Novel Spatial Audio Scenes
Classical Music for Surround

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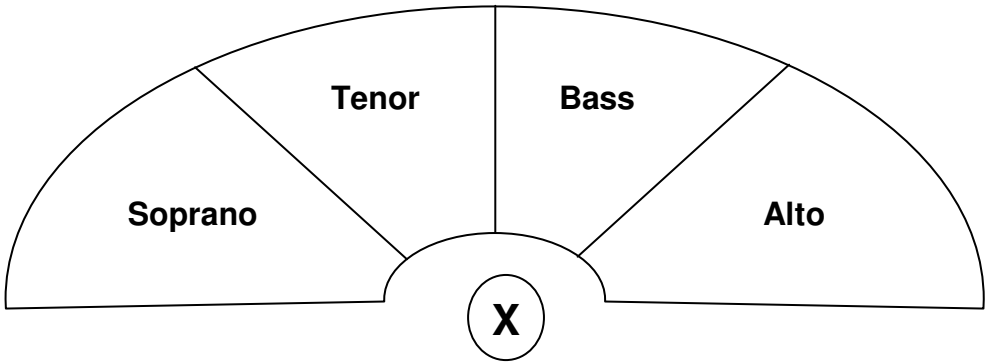
Classical Music for Surround

- Growing consumer acceptance of multichannel audio
- DVD-Audio and Super Audio CD are mainstream commercial media
- Music-only releases are taking advantage of the developments
- Classical commercial releases often maintain traditional recording practices
- Creative opportunities are often avoided

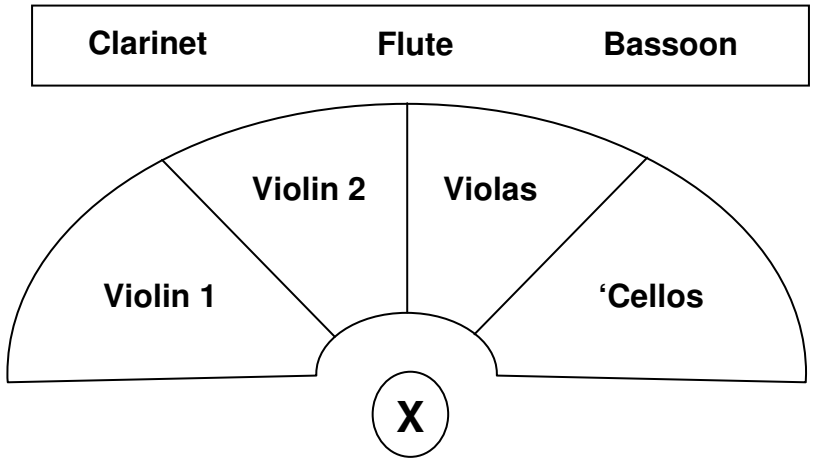
Novel Spatial Audio Scenes

- Listener opinions were sought for novel spatial audio scenes
- Series of specially made recordings
- Traditional spatial microphone arrays
- Alternative artist arrangements
- Formal listening test

