

Preferences for Loudness and Pitch Vary Across Cultures

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Background

- Do we have innate preferences for or aversions to sounds?
- Cross-cultural research can help us determine whether preferences for or aversions to different types of sounds are biologically determined or culturally contingent



Hypotheses

1. Certain sounds may be aversive because they can damage our auditory system

- Loud sounds and sounds in the 2-5kHz range, which are amplified by the ear canal
- Example: Posited that 2-5kHz sounds are unpleasant because that is the same pitch range as macaque alarm calls (Halpern, Blake, Hillenbrand, 1986)

2. Sounds may be aversive because of context/outside information or cultural expectations

- Example: Preferences for musical consonance are culturally contingent (McDermott et al., 2016, McPherson et al., 2020)

Methods and Participants

Tested Preferences for:

- High vs. Low Tones (125-6000 Hz)
- Loud vs. Soft Tones (50-90 dB)
- Amplitude Modulated Tones
- Environmental Sounds
- Laughter vs. Gasps



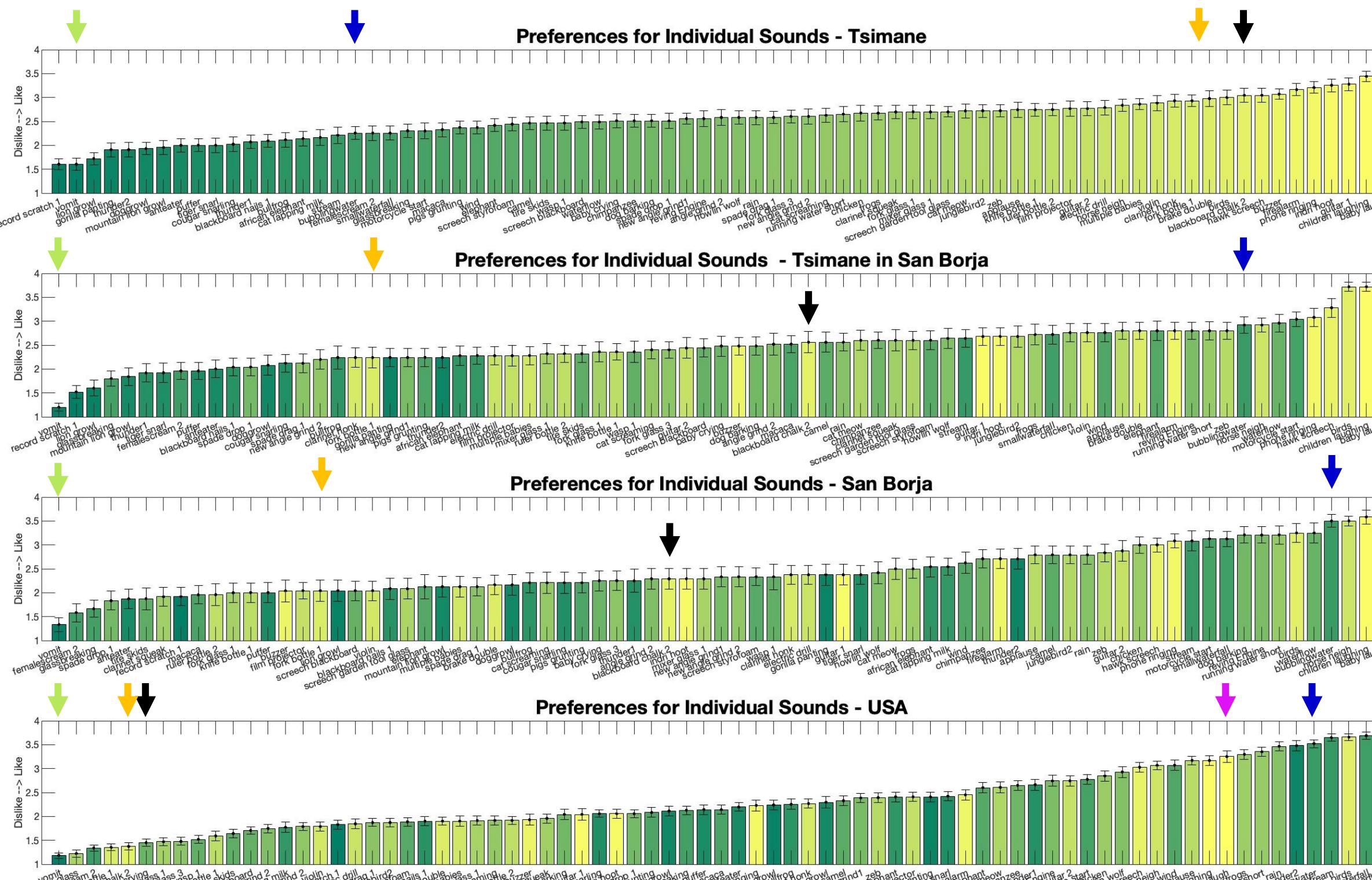
Identical Sets of Experiments in

- Tsimane'
 - Mostly monolingual Tsimane' speakers, live in the Bolivian Amazon
 - N=43
- Tsimane' who live in San Borja
 - N=25
 - Small town in rural Bolivia, in the region where Tsimane' live
- Non-Tsimane' Residents of San Borja
 - Non-indigenous Spanish speakers with electricity and cell phone service
 - N=24
- USA residents
 - In-person (N = 14) and online (N=71 – High vs. Low Tones and Environmental Sounds)



Experimenter on left, participant center, translator right. Participant wears over-ear headphones and experimenter enters responses.

Preferences for Environmental Sounds vary widely...



Color legend from Tsimane' held constant for other groups

Some preferences are shared:

Vomit

Baby Laughter

Some preferences are not shared:

