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# Data Selection

Music therapy is a great way to boost your mood and improve your mental well being through the power of sound, rhythm, and beat. It's a recognized method in the medical world that can lift your spirits and make you happier. Music works differently for each person, depending on tastes and preferences.

@Catherinerasgaitis created the [Music & Mental Health Survey Results dataset](#), which explores links between musical preferences and mental well-being.

People from all over the internet – Reddit, Discord, social media – answered questions about their musical background and habits. Additionally, respondents rated their experiences with anxiety, depression, insomnia and OCD. There were no restrictions based on age or location and the feedback was gathered between August and November 2022.

The team's motivation for reviewing the dataset was fueled by their passion for music and curiosity about what it might reveal.

Get ready to dive into the world of music and mental well-being together!

# Data Structure (Import and Cleaning)

This section examines the music dataset from Kaggle.com, an open-source database website. Before importing the data, we performed a little pre-cleaning of the dataset, which initially contained 736 rows and 33 columns. These steps involved importing the data as a CSV file into the online kaggle jupyter notebook, creating a variable to store the missing values, and visualizing the columns and counts of missing values. We then decided to drop rows with missing values from the dataset, this made our data a lot easier and clearer to work with. We transformed the music effects column to create a numerical representation of the categorical data that was previously in our dataset to make it easier to perform machine learning and algorithmic processes later. Lastly, we created a data dictionary to document our changes and processes to the data for further analysis.

Once the data is loaded, we can conduct a structural analysis to help us better understand the shape of our data, we look at the data types present in the data, look at the structure of the numerical data to determine the unique values within each column. We then investigate how many unique values each non-numeric feature has and the frequency. This helps us to better understand the distribution of the categorical(bi-variant or multi-variant) data and the descriptive statistics of the dataset. We also perform structural analysis on the numeric data, discovering how many unique values are in each column. With this information, we can get an idea of binary or ordinal data(multi-class) to help us formulate ideas for potential Machine learning algorithms. This processing could be used to understand the data better and gain deeper insight.

## Data Columns

Age  
Primary streaming service  
Hours per day  
While working  
Instrumentalist  
Composer  
Fav genre  
Exploratory  
Foreign languages  
BPM  
Frequency [Classical]  
Frequency [Country]  
Frequency [EDM]  
Frequency [Folk]  
Frequency [Gospel]  
Frequency [Hip hop]  
Frequency [Jazz]  
Frequency [K pop]  
Frequency [Latin]  
Frequency [LoFi]  
Frequency [Metal]  
Frequency [Pop]  
Frequency [R&B]  
Frequency [Rap]  
Frequency [Rock]  
Frequency [Video game music]  
Anxiety  
Depression  
Insomnia  
OCD  
Music effects

*Music & Mental Health Survey Results  
dataset, column headers*

# Exploratory Data Analysis

During the exploratory data analysis (EDA) phase, our primary objective was to unearth valuable insights and formulate pertinent questions regarding the impact of music on our daily lives. This phase serves as a preliminary investigation into the dataset, allowing us to identify potential questions and answers before delving into deeper analysis.

Our approach encompasses both bivariate and multivariate analyses to uncover relationships between various variables. Additionally, we conducted a comprehensive descriptive statistical analysis to ascertain the suitability of these metrics for our dataset and extract meaningful insights from them. This diligence ensures that our dataset is equipped to provide answers to our inquiries about how music influences individuals across different age groups, genres, and more.

To facilitate our exploration, we initially employed Microsoft Excel (please see accompanying excel file) to gain a holistic understanding of the data. Subsequently, we processed the data for integration into PowerBI for enhanced visualization and reporting capabilities. Throughout the EDA process, we scrutinized univariate, bivariate, and multivariate variables, meticulously confirming the absence of missing values, thereby maintaining a pristine dataset for future analysis.

