Sorting Carnātic Melodies based on Rāgams, Melody Type, and Expertise using DiSTATIS.

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Sorting Study - Abstract

In this study, we applied the sorting technique to South Indian classical (Carnātic) music to investigate the effects of melody type and music training on perception of rāgam (modal scale) similarities. Carnātic teachers, students, and aficionados sorted excerpts of Carnātic melodies played on the saxophone. We varied the rāgam type (2 pairs of similar rāgams) and melody type (3 songs vs. 3 improvised solfèges per rāgam). Participants sorted excerpts freely into any number of clusters. We analyzed the data using DiSTATIS[1], which showed an effect of rāgam, melody type, and musical experience.

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Sorting Study - Background

- Previous investigations show that:
  - Sorting tasks can reveal the underlying intuitive structure of a collection of items, in this case musical excerpts[2].
  - Sorting tasks can be used to compare experts and non-experts without relying on specialized vocabulary, and they tend not to fatigue participants[2].
  - Sorting tasks require minimal training. Amateurs and experts often give similar results[3,4], though similarity between amateurs and experts may differ by stimulus type[2].

- In Raman et al.'s[5] study, sorting tasks were used successfully to nonverbally compare experts' and non-experts' perception of similarity of piano melodies by Bach, Mozart, and Beethoven, which were either MIDI-generated or recorded performances played by 4 pianists.

Sorting Study - Participants

Carnātic Teachers (N = 11)

Age, M = 43.09 years

Years of training, M = 22.55 years

Years of performance, M = 17.27 years

Years of teaching, M = 13.32 years

Carnātic Students (N = 11)

Age, M = 38.82 years

Years of training, M = 14.73 years

Years of performance, M = 6.18 years

Years of teaching, M = 1.09 years

Carnātic Aficionados (N = 11)

Age, M = 49.82 years

Years of training, M = 0.36 years

Years of performance, M = 0.00 years

Years of teaching, M = 0.00 years

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Sorting Study - Stimuli

o 24 excerpts

- o played on saxophone for the study
- o 4 popular rāgams, wherein each rāgam of a pair of rāgams (Māyāmāḷavagowḷai-Pantuvarāḷi, Kīravāṇi-Simhēndramadyamam) differed from the other by only 1 note (F or F$^\#$, with tonic as C).
- o 3 kritis (songs) vs. 3 improvised kalpana-swaram segments (solfèges) per rāgam
- o All excerpts played with same tonic
- o All excerpts were played in tempo
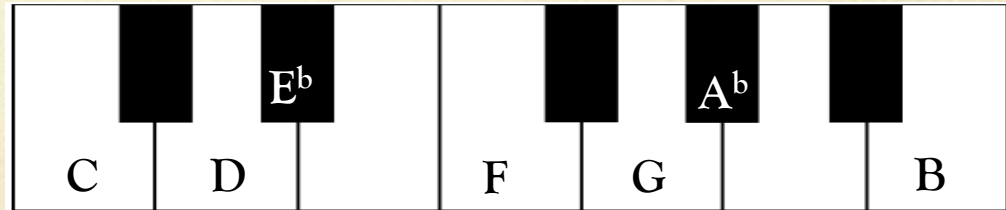- o Excerpts were 23 to 33 s long

