

***A new tool for measuring
musical sophistication: The
Goldsmiths Musical
Sophistication Index***

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What is the Gold-MSI?

- A new self-report inventory
- A new battery of musical tests
- A lot of data
- A novel concept

The Concept

- Motivation:
 - No standardised questionnaire instrument to assess skilled musical behaviours
 - Over-reliance on formal (classical?) music training as proxy for musical abilities and understanding
 - Recognising multiple facets of musical expertise
 - Joining self-report questionnaire and ability tests into one research tool and make it freely available

A New Definition

- **Musical Sophistication:**
 - Psychometric construct comprising musical skills, expertise, achievements and related behaviours across a range of facets measured on different subscales.
- **Assumptions:**
 - Facets of musical sophistication can develop through active engagement with music in its many different forms.
 - Individuals vary in their level of sophistication on the different facets.
 - High levels of musical sophistication are generally characterised by
 - higher frequencies for exerting the musical skills or behaviours
 - greater ease, accuracy or effect of the musical behaviour when executed,
 - a greater and more varied repertoire of behaviour patterns associated with it.
 - Differences in observable behaviour are related to levels of differentiation in cognitive systems for categorising and processing music.

Really a New Concept?

- **Self-report questionnaires:**

Cuddy, Balkwill, Peretz, & Holden (2005), Ollen (2006), Werner, Swope, & Heide (2006), MacDonald & Stewart (2008), Chin & Rickard (2012)

- **Musical ability tests:**

Seashore, Lewis, & Saetveit (1960), Wing (1962), Bentley (1966), Gordon (1989), Wallentin et al. (2010)

- **Conceptual suggestions:**

Hallam & Prince (2003), Bigand (2006), Levitin (2012), Law & Zentner (2012)

Missing:

(Focus on musical expertise) x (Covering wide range of skills) x
(Combining self-report and objective testing)

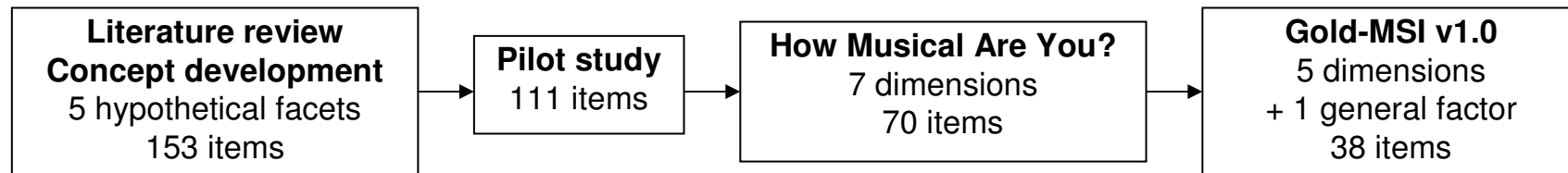
Components of the Gold-MSI v1.0

- 38-item Self-report Inventory covering 5 different facets of musical expertise
- 13-item Melodic Memory test:
 - AB comparison
 - novel folk tunes
 - akin to Dowling & Bartlett (1982) and Cuddy & Lyons (1981)
- 17-item Beat Perception test:
 - correct/incorrect judgement
 - unknown instrumental tunes from rock, jazz, popular classical
 - variant of Iversen & Patel's (2008) Beat Alignment Test
- 16-item Sound Similarity test:
 - 800ms audio excerpts from typical rock, pop, hiphop, jazz songs
 - Sorting paradigm similar to Gingras et al. (2011)
 - Inspired by Gjerdingen & Perrott (2008) and Krumhansl (2010)
- (Beat Production test)

