Valence in Music

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Introduction

Objectives:

- ➔ **Goal:** Explore and assess how musical elements influence the valence of a song to create a particular vibe in music.
- ➔ **Population of interest:** Songs (digital music compositions) that can be streamed on Spotify.
- ➔ **Possible stakeholders:** People who make music and want to create a certain feel to their songs (i.e. musicians, sound engineers, and producers); Companies and distributors in the music industry who want to better understand valence to implement it in their music marketing tactics.
- ➔ ***I expect mood to*** have a strong positive correlation with valence. A higher valence represents more of a positive sound, so a song with a happy mood would have a more positive sound, and vice versa for a sad mood song.
- ➔ ***I expect faster tempos to*** have a positive relationship with a higher valence, and vice versa, because tempo influences the pace of a song.

Research Question 1 – *Does a happy mood correlate with a higher valence?*

Research Question 2 – *Does a slower tempo correlate with a lower valence?*

Methods

Data Collection:

- ***Data collected from*** an open source raw dataset. My sample will not be completely representative of my population of interest as the *songs were not randomly selected*.
- **Individual sampling unit:** a single song
- **Final sample size:** n=100

Measures:

- ***Valence*** will represent my numeric response variable, which ranges from a scale of 0.0-1.0 and represents a more positive sound as the valence value gets closer to 1.0.
- ***Mood*** will be my categorical explanatory variable. It will categorize my song samples as either having a happy or sad mood.
- ***Tempo*** will be my numeric explanatory variable, which lists the tempo of each song with a standardized unit of beats in a song per minute (bpm).

Analysis Method: I ran a GLM model on RStudio.

Descriptives

Response Variable: Table 1 – Descriptive Statistics (n=100)

Valence	Median	IQR
Response Variable	0.4055	0.4505

Explanatory Variables: Table 2 – Descriptive Statistics (n=100)

Mood	Frequency	Relative Frequency
Happy	50	50%
Sad	50	50%
Total:	**100**	**100%**

Table 3 – Descriptive Statistics (n=100)

Tempo (bpm)	Median	IQR
Explanatory Variable 2	116.6675	28.1725

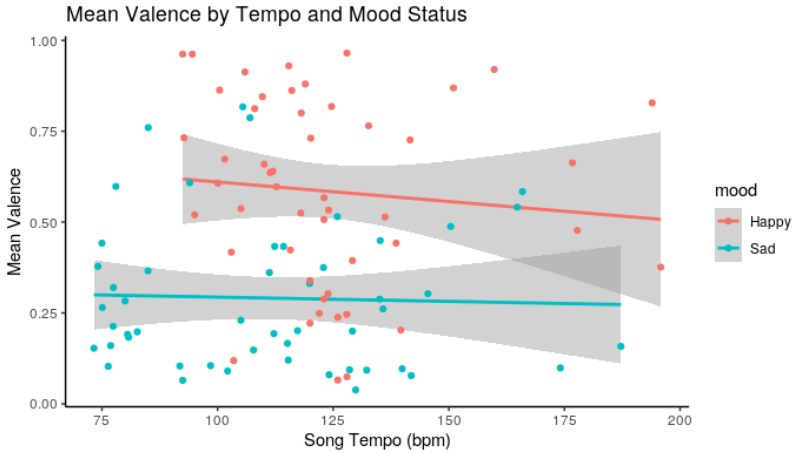
Results

Table 4 – Model Results – GLM with Interaction

Variable	Estimate	S.E.	T-value	P-value
(Intercept)	0.591	0.034	17.305	<2e-16***
mood_Sad	-0.302	0.048	-6.285	9.6e-09***
tempo_c	-0.001	0.001	-0.757	0.451
mood_Sad:tempo_c	0.001	0.002	0.460	0.646

