

# Final Project: Music Preference

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# Introduction

- Physiological data
  - Use has been increasing in User Experience (UX) research
  - Its sensors record the involuntary physiological responses of participants when they are exposed to different stimuli
  - Can be more accurate because it does not account for user bias and can sense data that the user may not report
- When both physiological and user response data is used, we benefit the most and have a fuller understanding of the meaning of the results

In our experiment, we intend to study the physiological responses of participants when exposed to different genres of music, based on their preferences.

# Background

- Shafer et al's study (2013)
  - Sought to identify the main functions for why humans listen to music
  - Concluded that people listen to music:
    - To regulate arousal and mood
    - To achieve self-awareness, and as an expression of social relatedness
    - To relieve emotional music/To better understand themselves and their goals
- Jongwan and Wedell's study (2016)
  - Participants had to listen to 16 pop and 16 rock songs at different tempo and key
  - Found that the measures most consistently linked with arousal are those related to skin conductance
    - It can be assumed that the more a user is aroused or inspired by the music, the higher their skin conductance
    - Additionally, negative stimuli results in a deceleration of HR leading to a negative correlation and vice versa.

# Background

- Yao et al's study (2014)
  - Researched the relationship between physiological data and traditional UX metrics such as self-report data and task performance.
  - Found that physiological data is a useful metric in evaluating User Experience in a media context.

# Research Questions

- Does a person's preferred or disfavored genre of music induce a statistically significant physiological response as compared to the response to other music genres?
- Does physiological data correlate to self-report metrics?

# Hypothesis

We hypothesize that participants will exhibit:

- A positive physiological response to their favorite genre of music
  - Resulting in an increase in heart rate and GSR
- A negative physiological response to their least favorite genre of music
  - Resulting in a decrease in heart rate and GSR

# Participants

- 11 participants, who are RIT students between the ages of 18 and 24
  - 6 males
  - 5 females

# Methodology

- This study will include the following music genres:
  - Electronic
  - Rock
  - Classical
  - Rap
  - Country
  - Pop
- Each genre with the exception of Classical will be split into several sub-genres to further narrow down the participants' preferences
  - For Classical, we will be using Beethoven's Fifth Symphony only



Rock	Electronic	Country	Hip-Hop/Rap	Pop
Screamo	Electro House	Alternative	Southern Rap	K-pop
Metalcore	Vocal Trance	Rockabilly	Dirty South	J-pop
Post-Hardcore	Progressive Trance	Bluegrass	G Funk	Bubblegum Pop
Stadium Rock	Tribal Techno	Christian Country Music	East Coast	Power Pop
Heavy Rock	Acid Techno	Country Rap	West Coast	Ballad
Progressive	Minimal House	Swing Music	Ghettotech	Vocal Pop
Emo		Stadium Country	Grime	Dance Pop
Shoegaze		Country Pop		
Lo-Fi				
Electroclash				

**Figure 1:** The selected genres and subgenres of music that will be tested

# Procedure

- Pre-Study Questionnaire & Consent Form
  - Favorite genre of music
    - Describe at least 3 features/characteristics of this genre
  - Least favorite genre of music
    - Describe at least 3 features/characteristics of this genre
  - Emotional State - Self-Assessment Manikin (SAM)
- Study
  - Participants will be hooked up to the physiological sensors and will be provided headphones
  - Participants will listen to 30 second sound bytes from their preferred or least preferred genre of music
  - 30 second of silence and participant will be given SAM to fill out
  - Participants will listen to 30 second sound bytes from their preferred or least preferred genre of music
  - Participants will be given SAM to fill out

