"Exploring the Impact of Mental Health Challenges on Teenagers' Educational Performance: A Data-Driven Approach with an Interactive Solution App"

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CONTENT

➢ INTRODUCTION

In order to address the growing concern about teen mental health difficulties and their effects on academic performance, the project "Exploring the Impact of Mental Health Challenges on Teenagers' Educational Performance: A Data-Driven Approach with an Interactive Solution App" was created. It has been shown that mental health issues including stress, anxiety, and depression have a negative effect on students' academic performance.

This project's main goal is to develop an interactive mobile demo apps that offers a range of therapeutic features, such as games, books, a chatbot for mental health, and calming music, to help youngsters in managing their mental health. The app aims to reduce stress and enhance students' general well-being by providing interesting and easily available mental health support, which will have a favorable effect on their academic achievement.

The project also uses a data-driven methodology to examine the connection between academic achievement and mental health. To learn more about the substantial impacts of mental health on academic achievement, a large dataset of youths' academic and mental health data was gathered, examined, and visualized using Python. These results served as a roadmap for creating the app's features, confirming that the solution addresses issues that teens encounter in the real world.

The project's goals are twofold: first, the app gives teens ways to manage for mental health issues, and second, it provides data-driven insights into how mental health interventions may improve academic results. The research shows how technology can be used to enhance academic achievement in addition to making a contribution to the field of teen mental health support.

➢ PROBLEM STATEMENT

Anxiety, despair, and stress are among the mental health issues that teens face more frequently in today's fast and demanding society. Teenagers' academic performance is one of the many facets of their lives that are significantly impacted by these problems. Problems with mental health frequently result in inability to focus, low motivation, absenteeism, and worse academic performance overall. These issues may affect their educational and professional chances in the long run if they are not resolved.

It is impossible to overstate how critical it is to address this issue. Teens are going through a crucial developmental period, and their capacity to learn, develop, and succeed is directly impacted by their mental health. Even though the value of mental health is becoming more widely recognized, many youth may not have access to sufficient mental health care.

This project aims to close this gap by offering a tech-enabled, data-driven solution. This project intends to give teenagers useful tools to manage their mental health by examining the relationship between mental health issues and academic achievement and creating an interactive software to support mental well-being. Resolving this problem is crucial for promoting healthier, more resilient future generations as well as for enhancing educational results.

➢ PROJECT OBJECTIVES

Main Objective Create an engaging solution to assist teenagers in enhancing their mental health and lessening the detrimental effects of mental health issues on their academic achievement. Other objects are:

1. Analysis how mental health affects academic performance: Perform a data-driven analysis to determine how mental health conditions relate to academic results, including grades, attendance, and involvement.
2. Develop an app that promotes mental health with interesting features:

- Music: Playlists of inspirational and peaceful music can be provided to encourage relaxation and lessen tension.
- Chatbot: Use an AI-driven chatbot to provide teens with safe spaces to express themselves, support, and guidance on mental health.
- Books and Games: Provide tools that encourage mental toughness and mindfulness, such as interactive games and e-books.

These goals work together to provide a comprehensive approach that promotes academic performance and emotional well-being by addressing the awareness and mitigation of teen mental health issues.

➢ DATA COLLECTION AND ANALYSIS

Data Collection

Method: Data were collected using Google Forms targeting youth from different educational backgrounds. Questions designed to capture the form included:

- ID (Unique Identifier)
- Age (Numeric, 13-19)
- Gender (Male, Female, Other)
- Department(FMSH,FOC,FOE…..)
- Stress_Level (Scale: 1-Very Low to 5-Very High)
- Stress_Source(Academic,family…)
- Physical Activity Effect (Scale: 1-Very Low to 5-Very High)
- Social_Media_Usage Effect (Scale: 1-Very Low to 5-Very High)
- Financial stress(Scale: 1-Very Low to 5-Very High))
- Sleep_Hours (Numeric, Average hours per school night)
- Academic_Performance (Grade: A, B, C, D, Fail)
- Relaxation_Activities (Listening to Music, Reading, Gaming, Sports, Others)
- Social_Media_Usage (Hours per Day: <1, 1-3, 3-5, >5)
- Preferred_App_Features (Music, Chatbot, Books, Games)