A Lot of Data

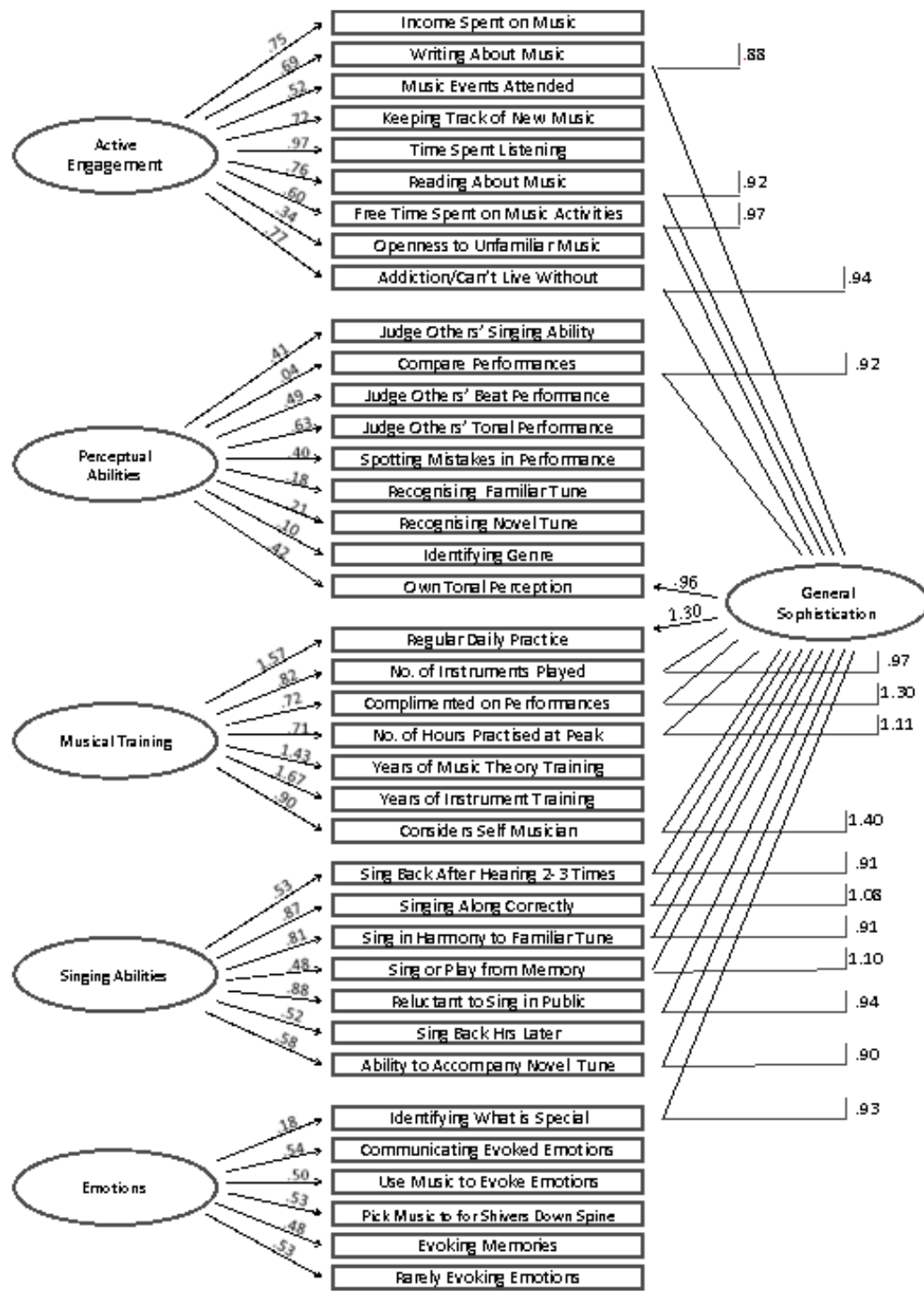
- Pilot study self-report inventory with BBC LabUK (n=488)
- BBC LabUK online implementation *How Musical Are You?* (n~148,000)
- 5 extended lab studies for optimisation of listening tests (together: n~600)
- 2 Questionnaire studies for external validity of self-report inventory (n=214, n=144)
- Online implementation for Channel 4's *Hidden Talent Show* (n= 3,793)
- Lab study testing reliability and correlation with cognitive abilities (n=51)