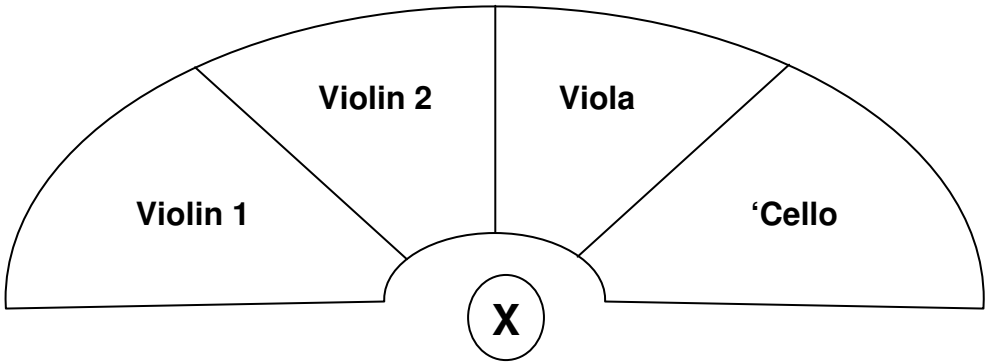
Traditional Setup - Choir



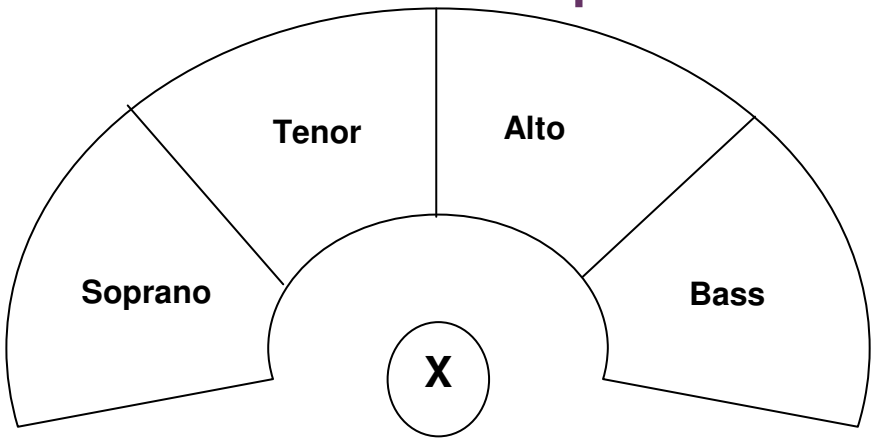
Traditional Setup – Chamber Orchestra



Traditional Setup - Quartet



