Perceptual fusion of musical notes by native Amazonians suggests universal representations of musical intervals

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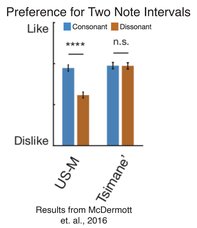
Introduction

- Music varies across cultures, but some features are widespread, and this raises the possibility that they are biologically determined.

- One proposed regularity in music is the presence of notes related by simple integer ratios; such note pairs are regarded as consonant (pleasant) by Westerners

- But Tsimane', an indigenous population living in the Bolivian Amazon, do not appear to have a preference for consonance over dissonance[1]



Results from McDermott et. al., 2016

Are observed aesthetic differences the result of perceptual differences?

Candidate Hypotheses:

1) Tsimane' might not represent concurrent notes similarly to Western listeners, potentially because of limited exposure to Western harmony

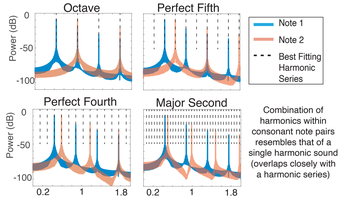
2) Tsimane' represent concurrent notes similarly to Western listeners, potentially because of adaptations to natural sound statistics

Approach & Methods

- Measure "fusion" - when note pairs are misperceived as a single note
  - Consonant intervals thought to "fuse" more than dissonant note pairs in Westerners[2]

- Measure preference for intervals

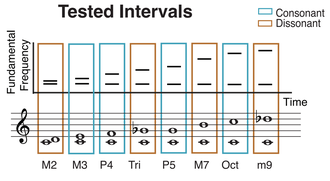
Spectra of Consonant vs. Dissonant Intervals



Combination of harmonics within consonant note pairs resembles that of a single harmonic sound (overlaps closely with a harmonic series)

- 31 Tsimane' participants and 28 participants from Boston completed the main Fusion and Preference experiments
- Experiments were conducted in participants' native language (Tsimane' or English)

Tested Intervals

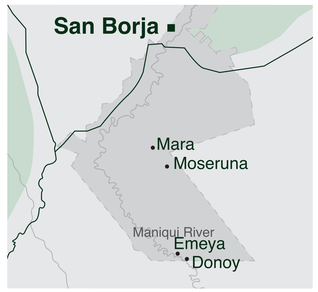


Typical Experimental Setup in a Tsimane' Village

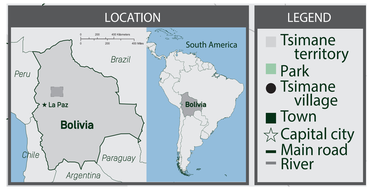
Experimenter sits across from participant, and translator gives instructions

- 100 participants completed the Individual Differences study, and were recruited online using Amazon Mechanical Turk.

Map of Tsimane' Territory with villages where testing occurred

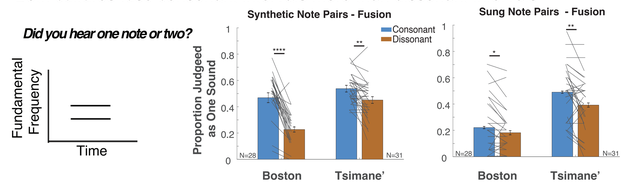


Mara and Moseruna are accessible from the town of San Borja by 4 wheel drive if there has been no rain. Emeya and Donoy are accessible by a 2-day trip in a motorized canoe.

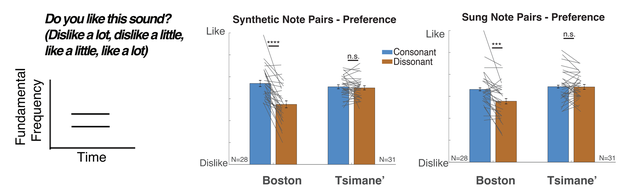


Observed aesthetic differences are not the result of perceptual differences

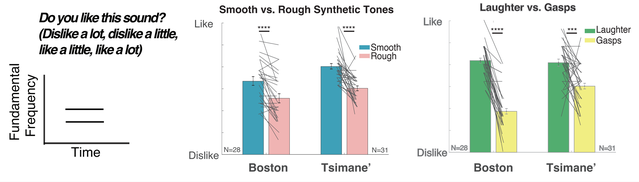
- Both cultures fuse consonant intervals more than dissonant intervals

