Does Music Aesthetics Contribute to Perceived Groove?

Toshiko Shibano, Anna MacLellan, Hyun Seung Son
University of British Columbia, MUSC 403/533F (17W2): Cognition of Musical Rhythm

INTRODUCTION

While there is a growing number of studies published on the topic of groove, there is still no established measures for groove perception. In addition, there seems to be two different definitions of groove. The psychological literature seems to refer only to sensorimotor synchronization (SMS) with musical rhythm but some researchers propose to include cognitive factors, too. Disentangling the make-up of groove perception is an important topic as it would facilitate scientific exploration of the dynamics of groove. Since literature about the mapping of dimensions of aesthetic reactions proposes a possibility of differentiating between the cognitive and affective dimensions, and given that quantitative methods are available in experimental aesthetics literature, we expect that groove perception is also quantifiable in terms of aesthetic experience based on these two dimensions. This study builds on Janata and colleagues' (2012) study; it measures three distinct dimensions (cognitive, affective, and motor) and identifies which dimension is the best predictor of perceived groove.

METHODS AND MATERIALS

Participants. Twenty-two adults (mean age = 37.7±12.9 years; 12 females, 9 males, 1 other) volunteered as part of a convenience sample.

Stimuli. The materials were taken from a previous study conducted by Janata and colleagues (2012): 'Superstition' by Stevie Wonder (H1), 'It's A Wrap by FH1' (H2) from high groove category; 'How High the Moon' by Ella Fitzgerald (M1), 'Walk on the Wild Side' by Jimmy Smith (M2) from mid groove category; and 'Thugamar Fin an Samhradh Linn' by Barry Phillips (L1), 'Hymn for Jaco' by Adrian Legg (L2) from low groove category.

Procedure. Participants completed an online survey (Qualtrics) in which they did two practice trials, six test trials, and completed demographics questionnaire. In each trial, they listened to a 30-sec stimulus once and rated four aspects of the stimulus: perceived groove (scale of 0-10), complexity (cognitive response), excitement (affective response), and motor impulse (each on a scale of 1-7).

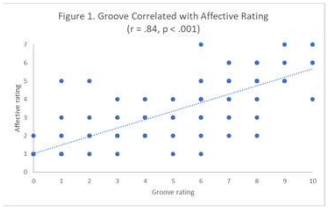
Survey. Aesthetic responses were measured by Bartel's (1992) CART-M (Cognitive Affective Response Test-Music). We chose two of 18 items from CART-M that demonstrated the greatest construct validity in his pilot study: complexity (cognitive aspect) and excitement (affective aspect).

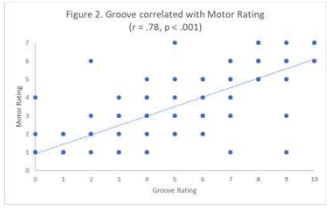
Table 1. Factor Association and Loading of Affective and Cognitive Adjectives by CART-M (scaled 1-7; n = 25)

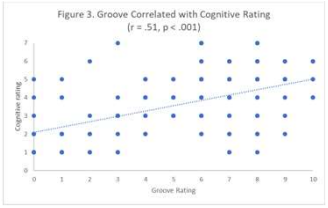
Affective dimension	Loading	Cognitive dimension	Loading
Excited*	(I) .91	Orderly	(II) .84
Joyful	(I) .88	Structured	(II) .87
Enlivening	(I) .80	Balanced	(II) .80
Elated	(I) .86	Clear	(II) .69
Thrilling	(I) .57	Delicate	(V) .85
Hot	(I) .64	Subtle	(V) .69
Delighted	(I) .54	Complex*	(III) .90
Emotional	(IV) .76	Ornate	(III) .78
Unforgettable	(IV) .75	Artistic	(III) .55

Roman numerals indicate component number: I. Affective (Emotional), II. Cognitive (Structural orderliness), III. Cognitive (Textural quality), IV. Affective (Inspiration), and V. Cognitive (Textural complexity). The figures after the roman numerals are the loading of the adjective on the particular component. The table was reproduced based on Table 6 of Bartel (1992).