Partial Arc Setup - Choir



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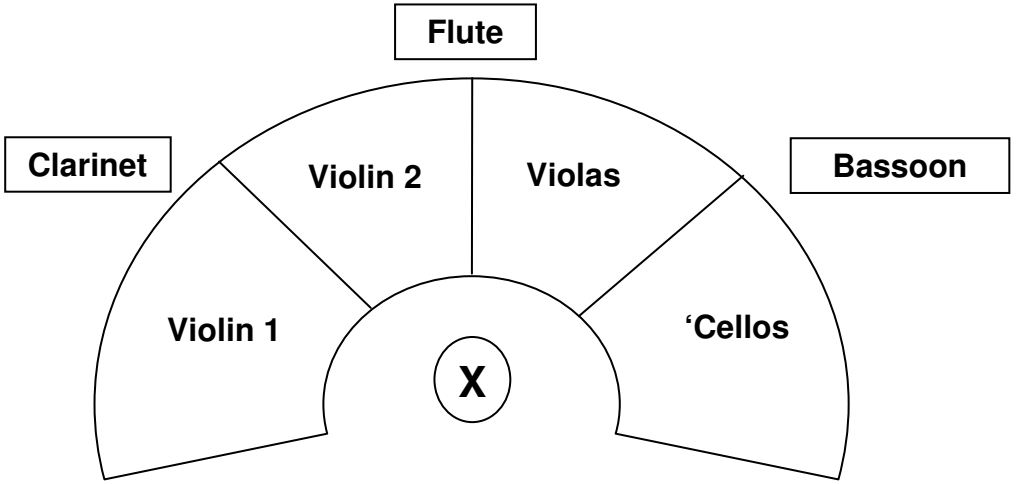
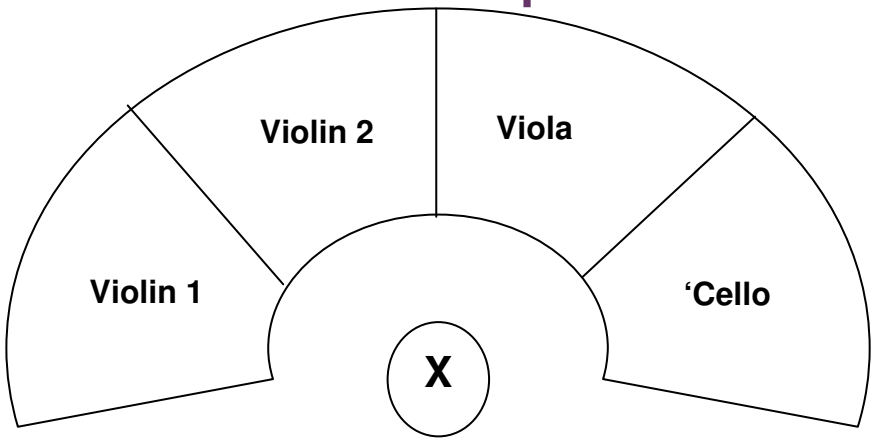
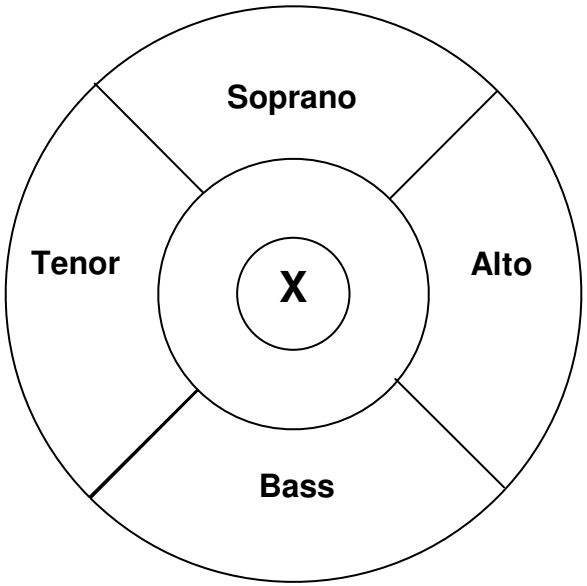