Count	616
Mean	24.7922077922078
Standard Error of the Mean	0.469353535948766
Median	21
Mode	18
Variance	135.700328891887
Standard Deviation	11.649048411432
Range	79
Interquartile Range	9
Maximum	89
Minimum	10
Skewness Coefficient	2.23548522855902
SE Skewness	0.098692754243965
Standard Coefficient of Skewness	22.6509559458942
Kurtosis Coefficient	5.52379605482242
SE Kurtosis	0.197385508487931
Standard Coefficient of Kurtosis	27.9848105219952
90th percentile	38.5
10th percentile	16
1st quartile	18
2nd quartile	21
3rd quartile	27

*Some basic analysis based on the AGE column*

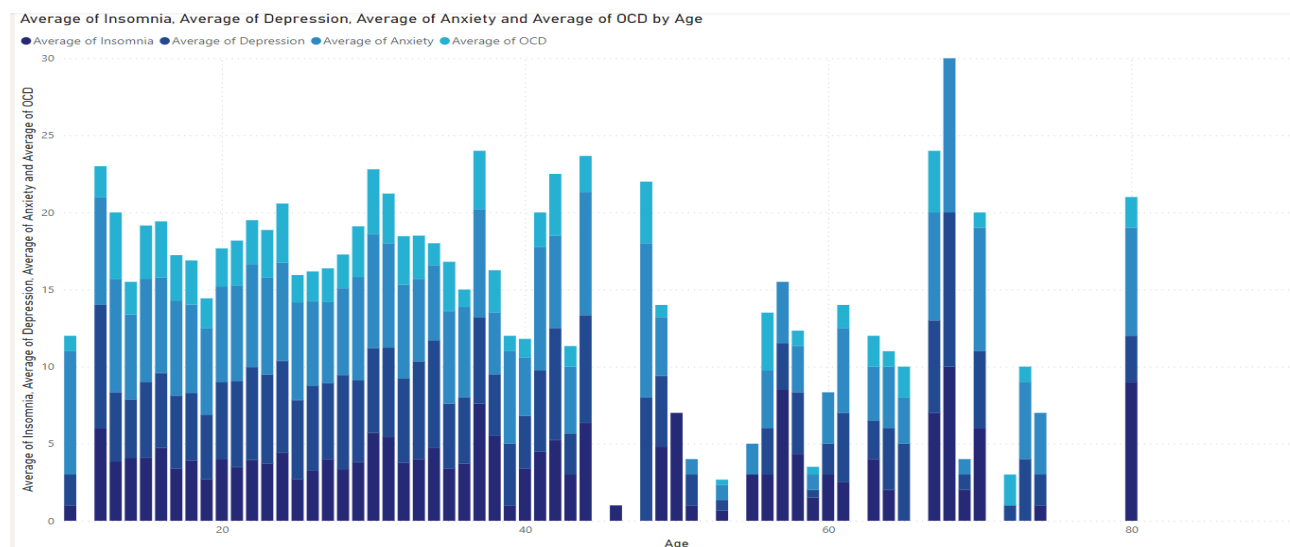
Visualization played a crucial role in deepening our comprehension of the dataset, allowing us to visualize trends and patterns effectively. While we considered several advanced EDA techniques such as data segmentation and feature extraction/engineering, it became evident that our dataset did not necessitate further enhancements to prepare it for reporting purposes.

# Insights and Visualization

## Mental Illness vs Age

We found a compelling insight within our data, particularly regarding how different age groups utilize music to combat symptoms of insomnia, depression, anxiety, and OCD. It's fascinating to observe the widespread impact of music across various contexts in people's lives. Whether it's during the commute to work, to maintain focus while working, as a companion on the way back home, or as a brief respite between tasks, music is a constant presence.

It's evident that music serves as a powerful tool for distraction, helping individuals cope with the challenges of depression, anxiety, and OCD. Moreover, many turn to music to alleviate insomnia, with a notable 52% of respondents using it as a sleep aid. Furthermore, a significant 89% of individuals reported that listening to music enhances their productivity, while 84% find themselves looking forward to work more when accompanied by music. This suggests that music not only distracts from distressing thoughts and emotions but also facilitates muscle relaxation and stress relief after a long day.



