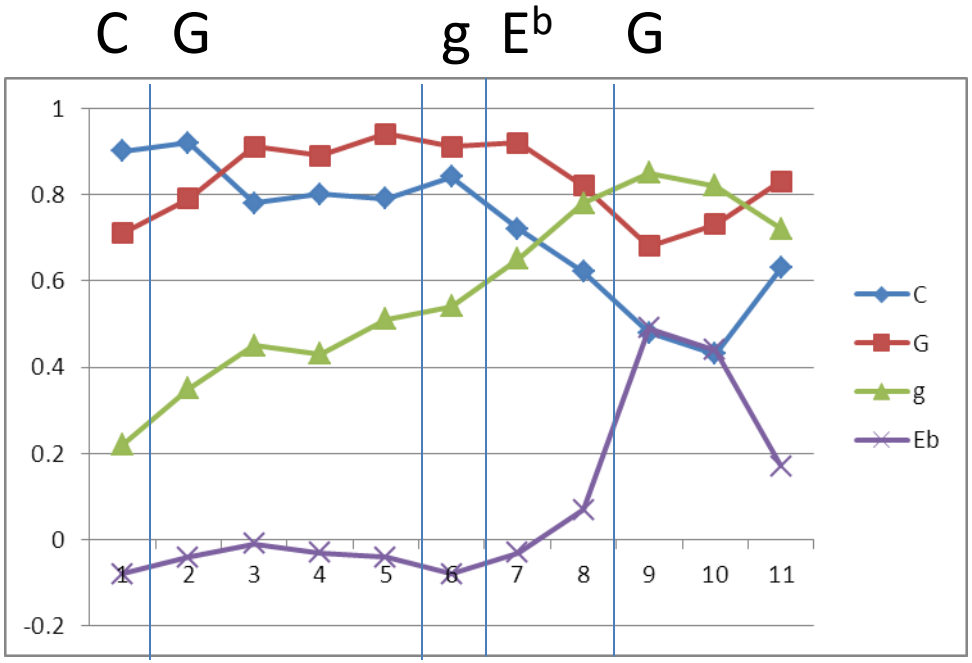
d F f F



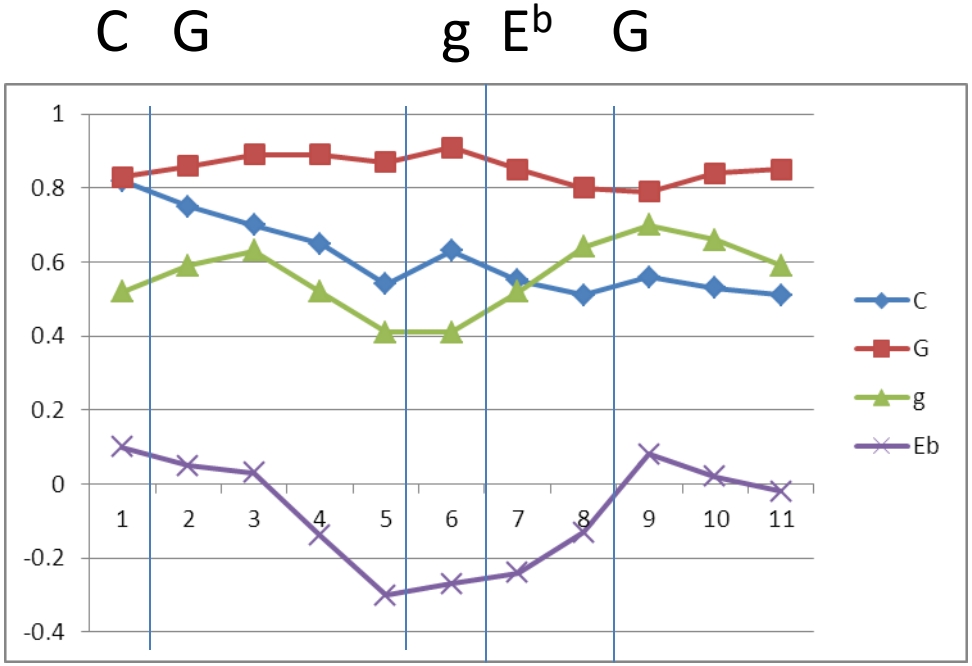