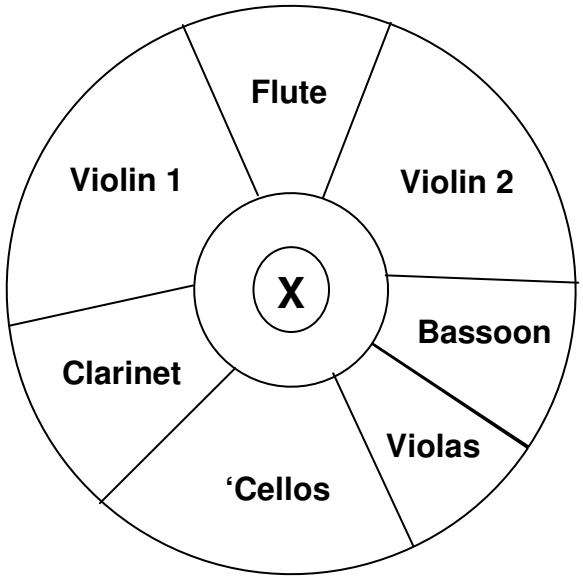
Partial Arc Setup - Quartet



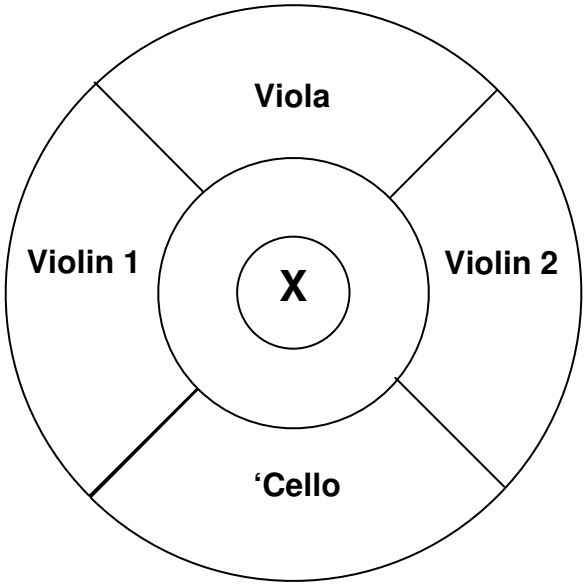
Full Surround Setup - Choir



Full Surround Setup – Chamber Orchestra



Full Surround Setup - Quartet

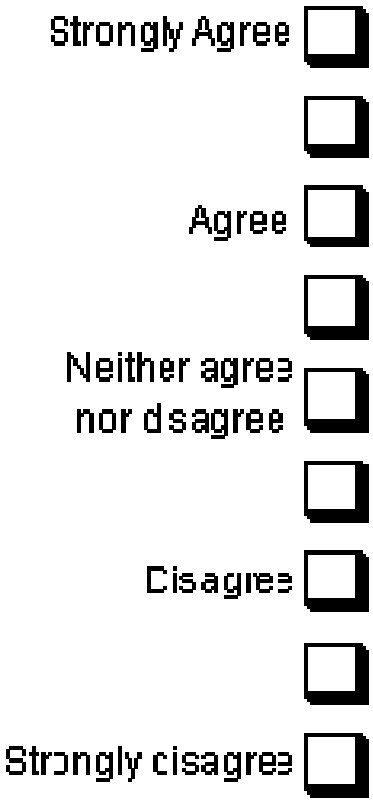


Listening Test

- 30 listeners (15 trained/15 naïve)
- IOSR, University of Surrey
- *5.0* loudspeaker setup
- 3 types of programme material
- 2 microphone arrays
- 3 artist arrangements (traditional, partial & full)

Listening Test

- 8 assessment attributes
- Accompanying statements and descriptions
- 9-point Likert Scale



Purchasing
Timbral Balance
Listening Comfort
Instrument Locatedness
Attributes
Tradition
Naturalness
Envelopment
Interest

Attributes

Purchasing – (disregarding the programme material)

I would like to purchase this recording to listen to at home.

Listening Comfort – would you feel comfortable to listen to the recording for a long period of time?

Listening to this recording is a comfortable experience.

Attributes

Tradition – in comparison with recordings previously experienced at home

This recording is traditional in terms of its recording concept.

Interest

I find elements of this recording interesting.

Attributes

Envelopment – do you feel surrounded by the audio?

I find this recording enveloping.

Naturalness – is it like being in a concert hall with the musicians? Or does it feel like an artificial experience?

I find this recording natural.

Attributes

Instrument locatedness

It is easy to pinpoint the location of instruments in this recording.

Timbral Balance – is the bass, middle and treble content well balanced? Is the frequency spectrum pleasing?

The recording has a good timbral balance.

Question Design

Listening Comfort

"Listening to this recording is a comfortable experience."