Bubbling Water

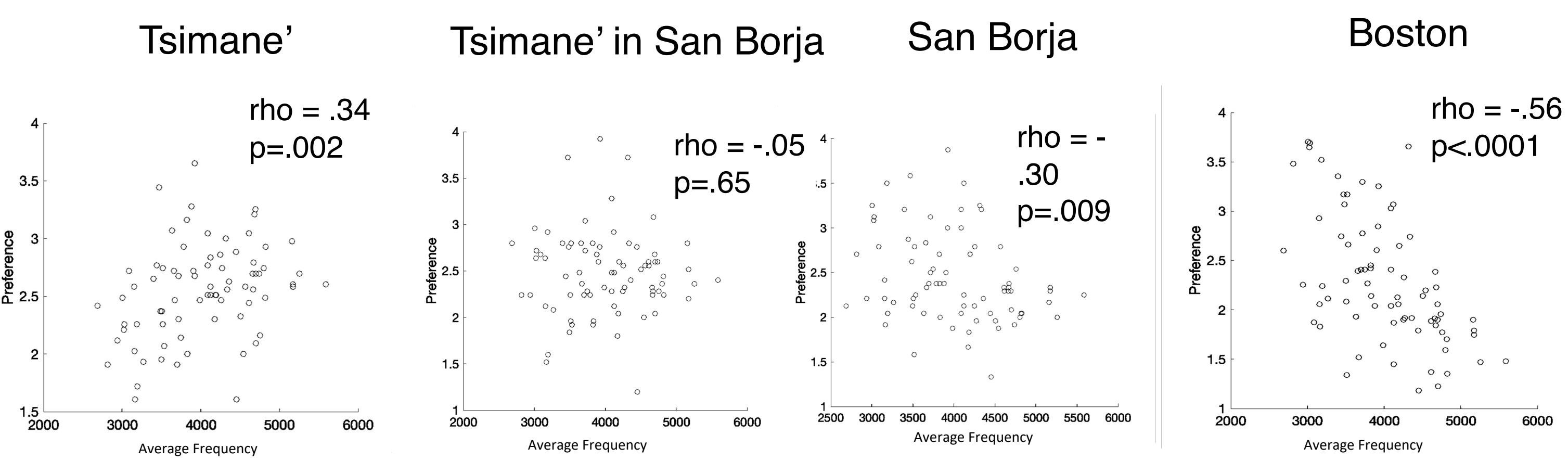
Chalk on Blackboard

Fork Scratching

Bottle

...but can be partially explained by different preferences for pitch height

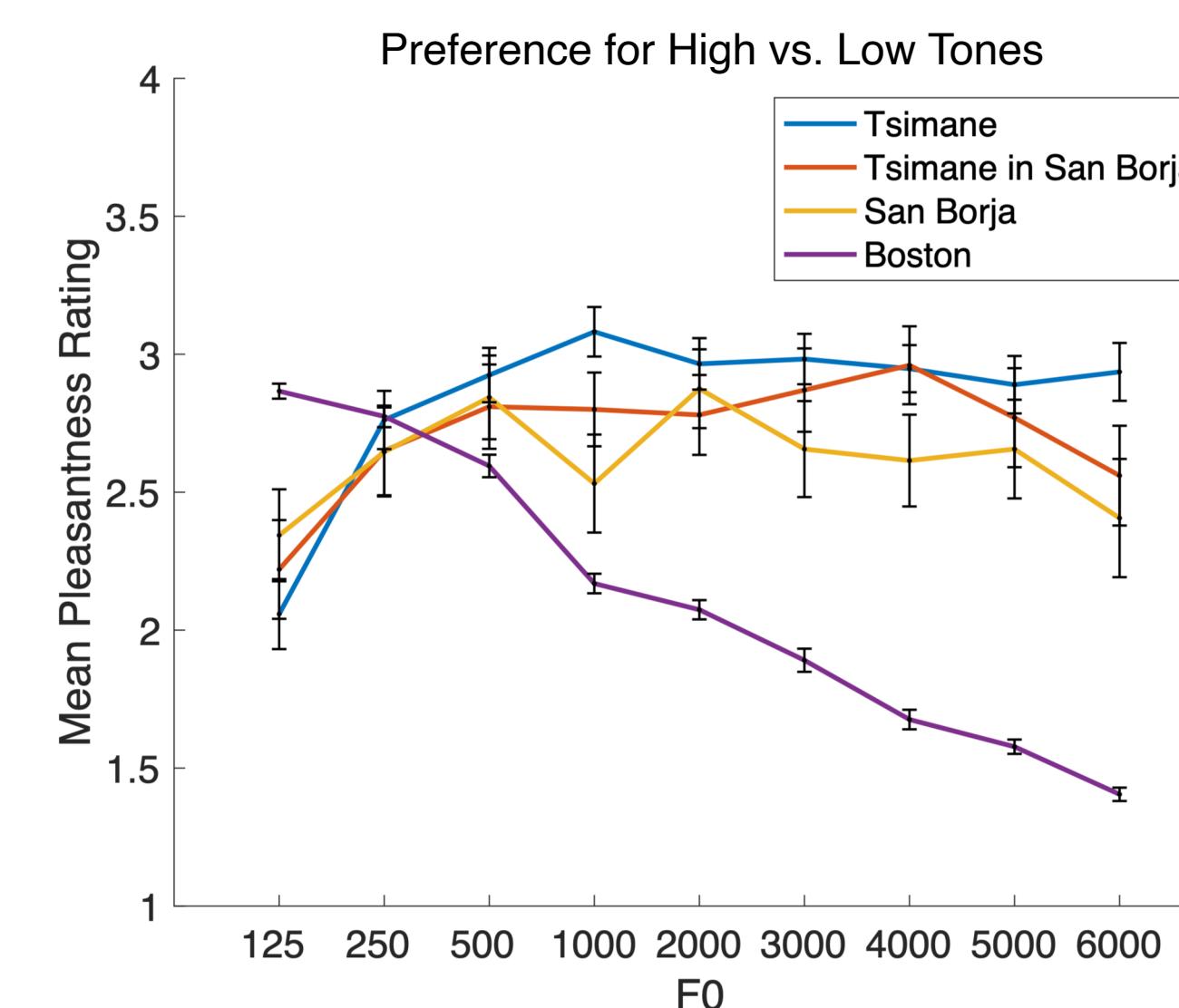
Post-Hoc Analysis: Correlation between preference ratings and average frequency content for individual sounds