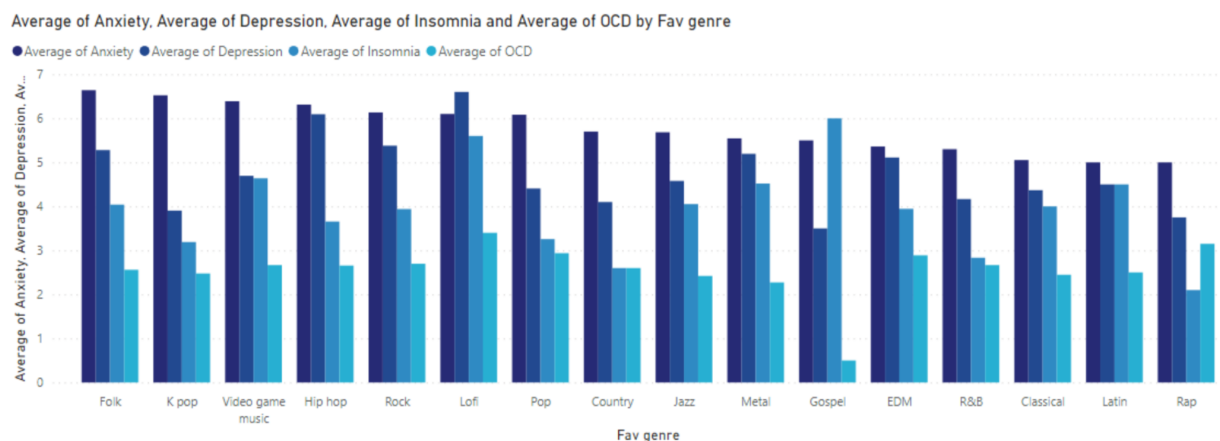
One striking discovery was the prevalence of anxiety, depression, and insomnia among individuals around the age of 68. This finding was unexpected, but upon further investigation, it became clear that this age marks a pivotal stage in people's lives. It's a time when individuals come to terms with the fragility of their bodies and the heightened susceptibility to illness. They grapple with the challenges of aging, confronting mortality and illness, and often engage in a quest for continuous eternal learning.

In contrast, between the ages of 12 and 44, we observed a significant prevalence of anxiety, depression, OCD, and insomnia. This corresponds to the period when individuals undergo significant physical and emotional development, trying to navigate the complexities of life, from managing stressors like work and bills to the ongoing process of self-discovery.

By analyzing this data, we can gain valuable insights into how we can provide targeted assistance to different age groups based on their specific needs.

## Emotions vs Favorite Genre

Taking a look at the world of music and emotions is what this database is all about. Capturing each respondent's favorite genre and exploring how it connects with their emotional state is represented below. The focus is on four key emotions: Anxiety, Depression, Insomnia, and OCD.



What makes this section of the analysis interesting is how it sheds some light between the relationship people have with music and the way it shapes their emotional well-being.

Points of interest:

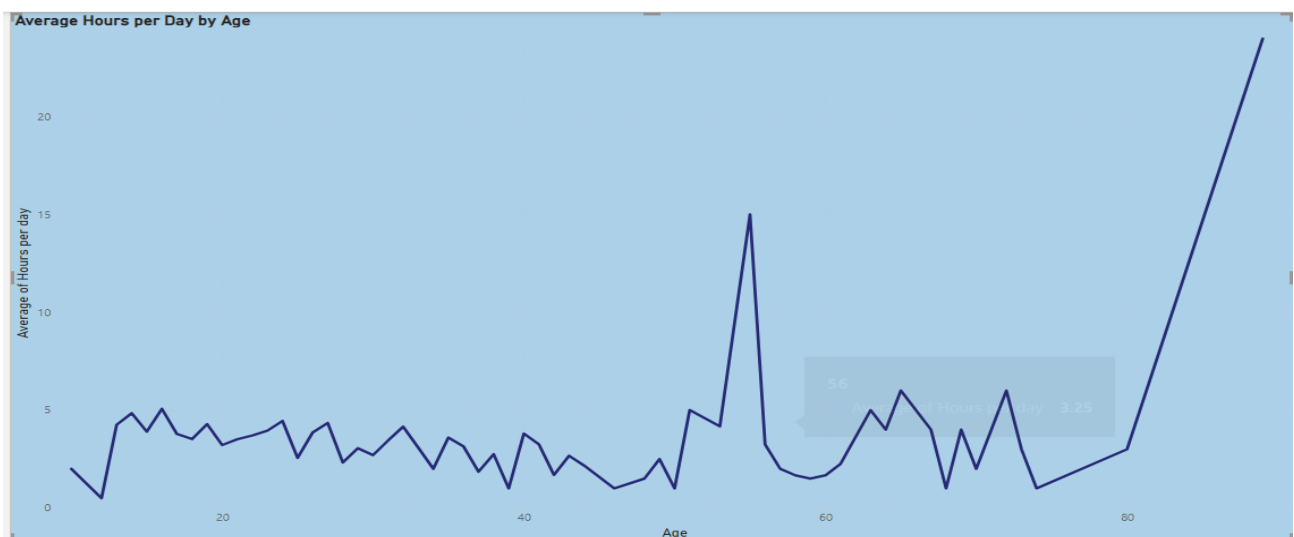
- While all the respondents report an anxiety level above 4, those who groove to Rock, Jazz, K-pop, Hip-hop, Pop, and Folk tunes seem to experience even higher anxiety levels, soaring above 6. Pursuing further similarities between these genres might be worthwhile.
- On the side of insomnia, most respondents have levels below 4, except for the Metal, Lofi, and Gospel enthusiasts who seem to have more problems with sleep.
- And within the realm of depression, every respondent reports a level above 3. What's interesting is that Lofi, Hip-hop, and Rock fans stand out with depression levels reaching above 5.

Something worth considering within this section of the analysis: there may be a bit of bias depending on how each individual perceived anxiety, depression, insomnia, and OCD. Since the study did not provide a clear framework, it's possible that participants had varying interpretations of these emotional states.

Let's not forget that rhythm and beat could also play a role in how emotions are influenced. It's worth exploring how the music's tempo might sway feelings.