76/2 Inexp trials 10-12



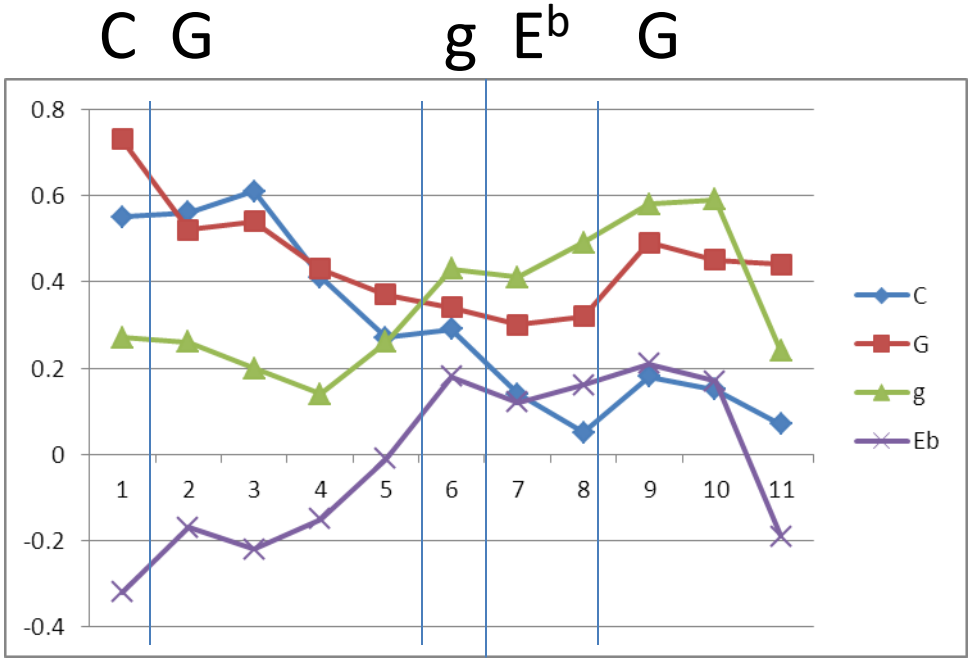
76/3 Exp trials 1-3