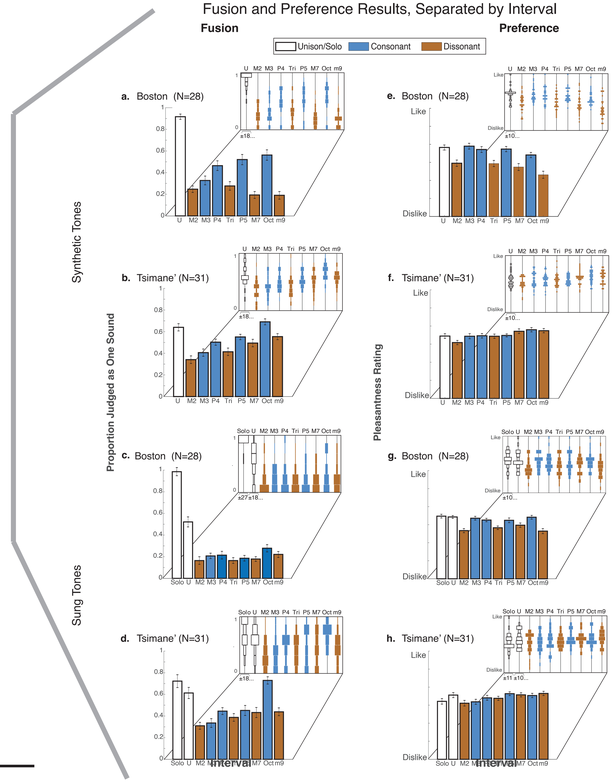


- Even though preference for consonance varies across cultures

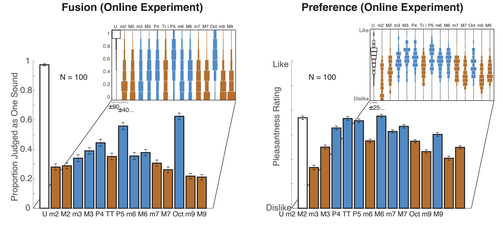


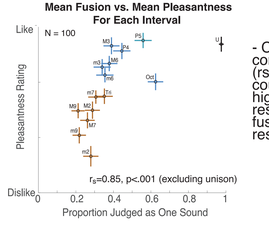
- Control conditions confirm task comprehension



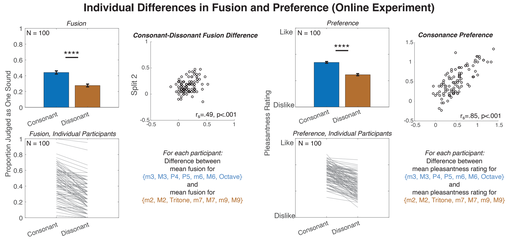


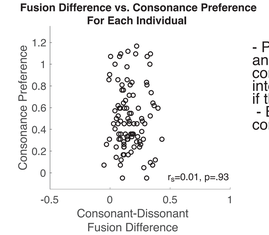
Individual differences in consonance do not predict fusion jugments in Western listeners





- Correlation between mean consonance and fusion (rs = 0.85) was lower than it could have been given the high reliability of the mean results (rs = 0.99 and 0.98 for fusion and consonance, respectively).





- Preference for consonance and degree of fusion for consonant vs. dissonant intervals should be correlated if the two effects are related.
- But the effects were not correlated across participants.

Conclusions & Discussion

- Both native Amazonians and US non-musicians were more likely to fuse cannonically consonant note pairs compared to dissonant note pairs, even though only listeners in the US exhibited preferences for consonance.

- Individual differences results show that consonance preferences of Western listeners are not predicted by fusion, suggesting distinct effects.

- Perceptual categories in music can be shared across cultures, but develop culture-specific aesthetic associations

- Fusion of consonant note pairs could reflect adaptations to harmonic natural sounds (importance of harmonicity in cocktail party problem)

Link to full paper:

References
1) McDermott, J.H., Schultz, A.F., Undurraga, E.A., & Godoy, R.A. (2016) Indifference to dissonance in native Amazonians reveals cultural variation in music perception.
2) Stumpf C. (1890) Tonpsychologie

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