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Sorting Study – Rāgam Notation
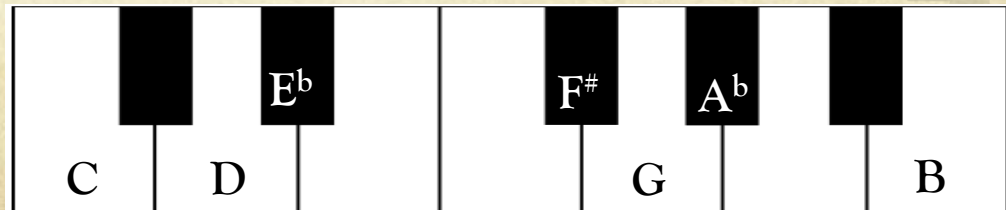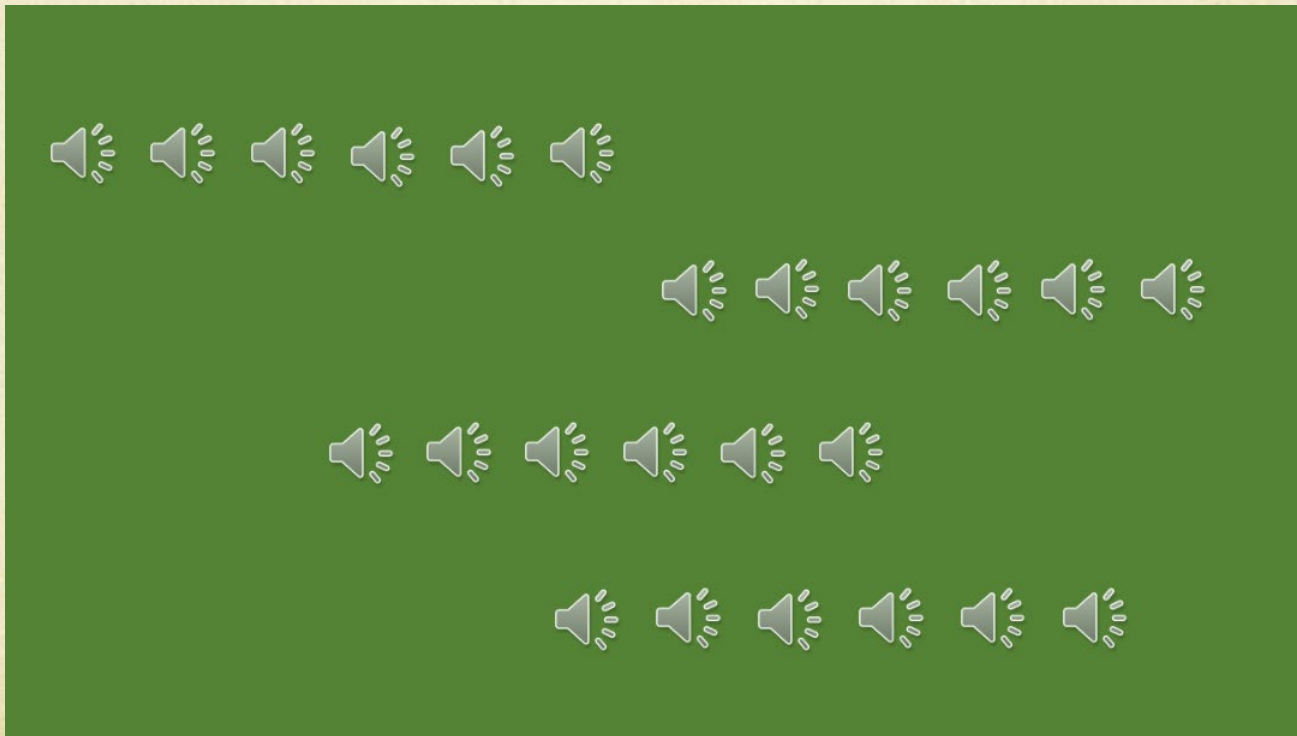
- Māyāmāḷavagowḷai
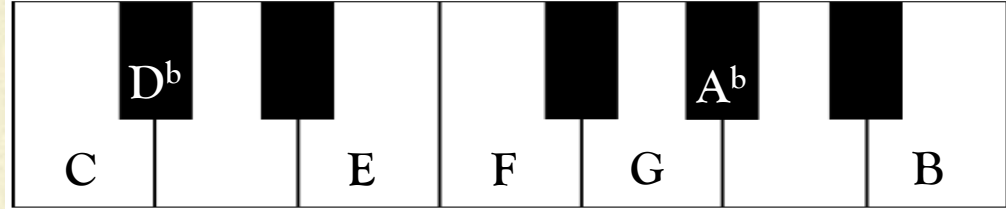
- Pantuvarāḷi
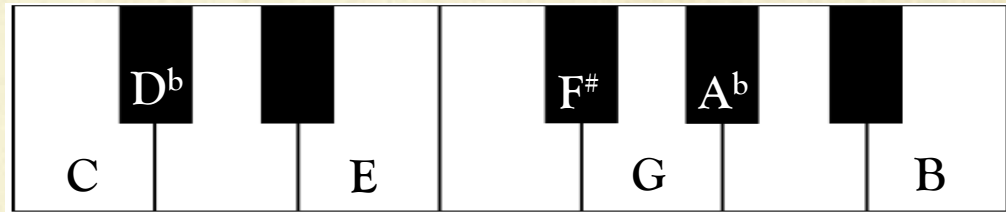
- Kīravāṇi