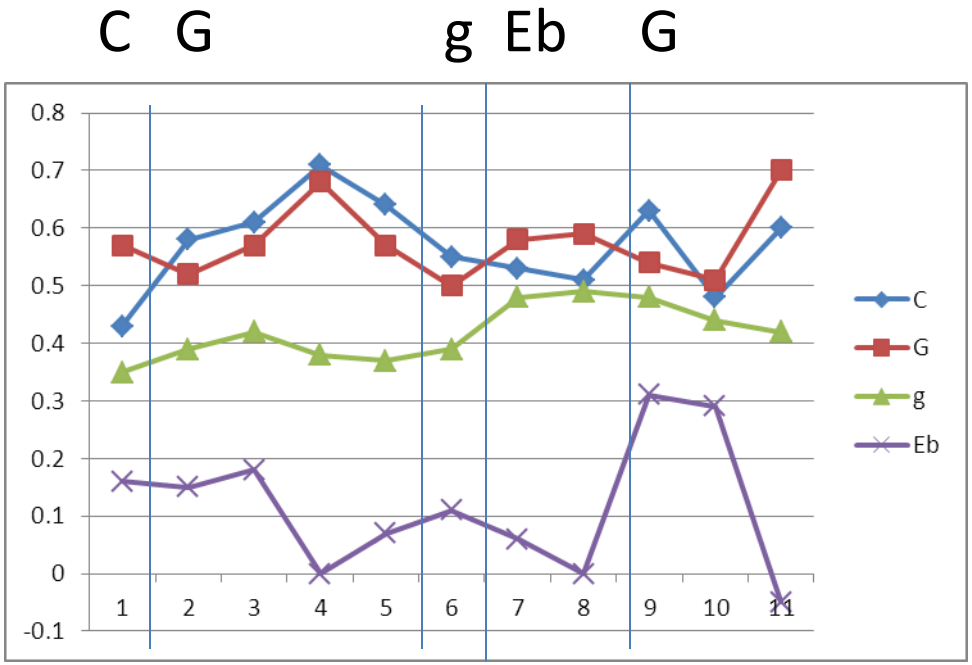
76/3 Exp trials 10-12



76/3 Inexp trials 1-3