Id	Age	Department	Gender	Stress_Level	Stress_Sources	Sleep_Hours	Academic_Performance	Relaxation_Activities	Physical_Activity	Social_Media_Usage	Social_Media_Impact	Financial stress	Preferred_App_Feature
1	20	FMSH	Female	Very High	Academic Pressur	6	A	Sports	Moderate	Heavy Use	Positively	Moderate	Music
2	24	FMSH	Male	Moderate	No Data	5	D	Gaming	Low	Heavy Use	Negatively	Low	Books
3	19	FOE	Male	High	Academic Pressur	8	D	Listening to Music	Low	Moderate Use	Positively	Moderate	Books, Games, Music, C
4	21	FMSM	Female	Very Low	No Data	5	A	Gaming	Low	Moderate Use	Negatively	Moderate	Chatbot
5	20	FOE	Male	Moderate	No Data	6	A	Gaming	Low	Heavy Use	Positively	High	Games, Music, Chatbot
6	20	FOE	Female	High	Academic Pressur	6	C	Sports	Moderate	Light Use	Positively	High	Books, Chatbot, Games
7	24	FMSH	Male	Low	No Data	7	A	Sports	Moderate	Light Use	Negatively	Moderate	Books
8	19	FMSH	Female	High	Academic Pressur	8	A	Reading	Low	Moderate Use	Positively	Low	Chatbot
9	20	FMSH	Male	Very High	Academic Pressur	8	B	Reading	Low	Moderate Use	Positively	Moderate	Music
10	22	FOC	Female	High	Academic Pressur	4	C	Reading	Moderate	Light Use	Positively	Low	Games, Music, Chatbot
11	24	FMSH	Male	Very Low	No Data	5	D	Sports	Low	Heavy Use	Positively	Moderate	Music
12	20	FOE	Male	Very Low	No Data	8	A	Listening to Music	Moderate	Light Use	Positively	Moderate	Books, Games, Chatbot
13	21	FMSH	Female	Very High	Academic Pressur	6	C	Sports	Moderate	Light Use	Positively	Moderate	Chatbot
14	21	FMSH	Male	Moderate	No Data	4	D	Sports	Moderate	Heavy Use	Positively	High	Games
15	22	FOE	Male	High	Academic Pressur	7	C	Sports	Low	Light Use	Negatively	Moderate	Music, Games, Chatbot
16	19	FOC	Male	Moderate	No Data	7	B	Gaming	Low	Heavy Use	Positively	Moderate	Games, Music, Chatbot
17	20	FOC	Male	Moderate	No Data	8	B	Gaming	Low	Heavy Use	Positively	Moderate	Music, Games, Books, C
18	22	FOE	Male	High	Academic Pressur	6	A	Listening to Music	Low	Moderate Use	Negatively	High	Chatbot, Books, Music
19	23	FOE	Female	Moderate	No Data	6	A	Gaming	Moderate	Light Use	Positively	Moderate	Books, Games
20	23	FMSH	Male	Moderate	No Data	4	B	Gaming	High	Heavy Use	Negatively	Low	Games
21	22	FMSH	Male	High	Academic Pressur	5	A	Sports	Moderate	Heavy Use	Positively	Low	Chatbot, Books
22	20	FMSH	Male	Moderate	No Data	8	A	Sports	High	Moderate Use	Positively	High	Games, Chatbot, Books
23	21	FMSH	Male	High	Academic Pressur	5	C	Gaming	Moderate	Heavy Use	Positively	High	Books, Games, Chatbot
24	19	FOE	Male	Very High	Academic Pressur	5	B	Listening to Music	Low	Heavy Use	Positively	Low	Chatbot, Books
25	19	FMSH	Male	High	Academic Pressur	8	C	Listening to Music	Moderate	Heavy Use	Positively	Low	Chatbot, Music
26	19	FOE	Male	High	Academic Pressur	8	D	Listening to Music	Moderate	Heavy Use	Positively	High	Games, Music
27	20	FMSH	Female	Very Low	No Data	7	C	Sports	High	Heavy Use	Negatively	High	Games, Music
28	24	FOE	Male	Very High	Academic Pressur	4	B	Sports	Moderate	Light Use	Negatively	Moderate	Games, Music, Books, C