Data from all groups had split-half reliability of at least $\rho = .72$

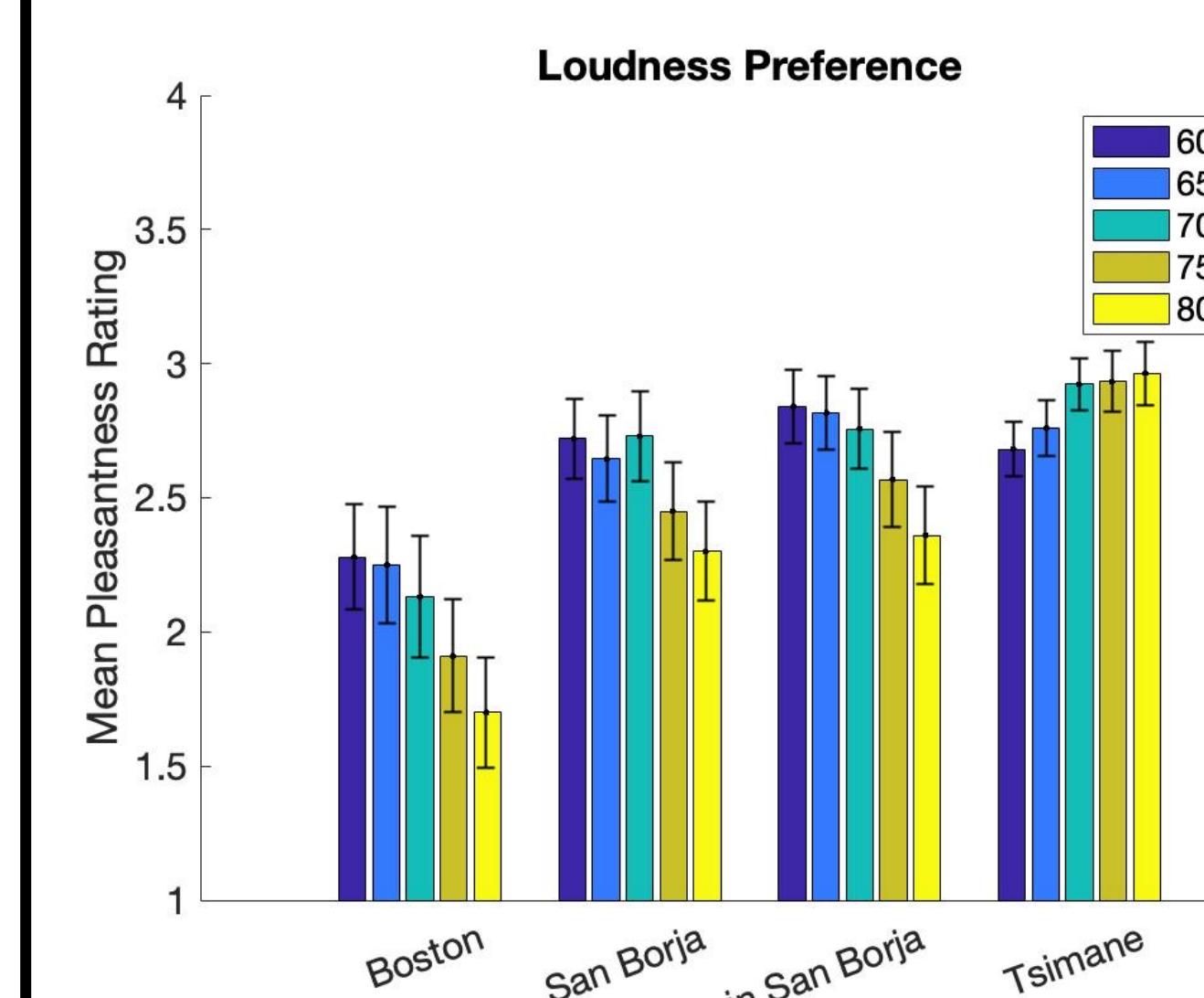
- While Tsimane' participants prefer low to high sounds, we observed the opposite pattern in San Borja and Boston

