



Predictive Coding in Musical Anhedonia: A Study of Groove

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Background

- Groove describes the pleasurable urge to move to music (Janata et al, 2012).
- Listeners experience the most groove in response to music which balances complexity and predictability, resulting in an inverted-U relationship between pleasure and stimulus complexity (Witek et al, 2014). This supports the Predictive Coding model of music (Vuust et al, 2022).
- Individuals vary in the degree of pleasure they derive from music listening: specific music anhedonics experience little to no pleasure during music listening despite no impairments in music perception or general anhedonia (Mas-Herrero et. al, 2014; Belfi and Loui, 2020).
- Little is known about musical anhedonics' subjective experience of groove. Here, we explored the relationship between individual differences in music reward sensitivity and the pleasurable urge to move to music.

Hypothesis: Individuals with specific musical anhedonia would show less of an inverted-U relationship between complexity and pleasure, as well as lower pleasure ratings overall, compared to matched controls. Second, individual differences in musical reward sensitivity would be a significant predictor of preference for complexity.

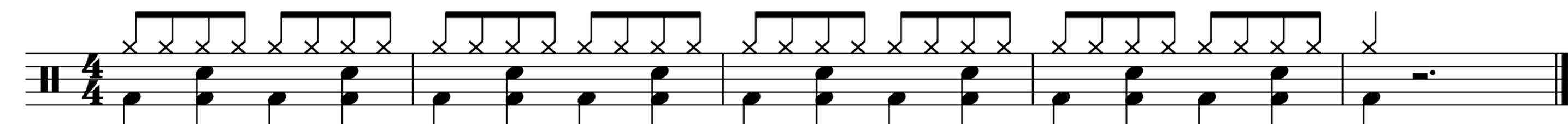
Methods

- 287 participants (140F; age_{mean} = 34) from a larger study in the lab (Lopez et al., 2023) listened to 15 excerpts varying in degree of complexity (Senn et al, 2023).
- Participants rated each excerpt on how pleasurable it was on a scale of 1 to 5, as well as how much they wanted to move to it on a scale of 1 to 5.
- Participants also completed a battery of psychometric surveys & tests:
- Extended Barcelona Musical Reward Questionnaire (eBMRQ), which measures participants' musical reward sensitivity (Mas-Herrero et al, 2013; Cardona et al, 2022).
- Goldsmith's Musical Sophistication Index (Gold-MSI), a measure of musical training and musical engagement (Müllensiefen et al, 2014).
- Musical Ear Test (MET), a test of melodic and rhythmic perception (Wallentin et al, 2010).
- Physical Anhedonia Scale (PAS), a measure of general anhedonia (Chapman, 1976).
- Musical Anhedonics (n=13; eBMRQ < 73 (10th percentile); PAS < 16 (mean + 2*SD)) were matched with matched controls (n=13; eBMRQ > 73; PAS < 16) on PAS scores and MET scores.

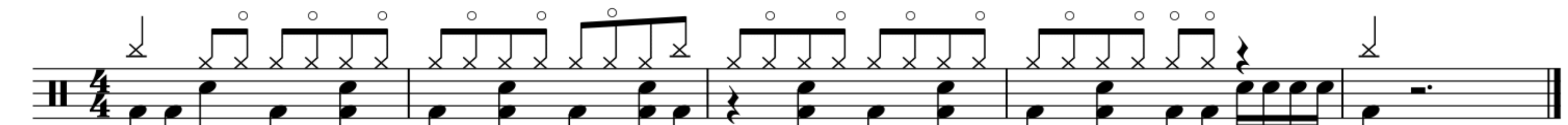
Stimuli

- Our stimuli were selected from a larger corpus of naturalistic drum excerpts normed on subjective perceived complexity measures (Senn et al, 2023)
- We split the entire corpus into tertiles based on perceived complexity (low, intermediate, and high complexity).
- Then, the five lowest rated stimuli were then matched on measures of loudness, number of onsets, initial tempo, and duration for five stimuli from the middle and high tertile complexity stimuli, resulting in 15 total stimuli.

