Perceiving Modulations in South Indian Classical Melodies by Indian and Western Musicians and Nonmusicians

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ABSTRACT

This study examined the role of musical expertise and culture in the perception of two types of modulation in South Indian classical (Carnatic) melodies. Indian and Western musicians and nonmusicians rated brief excerpts using the concurrent probe-tone technique. We compared baseline profiles of four rāgams (modes) with profiles of modulating excerpts containing the same rāgams. Results indicated that musicians’ profiles tracked the modulations whereas nonmusicians’ profiles did not reflect the modulations.

BACKGROUND

Previous investigations show that:
(a) people form mental representations of tonal hierarchies of a musical scale at a very young age;
(b) age and musical experience did not affect the formation of mental representations of tonal hierarchies; mere exposure to an individual’s culture leads to the formation of such representations, whereas training enhances it;
(c) even nonmusicians have a sophisticated implicit understanding of tonal hierarchy and expectancies in music;
(d) listeners access their mental representations of the hierarchy of notes in musical scales of their own culture when listening to culturally familiar and unfamiliar melodies;
(e) with culturally familiar music, listeners use culture-specific and psychophysical cues, whereas with culturally unfamiliar music they use psychophysical cues and schematic knowledge imported from their own culture.
(f) musicians can track modulations successfully, whereas with schematic chord sequences, continuously modulating melodies, or excerpts of real music.

PARTICIPANTS

Music Teachers
10 Indian (I) and 10 western (W)
- age range = 59 to 78 years (I: 71.5 years, W: 69.6 years)
- musical training, I: 1.5 years, W: 1.2 years
- music teaching, I: 24.3 years, W: 25.1 years
- musical experience, I: 27.4 years, W: 27.7 years
Nonmusicians
- 10 Indian and 10 western
- age range = 56 to 88 years (I: 69.5 years, W: 69.3 years)
- musical training, I: 1.5 years, W: 1.2 years

STIMULI

- Two types of modulation:
  (a) Rāgamālikā: retaining tonal center (e.g., C major to C minor).
  (b) Grahābēdham: shift of tonal center (e.g., C major to A minor).
- One excerpt in each type of modulation.
- Excerpts modulated from rāgam A to B, and back to rāgam A.
- Each excerpt was presented 13 times forming a block.
- Trial 1: familiarizing trial; participants heard the excerpt in both ears without the probe tone.
- Trials 2 to 13: participants heard the excerpt in one ear only; in the other ear, they heard a constant tone (i.e., probe tone) corresponding to one of the 12 pitches in the octave (i.e., C, C#, D, D#, etc.).
- Each probe tone consisted of sine waves sounded in 3 octaves (in the range of A3 to D7) spanning the range of the melodies.

RESULTS – BASELINE PROFILES OF INDIAN MUSICIANS

Figure 1. Top panel (a to d)—Baseline profiles of Indian musicians. Bottom panel (e to h)—Notes of each rāgam depicted on a piano keyboard with C as tonic.

RESULTS – PROFILES OF MODULATING EXCERPTS

Figure 2. Left panel (a to d)—Profiles of rāgamālikā (modulation retaining tonal center; e.g., C major to C minor). Right panel (e to h)—Profiles of grahabēdham (shift of tonal center; e.g., C major to A minor). Responses were averaged and smoothed across a jump of 1 semitone. Error bars indicate standard error of the mean.

DISCUSSION AND SUMMARY

- Indian and Western musicians’ profiles reflected the modulations.
- Indian musician profiles were more marked than Western musician profiles (see Figure 2a & 2e vs. 2b & 2f).
- related to culture-specific cues and individual differences
- Western musicians responded more strongly than Indian musicians:
  (d) in the absence of emotional context
  (e) Our findings supported previous research and identified three types of cues that musicians used:
  1) culture-specific cues by Indian musicians—cultural knowledge and familiarity of the rāgams and modulations in the study,
  2) psychophysical cues by Indian and Western musicians—pitch and rhythmic cues, and
  3) transfer of Western schematic knowledge by Western musicians—performance both with rāgams resembling Western modes—Sriranjani (dorian) and Mōhanam (major pentatonic)—and with modulations that changes tonal center (grahābēdham)—more prevalent in Western music (see Figure 2b & 2f).
- Indian nonmusicians’ rāgamālikā profile did not reflect the modulation, whereas their grahabēdham profile tracked the modulation with rāgam 1.
- Western nonmusicians were unable to track the modulations.
- Musical training facilitated performance on the binaural probe-tone task and in applying these cues.

REFERENCES


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