Problem Statement

Music, Movement, and Mental Health – Where movement and music meets mental wellness. Our project tackles the Mental health impact which is often overlooked and has great impact on social relationships, work producivity and overall quality of life. We know people around us who have been impacted with this issue and as per surveys from WHO, CDC and academic papers, this is one of the rising concerns after COVID-19 across the world.

Key Findings

- Higher GDP alone does not imply better mental health.
- Any gender does not imply better or worse mental health.
- Retirement and employment correlate with better mental health, while students and being unemployment has shown negative results.
- Exercise and good sleep significantly correlate with mental well-being.
- COVID-19 severely impacted mental health, with high infection and healthcare access issues worsening well-being.
- Music is widely perceived as beneficial for mental health.
- Different music genres correlate with different anxiety levels.

LET'S TAKE A WORLD WIDE LOOK AT THE MENTAL HEALTH QUOTIENT 🗺️

MHQ (Mental Health Quotient) is the metrice used for analysis.

- It ranges from a scale of **[-100, 200]**
- **Lower value indicates poor mental health and higher value indicates stable mental health**.
- The global average is **63** for the year 2023 but ~ 28% population is below 0 which is concerning.

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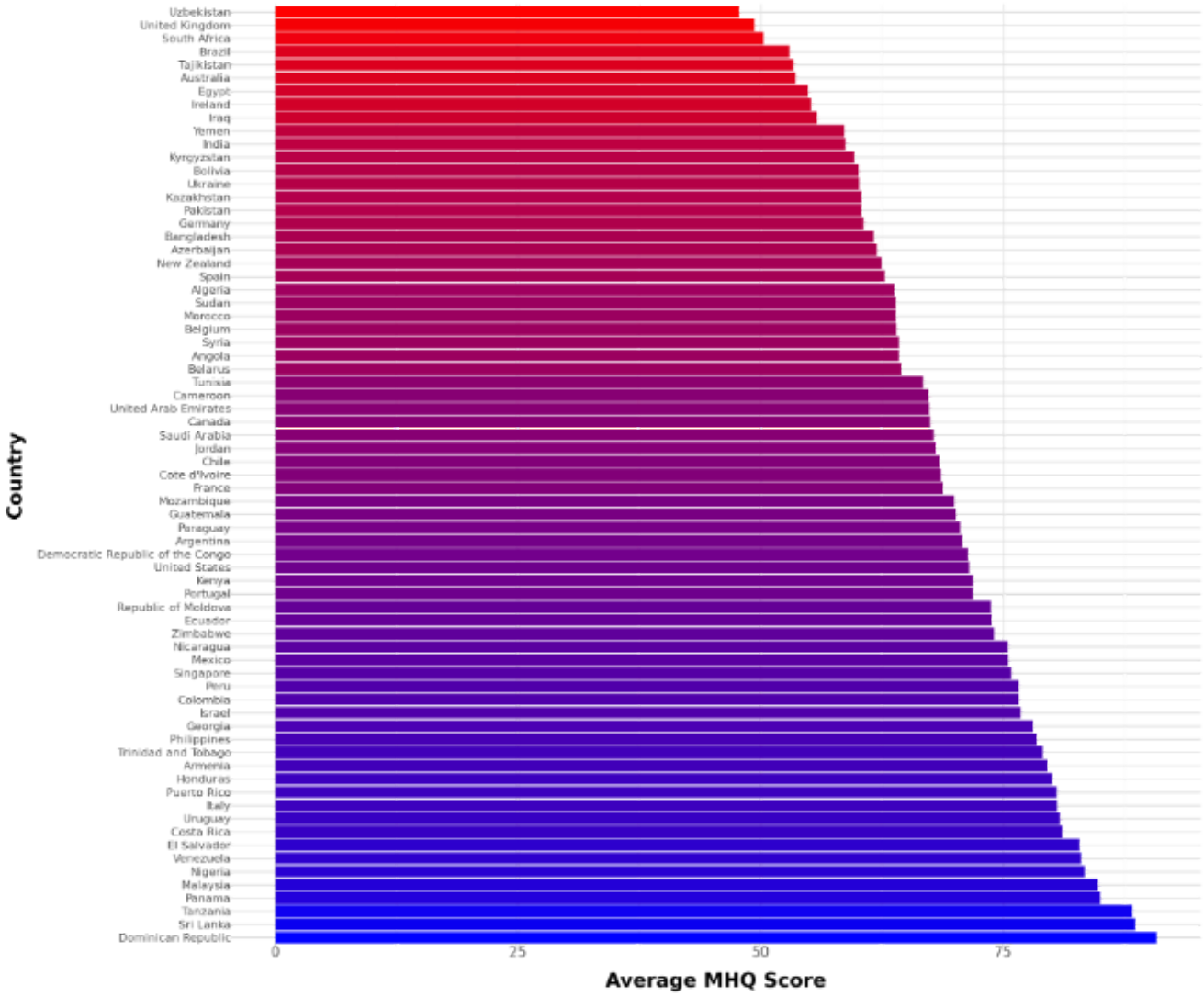


Figure 1: The distribution of Average MHQ Score by Country *This horizontal bar chart displays the average MHQ (Mental Health Quotient) scores for different countries. Higher the MHQ the better it is. Sorting this graph in ascending order makes it easier to find nations which need more attention since lower the value, the more concerning it is. Uzbekistan, the United Kingdom, and South Africa rank the worst in terms of mental health scores, while Venezuela, the Dominican Republic, and Sri Lanka have good(higher) MQH scores. The color gradient from red to blue visually represents the declining scores, with red indicating lower MHQ values (poor MHQ) and blue shades representing higher scores(good MHQ). The distribution suggests notable variations in mental well-being across different regions. Further analysis could explore potential contributing factors, such as socioeconomic conditions, healthcare access, and physical activities differences.*