Development of the Self-report Inventory



The Dimensions of Musical Sophistication

- Data: 147,633 participants responding to 70 question items;
- Analysis goals:
 1. Identify latent factor structure and 'cluster' items into subscales
 2. Refine and shorten subscales
- Techniques: Factor analysis, item response models, structural equation modelling; data split into training and testset

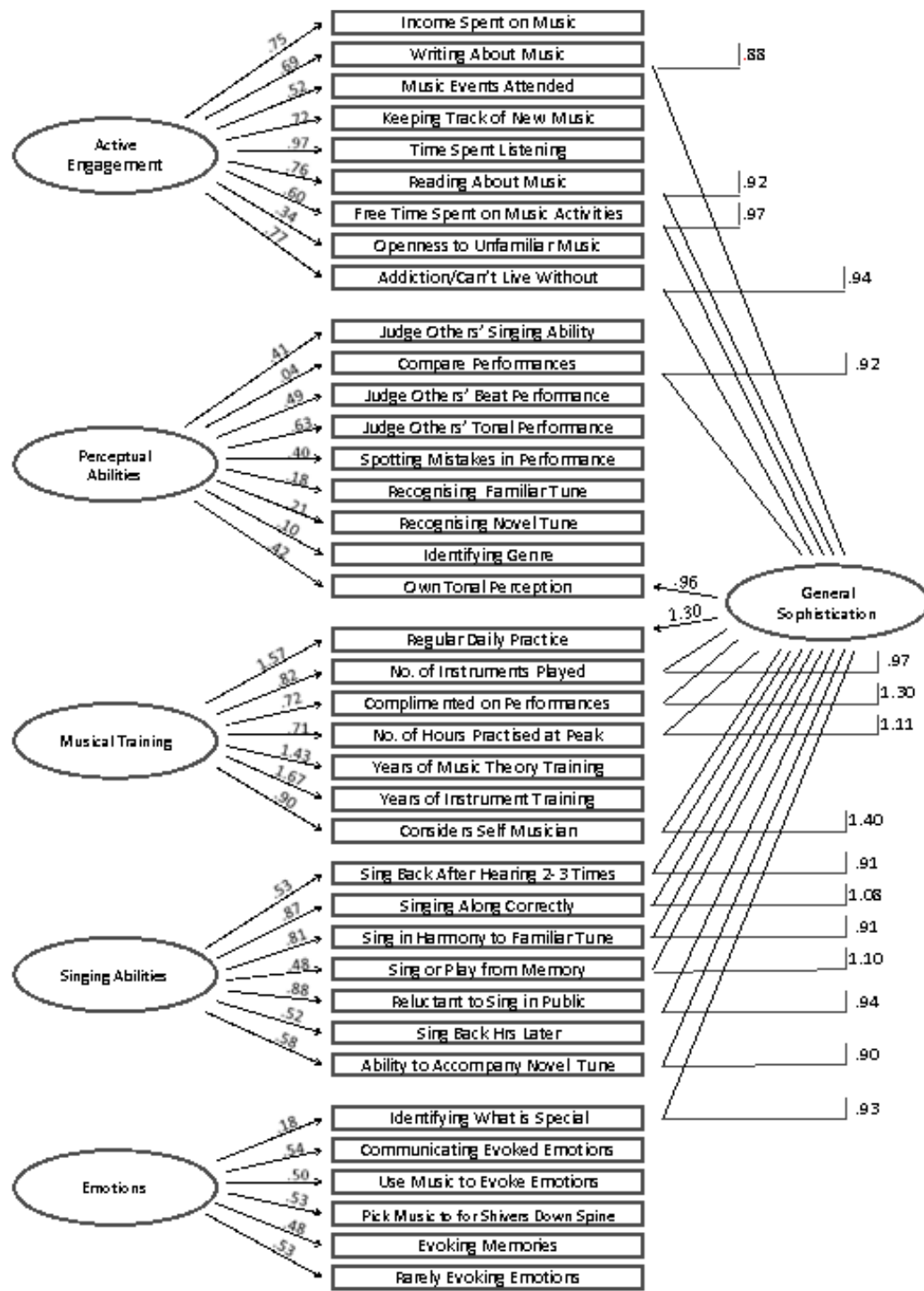


Result 1: There is a strong general factor of musical sophistication

- Evidence: High eigenvalue of 1st factor, high inter factor correlations, high $\omega_{\text{hierarchical}}$

