Sorting excerpts of Western classical music based on perceived similarity.

Rachna Raman, Michael Kriegsman, Hervé Abdi, W. Jay Dowling, & Barbara Tillmann

Contact: rachna.raman@utdallas.edu

UT DALLAS School of Behavioral and Brain Sciences

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ABSTRACT

The purpose of this study is to determine how musically trained and untrained listeners sort Western classical melodies into clusters based on perceived similarities. Listeners at three expertise levels sorted MIDI and natural excerpts from the piano music of Bach, Mozart, and Beethoven. We analyzed the data using DISTATIS[1], which showed an effect of composer with both MIDI and natural stimuli, and an effect of pianist with natural stimuli. However, there was only a weak effect of music training.

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].

PARTICIPANTS

Musicians

musical training = 5 years and above

- Experiment 1:
  N = 18
- Experiment 2:
  N = 10

Moderate Musicians

musical training = 1 to 4 years

- Experiment 1:
  N = 10
- Experiment 2:
  N = 17

Nonmusicians

musical training = less than 1 year

- Experiment 1:
  N = 11
- Experiment 2:
  N = 10

STIMULI

- Piano music from Bach, Mozart, Beethoven
- Experiment 1:
  - 21 MIDI, 7 from each composer
  - Excerpts were 9 to 10 s long

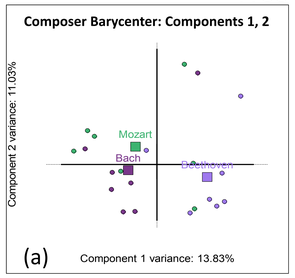
Experiment 2:

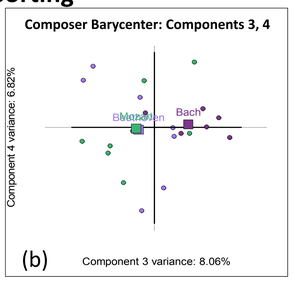
- 36 excerpts from CD recordings, with 3 from each composer by each of 4 pianists: Arrau, Barenboim, Pirès, Richter
- Excerpts were 9 to 15 s long

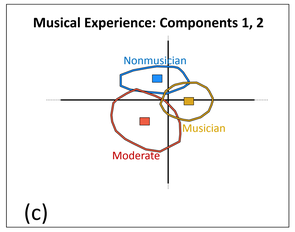
- We presented the stimuli as audio icons arranged randomly on a PowerPoint slide.

RESULTS – EXPERIMENT 1: 21 MIDI STIMULI

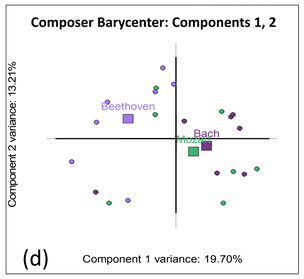
Free Sorting

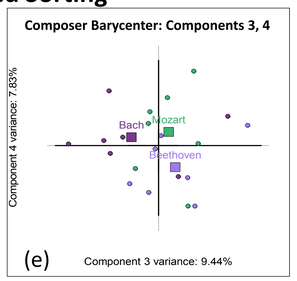


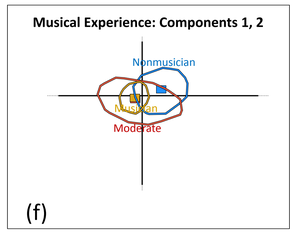




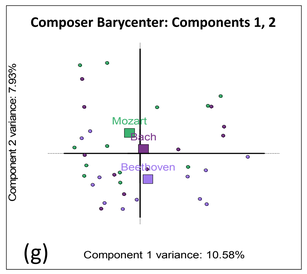
Constrained Sorting

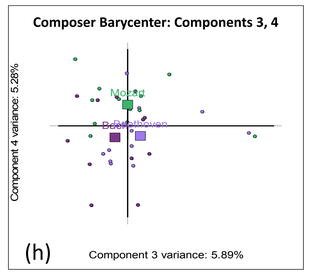


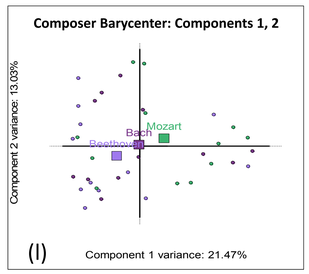


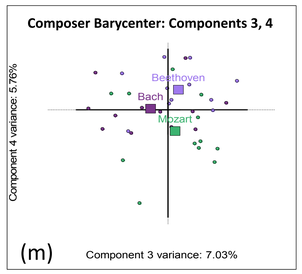


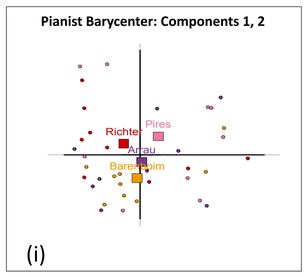
RESULTS – EXPERIMENT 2: 36 NATURAL STIMULI

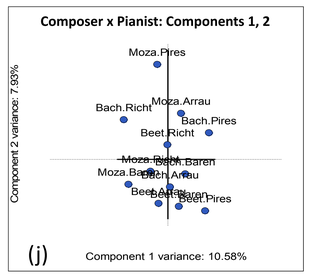


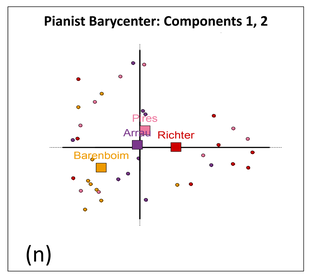


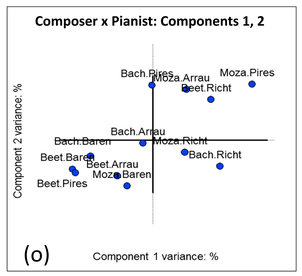


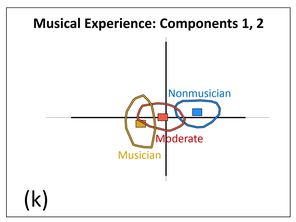


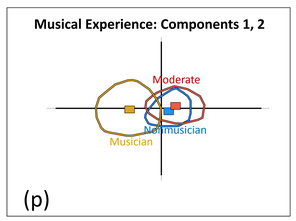












TASK

- Each experiment involved two parts:
- Part 1 – **Free Sorting**: At first, participants sorted excerpts freely into any number of clusters.
- Part 2 – **Constrained Sorting**: Then participants sorted excerpts into three clusters according to whether a single composer could have written the pieces in the group.
- Participants could listen to each excerpt as many times as they wanted to.
- We investigated the effects of composer, pianist, and music training on sorting.
- 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.

DISCUSSION AND SUMMARY

Composer

Experiments 1 & 2: Participants were able to strongly differentiate Mozart's excerpts from Beethoven's, with Bach falling in between those two (see Figures a, d, g, l).

Pianist

Experiment 2: Participants' sorting decisions were strongly influenced by pianists. Richter's performances of the three composers were clustered relatively close to the Mozart region of the solution, indicating their clarity and balance; in contrast, those of Barenboim were clustered in the Beethoven region, indicating their sumptuousness and passion (compare Figures g and i, l and n; also see Figures j, o).

Musical Experience

Experiments1 & 2: Effects were not strong and the highest and lowest expertise groups were differentiated only in the free sorting task of Experiment 2 indicated by nonoverlapping confidence intervals (see Figures c, f, k, p).

REFERENCES

[1]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.

[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.

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ACKNOWLEDGEMENTS

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