# Data Collection and Results

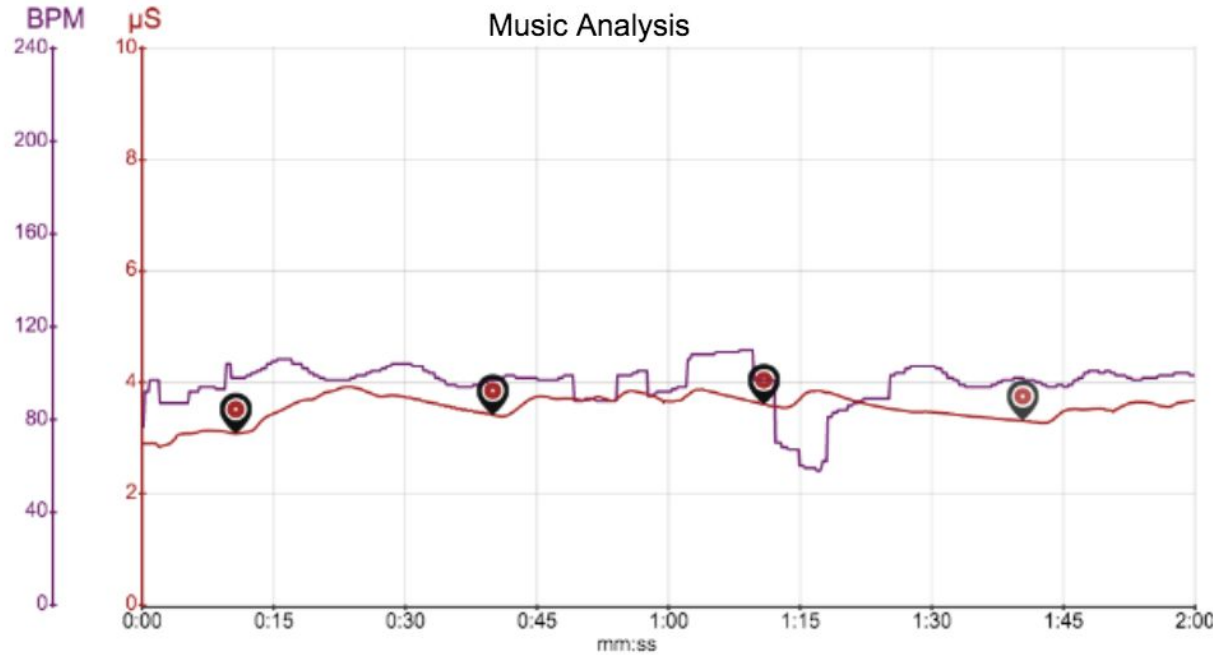
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# Quantitative

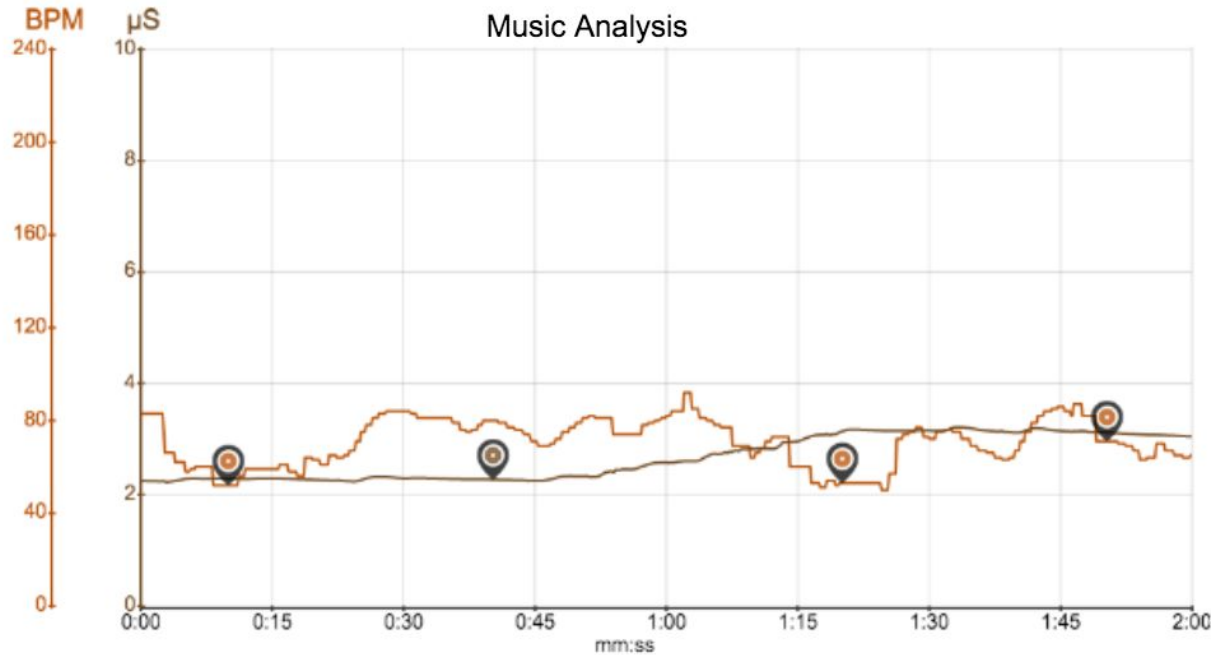
For this study, we used NeuLog equipment to record participants' heart rate (HR) beat per minute and galvanic skin response (GSR). Based on trends and patterns between participants, we determine if there are significant physiological changes based on the music played.