Result 2: There are 5 distinct dimensions of musical sophistication

- Evidence: Agreement of criteria (screeplot, MAP, VSS, eigenvalues >1); content validity



- Result 3: Each dimension can be measured by a shortened subscale (6 - 9 items)
 - Evidence: High internal reliabilities ($\alpha > .79$)
- Result 4: The 5+1 model holds true on a fresh dataset
 - Evidence: Good model fit of SEM: adjusted Goodness of fit: .85, RMSEA: .064

Reliability and Validity

- Very good **test-rest reliability** (n=53, mean time lag= 64 days):

● Active Engagement:	.90
● Perceptual Abilities:	.89
● Musical Training:	.97
● Singing Abilities:	.94
● Emotions:	.86
● General Musical Sophistication:	.97

- Very good **external validity** with Gordon's AMMA (total score, n=44):

● Active Engagement:	.46
● Perceptual Abilities:	.59
● Musical Training:	.56
● Singing Abilities:	.52
● Emotions:	.43
● General Musical Sophistication:	.60

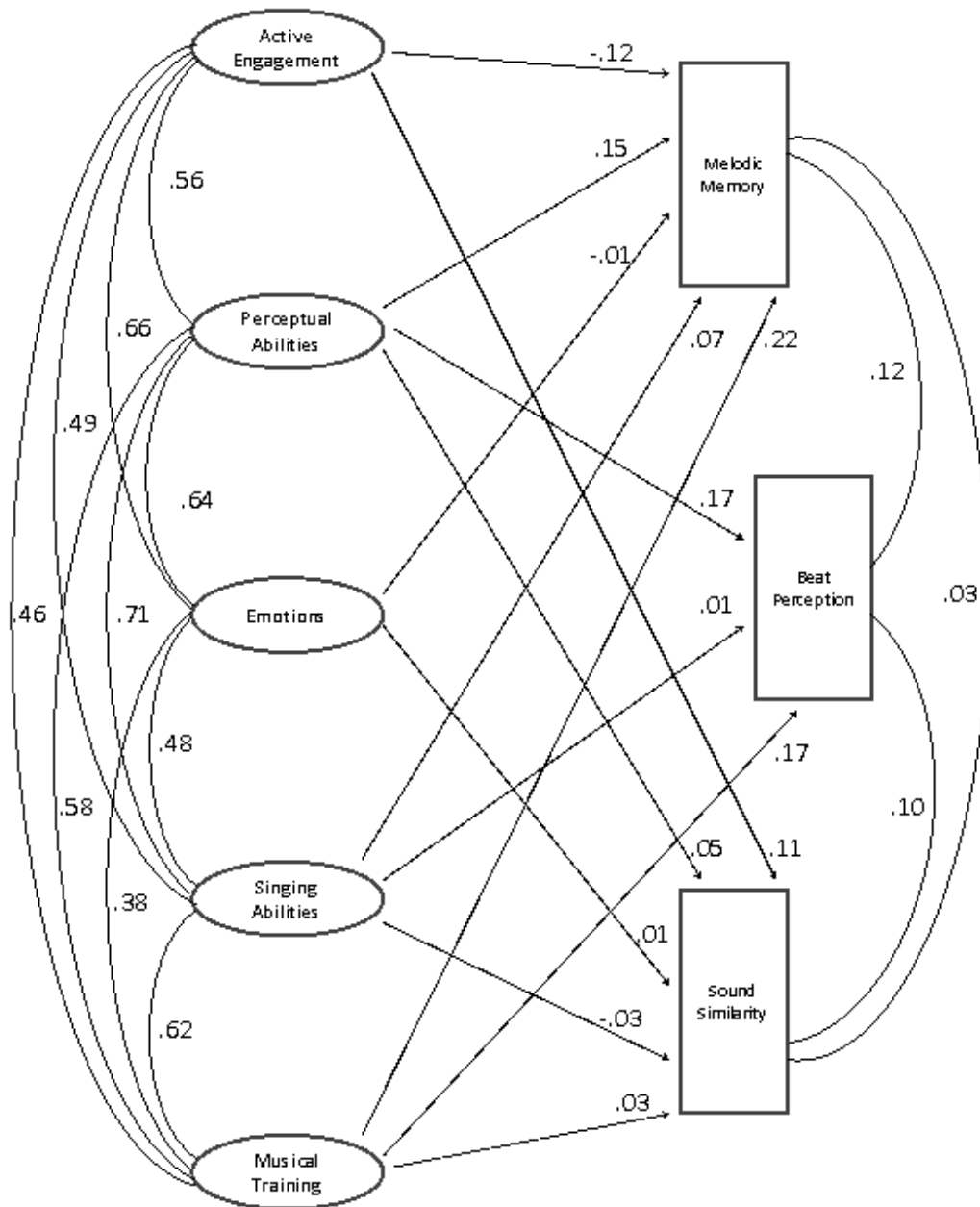
Reliability and Validity