"A Kind Of Magic", Queen, A Kind Of Magic, 1986, Roger Taylor PC = 0.4



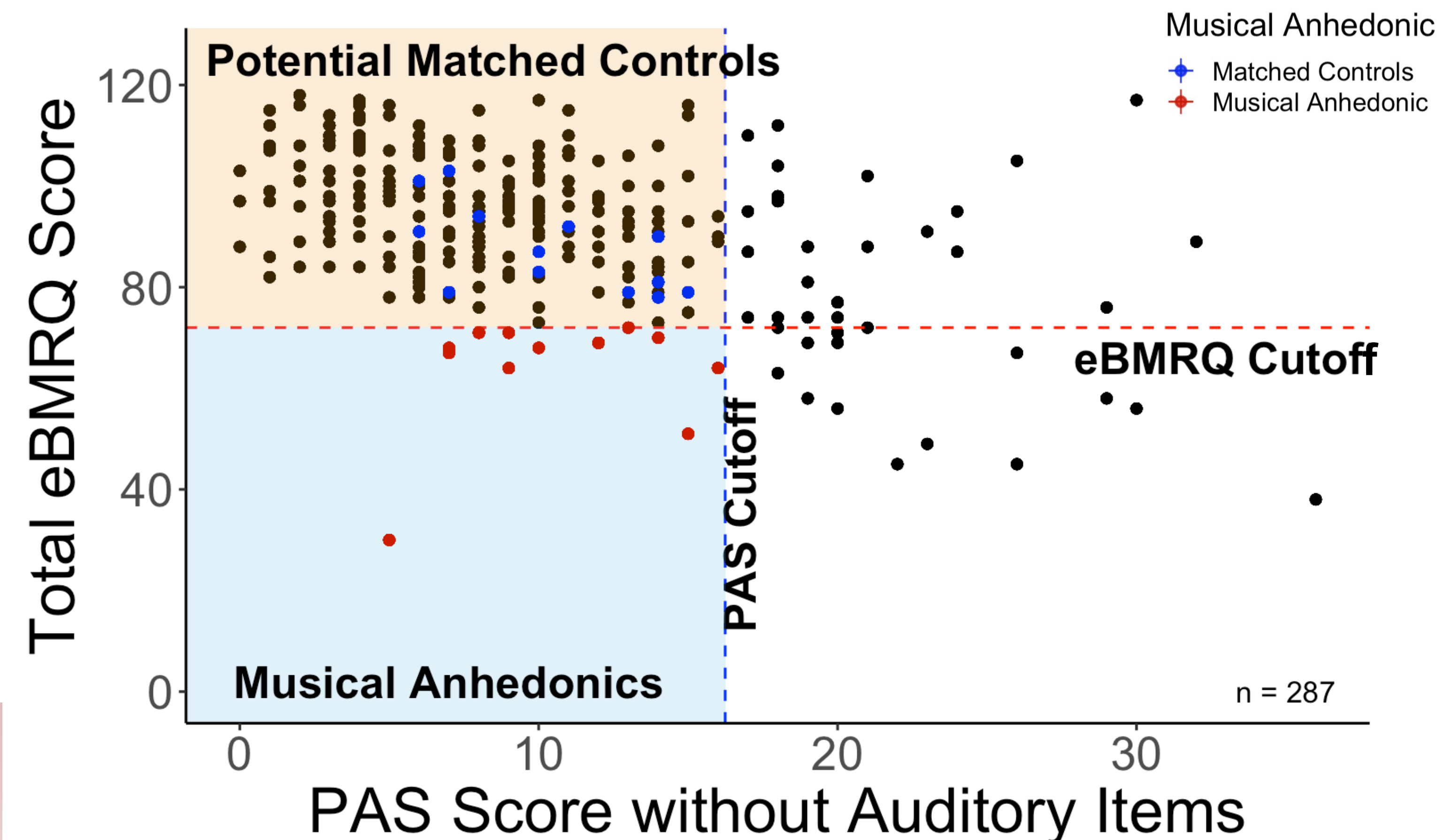
"The Pump", Jeff Beck, There & Beck, 1980, Simon Philips PC = 2.18