Preference for Pitch Height Varies Across Cultures

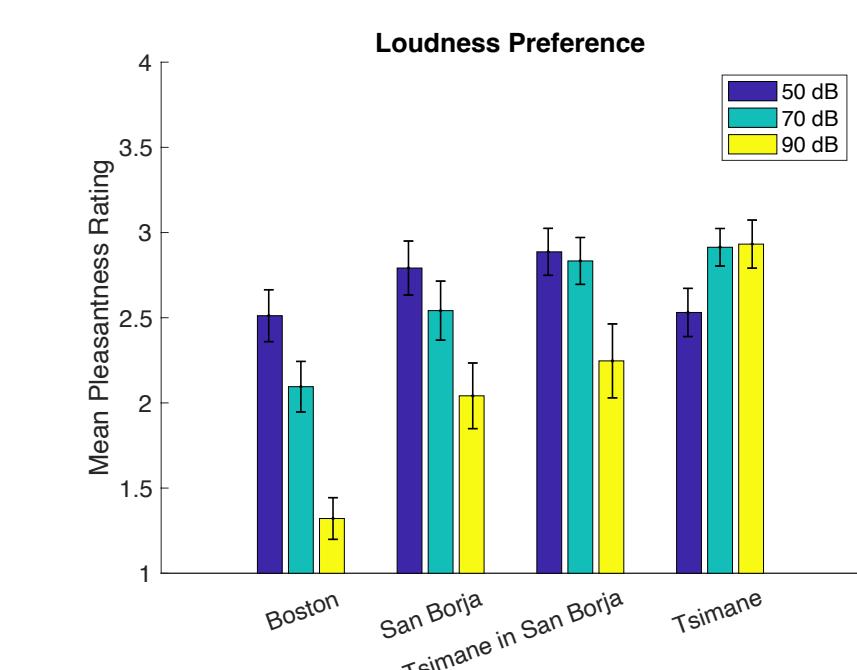


- Significant difference between Tsimane' who live in town and in traditional villages ($F(1,66)=5.89$, $p=.017$)
- Results suggest that the aversiveness of 2000-5000 Hz tones is acquired, rather than biologically determined
- Aversiveness of high or low tones is driven by some factor that varies continuously between Tsimane', San Borja (a small rural town), and the US