- Good **external validity** with relevant factor from Musical Experience Questionnaire (Werner et al., 2006), n=141:

	Active Engagement	Perceptual Abilities	Musical Training	Singing Abilities	Emotions	General Sophistication
Commitment to Music	.241**	.206*	.223*	.292**	.255**	.309**
Innovative Musical Aptitude	.203*	.319**	.395**	.422**	.189*	.449**
Social Uplift	.111	.168	.139	.289**	.159	.229*
Positive Psychotropic Effects	.181*	.200*	.198*	.300**	.237**	.282**
Affective Reactions	.076	.146	.142	.222*	.142	.182*
Reactive Musical Behaviour	.126	.195*	.198*	.312**	.159	.264**

Interim summary

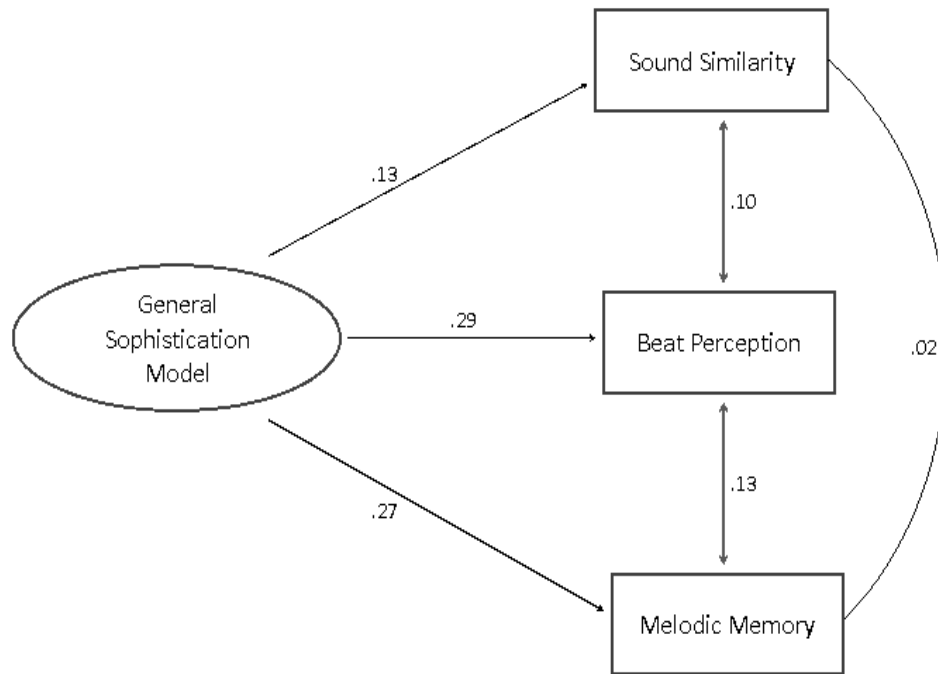
- Gold ~~M~~ self report inventory is a valid and reliable measure of different facets of musical sophistication
 - It comprises 5 factors and 1 general factor
 - It is based on self ~~ass~~essed skills and self ~~re~~ported behaviours
- ⇒ *How does self-reported sophistication compare to performance in listening tests?*