**Heart Rate BPM**

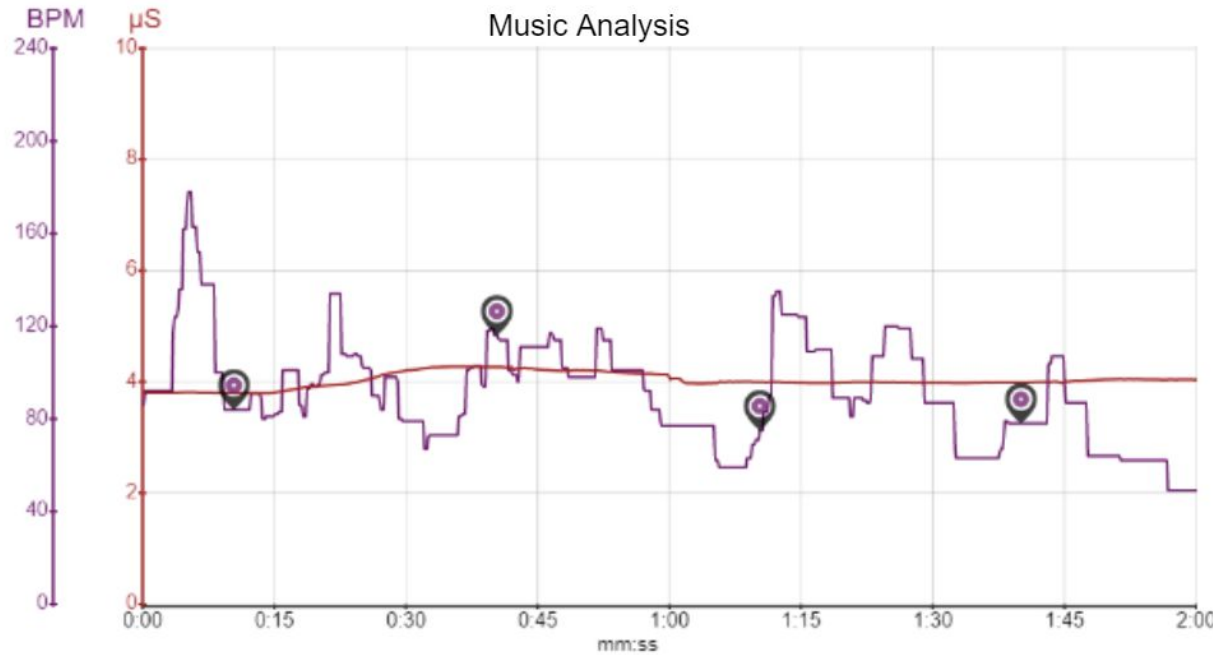
**Galvanic Skin Response  $\mu S$**



**Figure 10:** Participant 4 (mep8959) results when favorite (Emo Rock) was played first, and least favorite (Techno Acid Electronic) was played second.



**Figure 11:** Participant 5 (mmh7157) results when least favorite (Stadium Country) was played first, and favorite (East Coast Hip-Hop/Rap) was played second.



**Figure 17:** Participant 11 (tjr9268) results when favorite (Electronic Acid Techno) was played first, and least favorite (Classical) was played second.