- Simhēndramadyamam
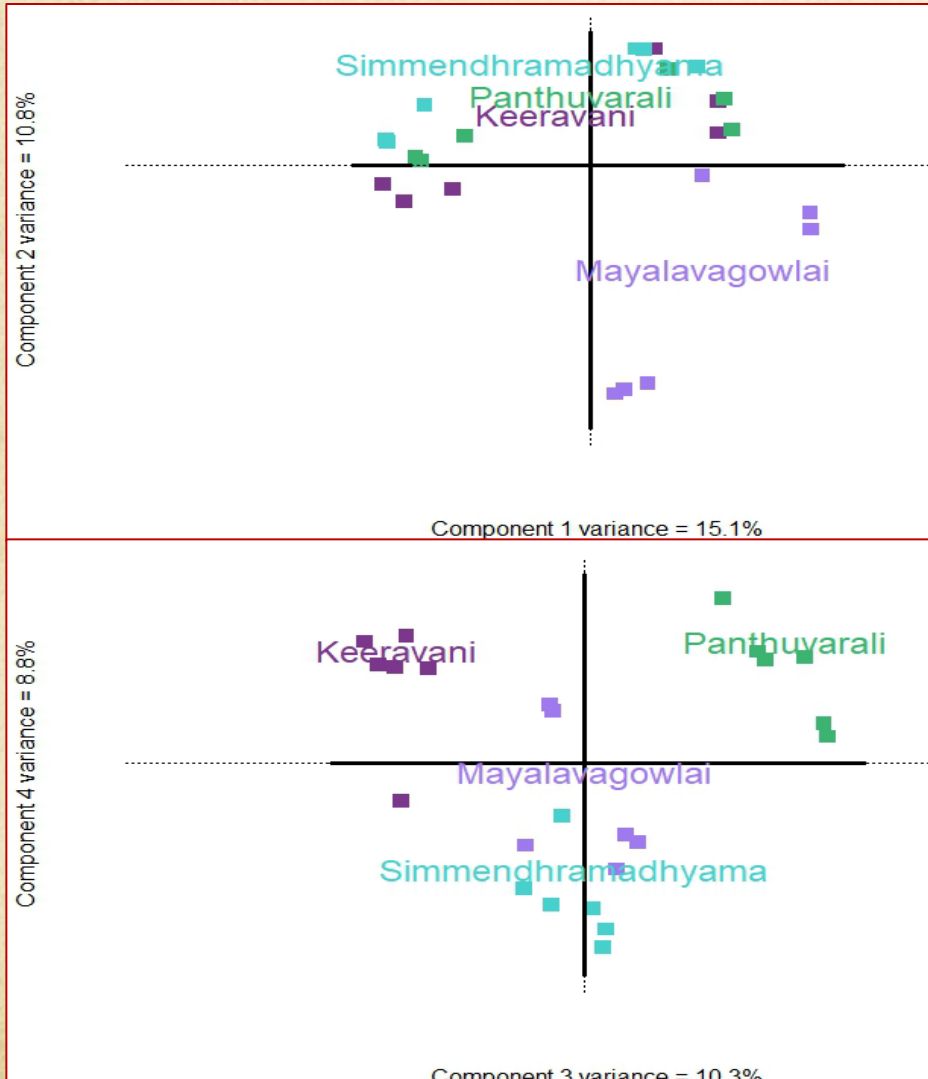
Sorting Study - Task

o We presented the stimuli as audio icons arranged randomly on a PowerPoint slide.

Sorting Study - Task

○ Participants sorted excerpts freely into any number of clusters.

○ They could listen to each excerpt as many times as they wanted to.