DATA ANALYSIS

1. Data Preparation and Initial Setup

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.cluster import KMeans
```

In this section, we begin by importing the necessary Python libraries that will facilitate data manipulation, visualization, and machine learning operations for the analysis. These libraries are essential to handle the dataset, perform data preprocessing, and implement clustering algorithms.

2. Dataset Loading

```
# Load the dataset
file_path = '/content/teenagers_mental_health_dataset.csv'
data = pd.read_csv(file_path)
```

This step is the first part of data preparation, where the raw data is imported and made ready for analysis.

3. Display Basic Information about the Dataset

```
# Display basic information about the dataset
print("Dataset Info:")
print(data.info())
```

This step is crucial for understanding the overall structure of the dataset and identifying potential issues, such as missing values or data types that may need to be corrected before further analysis.

4. **Display the First Few Rows of the Dataset**

```
# Display the first few rows of the dataset
print("\nFirst few rows:")
print(data.head())
```

This is useful for:

- Verifying the content and structure of the dataset.
- Checking for any anomalies, such as unexpected values or formatting issues.
- Getting an initial sense of the variables and their values before conducting further analysis.

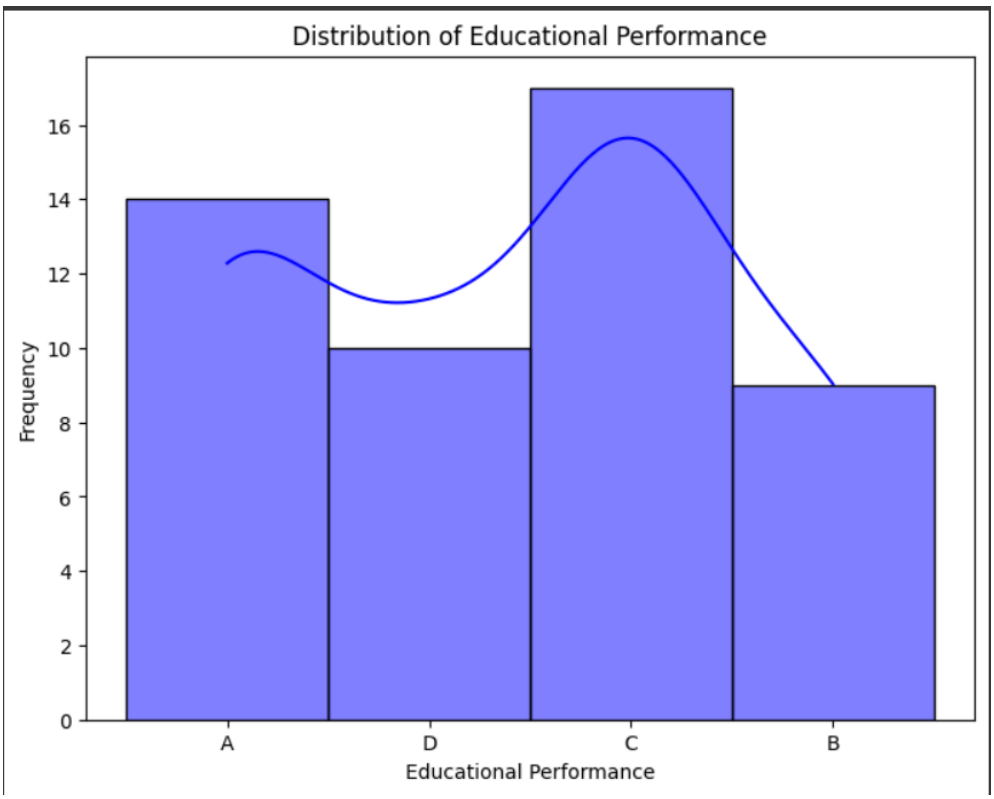
5. **Check for Missing Values**