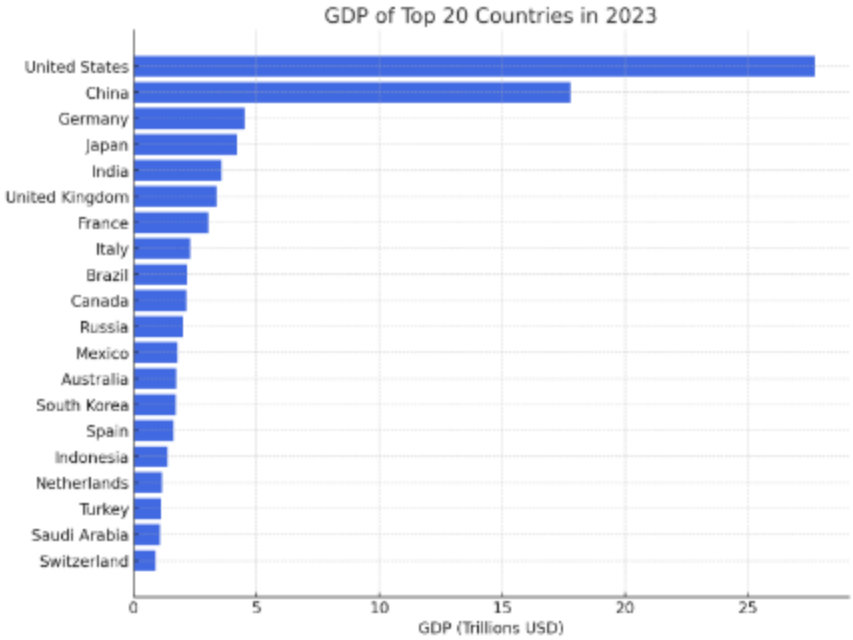
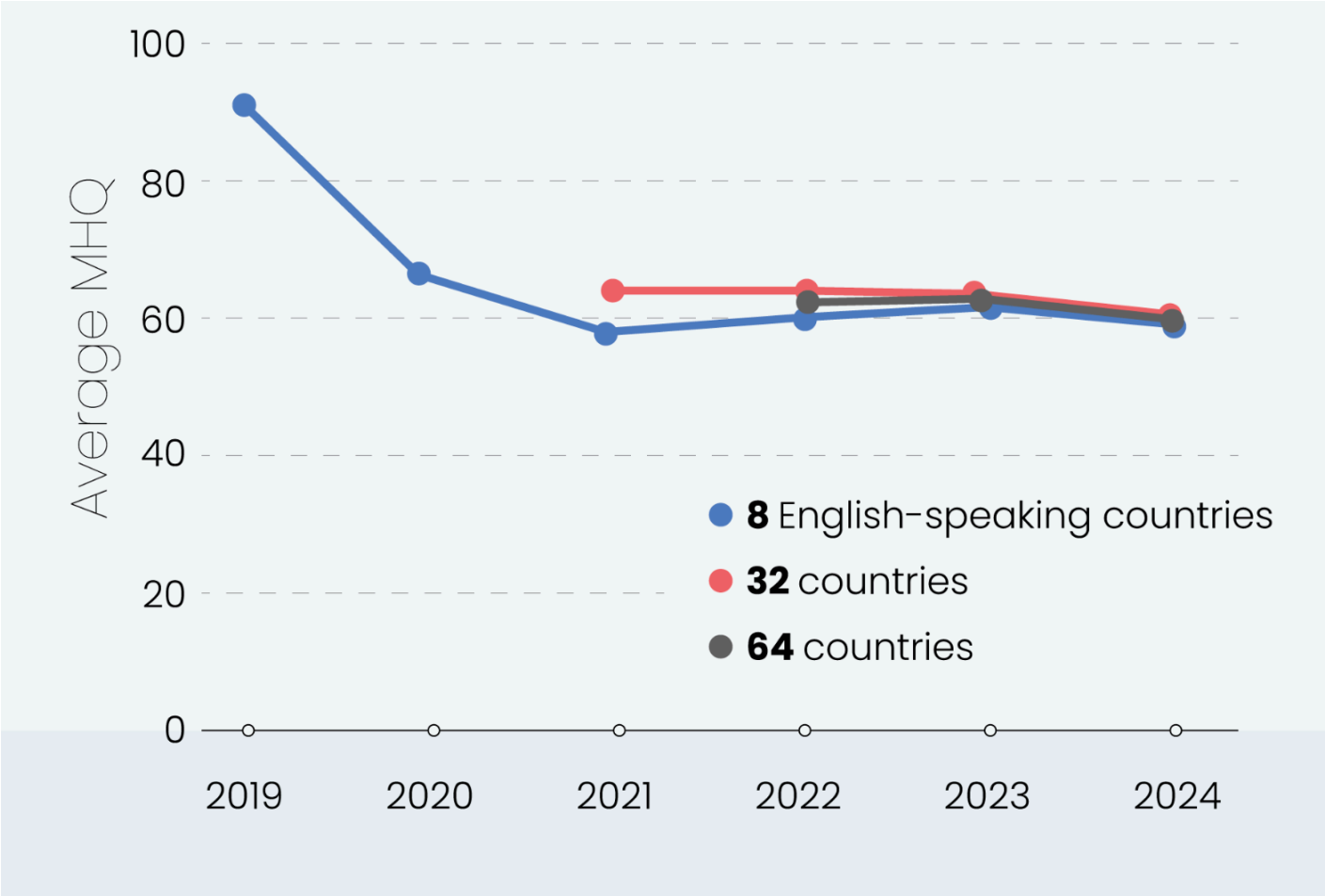


Figure 2: GDP of the Top 20 Countries in 2023 *This bar chart illustrates the GDP of the world's 20 largest economies in 2023. The United States and China dominate with the highest GDP, followed by Germany, Japan, and India. The distribution highlights the economic disparity among nations. While economic strength is often linked to prosperity, it does not necessarily correlate with mental well-being. Many high-GDP countries, such as the United States, India, and the United Kingdom, report lower MHQ scores, suggesting that income alone does not guarantee good mental health.*

From above charts and based on research, we decided to tackle the most concerning nations. From research we found that the **8 English speaking countries have lower MHQ Score.**



Source: https://sapienlabs.org/data_gallery/time-trends-for-countries-grouped-by-first-year-of-data-collection-mhq-scores/