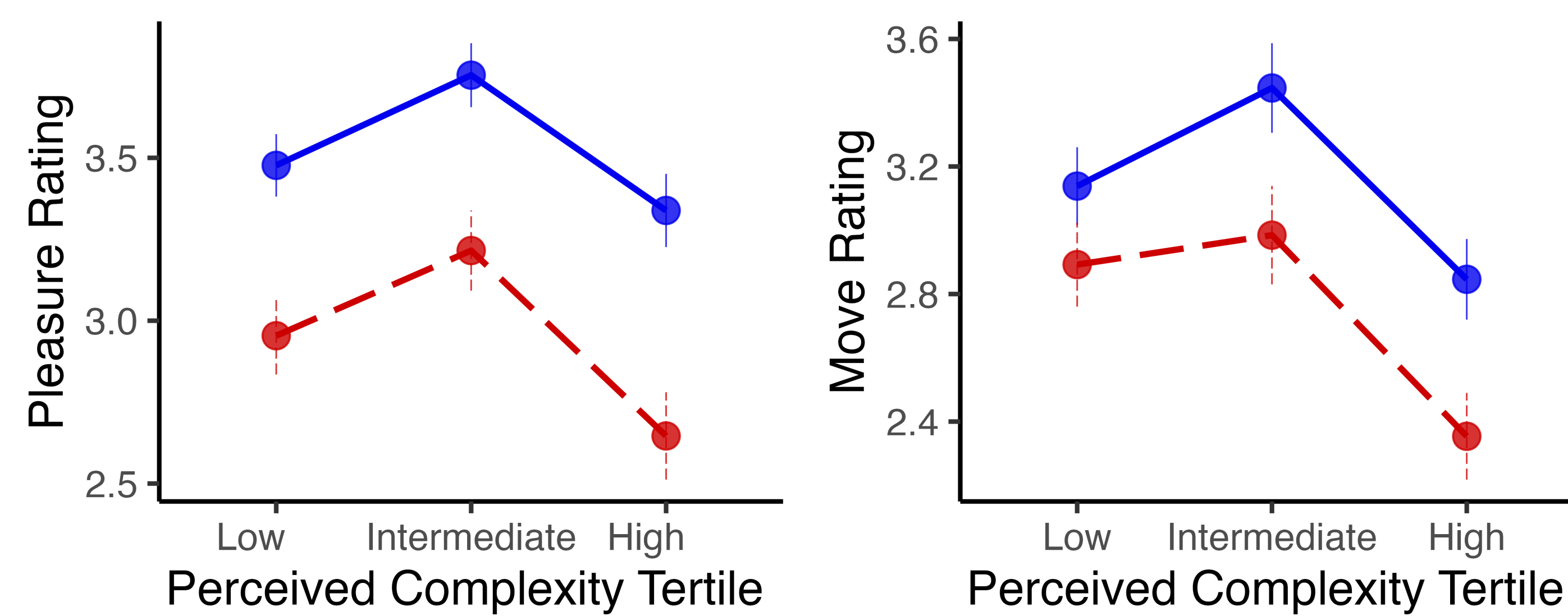
"Rock Steady", Aretha Franklin, Young Gifted And Black, 1971, Bernard Purdie PC = 3.39



