

THE UNIVERSITY OF TEXAS AT DALLAS¹
JUNIA GRANDE ECOLE D'INGENIEURS²

Music Listening Space

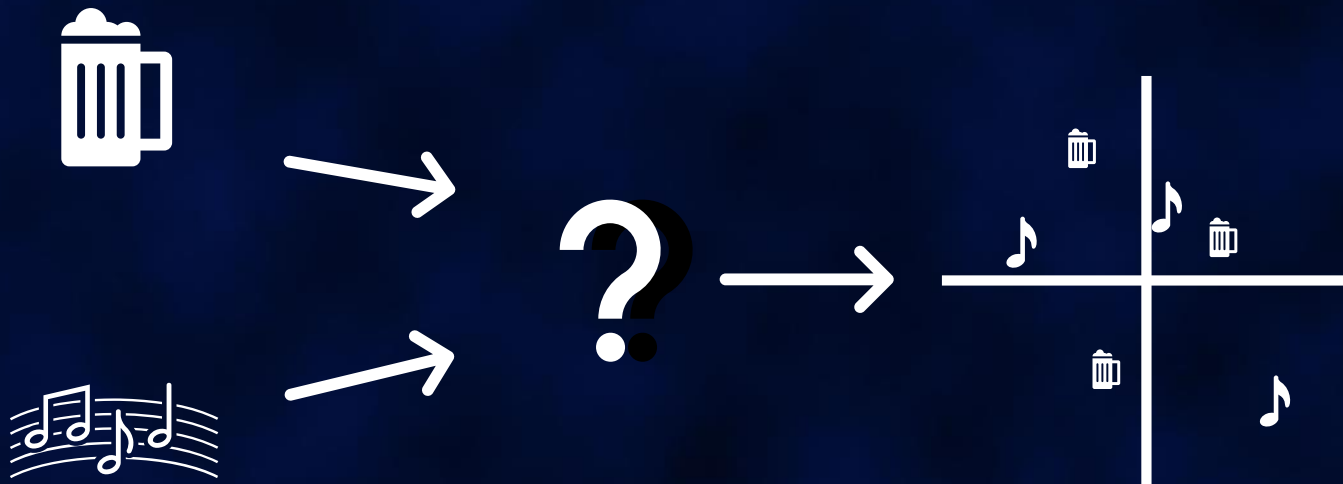
A multivariate analysis of cognitive listening space

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PROBLEM



VARIABLES & STIMULI

- Stimuli:
 - 30 novel excerpts composed in a range of western styles
- Variables:
 - Participant nationality (Ex. 1 & 2)
 - Level of music training (Ex. 1)
 - Quantifiable musical qualities (Ex. 1)
 - Adjectives (Ex. 2)

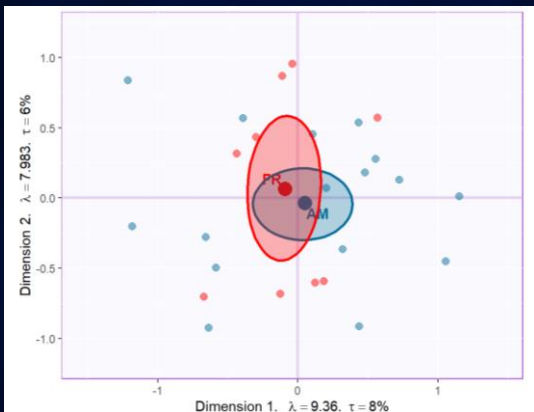
STATISTICAL METHODS

- Correspondence Analysis (CA)
 - Benzécri (1973); Escofier-Cordier (1965); Greenacre (1984)
- Multidimensional Scaling (MDS)
 - Borg & Groenen (2005); Gower (1966); Torgerson (1958)
- Multiple Factor Analysis (MFA)
 - Abdi et al. (2013); Escofier & Pagès (1994)
- Partial Least Squares Correlation (PLSC)
 - Abdi & Williams (2013); Tucker (1958)
- Hierarchical Cluster Analysis (HCA)
 - Pielou (1984)
- Bootstrapping & Permutation Testing
 - Hesterberg (2011); Fisher (1925); Geary (1927); Berry et al. (2011)

EXPERIMENT 1: MUSICAL QUALITIES

Correspondence Analysis (CA)