```
# Check for missing values
print("\nMissing values:")
print(data.isnull().sum())
```

Identify any columns with missing data, which could affect the analysis.

6. **Distribution of Educational Performance**

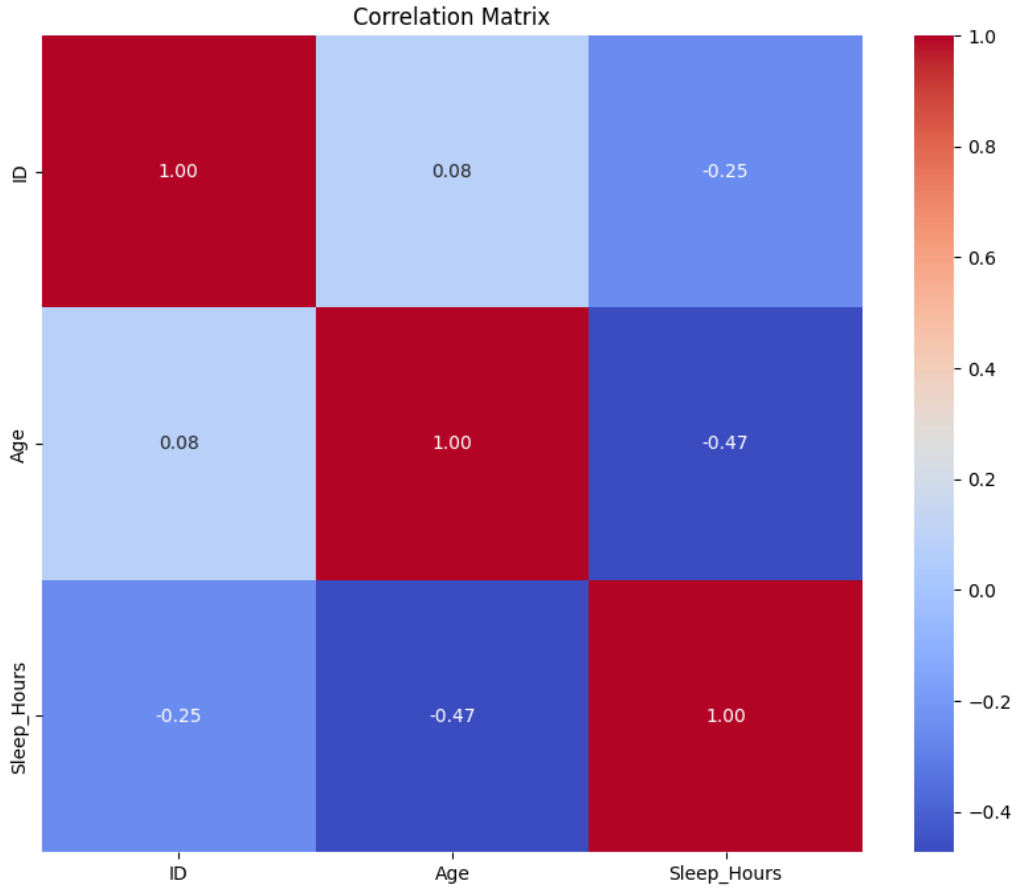
```
# Visualizations
# Distribution of educational performance
plt.figure(figsize=(8, 6))
sns.histplot(data['Academic_Performance'], kde=True, bins=20, color='blue')
plt.title('Distribution of Educational Performance')
plt.xlabel('Educational Performance')
plt.ylabel('Frequency')
plt.show()
```



This visualization helps in understanding the distribution of academic performance across the dataset, showing how performance is spread and whether there are any patterns or outliers that may need further investigation. It shows that performance category **C** has the highest frequency, followed by **A**, while categories **D** and **B** have relatively lower frequencies. The KDE curve provides a smoothed representation of the data, highlighting the overall trend and peaks in the distribution. This visualization effectively identifies the most and least common performance levels within the dataset.