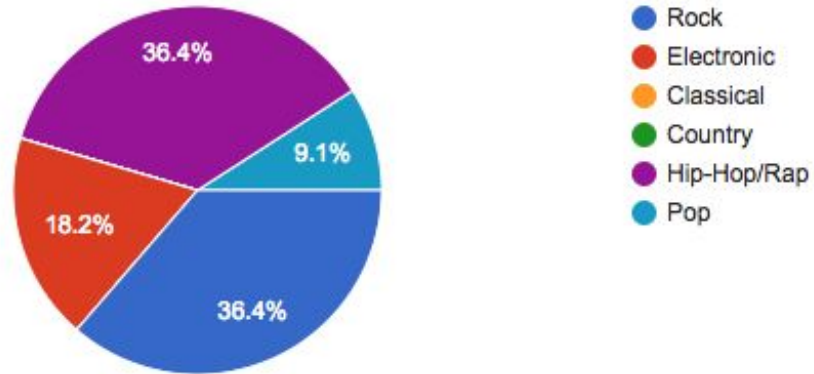
# Qualitative

- The self-reported questionnaire that was given to all the participants will determine their preferences of music.
- The three Self-Assessment Manikin survey's per participant in each experiment will be able to tell us how each participant is feeling before and after each song.
  - We will cross-reference this data with the physiological responses of HR and GSR to see if there is a correlation between the two data sets



## Which of the following is your favorite genre of music?

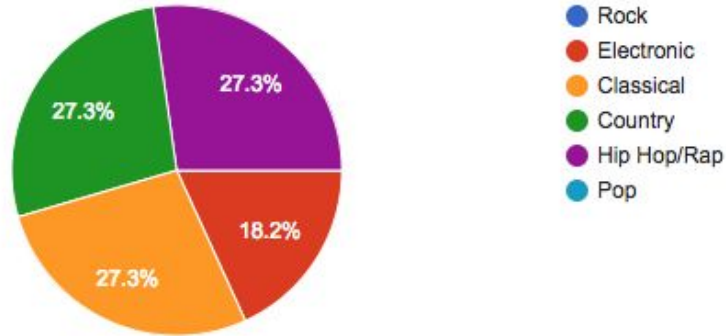
11 responses



**Graph 1:** Pie Graph showing the relative comparisons of preferred music genre

## Which of the following is your least favorite genre of music?

11 responses



**Graph 2:** Pie Graph showing the relative comparisons of least preferred music genre

# Data Analysis

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# Data Analysis

Using the physiological data to determine if there are any genres of music that affects the participant's response based on their preference.

We also use the results from the pre-study questionnaire and the Self Assessment Manikin (SAM) to compare the recorded physiological responses of the participants to their self-reported responses to see if there is a significant correlation to user's preferences and their response to each sample.

# Heart Rate and Galvanic Skin Response with SAM

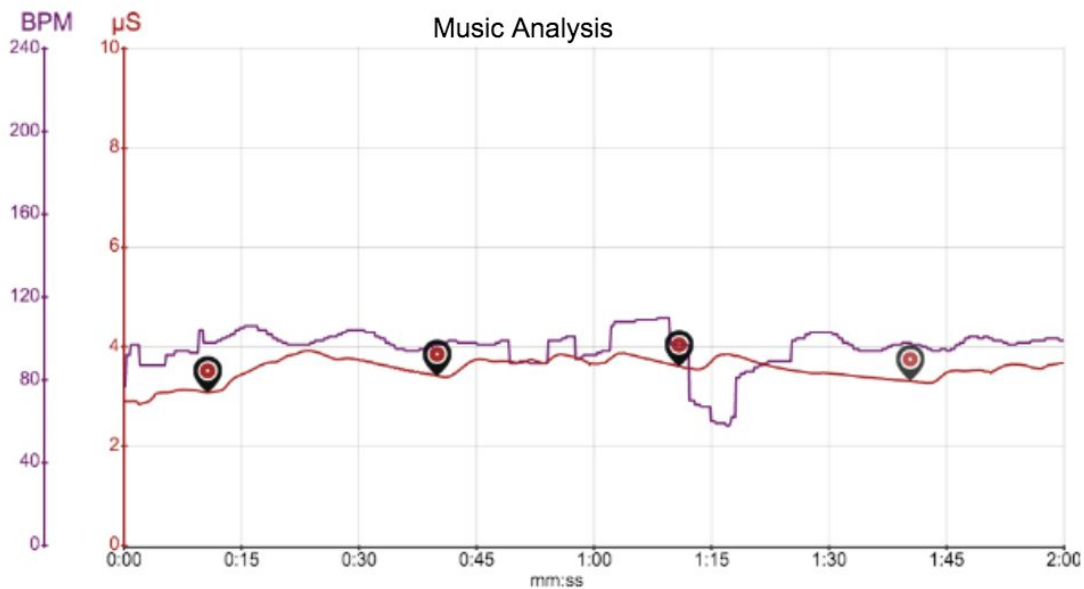
To completely analyze the effect on physiological response to least and most preferred music genres, we have selected three participants which demonstrate the many responses that can occur.