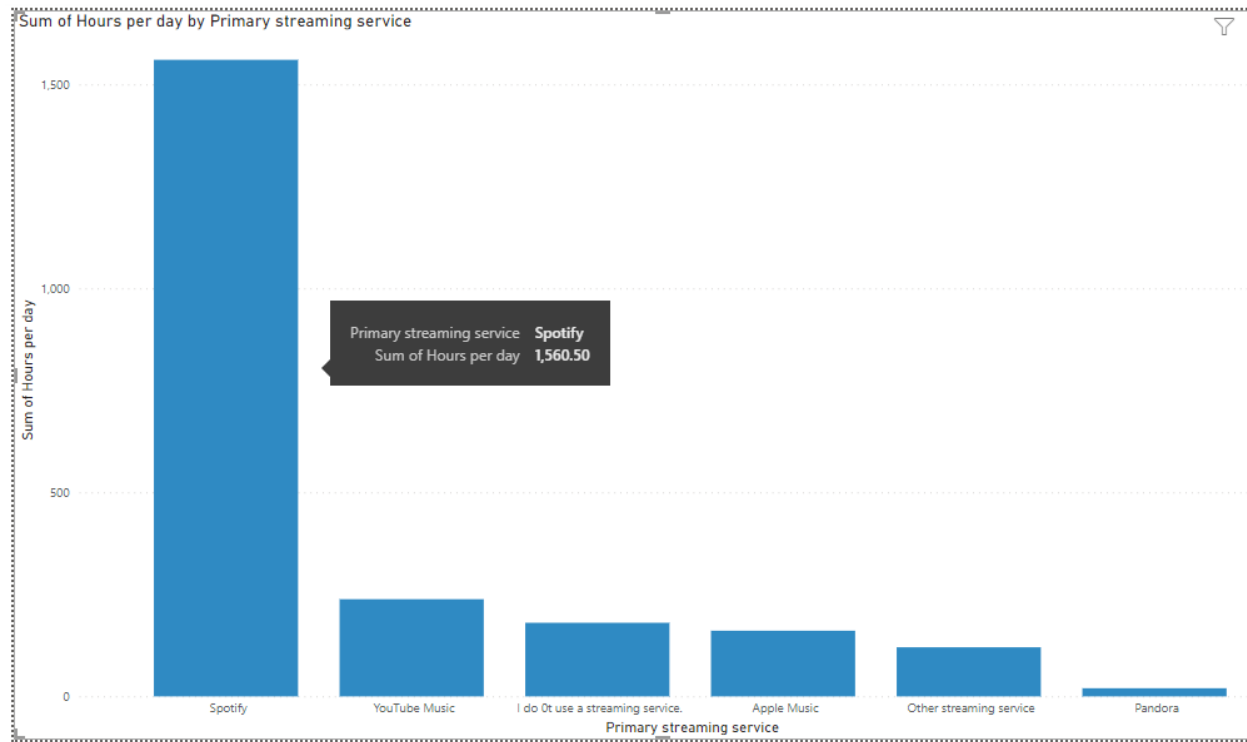
### Average Hours per Day per Age

Based on this visual, it is confirmed that people of age 55 listen to the most hours of music per day with an average of 15 hours per day. In general most of other age groups fluctuate between 1 and 6 hours per day



Based on the data represented in this graph it can be concluded that folks listen between 0.5 and 6 hours of music on a regular basis.

## Hours per day per Popular Streaming Services



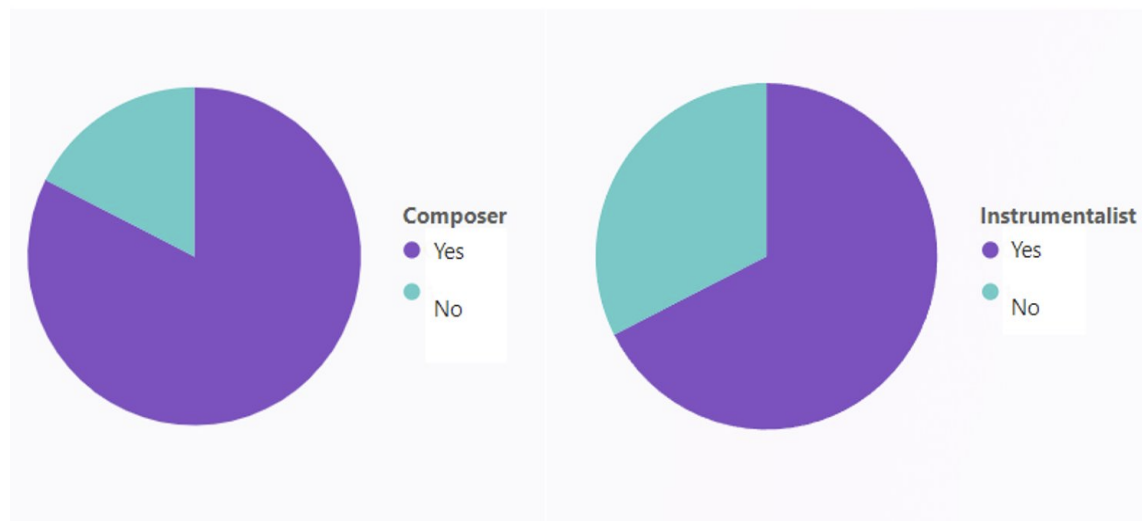
Based on the data that was conducted, *Spotify* was the most popular music streaming service. *Spotify* had the highest number of hours per day listened by users. The data showed that 1560.50 hours were spent by listeners on *Spotify*. The second most popular streaming music service was *YouTube Music*, which had 238.25 hours per day. This was a major difference from *Spotify*. It was a difference of 1322.25 hours per day. The third streaming service was “*I do not use a streaming service*”, which came in at 180.50 hours per day. Coming in at a close fourth was *Apple Music*, which had 161 hours per day by its listeners. The category of “*Other streaming Services*” came in fifth place with 120.45 hours per day. Pandora came in at last place with only 20 hours per day listened to by its users. It was interesting to see that *Spotify* was the clear front runner in the Streaming Music choice of the listeners in this study. The other five were not even close to that of *Spotify*.