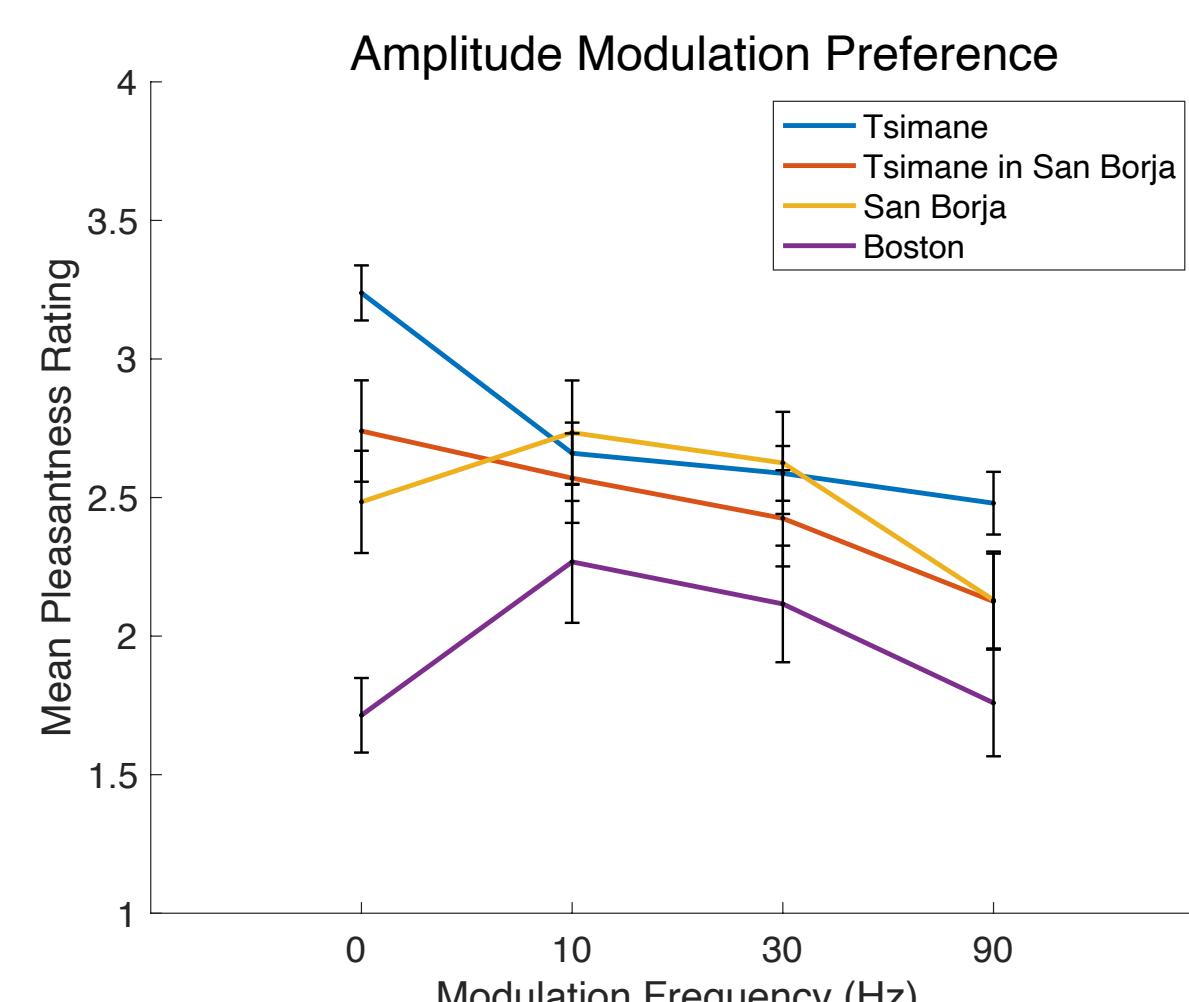
Tsimane' Prefer Loud to Soft Tones



Replication: Preference for loud sounds may plateau above 70 dB for Tsimane'



Preferences for Amplitude Modulations Vary Across Cultures



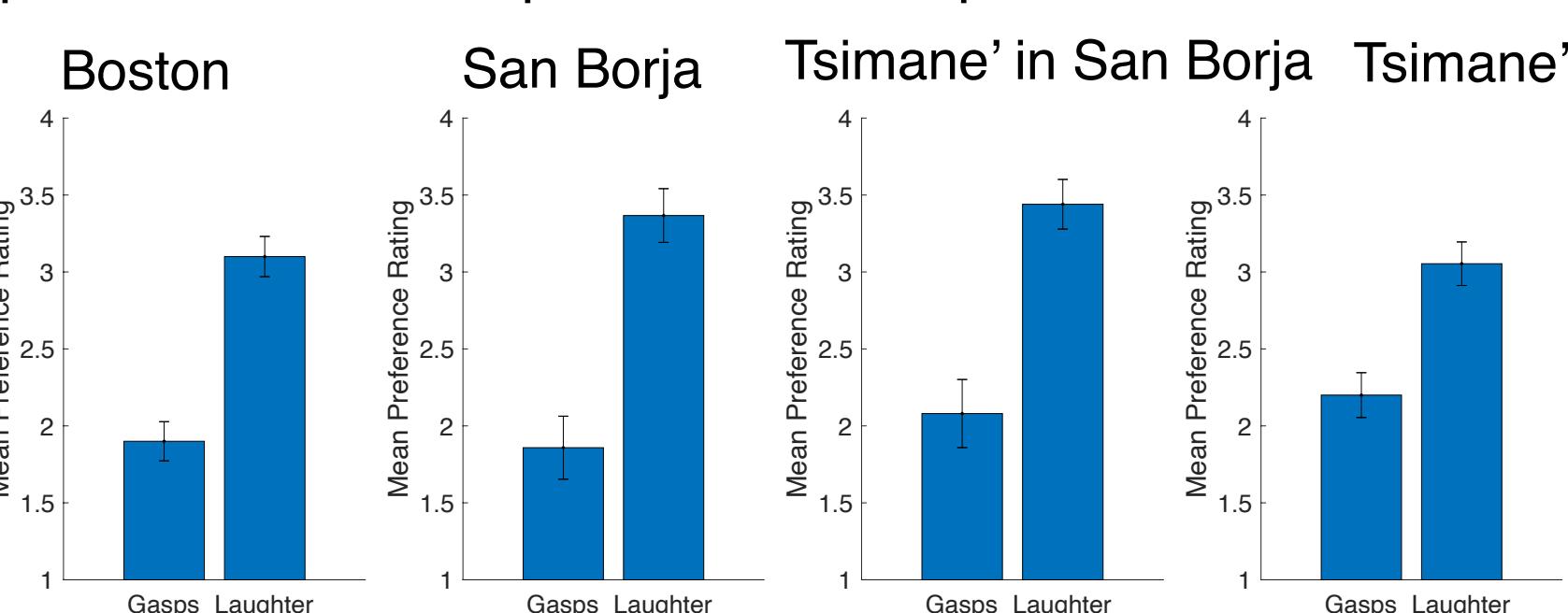
- All participants prefer lower modulation frequencies to higher modulation frequencies
- Boston participants prefer low levels of amplitude modulation to unmodulated tones, while Tsimane' strongly prefer unmodulated tones