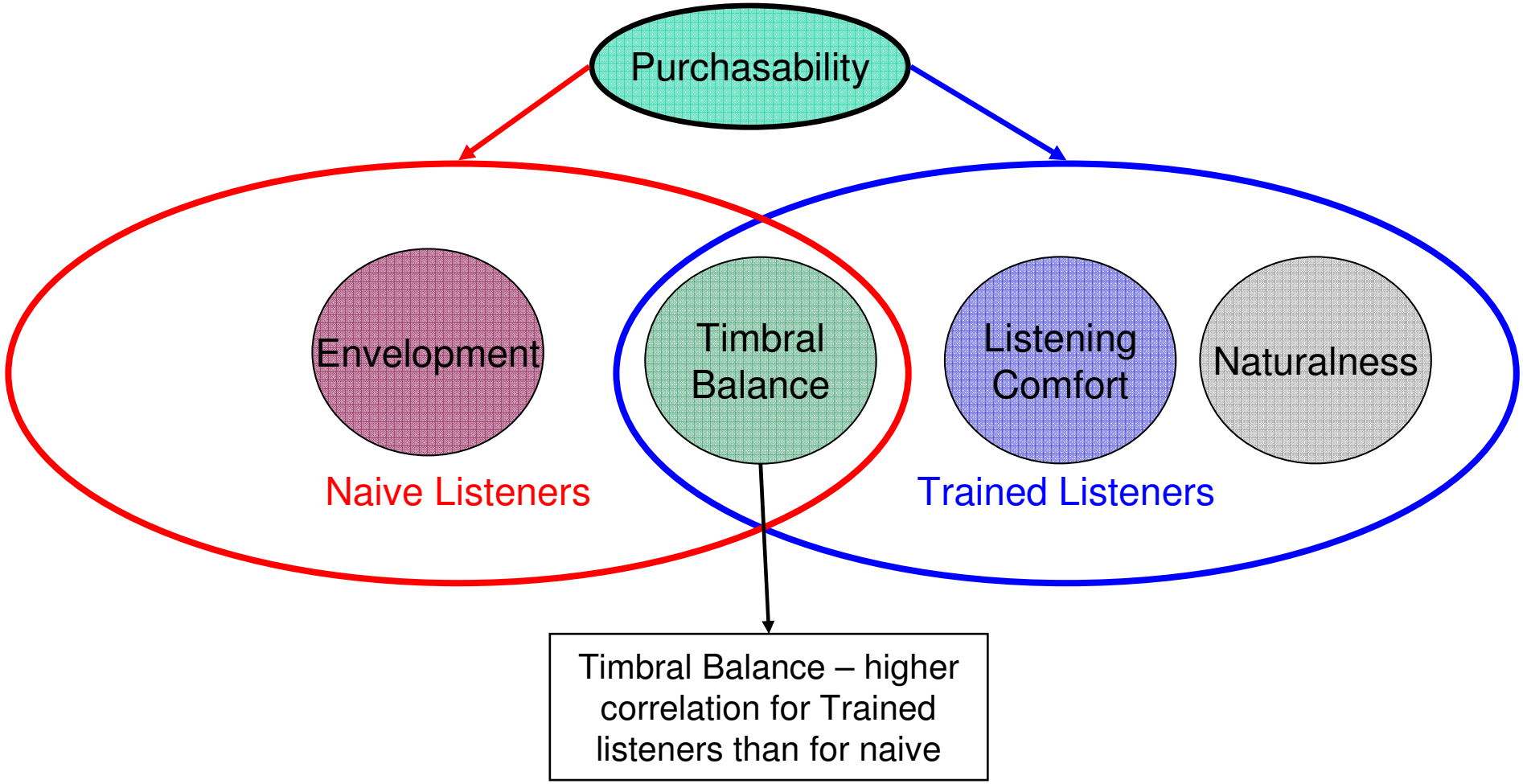
Trial 36

A	B	C
Strongly Agree	Strongly Agree	Strongly Agree
Agree	Agree	Agree
Neither agree nor disagree	Neither agree nor disagree	Neither agree nor disagree
Disagree	Disagree	Disagree
Strongly disagree	Strongly disagree	Strongly disagree

Results

- Preliminary analysis suggested division of naïve and trained listeners
- Programme Material and Artist Arrangement:
  - Purchasability – significant interaction for naïve but not trained listeners
  - Timbral balance – significant interaction for trained but not naïve listeners