RESULTS: INFERENTIAL STATISTICS







Figures 1-3. The affective rating was the most highly correlated with groove rating, $r = .84$, $p < .001$, followed by motor impulse, $r = .78$, $p < .001$, and then cognitive, $r = .51$, $p < .001$.

Table 2: Model Summary of Multiple Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.861[a]	.742	.736	1.55355

a. Predictors: (Constant), Motor_impulse, Complexity, Excitement

Table 2. Multiple regression analysis revealed that the correlation between groove rating and the best linear combination of cognitive, affective, and motor ratings is .86, indicating that the predictor variables account for 86% of the groove rating. $R^2 = .742$ means that 74.20% of variability in groove rating can be accounted for and predicted by the three variables.

Table 3: Coefficients of Cognitive, Affective, and Motor Ratings with Groove Rating

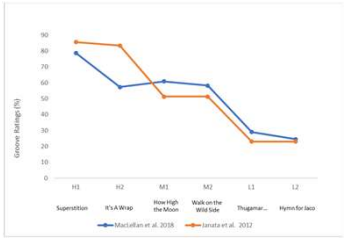
Extracted from an SPSS multiple regression between the dependent variable (groove ratings) and predictor variables (complexity, excitement, motor impulse)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-.478	.352		-1.356	.177			
	Complexity	.222	.098	.126	2.256	.026	.510	.196	.101
	Excitement	.738	.140	.422	5.282	.000	.814	.423	.237
	Motor_impulse	.643	.104	.426	6.159	.000	.784	.478	.277

a. Dependent Variable: Groove_Rating

Table 3. All of the predictor variables significantly predict groove ratings. Motor impulse was found to have the largest partial and semi-partial correlation with groove rating when the other predictor variables were removed.

RESULTS: DESCRIPTIVE STATISTICS



	Groove Ratings (%)		
	Shibano et al. 2018	Janata et al. 2012	Difference
H1	78.64	85.60	-6.96
H2	57.30	83.39	-26.09
M1	60.91	51.34	9.57
M2	58.20	51.26	6.94
L1	29.09	23.07	6.02
L2	24.55	23.07	1.48

Figure 4. Comparison of Groove Ratings
Ratings were transformed into a percentage scale.

Figures 4. The overall groove ratings were very similar between the two studies. One noticeable difference was 'It's A Wrap' (-26.09%).

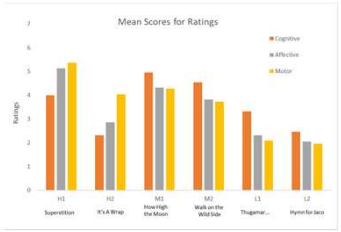


Figure 5: Mean Scores for Ratings
The average scores for each of the three measures (cognitive, affective, and motor)

Figure 5. The rating patterns of 'Superstition' and 'It's A Wrap' are similar; in contrast, the rating patterns of the remaining four songs have the opposite pattern. Distinct rating pattern of 'Superstition' may suggest that the optimal groove perception is likely when cognitive demand (i.e., complexity) is substantially low relative to arousal (i.e., excitement) and motor impulse.

CONCLUSION

This pilot study provides some evidence for the utility of aesthetic perception measures in the effort of disentangling the dynamics of groove perception. However, this study had limitations such as a small sample size and measuring only for two of CART-M items. In addition, we did not discard data who reported no English reading fluency. We intend to address this issue in our structured abstract. Future studies would be advised to repeat this study with a larger sample size in order to increase the power of the results. They should also include all the 18 items of Bartel's (1992) CART-M as well as more of Janata and colleagues' (2012) music samples to ensure that the nuances of each aspect are covered.

ACKNOWLEDGEMENTS AND REFERENCES

We would like to thank Dr. Poudrier, our fellow classmates, and the participants of our study for their valuable assistance with this project.

Bartel, L. R. (1992). The development of the cognitive-affective response test-music. *Psychomusicology, 11*, 15-26.

Janata, P., Tomic, S. T., & Haberman, J. M. (2011). Sensorimotor coupling in music and the psychology of the groove. *Journal of Experimental Psychology, 141*(1), 54-75.