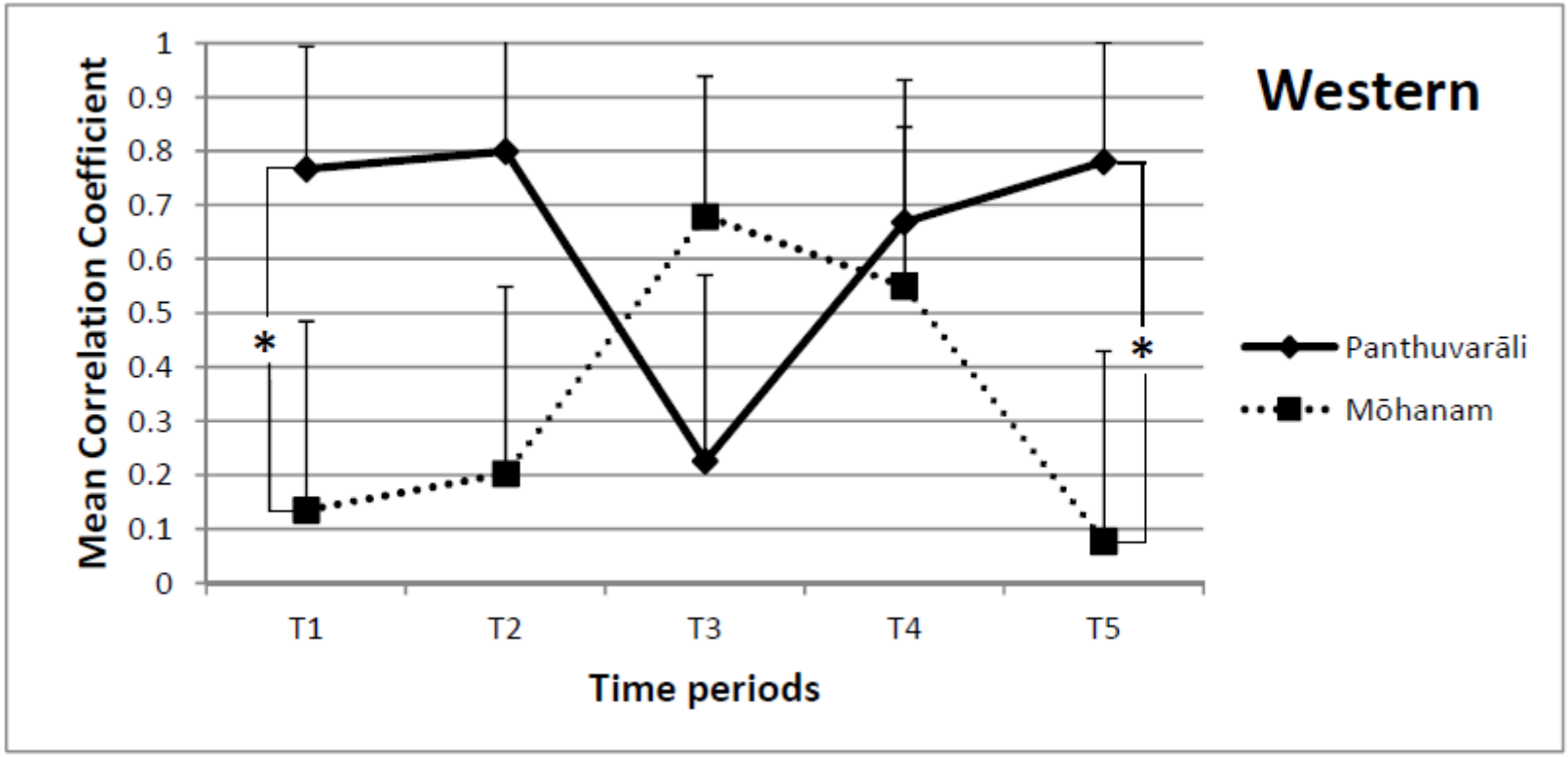


76/3 Inexp trials 10-12

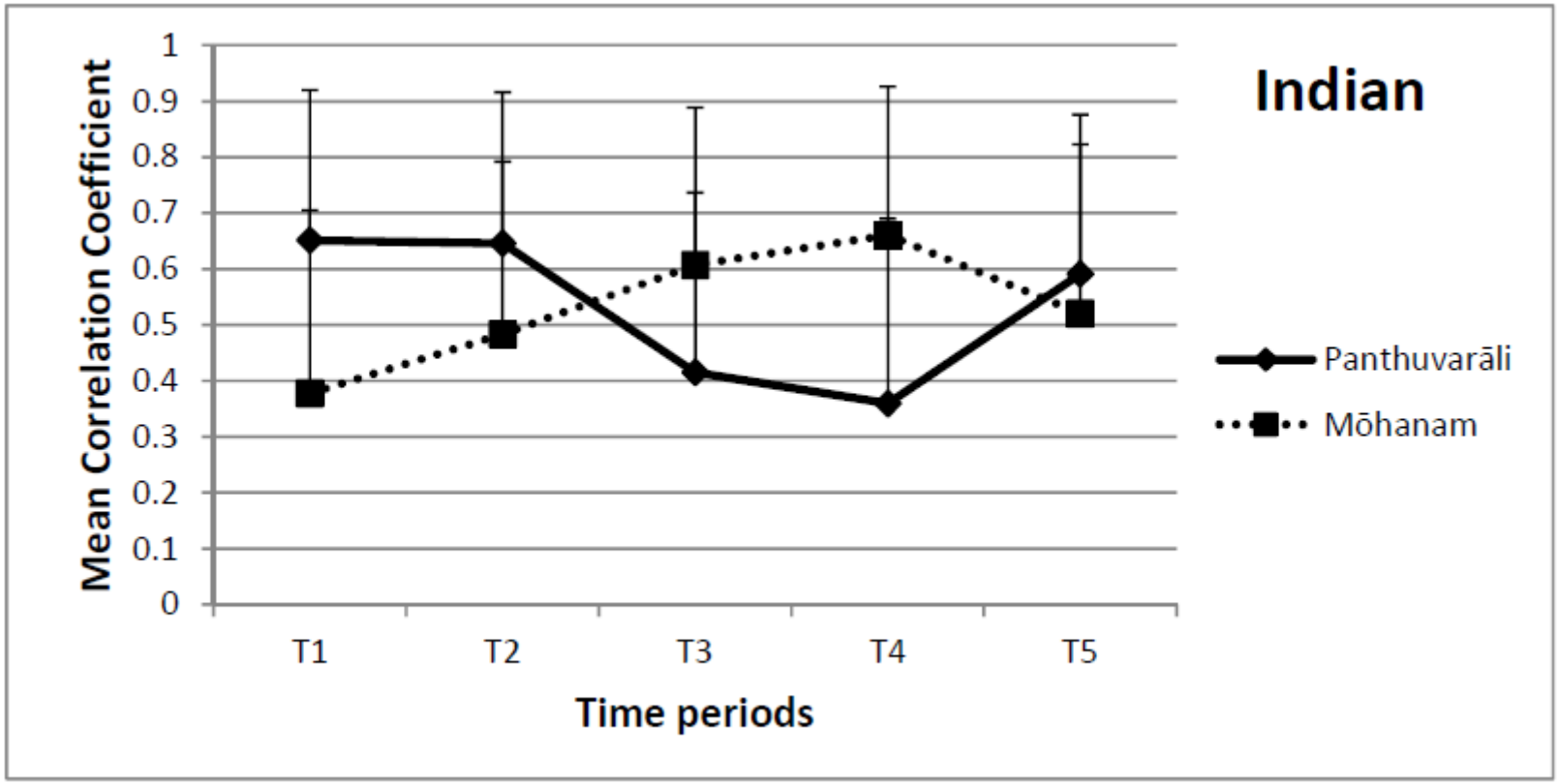