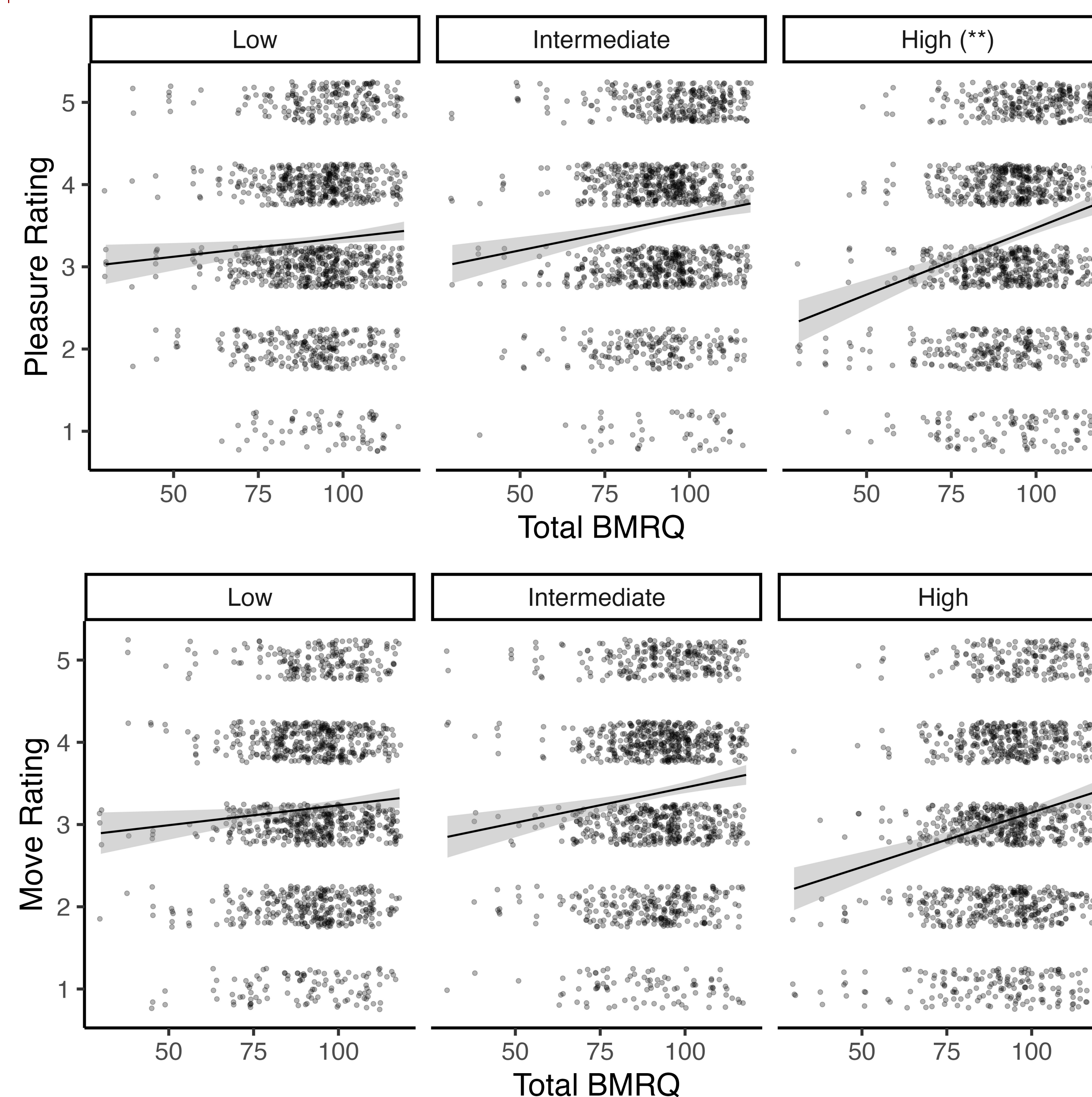
Identifying Musical Anhedonics



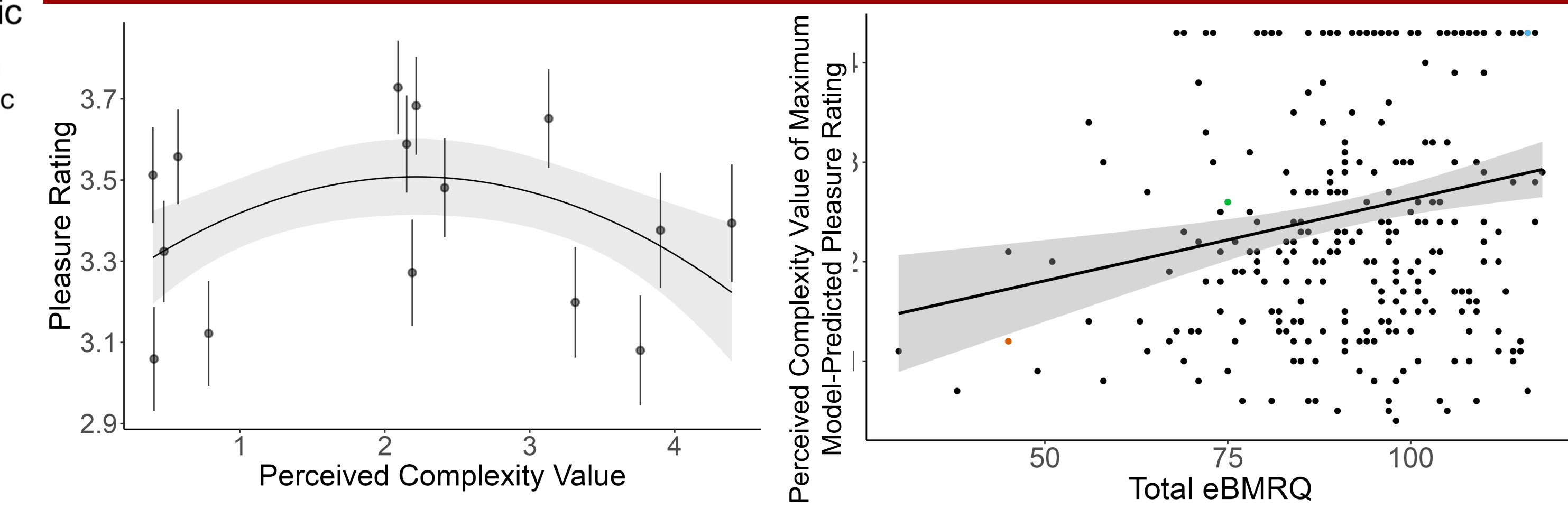
Musical Anhedonics Derive Less Pleasure than Matched Controls