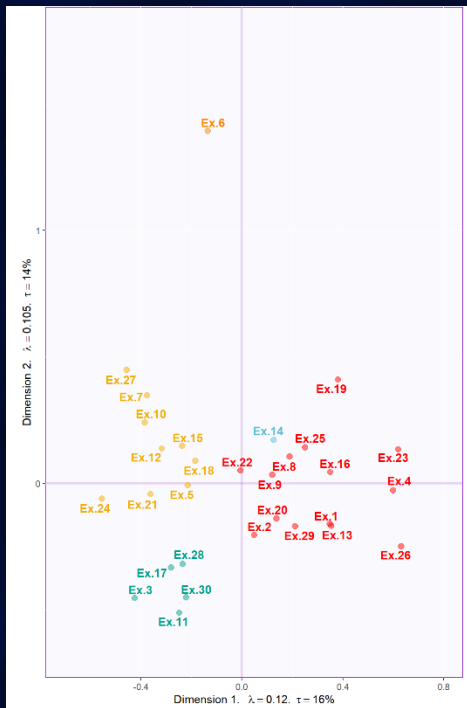
Multidimensional Scaling (MDS)



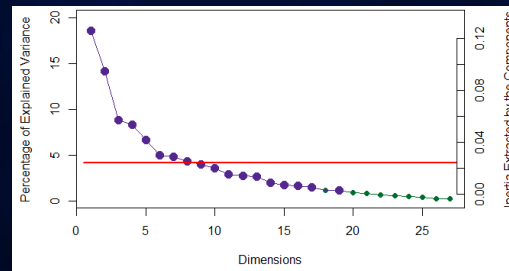
$N_{US} = 18$

$N_{France} = 9$

No significant group differences

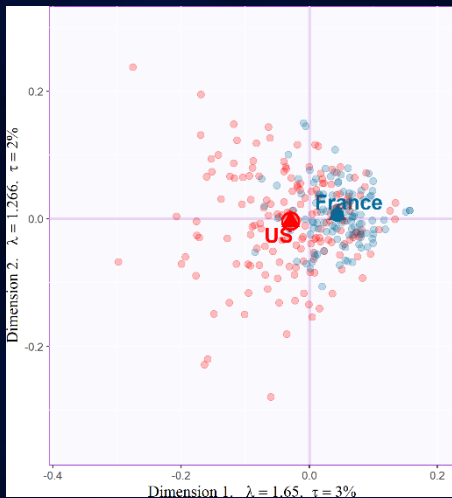


Scree Plot with Permutation Testing



EXPERIMENT 2: ADJECTIVES

Multidimensional Scaling (MDS)

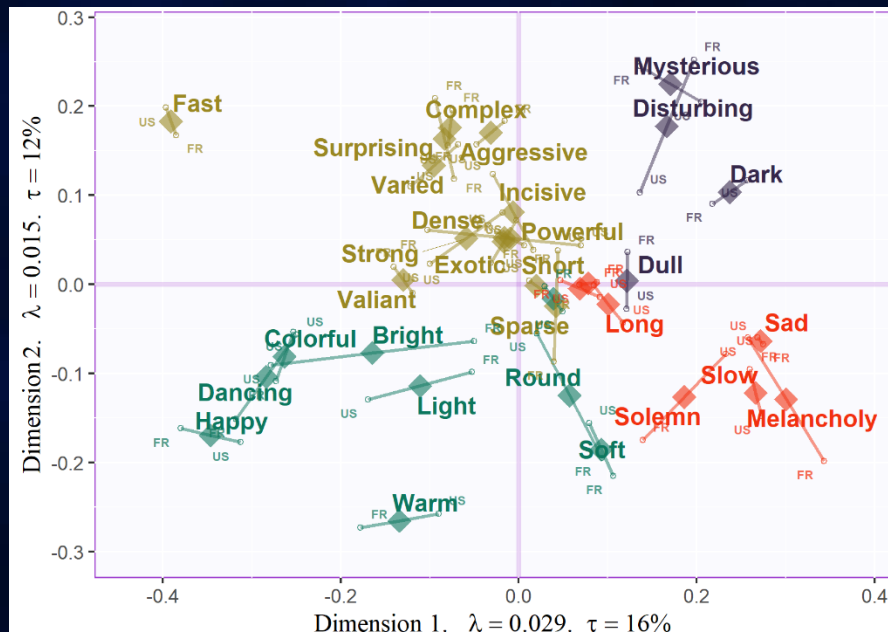


$N_{US} = 171$

$N_{France} = 111$

Significant group differences ($p < .001$)