○ To analyze the data, we applied DiSTATIS, a recent adaptation of multi- dimensional scaling specifically adapted to reveal the perceived dissimilarity among items, as well as to investigate group differences.
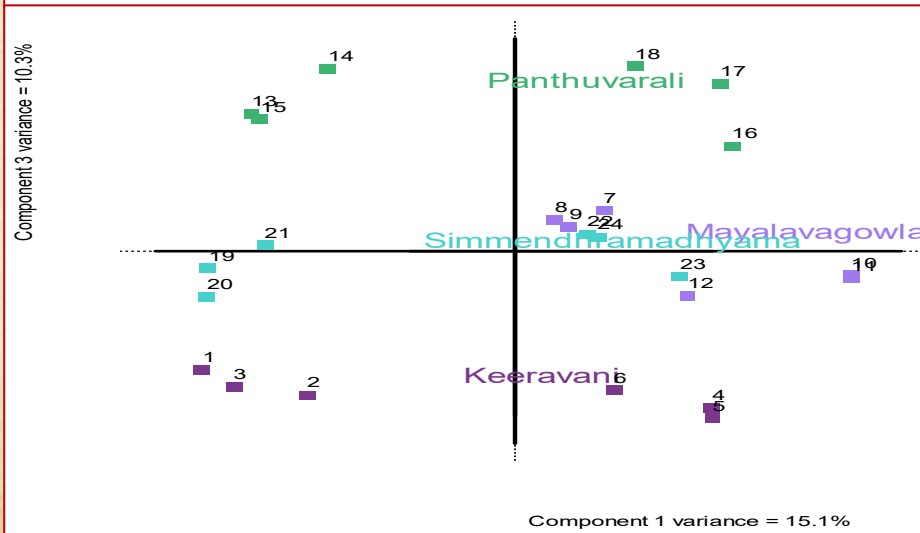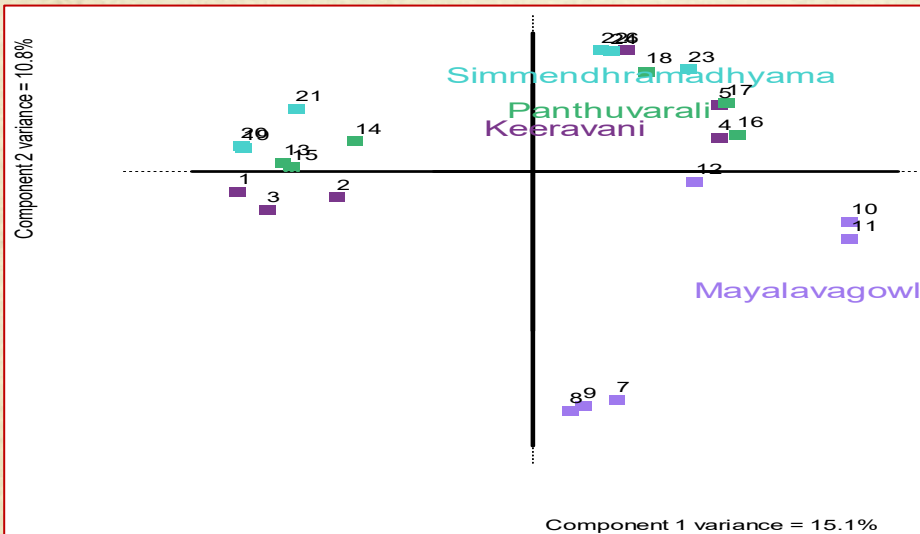
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SORTING STUDY – RESULTS & DISCUSSION

Rāgam Type:

❑ Participants were able to strongly differentiate among the four rāgams.

  ❑ Māyāmāḷavagowḷai is distinguished from the other 3 rāgams (top panel).