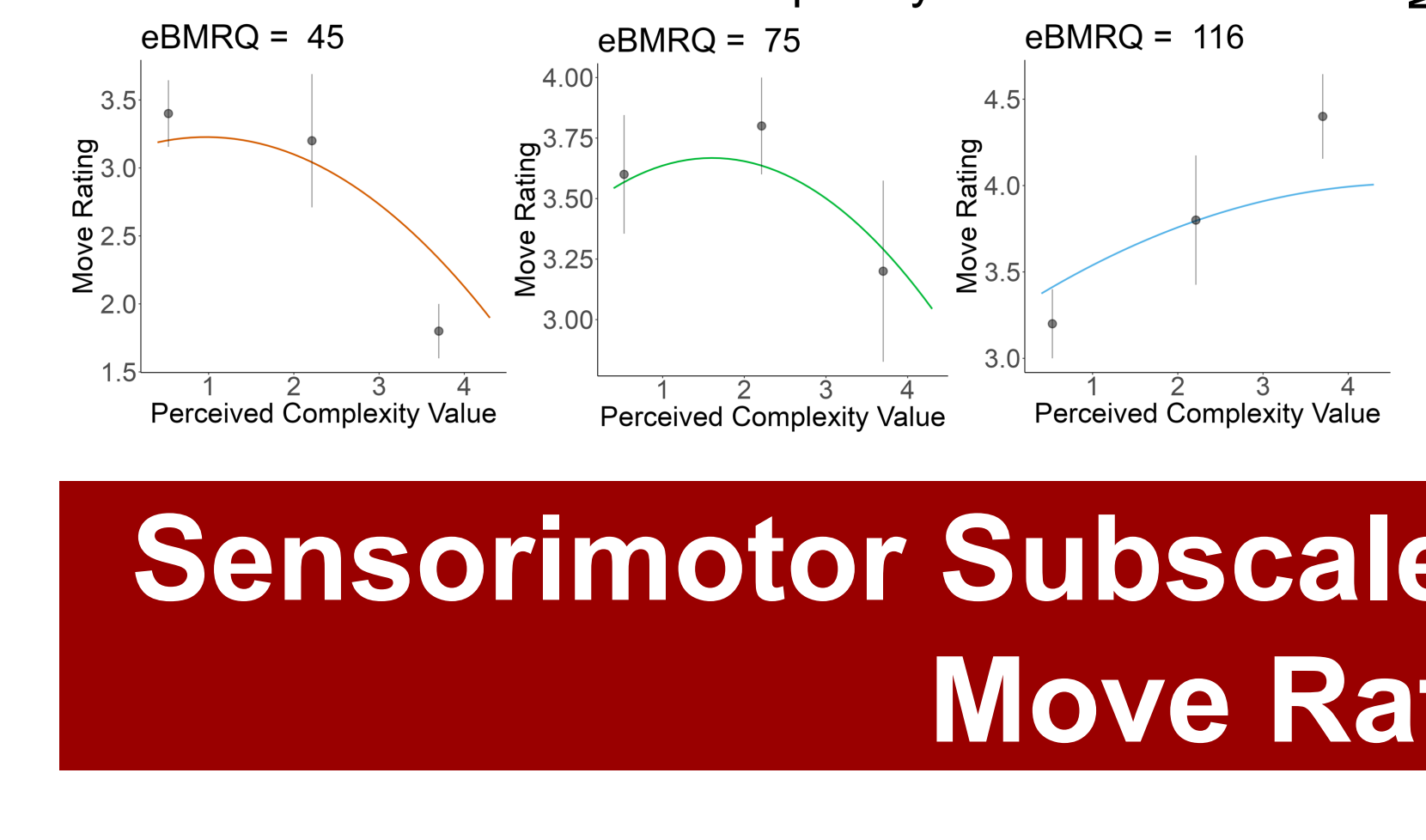
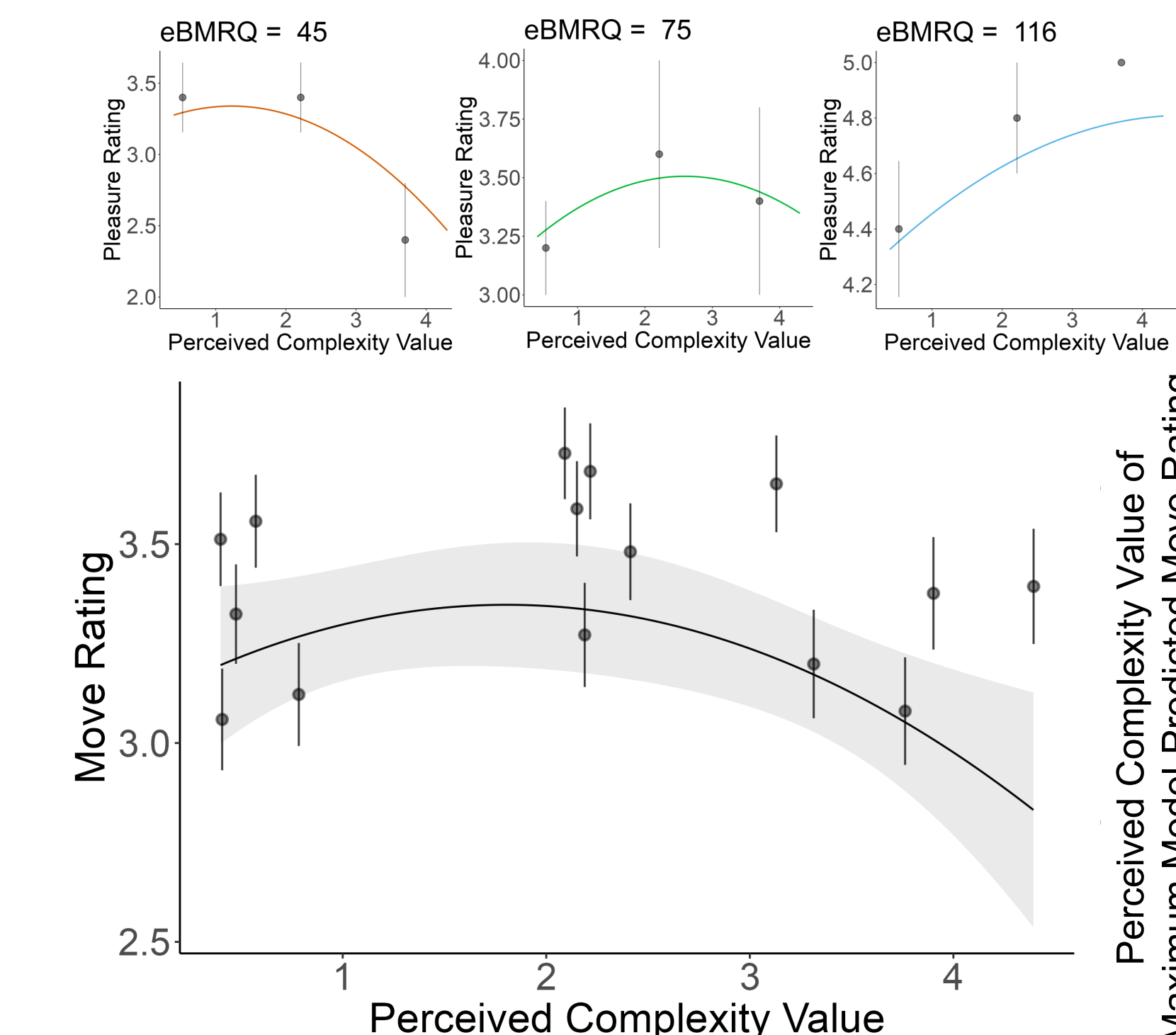
eBMRQ Scores Interacts with Complexity