Grahabēdham

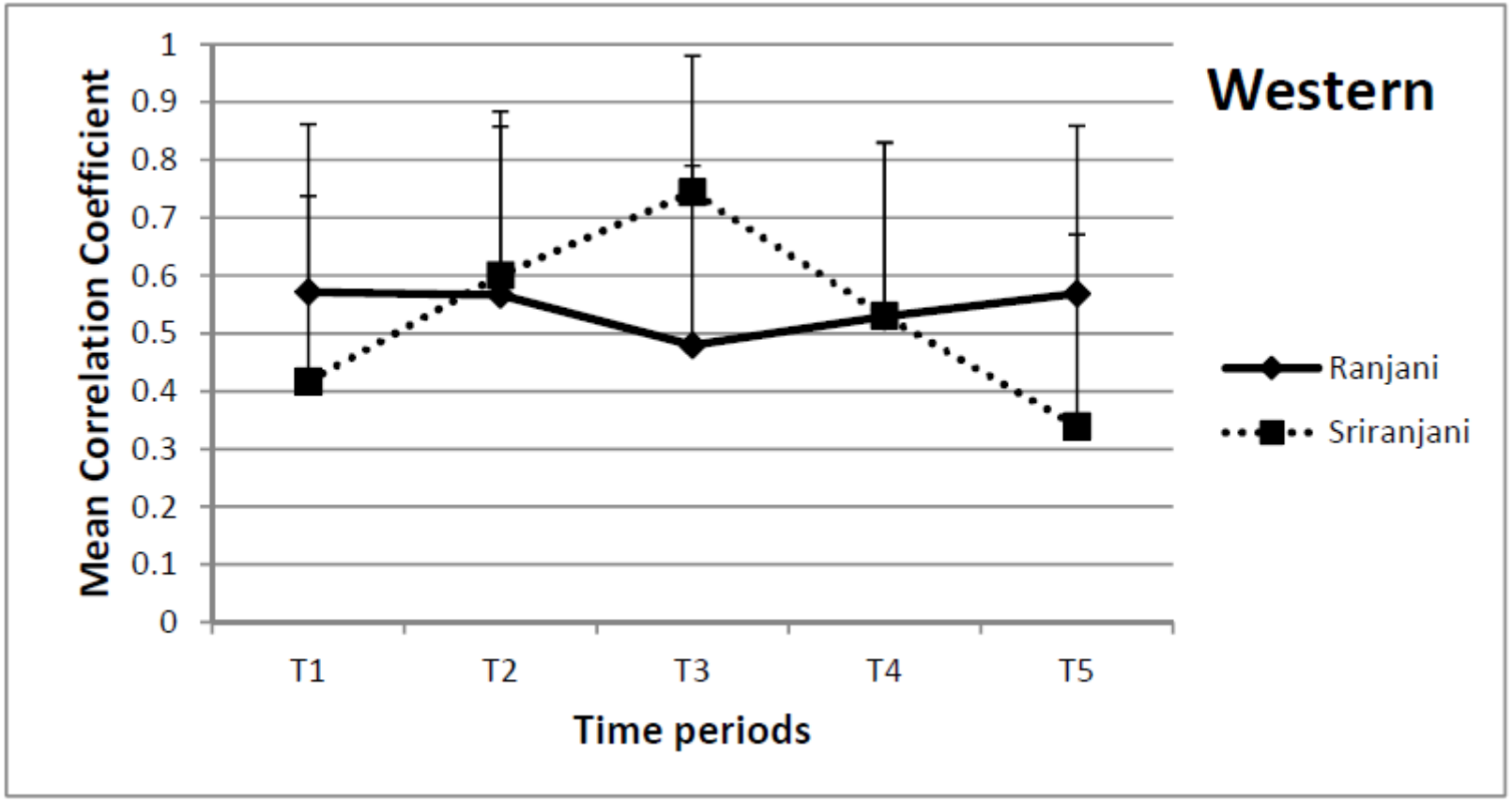
(Raman & Dowling, 2016)