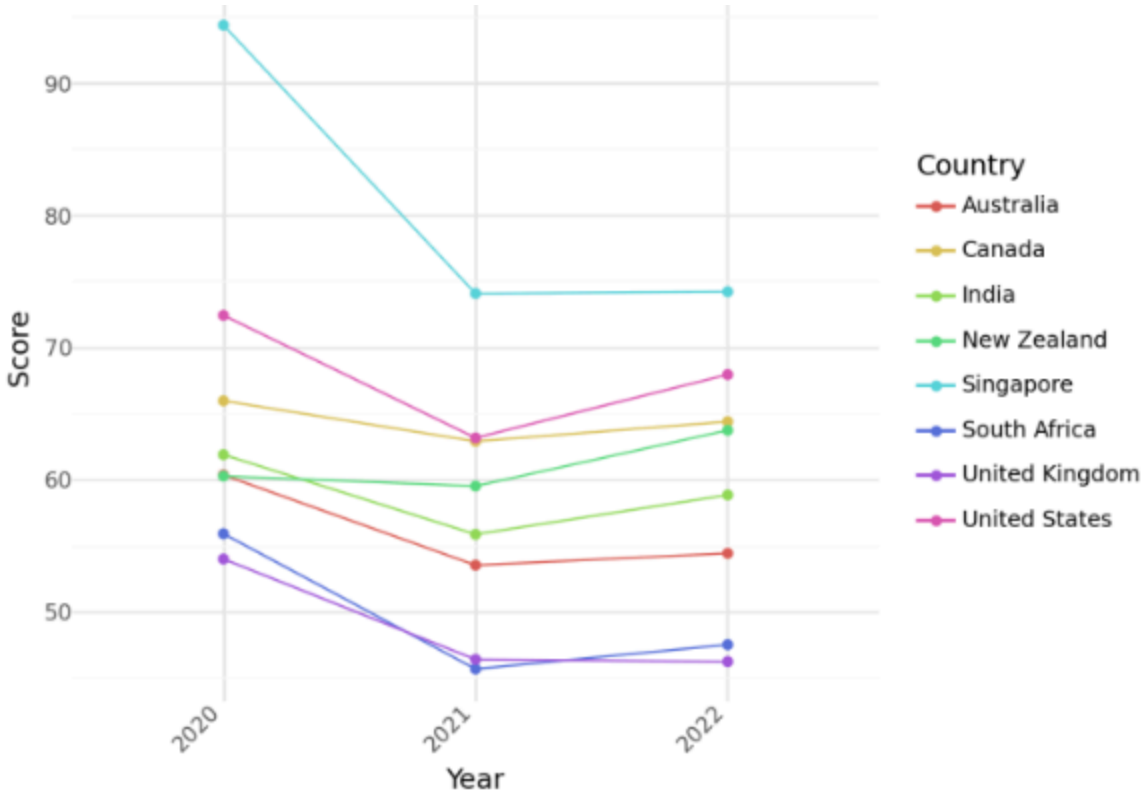


Figure 3: Trend of MHQ Scores Over Time *This line chart shows the change in MHQ scores for different countries from 2020 to 2022. A significant drop is observed in 2021, possibly reflecting the impact of the COVID-19 pandemic, followed by slight recovery or stabilization in 2022 for most nations. Among the eight major English-speaking countries, the United Kingdom and the United States have the lowest MHQ scores, further indicating that income and economic success do not directly translate to better mental health outcomes.*

- **CAN WE SAY FOR SURE THAT A PARTICULAR GENDER IS HAPPIER THAN ANOTHER?**
- **WHICH AGE GROUP HAS BETTER MENTAL HEALTH STATUS?**

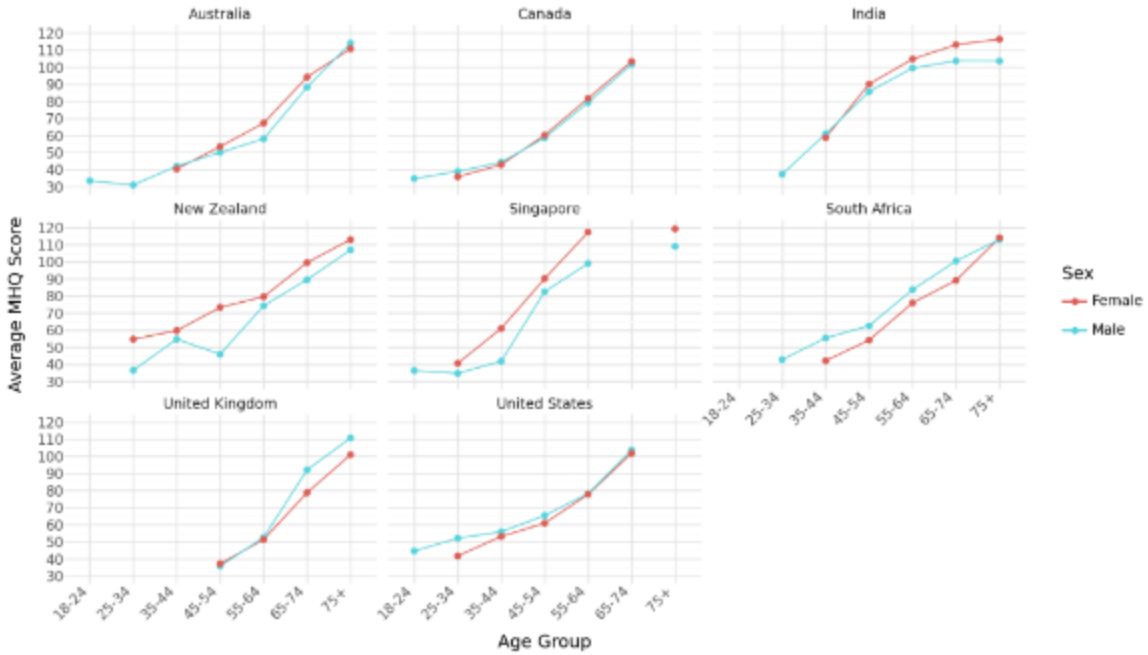


Figure 4:Mental Health Quotient (MHQ) Trends Over the Years *The MHQ trends across different years reveal notable shifts in mental well-being. In 2020, many countries had relatively higher MHQ scores, but 2021 saw a decline, likely due to the pandemic's impact. By 2022, some nations showed signs of recovery, while others continued to struggle. Gender-based trends indicate that males have better MHQ scores in some countries, while females perform better in others, suggesting that gender alone does not determine mental well-being. Age-wise, older age groups generally have higher MHQ scores, while younger age groups tend to have lower scores, highlighting generational differences in mental health resilience.*

DOES EMPLOYMENT IMPACT MHQ?