## Musical Background

The Musical Background section of the survey aimed to determine whether respondents identify themselves as composers or instrumentalists. This distinction was assessed through a straightforward binary response of "yes" or "no."

In the visual representation of our findings, you will find a pie chart below, illustrating the distribution of responses.

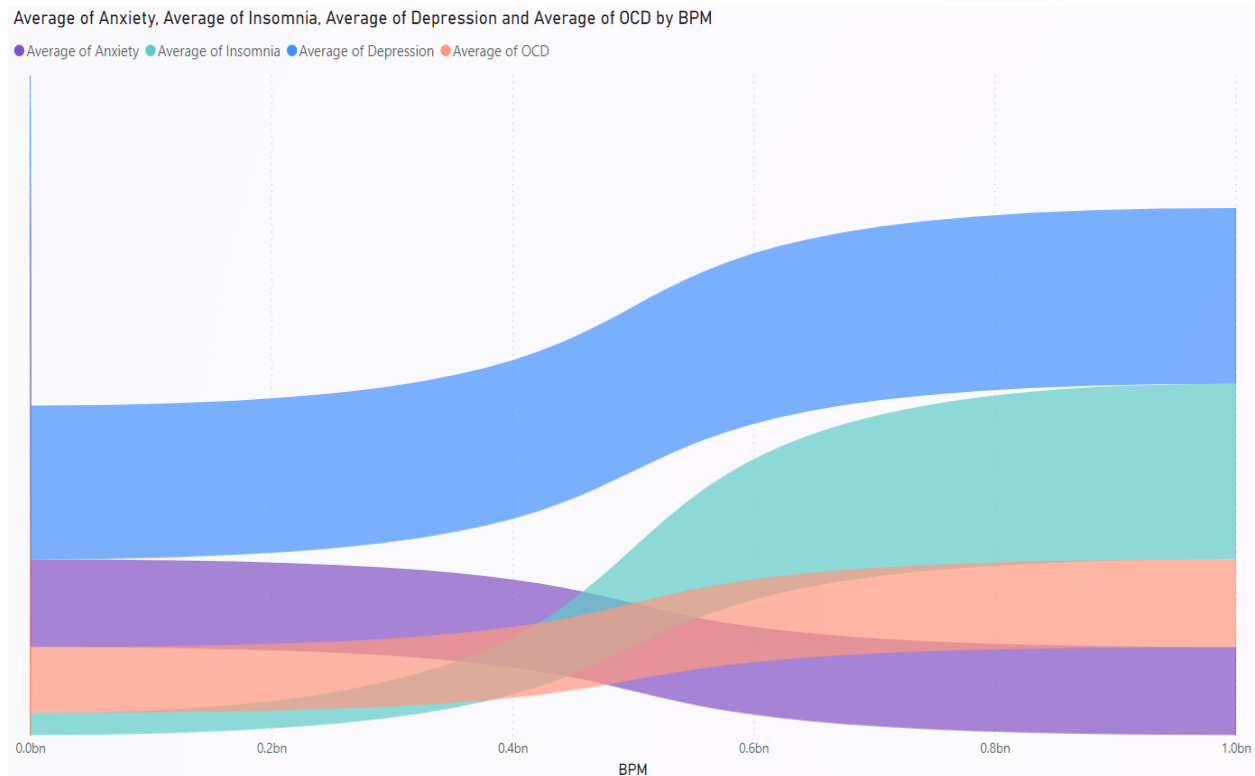


Upon analyzing the data and drawing insights, a noteworthy pattern emerged. It seems that a majority of our respondents possess a strong affinity for music, with most self-identifying as composers or instrumentalists.

This observation raises concerns about potential bias within our dataset. Given that all respondents have a musical background, there is a risk of skewing the data from those individuals who have a strong connection with music. This could influence the outcomes of our survey, possibly favoring those with a keen ear for music.

As we move forward with data analysis and interpretation, it is essential to remain mindful of this inherent bias and consider its implications on our study's outcomes.