- Result 1: Musical Training benefits melodic memory and beat perception performance
 - Evidence: $\beta = .22$ and $.17$
- Result 2: Active (listening) Engagement (but not Musical Training) benefits sound similarity judgements
 - Evidence: $\beta = .11$ and $.03$
- Result 3: Similar (but weaker) relationships between self-report and test scores compared to lab studies.

=> uncontrolled test conditions add noise to test scores(?)

 - Evidence: Low β 's between self-reported perceptual abilities and test scores ($.15$, $.17$, $.05$)



Result 4: General Musical Sophistication indexes all three test scores best

- Evidence: $\beta = .27, .29$ and $.13$

Result 5: The three listening tests measure different abilities

- Evidence: Low inter-test correlations ($< .15$)

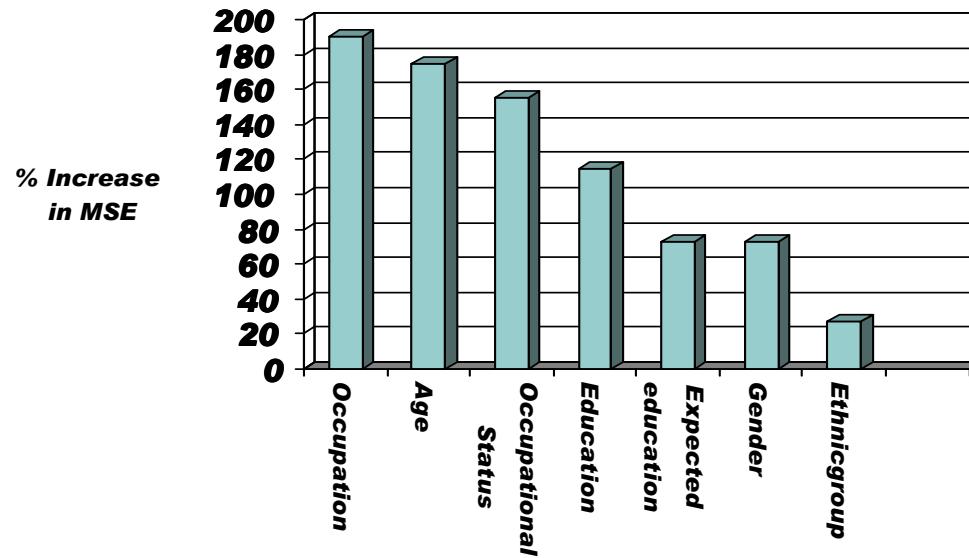
Conditions of Musical Sophistication

- Question:

*How does **self-reported musical sophistication** relate to socio-economic variables?*

- Analysis:
 - 90,474 Brits from *How Musical Are You?* and split sample
 - Sub-sample 1: Identify most important socio-economic variables via random forest regression and permutation tests
 - Sub-sample 2: Relate General Musical Sophistication to socio-economic variables using a conditional inference tree model

Variable Importance



- Result 1: Occupation, Age, and Occupational status are most important variables influencing General Musical Sophistication.