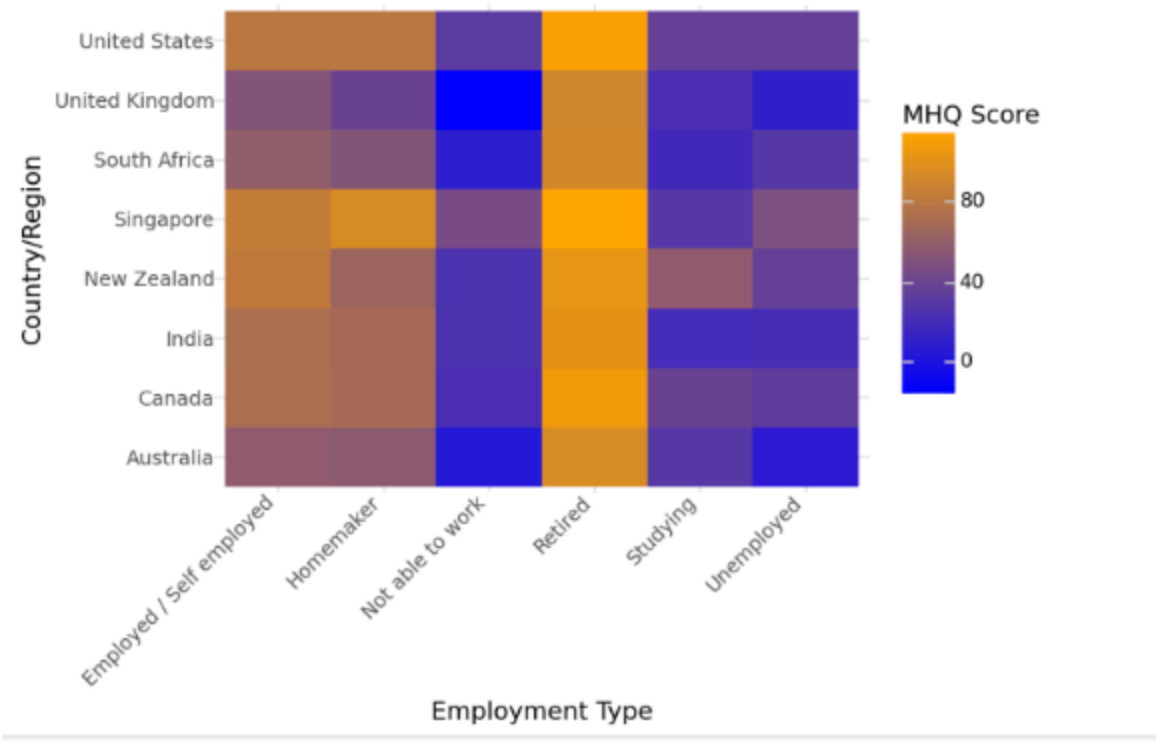


Figure 5: MHQ Score by Employment Type and Country *This heatmap illustrates the Mental Health Quotient (MHQ) scores across different employment types for eight English-speaking countries.* ***Retired individuals*** *generally have the* ***highest MHQ scores****, while those unable to work or unemployed tend to have the lowest scores. Among countries, the United Kingdom and the United States exhibit the lowest MHQ scores overall, particularly for those who are not able to work or unemployed. On the other hand, Singapore and New Zealand show relatively better mental health scores across employment categories. Employment status appears to have a strong influence on mental well-being, with self-employed and retired individuals often faring better than students, homemakers, or the unemployed.*