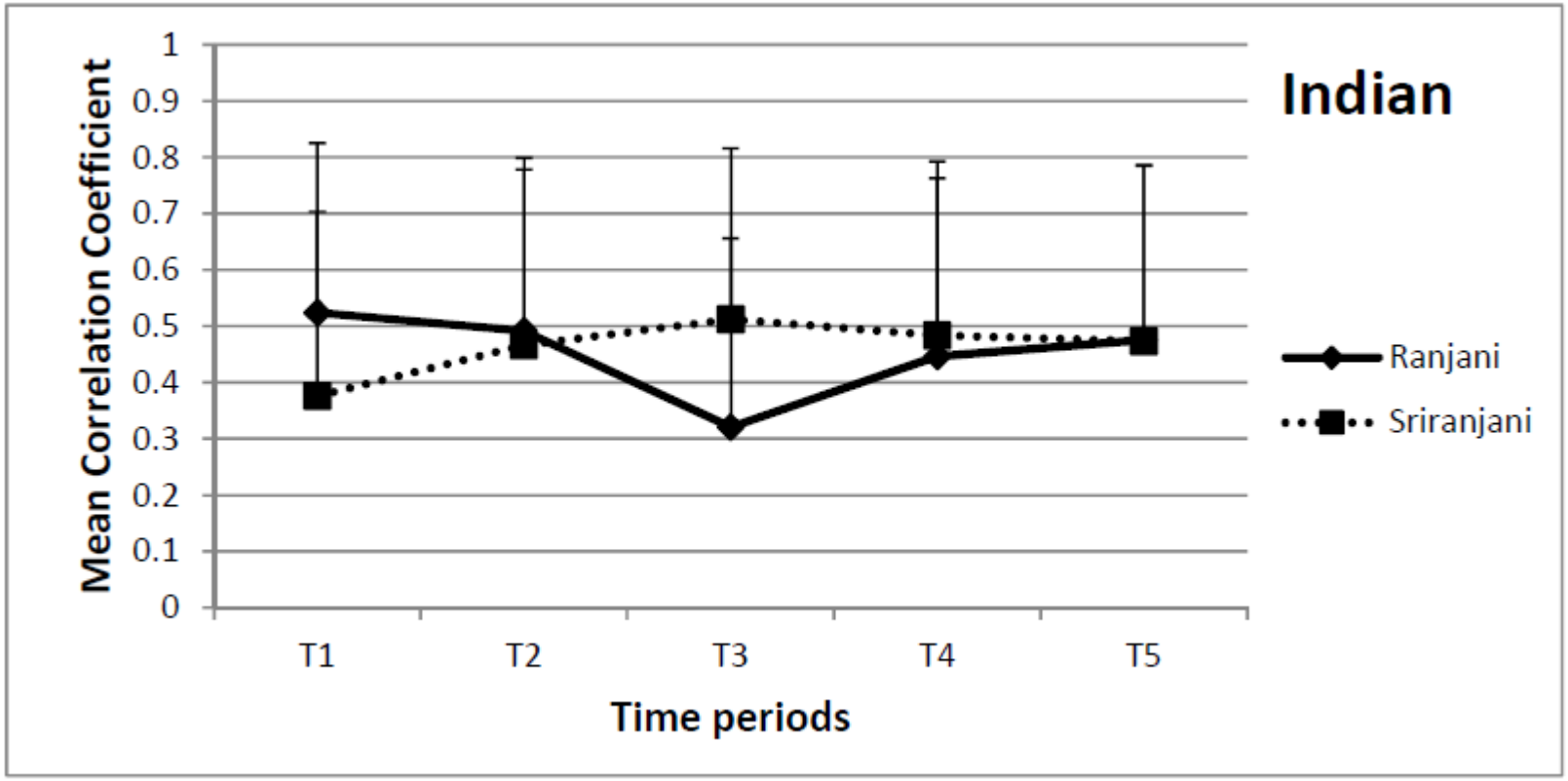
Grahabēdham



Rāgamālikā


Western
Mean Correlation Coefficient
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
T1
T2
T3
T4
T5
Time periods
Ranjani
Sriranjani

Rāgamālikā


Mean Correlation Coefficient
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
T1
T2
T3
T4
T5
Time periods
Indian
Ranjani
Sriranjani

Conclusions

- The cues for the tonal hierarchy (the key) are present in the surface details of a melody – duration and frequency of occurrence of pitches
- Knowledgeable listeners, even from another culture, can pick up on those cues, and track modulations
- Less knowledgeable listeners tend to a more global pattern of response, correctly tracking the principal keys of an excerpt, but not always tracking shifts of key
- Greater familiarity with a piece leads to more global patterns of response. This was seen in the contrast between Western and Indian music teachers with Indian excerpts, and with Western musicians as they became more familiar with an excerpt.

THANK YOU

- Alex Bichler
- Participants

THANK YOU

- Kieth Gryder
- Kevin Herndon
- Jaicey Johnson
- Chris Lo
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- Bhavana Penmetsa
- Rachna Raman
- Ashwin Ramesh
- Franco Sabatini
- Alan-Michael Sonuyi
- William Stanford
- Naveen Subramanian
- David Tram
- Sahiti Yarakala