Tracking the Emotion of Music Across the Covid-19 Pandemic

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Introduction

During the course of the Covid-19 pandemic, the popular music streaming service Spotify saw a large increase in its number of subscribers, even surpassing pre-pandemic estimates. The sudden increase in Spotify listeners suggests that more people used music as a method of coping during the pandemic. The constant varying conditions of the pandemic led to highs and lows in public sentiment over the course of the past two years, as well as an overall decrease in the mental health of the US population. The ups and downs were in part caused by changing policies, conditions, and the discovery of novel variants. I became interested in learning more about the types of music that were widely listened to over the course of the pandemic, specifically seeing if there was a correlation in musical emotion with the emotional response to the Covid-19 pandemic. In order to accurately measure the emotion of music, I used the quantitative measures of mood provided by the Spotify API and Python: danceability, energy, and valence. By analyzing Spotify chart data that spanned from December 2019 to December 2021, I was able to visualize the changing emotional trends of popular music in Tableau and examine them in relation to high and low points of the pandemic.

Background

Music and its connection to mental health has been a widely researched topic over the past decade, especially with the advent of more accessible ways of listening to music. It has led to numerous developments and studies, including the rise of the field of music therapy – in which licensed professionals utilize music to treat mental health issues. Over the course of the pandemic, many studies have been conducted on the influence of music on mental health, specifically as a way of dealing with times of crisis and stress.

Studies by UCLA DataRes tracked changes in valence, duration, and other trends of music over time. Observing changing trends of musicality and musical emotion has been a popular way of understanding the characteristic sentiment of a time period. Valence is a relatively new method of quantitatively assessing the positive and negative emotions of music, measured on a scale of 0.0 to 1.0 with a score of 0.0 representing extremely negative emotion and a score of 1.0 representing extremely positive emotion. The study using music valence has also revealed interesting conclusions about popular songs, including the tendency for artist collaborations to be high valence, or positive energy.

Comparable to the sentiment analysis of literature, valence analysis of music can lead to surprising and important new discoveries in the fields of musicology, sociology, psychology, and more. In particular, valence studies can illuminate meaningful trends, including how certain types of music may impact mental health. Taking valence into account, it may be possible to discern types of music that reflect public sentiment during particular moments in history. We already see this occurring in the rise of the new genre of "coronamusic"- compilations of songs, tracks, and albums, either newly composed during the pandemic or consisting of lyrics related to the Covid-19 pandemic. Studies show that this style of music streaming has created an effective community response, one that strengthens the resolve of individuals and societies. I believe that further research concerning valence and audio streaming could lead to new insights regarding music and its connection to mental health.

Methodology

In order to compare trends across the span of the Covid-19 pandemic, I first selected the top 50 viral songs of each month from December 2019 to December 2021 using data from Spotify Charts. I used the "Daily Viral Songs" chart because it calculates the popularity of tracks based on social media, trending topics, and other such factors. The viral songs provide a more accurate snapshot of the prevailing sentiment in music at a given moment in time. I then selected one day chosen at random to represent a sample size of the top viral tracks for the month. Using the Spotify API and Python, I was able to create a CSV file with each track's audio features for a total of 1250 tracks. The audio features of each track include elements of musicality, such as tempo, key, and time signature, but also measures of mood, such as valence, energy, and danceability. For my project, I focused on these measures of mood in order to determine the average sentiment of music.

Valence – Valence is a measure of musical positiveness conveyed by a track. It is quantified by a scale of 0.0 to 1.0, where 0.0 represents negative emotion and 1.0 represents positive emotion.
Energy – Energy represents a perceptual measure of intensity and activity. Perceptual features contributing to this attribute include dynamic range, perceived loudness, timbre, onset rate, and general entropy. A value of 0.0 refers to low energy and a value of 1.0 refers to high energy.
Danceability – Danceability describes how suitable a track is for dancing based on a combination of musical elements including tempo, rhythm stability, beat strength, and overall regularity. A value of 0.0 is least danceable and 1.0 is most danceable.

In order to compare my results to important events during the Covid-19 pandemic in the US, I used the CDC's Museum Covid-19 Timeline. The dates below correspond to significant points of the pandemic, with dates in green representing the high points, and dates in red representing the low points.