## Beats Per Minute vs Mental Conditions



Music is a well-established tool for relaxation and stress management, supported by scientific research. Recent findings suggest that music with a tempo around 60 beats per minute can synchronize the brain with the beat, inducing alpha brainwaves. When you're feeling anxious, this relaxed tempo can help regulate your body's functions, easing you out of a heightened nervous state. This process triggers the release of pleasure chemicals in the brain and a gradual slowing of bodily rhythms.

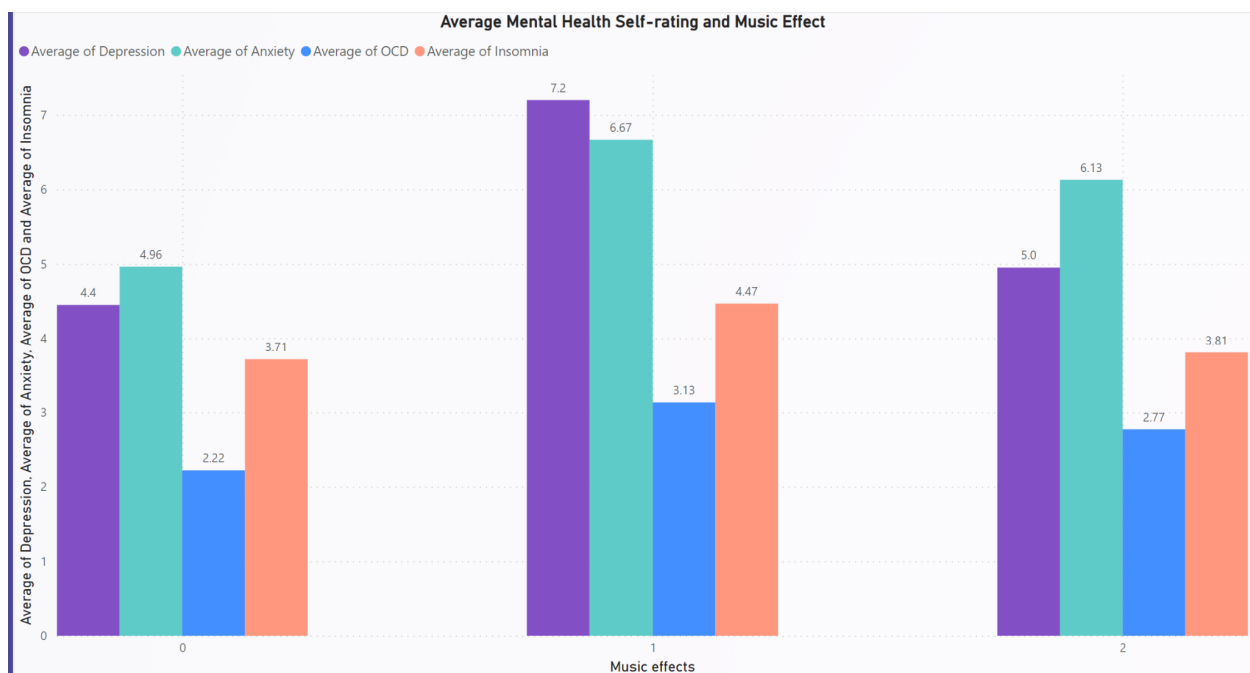
It's important to note that music with different tempos can evoke a range of emotions. Fast-tempo music tends to trigger positive emotions like happiness, excitement, delight, and liveliness, while slow-tempo music often elicits negative emotions such as sadness and depression. Moreover, research has shown that the tempo, measured in beats per minute (BPM), is associated with individuals' musical training, leading to enhanced activation in brain regions like the dorsal premotor cortex, prefrontal cortex, and subcortical systems.

## Average Mental Health Self-Rating and Music Effects

The survey respondents of this dataset provided their self-rating in a scale of 1-10 in 4 areas of mental health: depression, anxiety, OCD, and insomnia. They also rated the overall effects of music on their well-being on a scale of 0-1 with 0 as no effect, 1 as negative effect, and 2 as positive effect.

The visual below explores the self-rating in mental health conditions and the reported effects from listening to music. Through this visual we can see that individuals who reported the highest scores across all mental health conditions also reported that music has a negative effect on their well being.

