Multivariate techniques for sorting data: DiSTATIS and Discriminant DiSTATIS

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Introduction

- **Sorting:**
  - In a sorting task: assessors (participants) sort stimuli by similarity
  - Free vs constrained: Assessors may or may not be told the number of stimulus categories
  - Verbal descriptions of stimuli can also be analyzed, and can enrich interpretation

- **Fields:** consumer preference (food, beer, wine, textile, perfume) sensory evaluation (aroma, taste, sound, touch, cognition (music))
- **Applications:** R&D, quality control, marketing

- **Advantages of sorting:**
  - Requires minimal training. Amateurs and experts often give similar results, though similarity between amateurs and experts may differ by stimulus type
  - Relatively easy, fast, and not fatiguing, even for many stimuli
  - Does not require a priori selection of attributes/categories

- **Disadvantages of sorting:**
  - May be less accurate than ratings (a.k.a., profiling)

- **Other potential applications of (Di)DiSTATIS:** brain data (functional and/or structural connectivity)

References:


(D)DiSTATIS: PCA + dissimilarity + multitable (+ discriminant)

An Example in Music Cognition

Experimental question:
- Do assessors perceive the stylistic differences between 3 composers, Bach, Beethoven, and Mozart?

Experimental Design:
- Constrained sort into 3
- Unconstrained to assess 3 composers
- Two Experiments: (1) MIDI sound clips, (2) recordings by 4 pianists: Richter, Araús, Pesce, Barenboim

Results Summary / Discussion:
- Better discrimination for recordings
- DiSTATIS > DISTATIS
- Across all analyses: Beethoven opposed Mozart

**MIDI**
- DiSTATIS
- Disturbing

**Recordings**
- DiSTATIS
- Disturbing
- DiDiSTATIS had ↑ % variability

Experimental Designs:
- 3 pianists: Beethoven, Richter, Barenboim
- 5 pianists: Beethoven, Araús, Pesce, Barenboim, Barenboim

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- 4 pianists: (1) Richter (2) Araús (3) Pesce (4) Barenboim

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- Recordings showed:
  - Barenboim was Beethoven-like, Richter was Mozart-like
  - No main effect of experience, except on recordings, where 1 experience ↑ sorting variability
  - Only some songs within each category were consistently sorted

**DiSTATIS vs DiDiSTATIS**: DiSTATIS had ↑ on Component 2 but only a modest ↑ in R²

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