We will analyze these participants' heart rate and skin conductance for both songs played and compared these with their self-reported mood responses from SAM.

# Participant 4

**Favorite:** Emo Rock - *I'm Not Okay (I Promise)* by My Chemical Romance

**Least Favorite:** Electronic Acid Techno - *Hard Acid Techno* - Acid Track



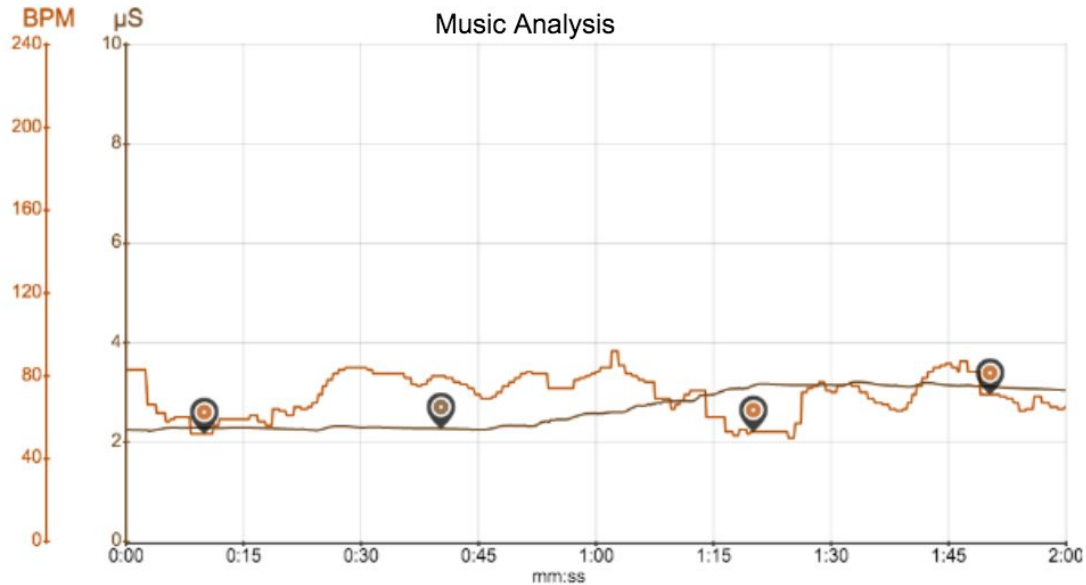
# Participant 4

- **Before the Study:**
  - **SAM:** Neutral Valence, Low Arousal, Slightly Below Neutral Dominance
  - **BPM:** Increase
  - **GSR:** Increase
- **First Song - Favorite:**
  - **SAM After:** Major Increase in Valence (1 under max) and Increase in both Arousal and Dominance, both slightly over neutral
  - **BPM:** Steady Increase - Overall positive increase from 50-77 BPM
  - **GSR:** Steady Increase - 2.81-3.21  $\mu$ S
- **Second Song - Least Favorite - and End of the Study:**
  - **SAM After:** Major Decrease in Valence and Dominance and Major Increase in Arousal
  - **BPM:** Initial drop, then the heart regulates itself - Overall positive increase from 58-103 BPM
  - **GSR:** Slow Decrease - 3.30-3.38  $\mu$ S