LET'S DO SOME ANALYSIS ON PEOPLE'S PHYSICAL ACTIVITIES

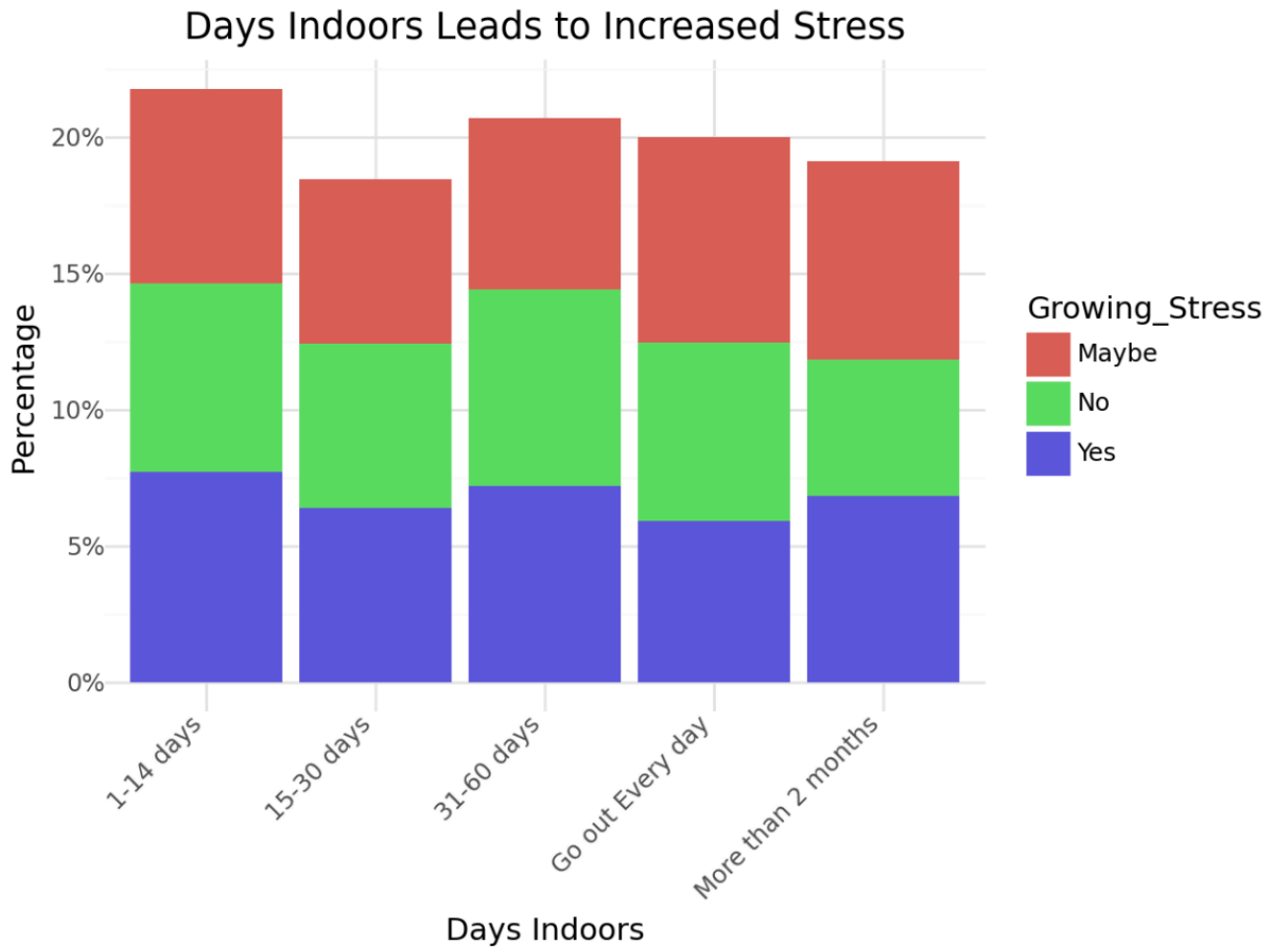


Figure 6:Impact of Staying Indoors on Stress Levels This chart explores the relationship between the number of days spent indoors and increasing stress levels, segmented into three responses: "Yes" (growing stress), "No" (no stress increase), and "Maybe" (uncertain). Around 7-8% of individuals report increased stress ("Yes") across all categories. Approximately 6-7% of individuals report no increase in stress ("No"). Uncertainty: The "Maybe" response fluctuates between 6-7%, peaking for the 1-14 days and 31-60 days groups. Overall Trend: The highest stress levels are observed when individuals stay indoors for 1-14 days (8%) and 31-60 days (7.5%). Those who go out every day still experience stress (~6%), indicating that other factors also contribute to mental well-being. This reinforces the need for balanced outdoor activity to manage stress effectively.

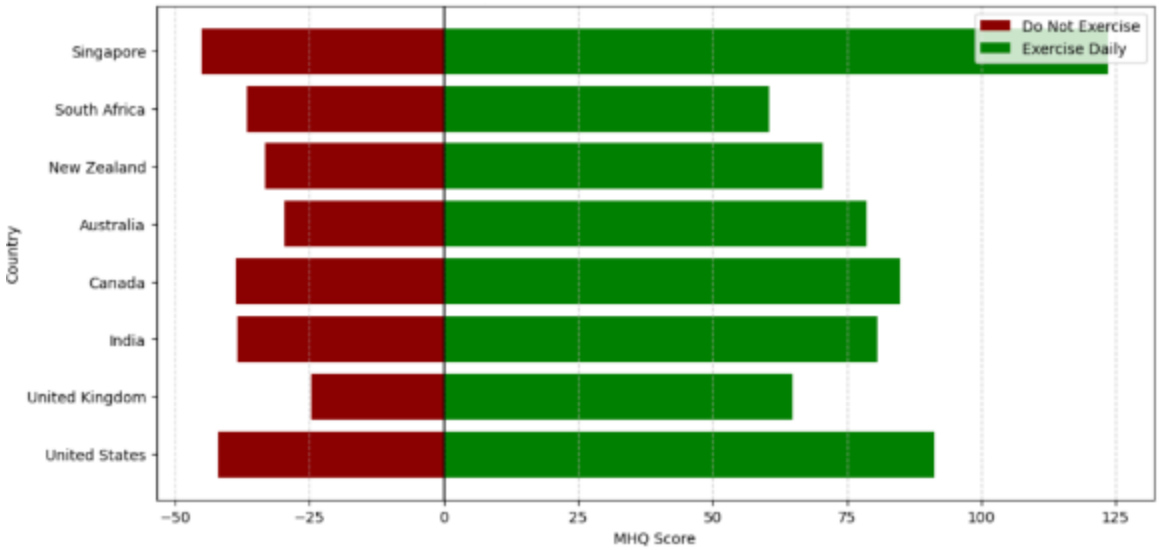


Figure 7: MHQ Score Comparison by Physical Activity *This bar chart compares Mental Health Quotient (MHQ) scores between individuals who exercise daily (green) and those who do not exercise (red) across multiple countries. Regular exercisers consistently report significantly higher MHQ scores, indicating a positive correlation between physical activity and mental well-being.Among the countries, Singapore, the United States, and Canada exhibit the largest gaps between exercisers and non-exercisers. South Africa and the United Kingdom show slightly smaller differences, but the trend remains the same. The results suggest that daily exercise plays a crucial role in improving mental health across different populations, reinforcing the importance of physical activity in maintaining well-being.*