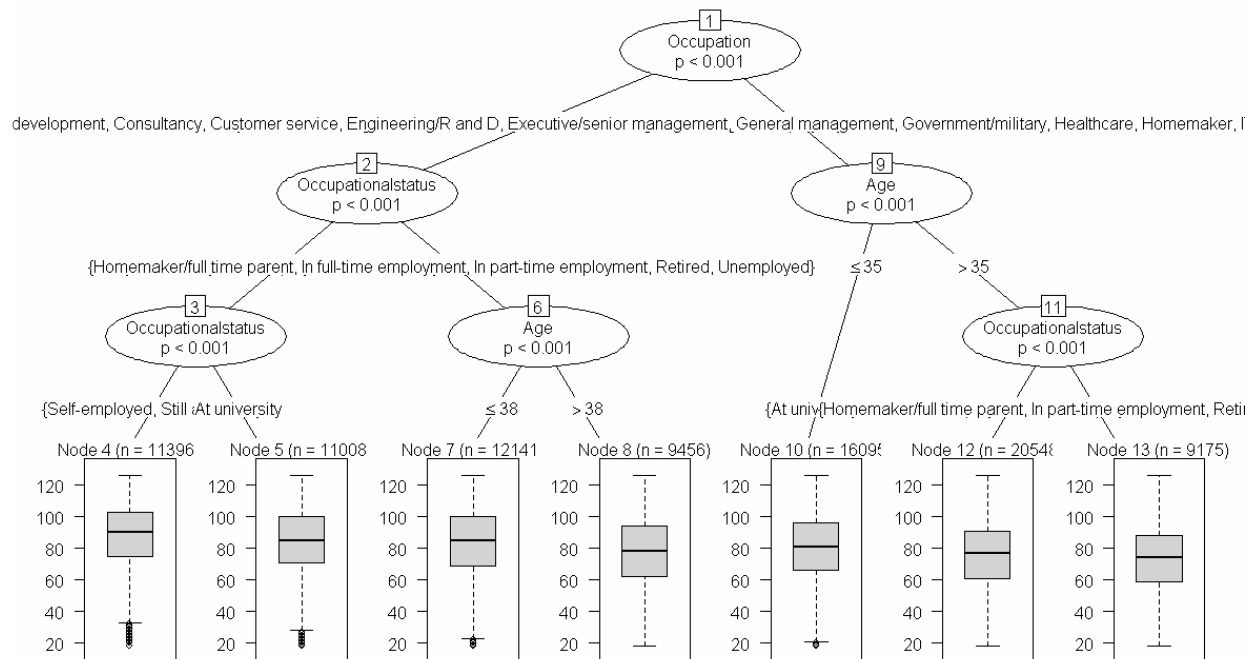
- Evidence: Highest variable importance values from random forest

- Result 2: 'Creative' professions (media, music) and people still in education, younger and non-retired people report higher levels of Musical Sophistication:

- Evidence: Significant splits in regression tree and significant differences in permutation tests.

- Result 3: Socio-economic variables account only for small proportion of variance in Musical sophistication:

- Evidence: 4.56% of variance explained by random forest



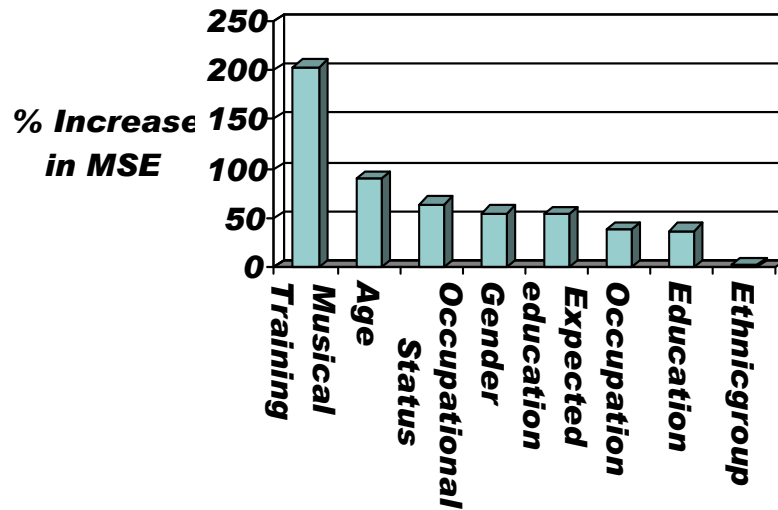
Conditions of Musical Sophistication 2

- Question:

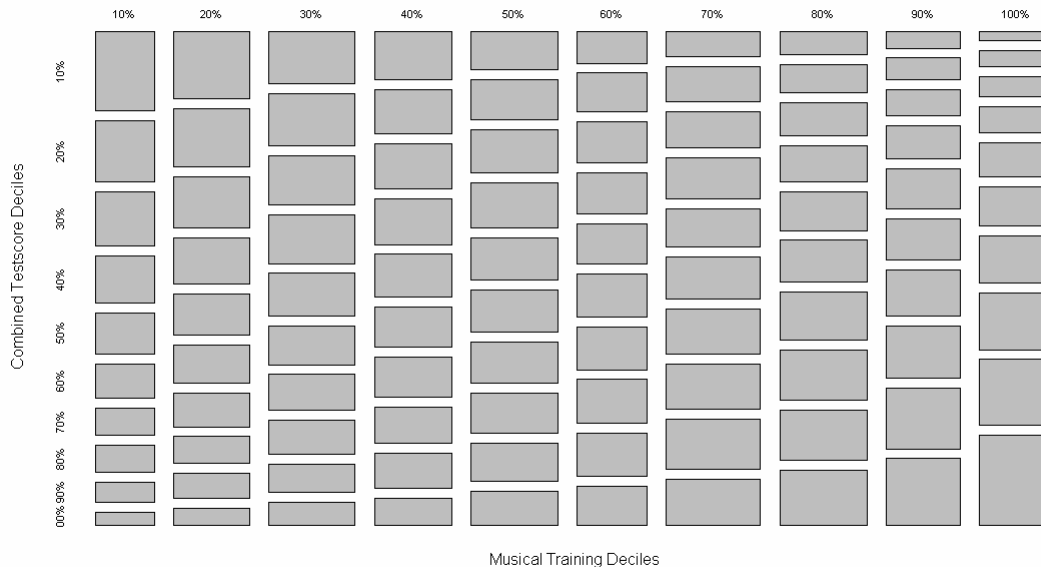
*How do **test scores** relate to socio-economic variables and musical training?*

- Analysis:
 - 90,474 Brits from *How Musical Are You?* and split sample
 - Combine z-transformed test scores into single score
 - Sub-sample 1: Identify most important variables with random forest for each test
 - Sub-sample 2: Significance testing of variables with permutation tests

Variable Importance for Combined Testscore from Listening Tests



Association between Musical Training and Listening Tests Scores



- Result 1: Musical Training, Age, Occupational Status, Gender, and expected education level are most important variables.
 - Evidence: Variable Importance according to random forest and significance in linear permutation tests.
- Result 2: Only small amounts of variance in test scores explained by socio-economic variables:
 - Evidence: R^2 from random forests: .03 (excluding musical training) .11 (including musical training)
- Result 3: Musical Training necessary condition for perfect listening skills?
 - Evidence: Only 85 Brits with no musical training among 7902 Top10 test takers.

Summary

- Gold-MSI inventory is valid and reliable self-report measure for musical skills and expertise.
- It helps to identify relationships between facets of musical behaviour (Musical Training, Active Engagement etc.) and a range of listening skills
- Influence of socio-economic variables on sophisticated musical behaviour and listening skills is very small
- All components of the Gold-MSI:
 - Are freely available for research purposes
 - Are fully documented
 - Have data norms derived from an adult population

Go to: <http://www.gold.ac.uk/music-mind-brain/gold-msi/>
... to get self-report inventory v1.0 and v0.9 of audio materials



Thank you!



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