# Participant 5

**Favorite:** East Coast Hip-Hop/Rap - A sample by NY State of Mind

**Least Favorite:** Stadium Country - *Big Green Tractor* by Jason Aldean





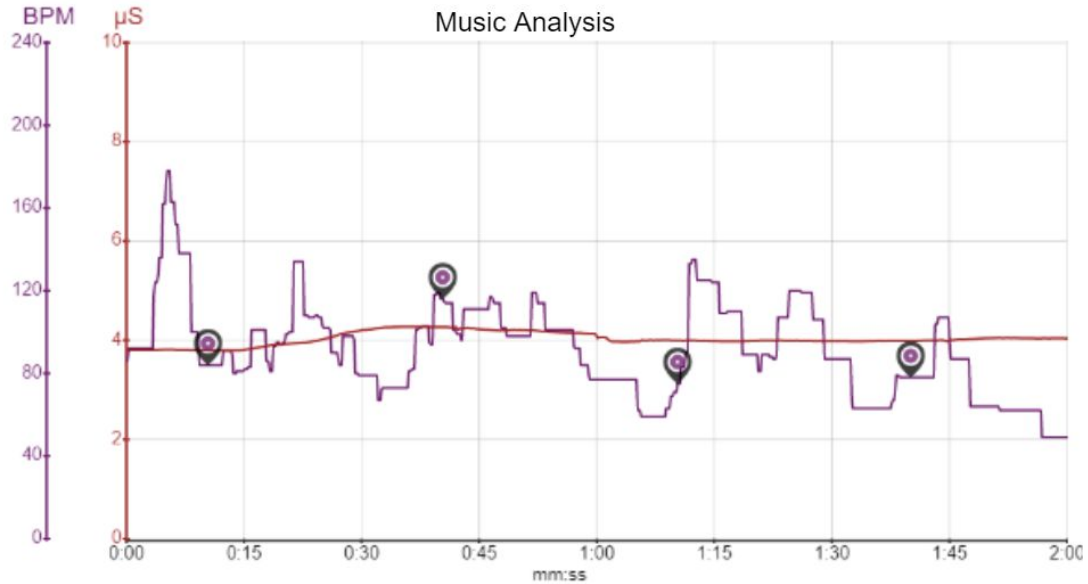
# Participant 5

- **Before the Study:**
  - **SAM:** Neutral Valence, Relatively Calm in Arousal, Neutral Dominance
  - **BPM:** Steady Decrease
  - **GSR:** Flatline
- **First Song - Least Favorite:**
  - **SAM After:** Slight Decrease in Valence, Decrease in both Arousal and Dominance
  - **BPM:** Increase slightly and a sharp dip before the heart regulates itself - Overall positive increase from 52-84 BPM
  - **GSR:** Relatively Same, with little arousal - 2.23-2.31  $\mu$ S
- **Second Song - Favorite - and End of the Study:**
  - **SAM After:** Increase 1-2 levels in all three, Valence, Dominance, and Arousal
  - **BPM:** Spike twice as the heart tries to regulate itself - Overall positive increase from 50-77 BPM
  - **GSR:** Steady Increase throughout the sample

# Participant 11

**Favorite:** Electronic Acid Techno - *Hard Acid Techno* - Acid Track

**Least Favorite:** Classical - *Beethoven's Fifth Symphony*



# Participant 11

- **Before the Study:**

- **SAM:** High Level in Valence, Neutral Arousal, Slightly Above Neutral Dominance
- **BPM:** Huge spike before falling into baseline
- **GSR:** Flatline

- **First Song - Favorite:**

- **SAM After:** Maximum level in Valence and Arousal and Decrease 2 levels in Dominance
- **BPM:** Three initial spikes then the heart tries to regulate itself - Overall increase from 67-134 BPM
- **GSR:** Steady Increase - 3.79-4.27  $\mu\text{S}$

- **Second Song - Least Favorite - and End of the Study:**

- **SAM After:** Same level of Valence as before the study, Slightly Below Neutral Dominance and Major Decrease in Arousal (Fell to the minimum level)
- **BPM:** Spike less often than the previous song, then the heart regulates itself - Overall negatively increase from 63-135 BPM
- **GSR:** Relatively Neutral - 3.98-4.0  $\mu\text{S}$

# Conclusion

Our hypothesis is inconclusive as our study has shown.

- Tempo and Musical and Lyrical Intensity of a song directly correlates to increase heart rate and GSR.
- Regardless of participant's feelings toward the genre, their heart rate will *always* regulate itself to sync up with the tempo of the song.
- GSR correlates with participants' level of arousal. It is dependent on their mood and feelings towards the particular genre.

# Recommendations

In the future, we suggest :

- A higher number of participants
- Limiting the number of genres to a few that represent various beats, tempos, and bass lines that would cause heart rate to fluctuate
- Instead of collecting preferences, have participants listen to same number of various songs being played at random

Thank You

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