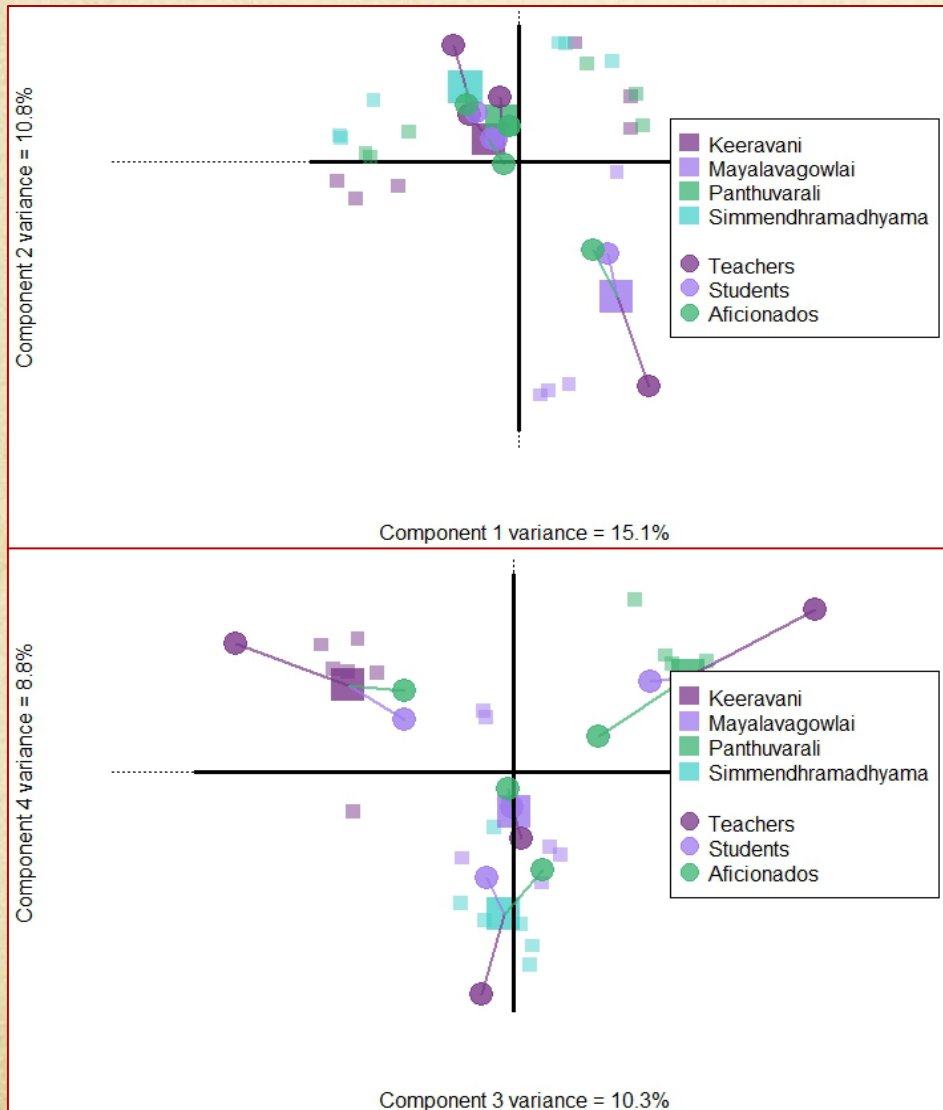 ❑ The other 3 rāgams are differentiated from each other (bottom panel).

SORTING STUDY – RESULTS & DISCUSSION

Melody Type:

❑ Participants were able to strongly differentiate kritis (songs) from kalpana-swaram segments (solfèges).

❑ Kritis are nos. 1 – 3, 7 – 9, 13 – 15, 19 – 21.

❑ Kalpana swarams are nos. 4 – 6, 10 – 12, 16 – 18, 22 – 24.

SORTING STUDY – RESULTS & DISCUSSION

Expertise:

❑ Teachers performed differently from the other two groups.

    ❑ 7 out of 11 teachers grouped based on rāgams.

❑ Students and aficionados performed similarly.

    ❑ 2 out of 11 students grouped based on rāgams.

    ❑ Students & aficionados grouped based on surface cues (e.g., tempo, emotion, starting pitch/octave).

Sorting Study - References

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○ [2]Chollet, S., Valentin, D., & Abdi, H. (2014). Free sorting task. In P. V. Tomasco & G. Ares (Eds.), *Novel Techniques in Sensory Characterization and Consumer Profiling* (pp. 207–227). Boca Raton: Taylor and Francis.

○ [3]Cartier, R., Rytz, A., Lecomte, A., Poblete, F., Krystlik, J., Belin, E., & Martin, N. (2006). Sorting procedure as an alternative to quantitative descriptive analysis to obtain a product sensory map. *Food Quality and Preference, 17*(7-8), 562–571.

○ [4]Chollet, S., Lelièvre, M., Abdi, H., & Valentin, D. (2011). Sort and beer: Everything you wanted to know about the sorting task but did not dare to ask. *Food Quality and Preference, 22*(6), 507–520.

○ [5]Raman, R., Kriegsman, M. A., Abdi, H., Tillmann, B., & Dowling, W. J. (2020). Bach, Mozart, and Beethoven: Sorting piano excerpts based on perceived similarity using DiSTATIS. *New Ideas in Psychology, 57*, 100757.

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