Summary and Conclusions

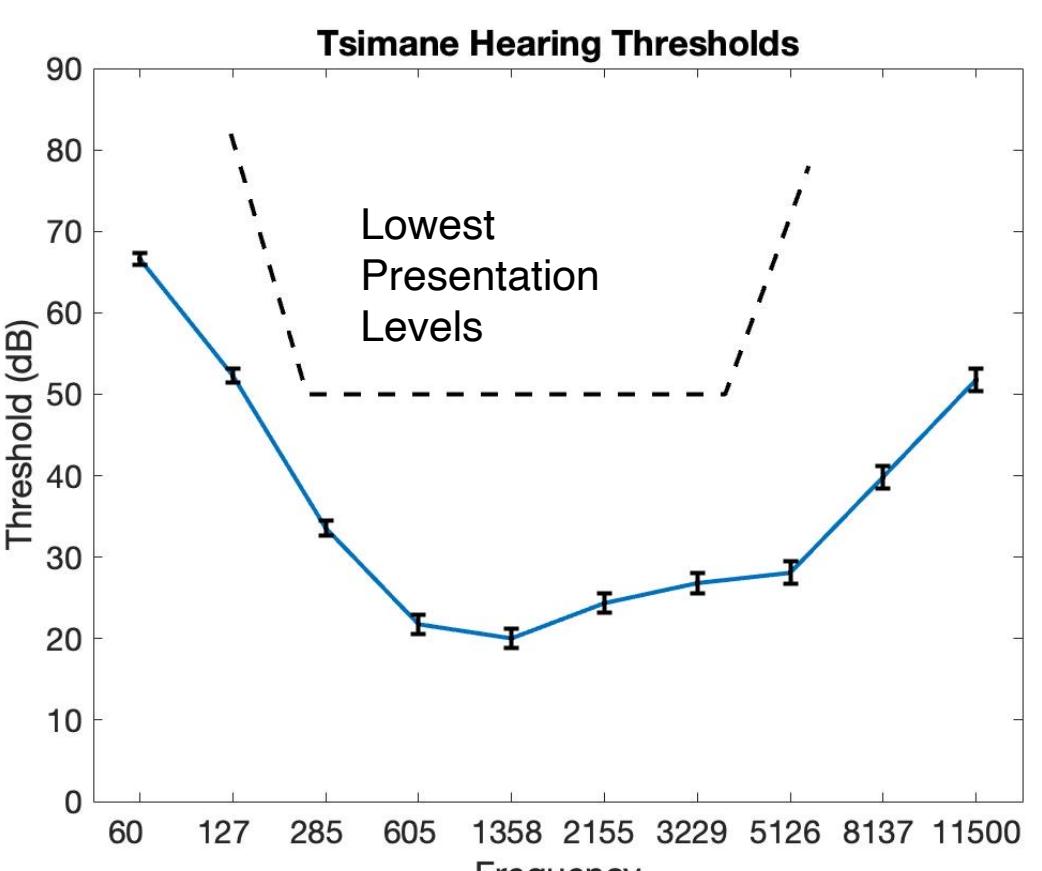
- Preferences for frequency and loudness appear to be learned
- Given the gradients in responses from Tsimane' to USA participants, aversion to high frequencies and loud noises is plausibly related to industrialization
- Preferences for environmental sounds appear to be at least partially driven by the frequency content of sounds

Possible Concerns & Alternative Explanations

People don't understand the task? → Control conditions confirm task comprehension, and anecdotal evidence from translators confirms that high-pitched sounds are preferred to low-pitch sounds