March 2020 – lockdowns begin in the US, national emergency declared
April 2020 – lockdowns increased, mask mandates go into effect, US becomes global leader in Covid-19 deaths
June 2020 – recession caused by pandemic, mental health at an increasing low
January 2021 – vaccine rollouts in the US at an all time high, lockdowns are lifted
March 2021 – CDC lifts mask mandate
June 2021 – Delta variant begins to spread among vaccinated populations in the US
November 2021 – Omicron variant is first discovered
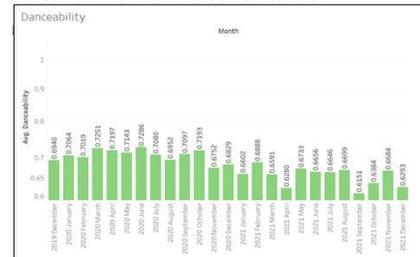
Average danceability of monthly viral tracks during the Covid-19 pandemic, spanning from December 2019-December 2021. Graphed on a logarithmic scale.

Results
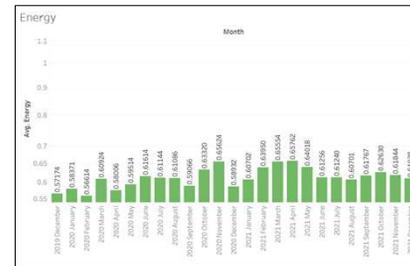
Average energy of monthly viral tracks during the Covid-19 pandemic, spanning from December 2019-December 2021. Graphed on a logarithmic scale.
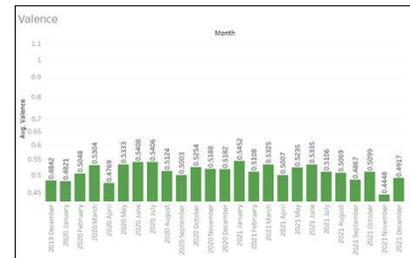
Average valence of monthly viral tracks during the Covid-19 pandemic, spanning from December 2019-December 2021. Graphed on a logarithmic scale.

Average trends in danceability showed no real correlation to the months I had chosen as points of comparison. The average danceability of viral songs has gone down over time, yet they appear to have no correlation to notable events and trends of the Covid-19 pandemic.

The average energy of monthly viral tracks also appear to have no correlation with events of the Covid-19 pandemic, aside from a notable dip during April 2020 – when the US reached an all-time high in Covid-19 fatalities. However, it did appear to loosely follow the trends of average valence during the Covid-19 pandemic

Trends in the average valence of viral tracks reflected the events of the Covid-19 pandemic. Between March 2020 and April 2020, there was a large decrease in the average valence of streamed music. Valence increased again, but began to decrease following June 2020. Average valence during the Covid-19 pandemic reached an all-time high during January 2021 – the time of greatest vaccine distribution. The lowest average valence of music is seen during November 2021, correlating with the discovery of the Omicron variant.

Conclusion

Overall trends: Although danceability and energy had little to no correlation with the notable events of the Covid-19 pandemic, I found that trends of valence shifted over the course of the pandemic. Notable events during the pandemic corresponded with significant changes in the average valence of individual months. When strenuous changes during the pandemic occurred, such as the beginnings of lockdown and the discovery of the Omicron variant, there was an associated decrease of average valence in the viral songs. Similarly, at high points of the pandemic, such as the increased vaccine rollout during the winter of 2020-2021, we see an increase in the average monthly valence. While we can identify key moments of the pandemic based on valence of viral songs, it is difficult to identify the exact trends and relations between the valence of each month.

The positive or negative emotion of music appears to correlate with changes in the Covid-19 pandemic, in particular, with the significant high and low points of the pandemic. This suggests that people will most likely listen to music with negative emotions during extremely strenuous and traumatic events.

Limitations: Although this study does find a correlation between events of the Covid-19 pandemic and the emotions of viral music, this does not imply that the trends of music valence are a direct result of the events of the Covid-19 pandemic. There are numerous influences that can affect the popularity of certain songs over time, including social media, novelty, time of year, etc. We cannot decisively conclude that the US public listens to more negative music because of the stress of Covid-19. Rather, the results of this study are meant to show the trends of musical sentiment in consideration of the events of the pandemic.

Future Studies: In highlighting trends of musical emotion during the Covid-19 pandemic, we can come to understand more about the impact of music on mental health. During times of great stress, people tend to listen to music with more negative emotions. In the future, I believe conducting studies on the neurobiological effects of listening to negative music could lead to significant developments in the field of music therapy. I also think it would be interesting to compare the results of this study to a sociological study of the emotional oscillations during the Covid-19 pandemic in order to determine a more explicit relationship between the emotions of music and public sentiment.

Acknowledgements

Sources

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