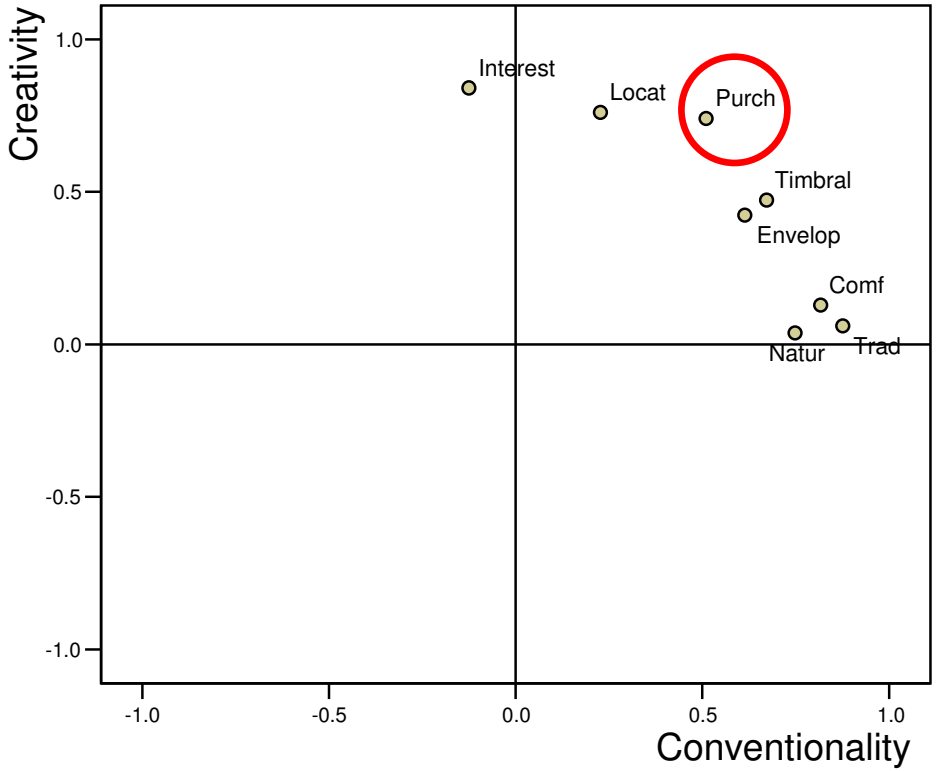
Correlation Analysis



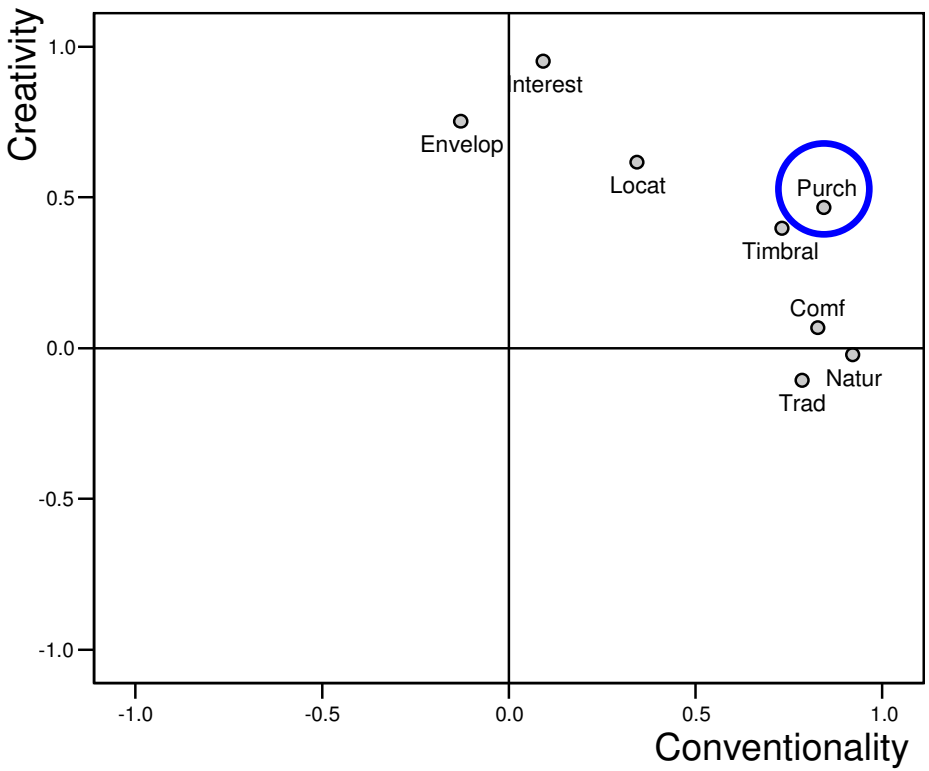
Factor Analysis

- Extracted components:

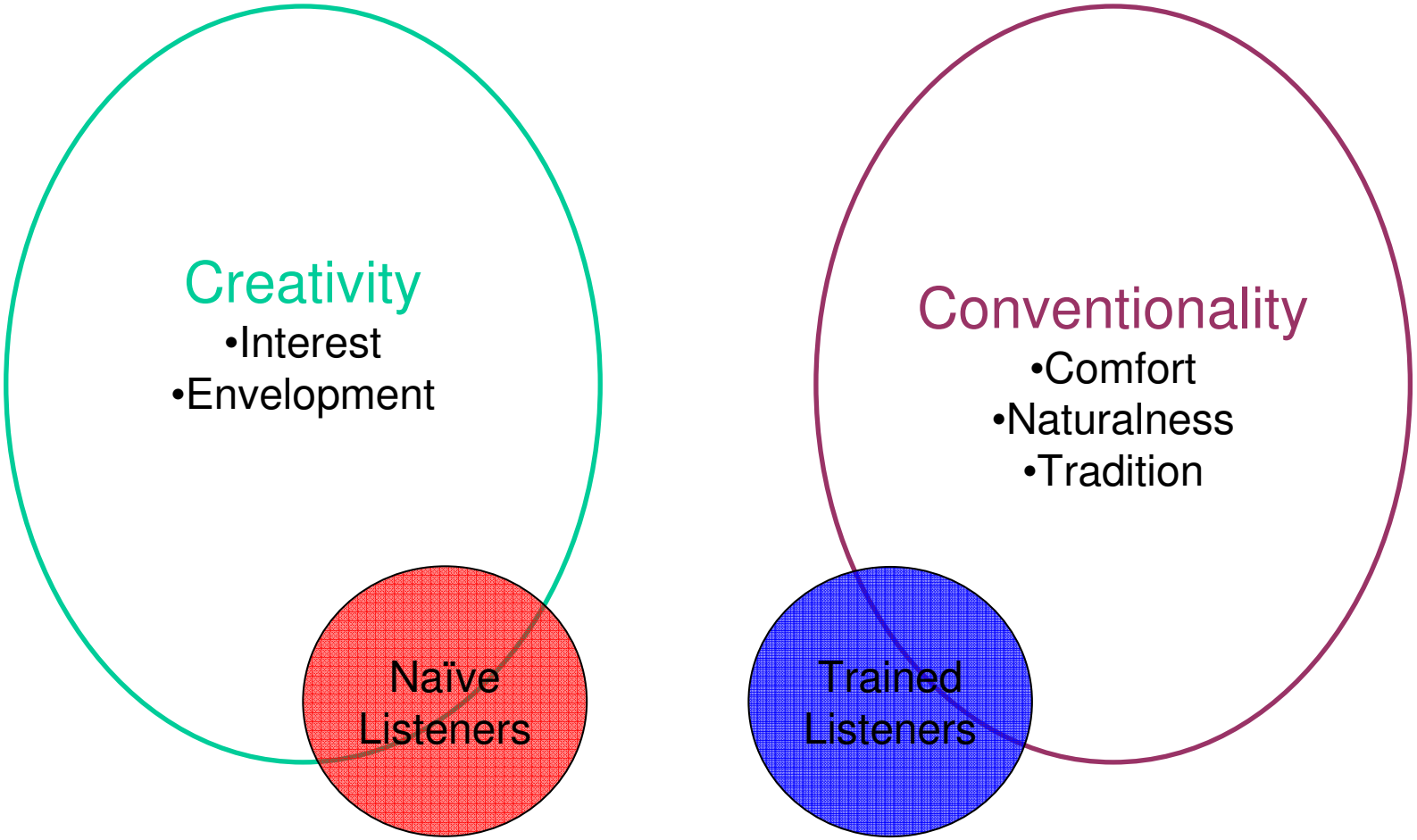
Conventionality and Creativity



Component Plot for Naïve Listeners



Component Plot for Trained Listeners


Creativity
•Interest
•Envelopment
Naïve Listeners
Conventionality
•Comfort
•Naturalness
•Tradition
Trained Listeners