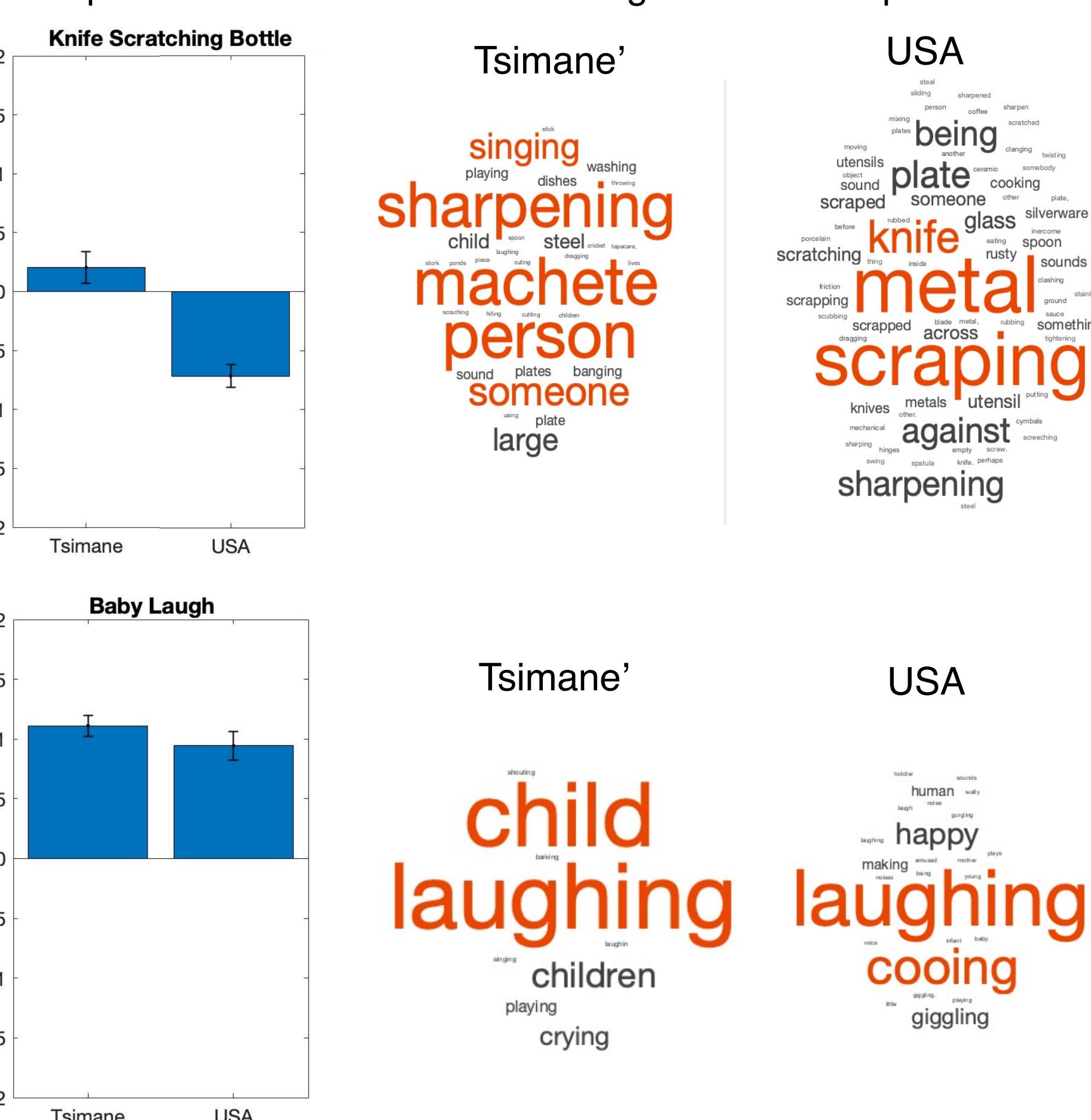


Hearing differences between populations? → Hearing test confirmed all sounds were audible to all groups



Genetics? → Differences between Tsimane' and Tsimane' who have moved into San Borja suggest that preferences are not genetically driven

People interpret the sounds differently → When asked to identify sounds, participants from Bolivia and the USA give similar responses



References

1. Halpern, D. Lynn, Randolph Blake, and James Hillenbrand. "Psychoacoustics of a chilling sound." *Perception & Psychophysics* 39 (1986).
2. McDermott, Josh H., et al. "Indifference to dissonance in native Amazonians reveals cultural variation in music perception." *Nature* 535:613 (2016).
3. McPherson, Malinda J., et al. "Perceptual fusion of musical notes by native Amazonians suggests universal representations of musical intervals." *Nature communications* 11.1 (2020).