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 ragam (modal scale) similarities. Carnātic teachers, students, and aficionados sorted excerpts of Carnātic melodies played on the saxophone. We varied the ragam type (2 pairs of similar ragams) 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<sup>1</sup>, which showed an effect of ragam, melody type, and musical experience.

## **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<sup>2</sup>.
  - Sorting tasks can be used to compare experts and non-experts without relying on specialized vocabulary, and they tend not to fatigue participants<sup>2</sup>.
  - Sorting tasks require minimal training. Amateurs and experts often give similar results<sup>3,4</sup>, though similarity between amateurs and experts may differ by stimulus type<sup>2</sup>.
- In Raman et al.'s<sup>5</sup> 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 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 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

# **SORTING STUDY - STIMULI**

#### o 24 excerpts

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

### SORTING STUDY - RAGAM NOTATION

Māyāmāļavagowļai



o Pantuvarāļi



o Kīravāņi



o Simhēndramadyamam



#### **SORTING STUDY - TASK**

• 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.

# SORTING STUDY - RESULTS & DISCUSSION



#### <u>Rāgam Type</u>:

- Participants were able tostrongly differentiate amongthe four rāgams.
  - Māyāmāļavagowļai is distinguished from the other 3 rāgams (top panel).
  - The other 3 rāgams are differentiated from each other (bottom panel).

#### SORTING STUDY - RESULTS & DISCUSSION



#### <u>Melody Type</u>:

Participants were able to
strongly differentiate kritis
(songs) from kalpanaswaram 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.

Component 1 variance = 15.1%

# SORTING STUDY - RESULTS & DISCUSSION



#### Expertise:

- Teachers performeddifferently from the othertwo 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**

- <sup>1</sup>Abdi, H. (2007). Metric multidimensional scaling: Analyzing distance matrices. In N. J. Salkind (Ed.), *Encyclopedia of Measurement and Statistics* (pp. 598–605). Thousand Oaks (CA): Sage.
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- <sup>3</sup>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.
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- <sup>5</sup>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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