Forming Prediction Equations

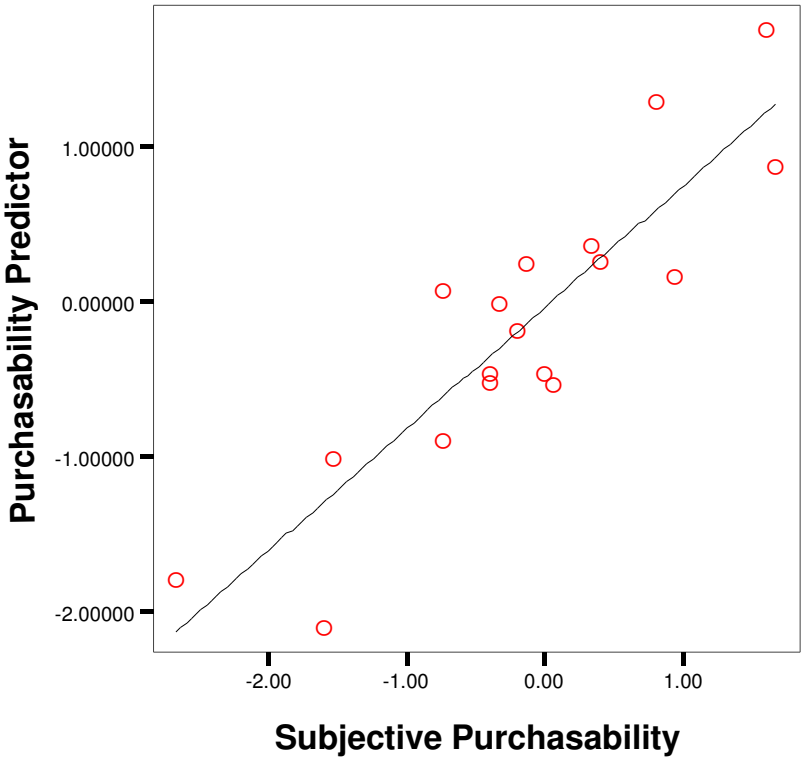
$$\text{Purchasability} = 0.556 \times \text{Envelopment} - 0.531$$

Purchasability Predictor - Naïve listeners

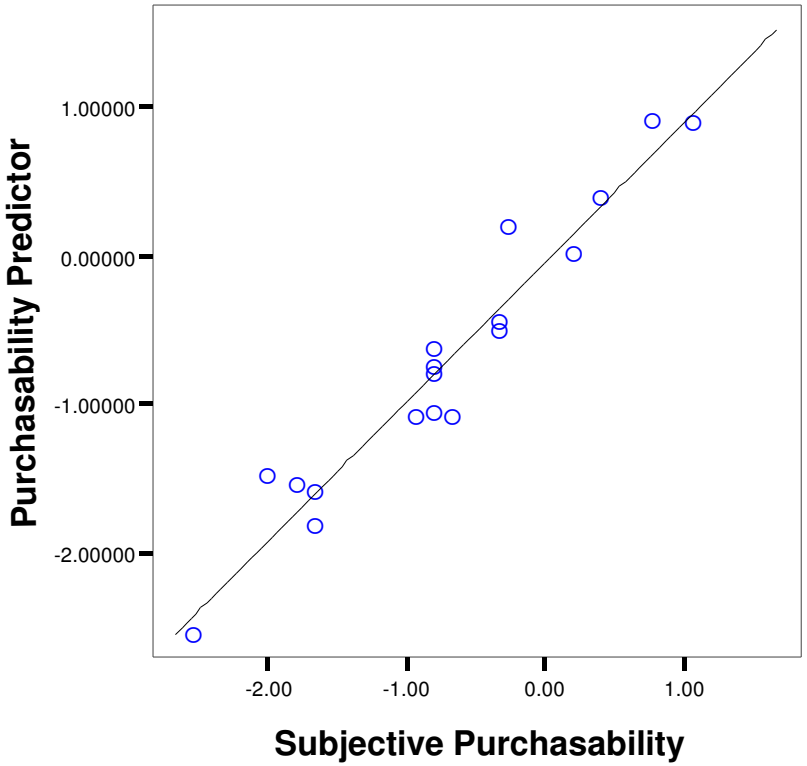
$$\text{Purchasability} = 0.742 \times \text{Locatedness} + 0.534 \times \text{Naturalness} + 0.576 \times \text{Timbral} - 0.573$$

Purchasability Predictor - Trained listeners

Subjective vs. Predicted Purchasability



Naïve Listener Correlation: Subjective vs Predicted Purchasability



Trained Listener Correlation: Subjective vs Predicted Purchasability

Conclusions

- Novel recording method developed
- Listener opinions gauged for a variety of attributes
- Purchasability of recordings was related to components labelled Conventionality and Creativity
- Predictor equation formed for Purchasability for both naïve and trained listeners

Further Work

- Refinement of technique – both with regards to recording design and listening test design
- Implementation of purchasability predictor to enable shorter listening tests
- Enable establishment of the viability of unusual recording techniques within the consumer market