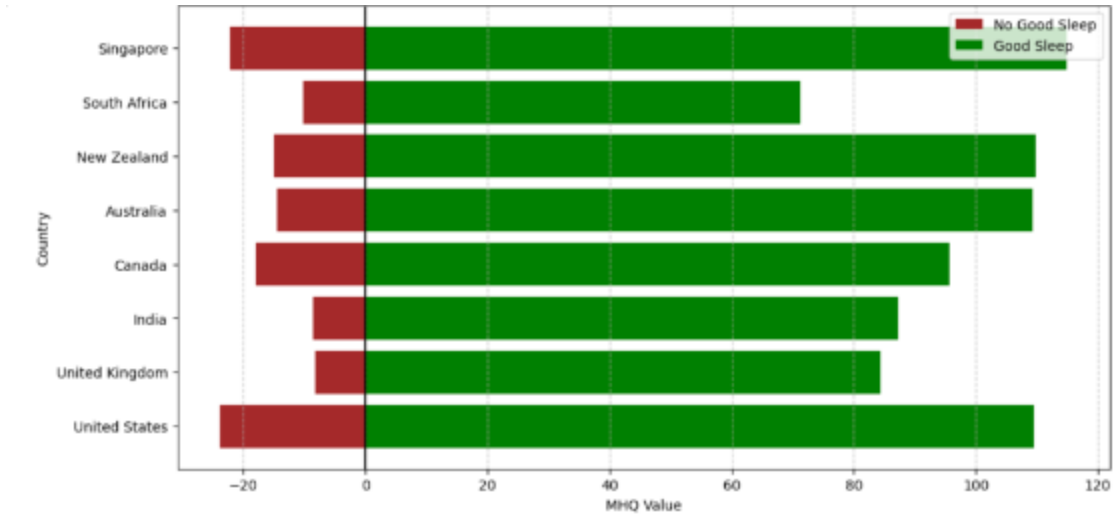


Figure 8: MHQ Score Comparison - Sleep Routine: *This chart illustrates the Mental Health Quotient (MHQ) scores of individuals who report having good sleep (green) versus those who do not (red) across different countries. Good sleep is strongly associated with higher MHQ scores in every country, highlighting its crucial role in mental well-being. The United States and Singapore show the*

largest differences in MHQ scores between those with good sleep and those without. South Africa and the United Kingdom have relatively smaller gaps, but the trend remains consistent. This visualization reinforces the significant positive impact of quality sleep on mental health, emphasizing the need for good sleep hygiene.

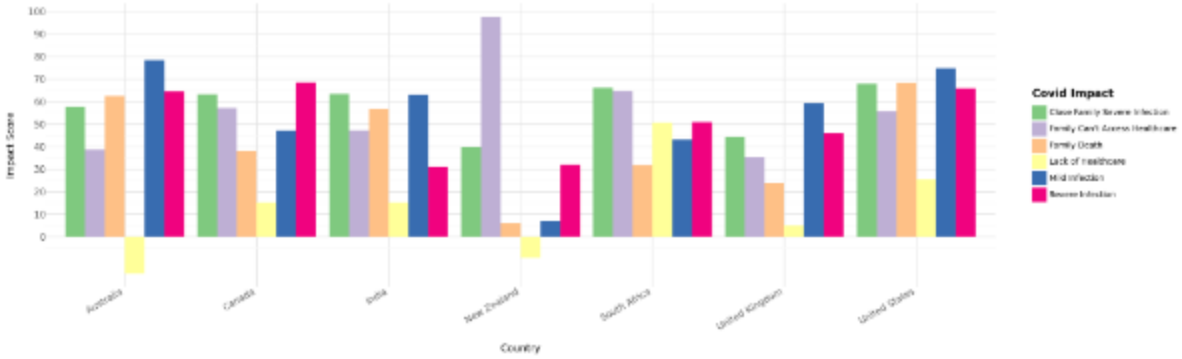


Figure 9: Covid Impact on Different Countries This chart presents the impact of Covid across multiple countries based on different factors, measured by an impact score. Key Insights: Severe Infection (Pink & Green Bars): The New Zealand and India show negative impact scores for both severe infections (self and family), indicating that Covid had a significant direct health impact in these regions. Mild Infection (Blue Bars): Countries like New Zealand, South Africa report worse scores for mild infections, while others have moderate levels. Family Death (Orange Bars): Australia and India have the highest impact scores in this category, suggesting a larger percentage of individuals faced loss due to Covid. Lack of Healthcare (Yellow Bars): Australia and New Zealand show significant impact due to healthcare inaccessibility. Family Unable to Access Healthcare (Purple Bars): United Kingdom has the highest impact in this category, indicating severe difficulties in accessing healthcare. New Zealand had the highest issue with healthcare accessibility.