High-eBMRQ Individuals Prefer Higher Complexity

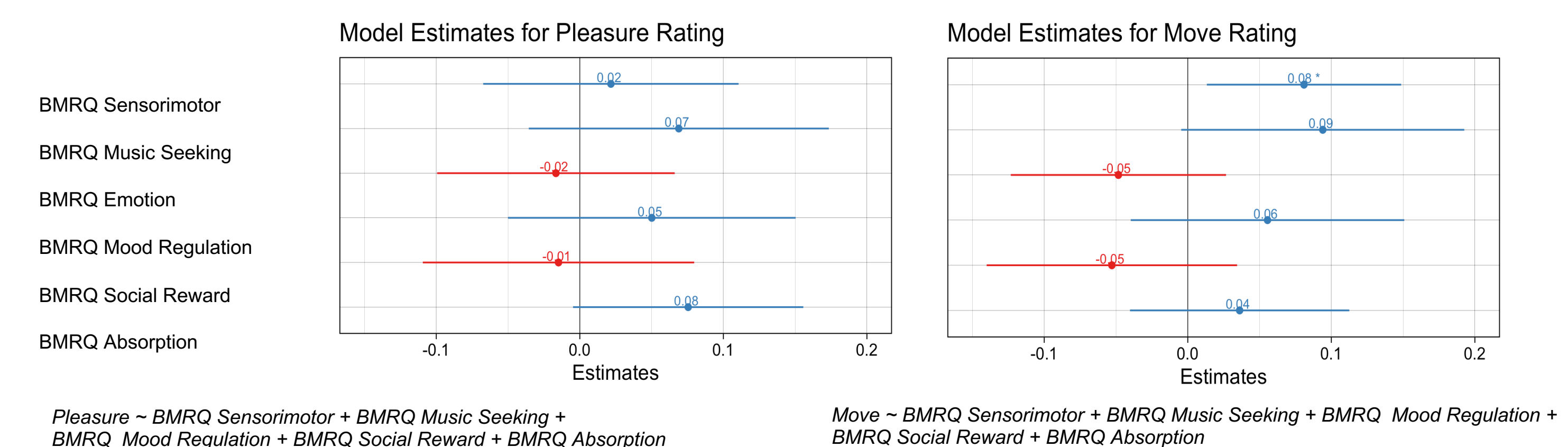


Apex of Quadratic Model relating Perceived Complexity vs. Pleasure Rating shifts upwards with eBMRQ.



Apex of Quadratic Model relating Perceived Complexity to Move Rating shifts upwards with eBMRQ.

Sensorimotor Subscale Uniquely Predicts Move Ratings



Discussion

- Musical Anhedonics experience less pleasure and desire to move than matched controls.
- Broadly, pleasure and move ratings increase with individual musical reward sensitivity. This relationship is steeper for high-complexity stimuli.
- Individual musical reward sensitivity increases peak preferences of complexity.
- Future work may disentangle the overlapping but separable mechanisms underlying pleasure and groove in motor and reward systems.

References

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