Multiple Factor Analysis (MFA)



EXPERIMENT 3: THE COMBINED SURVEYS

Partial Least Squares Correlation (PLSC)

Excerpt groupings:

Gold: positive valence, low arousal

- Calm, content

Green: negative valence, high arousal

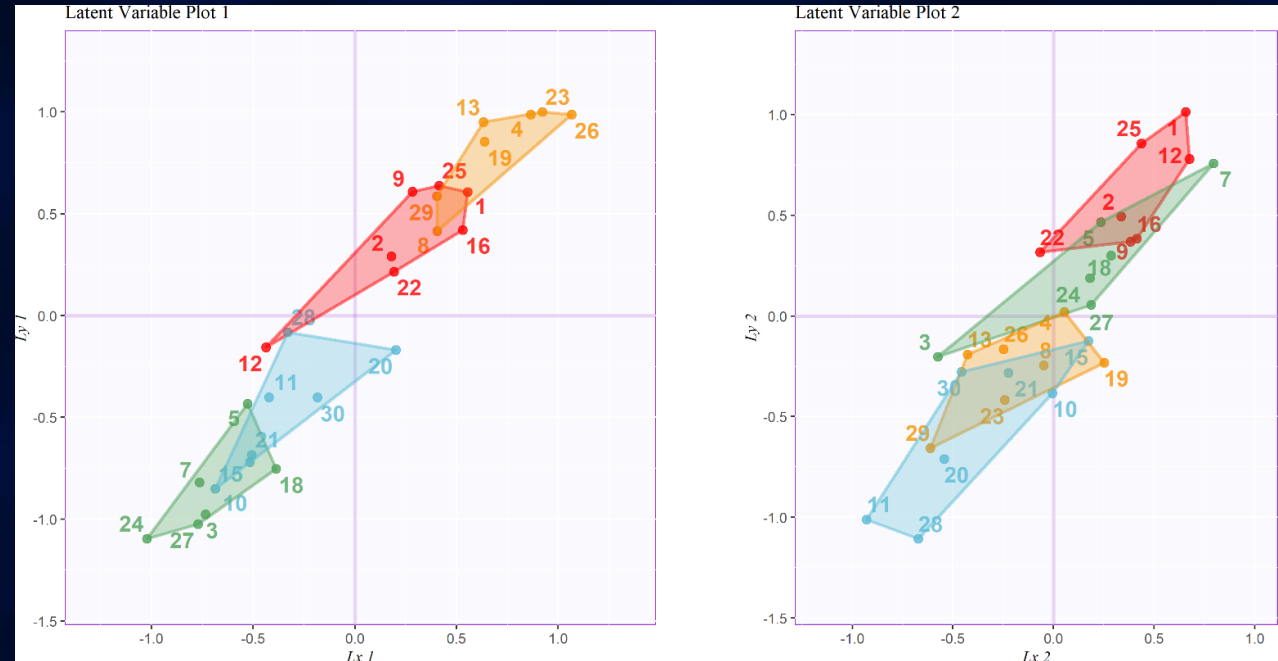
- Anger, fear

Red: positive valence, high arousal

- Joy

Blue: negative valence, low arousal

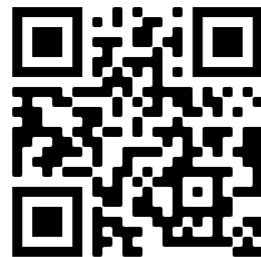
- Sadness or depression



CONCLUSIONS

- Participants from different countries describe music differently, but those differences appear to be semantic, not perceptual.
- Even when using adjectives that are not explicitly emotional, multivariate analysis of the adjectives used to describe the excerpts reveals the valence-arousal plane in the two strongest dimensions.
- Multivariate analysis of the musical quality ratings revealed many significant dimensions, the first of which can be interpreted as arousal and the second dimension can be interpreted as complexity, not arousal.
- The latent variables common to the two data sets separate the excerpts by positive and negative valence and high and low arousal

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