Based on the findings it can be assumed that folks with chronic mental health conditions do not benefit as much from music as folks with mild mental health conditions.



## Machine Learning Insights

Machine learning played a pivotal role in our quest to unearth profound insights from our dataset. Through our analysis, it became apparent that participants might not always provide entirely accurate answers when responding to survey questions. Notably, we observed instances where respondents discussed their favorite music genre within the context of the survey, yet further investigation revealed that they either had never actually listened to that genre or had a significantly lower frequency of engagement with it compared to their stated preference.

We dived deeper into the dataset and discovered a wealth of potential business questions that could be explored and expounded on. We recognized the potential to develop predictive models for commercial use across various industries, including advertising, insurance, and retail markets, among others. For instance, by refining and requalifying our data, we could predict which type of streaming service an individual may prefer, how marketers may use music to induce certain elicited states. Additionally, we identified trends related to age groups and specific music genres, shedding light on which demographics frequently engage with various musical styles. Furthermore, we explored the use of beats per minute (BPM) as a valuable metric for gaining insights into how music influences mental well-being and emotional states.

Viewing how music can affect mental and emotional states, we discovered that the tempo of music can have a profound impact on individuals. Our analysis revealed that faster-paced music with higher BPM often elicits a more energetic and euphoric response, making it an ideal choice for workouts or celebratory occasions, and that many participants enjoyed listening to music at work, which could be viewed as a stressful activity. As opposed to slower, more melodic music this can have a calming and soothing response aiding relaxation and reducing stress. This insight helped us in understanding the different ratios within the mental emotion's columns provided by the dataset.

Genre of music can be closely linked to emotions and moods. One example would be classical music. This form of music is often associated with feelings of serenity and focus, while heavy metal may evoke intensity and empowerment. Understanding these connections between music and emotions can have significant implications for various applications, including therapy, marketing, and mood-based playlists in streaming services.

# Analysis Recap

Based on the data that we studied, there are several recommendations that can be made with regards to music and its effect on Mental Health Conditions. Here are some following recommendations:

- ❖ Marketers & Advertisers can use the data to promote specific products and services targeting mental health conditions. Ex. Pharmaceutical and Wellness Companies might use the data to target and promote their products.
- ❖ Insurance companies can use the information to develop health and wellness programs for insurers. This could help reduce the cost that insurance companies spend on hospital stays and expensive pharmaceutical treatments.
- ❖ Medical Professionals can use the data to help develop treatment plans for patients dealing with specific mental health conditions. This would be especially helpful for those seeking holistic and non-chemical treatments and therapies.
- ❖ Researchers should conduct future surveys using a random sampling of surveyors, to decrease the occurrence of bias.
- ❖ Data can be used to help decrease anxiety in settings that are high stressed for individuals. For example, at cancer treatment centers, dialysis centers, dentist offices, operating rooms, and prisons.
- ❖ Employers can utilize the data to develop Employee Assistant and Wellness programs for their employees. Perhaps this could increase productivity and attendance at work.
- ❖ Online streaming services can look further into why some users select one streaming service over another.
- ❖ Online streaming music companies can use the data to develop preset playlists that are geared for specific mental health conditions. For example, developing an “Anxiety Reducing Playlist” for individuals dealing with anxiety.

Our analysis of the Music & Mental Health Survey Results dataset, curated by @Catherinerasgaitis, has led to many insights into the correlation between music and well-being across different age groups and music types.

We found that music can serve as a mechanism for combating insomnia, depression, anxiety, and OCD, with different age groups using it uniquely. Individuals around the age of 68 reported elevated emotional challenges, while those aged 12-44 also faced these issues, mirroring their life stages.

The relationship between music genres and emotions was reviewed, but we found the interpretations could be varied due to a lack of a standardized framework.

The data shows that people across all age groups dedicate a significant amount of time to daily music listening, with 55-year-olds leading at an average of 15 hours per day. Additional research into where music is being played could help arrive at some conclusions.

In summary, our analysis highlights the complexities between music and mental well-being, emphasizing that it is indeed a personal matter and supports further research. Our exploration just touches the surface into this exciting topic.