THROUGH DATA AND RESEARCH WE FOUND THAT MUSIC HAS A SIGNIFICANT IMPACT ON ALLEVIATING THE EFFECTS OF ANXIETY 🎵

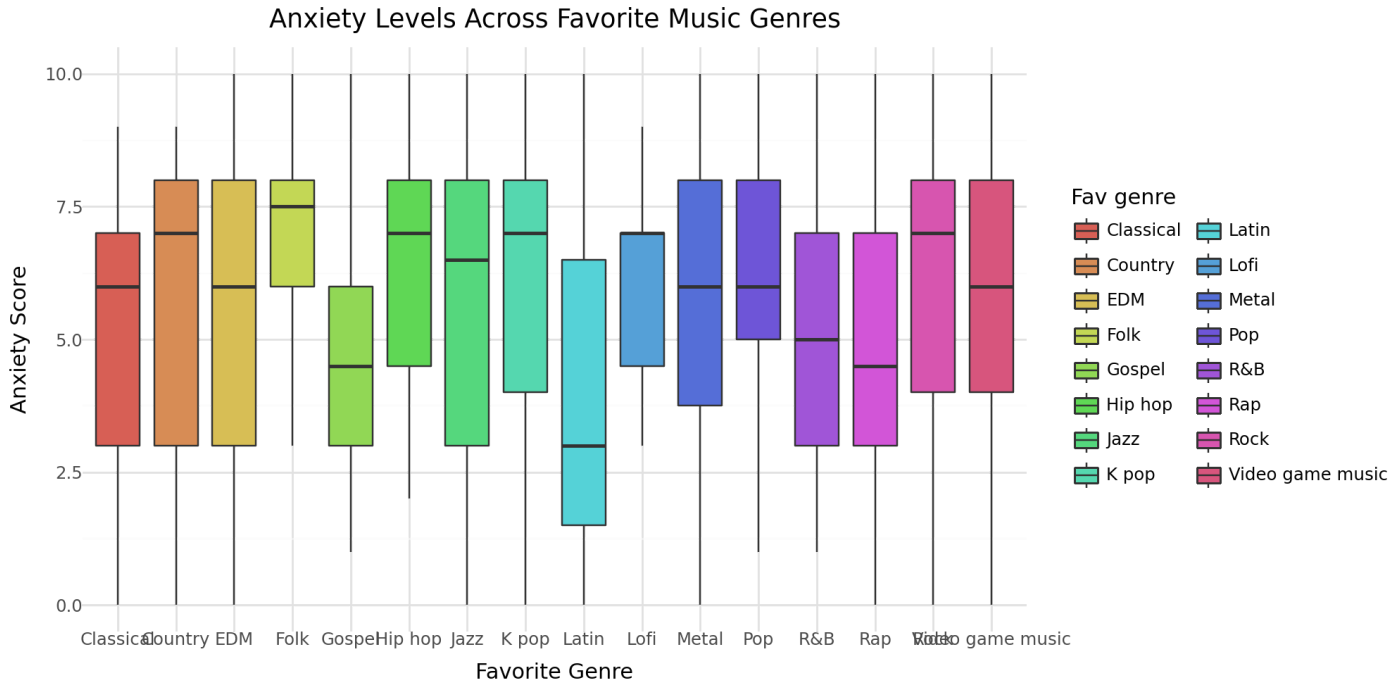


Figure 10: Anxiety Levels Across Music Genres *This box plot illustrates the distribution of anxiety scores across different favorite music genres. The y-axis represents anxiety scores, while the x-axis lists various music genres. The color-coded boxes indicate the range of anxiety scores for each genre, with wider boxes showing greater variability. Genres such as Classical, Country, and EDM exhibit higher median anxiety scores, while genres like Jazz, Gospel, and Latin show lower anxiety levels. Notably, K-pop displays a broad range of anxiety scores, indicating varied responses among listeners. These findings suggest a potential correlation between music preference and anxiety levels, warranting further investigation into the psychological effects of different musical genres on mental health.*

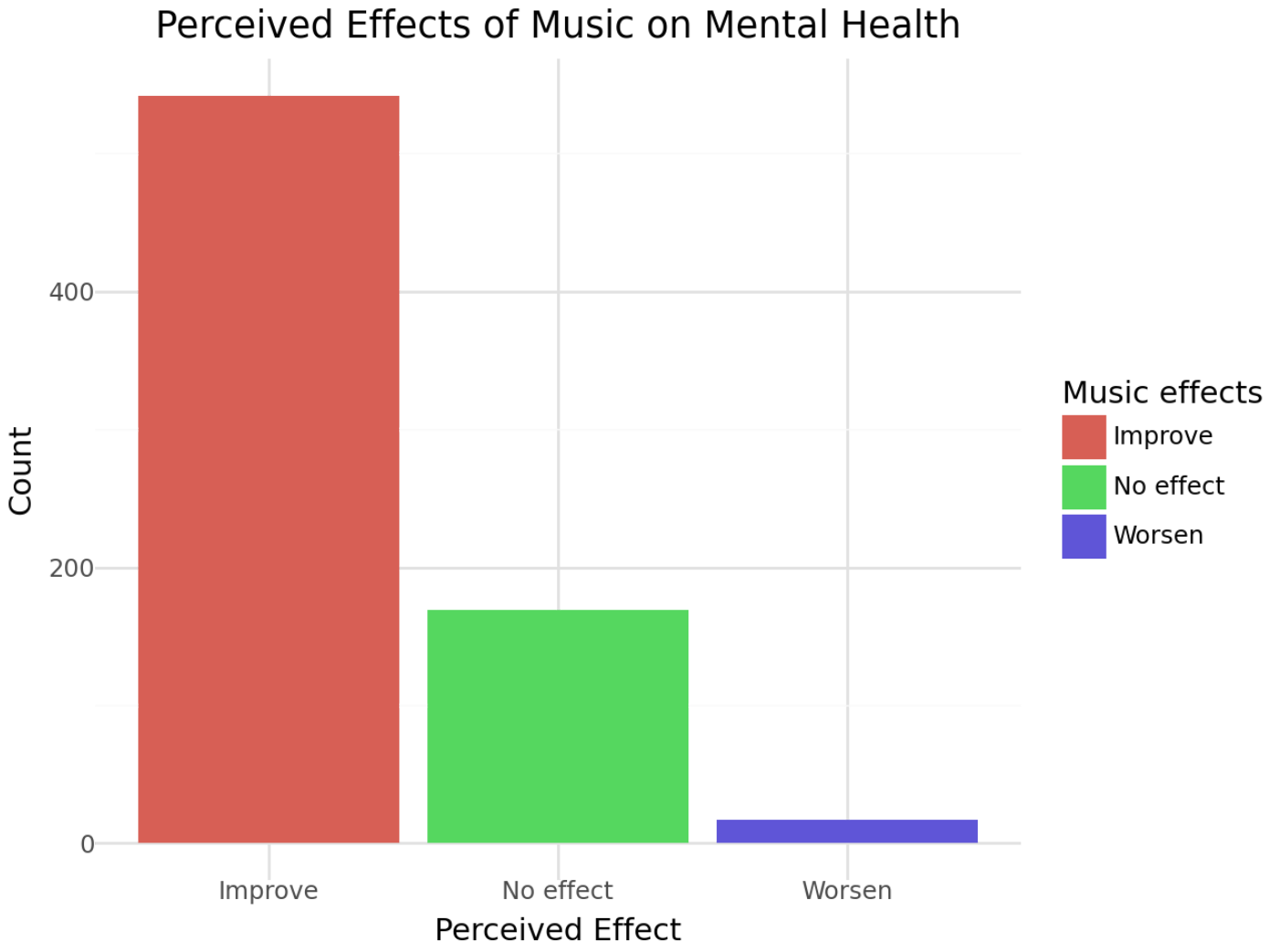


Figure 11: Effects on Music on Mental Health *This bar chart illustrates the perceived impact of music on mental health. The x-axis represents different perceived effects—whether music improves, has no effect, or worsens mental well-being—while the y-axis shows the count of responses. The majority of respondents believe that music improves mental health, as indicated by the tallest bar. A smaller portion reported no effect, while only a minimal number of participants perceived music as worsening their mental well-being. This distribution suggests that music is widely regarded as a beneficial factor for mental health, though individual differences exist. Further analysis could explore how specific genres or listening habits influence these perceptions.*