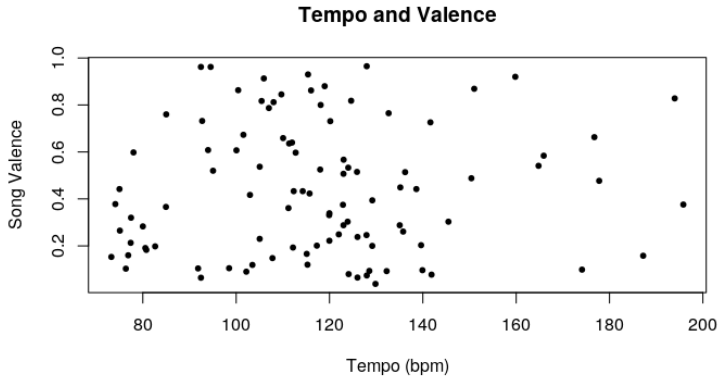
***Adjusted R-squared* = 27.3%**

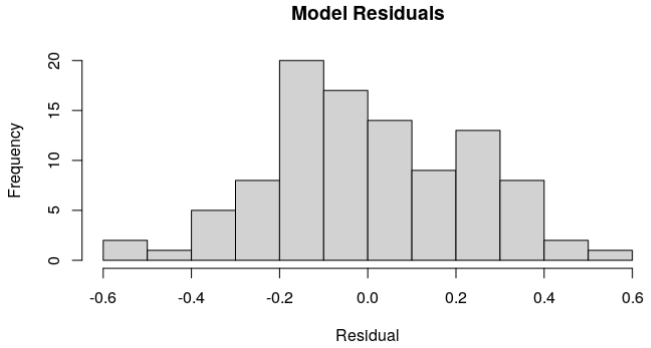
Interaction Plot:

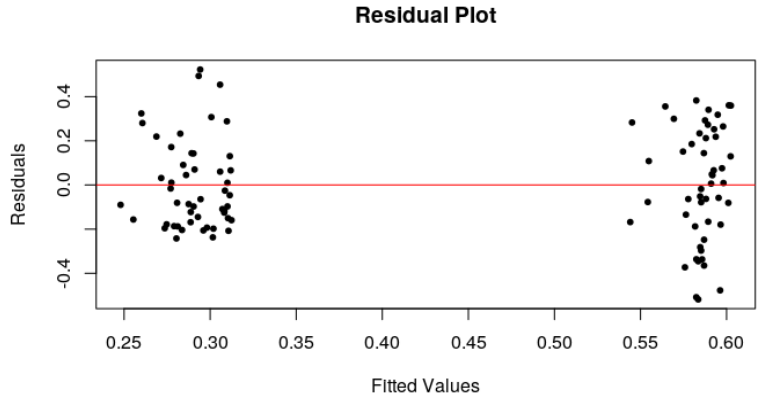


Assumptions

1. I visually checked for **linearity** of my numeric predictors with a **scatter plot**. This *assumption was not met* as the points were mainly scattered.
2. I checked for **normality** of the model residuals using a **histogram**. This *assumption was met* as the shape was roughly symmetric.
3. The pattern of the dots in the **residual plot** being divided on opposite ends of the graph indicates that the **equal variance** *assumption was not met*.







Discussion

Interpretation:

I found ***no significant interaction*** between song mood and tempo on valence ($t = 0.460$, $df = 96$, $p = 0.646$). This means that the effect of tempo on valence is the same for happy and sad songs.

When tempo is at zero bpm, mood has a significant effect on valence ($t = -0.757$, $df = 96$, $p = 0.451$).

Controlling for tempo, there is ***a significant difference*** in mean valence between happy and sad mood songs ($t = -6.285$, $df = 96$, $p < 0.001$). For songs with an average tempo, sad songs have a valence that is -0.302 times less than happy songs, on average.

★ Overall, the model explains ***27.3% of the variation*** in valence.

Limitations: My results will not be as trustworthy as I like because my linearity and equal variance assumptions failed, so people should *be careful of making big decisions based on the results* in my study. My sample will not be completely representative of my population of interest as the songs *were not randomly selected*. So, artists whose music is not on Spotify and does not have an English title will not be included in the data pool.

Implications: My results suggest that mood does influence valence, but tempo does not. As the different processes of making and marketing music continue to prioritize the use of new technologies, the music industry may begin taking even more scientific/statistical approaches to implementing mood into music. If enough people begin to find more interest in the valence of a song, songs may become specifically engineered to have a specific valence value.

- ***Stakeholders*** may use these results to further change the way they make and market music.
- **Consequence:** Certain styles of music could become more or less popular for digital consumption as people begin to find more interest in the valence value of music.

Future Research: The music industry is always looking to innovate. Studies on valence in music could further expand its studies into AI in composition and production of music, music therapy, and neuroscience research on what the brain considers 'pleasant' in terms of sound. If I could change anything, I would be more specific in how I study tempo; and account for rhythmic

devices that influence tempo– like half-time or double-time. Changing this may give more context to how tempo influences the pace of a song.

References

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