Purpose of this analysis

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Methodology

Data Collection

The data used in this analysis was obtained from publicly available Kaggle datasets:

Dataset 1: Across nations, we have mental health recent data of **1000 users (rows)** by country, occupation and mental health status. There are additional contributors like physical activity, sleep levels considered in this dataset. It has overall **12 features (columns)**. This is a recent dataset so not much work has been done yet online. Link - https://www.kaggle.com/datasets/bhavikjikadara/mental-health-dataset

Dataset 2: Sapiens Lab Data for Mental Health. This includes reports and datasets of certain features from 2020 to 2023. Link - https://mentalstateoftheworld.report/

Dataset 3: This dataset analyzes the impact of music as a remedy to alleviate the impact of stress. This dataset includes 33 columns and 737 users rows (users) reporting their stress levels, work type and improvement status. Link - https://www.kaggle.com/code/marinalozanskaya/music-impact-eda?select=mxmh_survey_results.csv

- Music Impact EDA
- Mental Health Dataset
- Music Impact EDA - Survey Results

Analysis Techniques

The following analysis techniques were applied in this notebook:

Data Cleaning

- Handled missing values using methods like mode imputation.
- Removed duplicate entries where applicable.
- Standardized and transformed data types for consistency.
- Filtered outliers using statistical techniques.

Descriptive Statistics

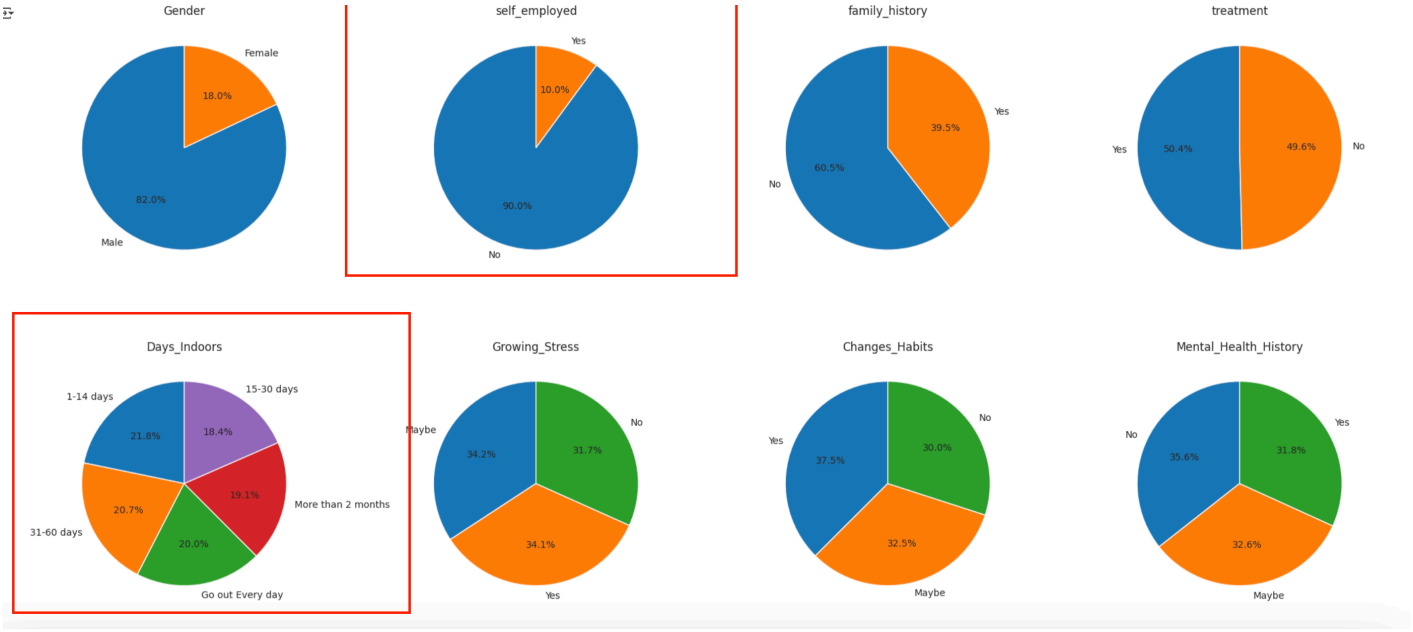
- Utilized `describe()` to summarize datasets.

Data Visualization

- Used `plotnine`, `matplotlib`, and `seaborn` to create various visualizations (e.g., histograms, bar charts, scatter plots).

Hypothesis Testing

- Performed chi-square test to validate different features' impact on 'Growing Stress'.




```
Degrees of Freedom: 2
P-value: 0.1241
The relationship between 'Growing_Stress' and 'self_employed' is not statistically significant.

Chi-Square Test between 'Growing_Stress' and 'family_history':
Chi2 Statistic: 37.7212
Degrees of Freedom: 2
P-value: 0.0000
The relationship between 'Growing_Stress' and 'family_history' is statistically significant.

Chi-Square Test between 'Growing_Stress' and 'treatment':
Chi2 Statistic: 30.0300
Degrees of Freedom: 2
P-value: 0.0000
The relationship between 'Growing_Stress' and 'treatment' is statistically significant.

Chi-Square Test between 'Growing_Stress' and 'Days_Indoors':
Chi2 Statistic: 1971.0834
Degrees of Freedom: 8
P-value: 0.0000
The relationship between 'Growing_Stress' and 'Days_Indoors' is statistically significant.

Chi-Square Test between 'Growing_Stress' and 'Changes_Habits':
Chi2 Statistic: 2379.6029
Degrees of Freedom: 4
P-value: 0.0000
```