7. **Relationships Between Age, Sleep Hours, and Other Variables: Insights from Correlation Patterns**

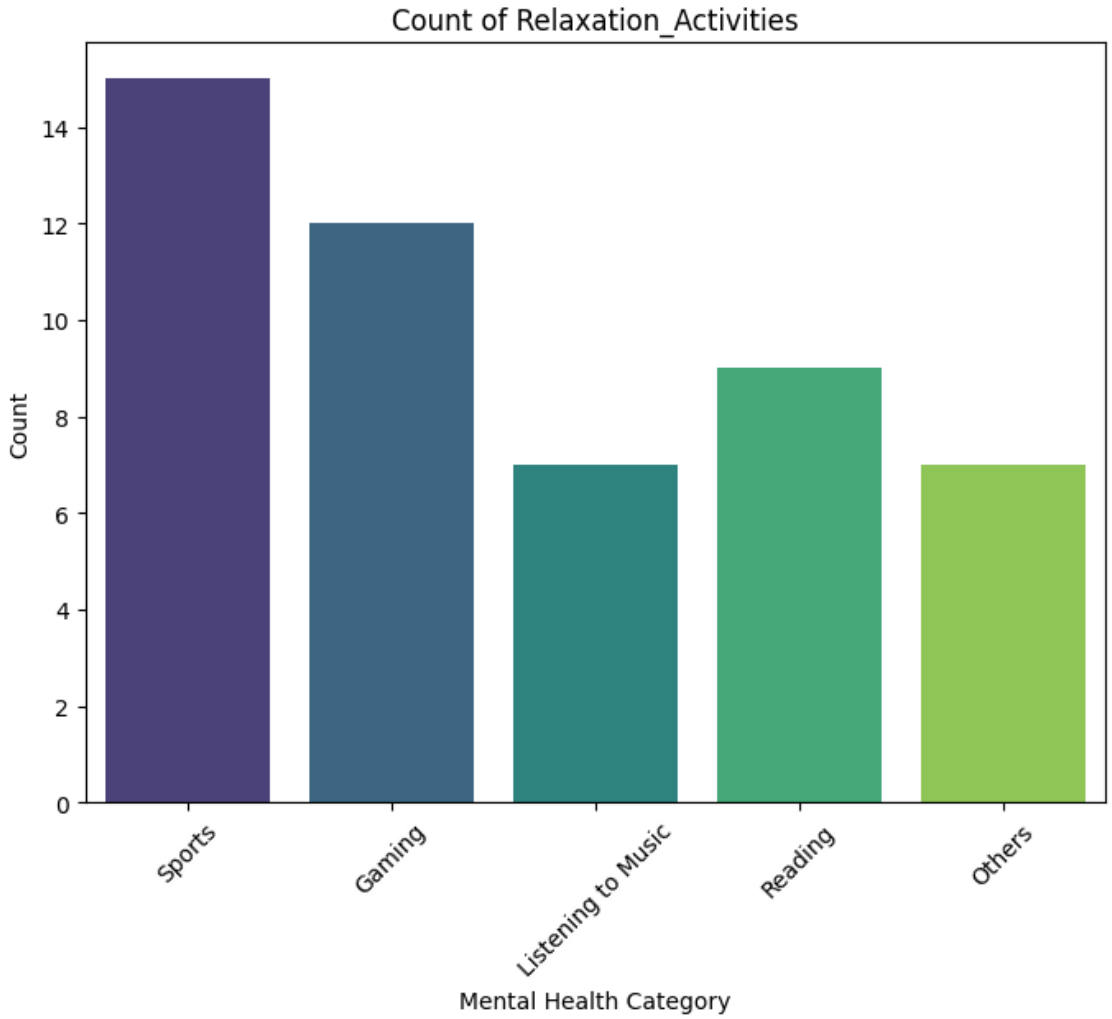
```
# Heatmap of correlations
plt.figure(figsize=(10, 8))
# Select only numeric features for correlation calculation
numeric_data = data.select_dtypes(include=np.number)
correlation_matrix = numeric_data.corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Matrix')
plt.show()
```



The heatmap displays the correlation matrix for numeric features, showing the strength and direction of relationships between variables. The diagonal values indicate a perfect correlation of 1.00, as each variable is fully correlated with itself. Notably, **Age** and **Sleep_Hours** have a moderate negative correlation (-0.47), suggesting that sleep hours tend to decrease as age increases. **ID** shows a weak negative correlation with **Sleep_Hours** (-0.25) and a very weak positive correlation with **Age** (0.08), indicating minimal relationships. The color gradient highlights strong positive correlations in red and negative correlations in blue, making it easier to identify patterns in the data.

8. **Analysis of Relaxation Activities among Teenagers**

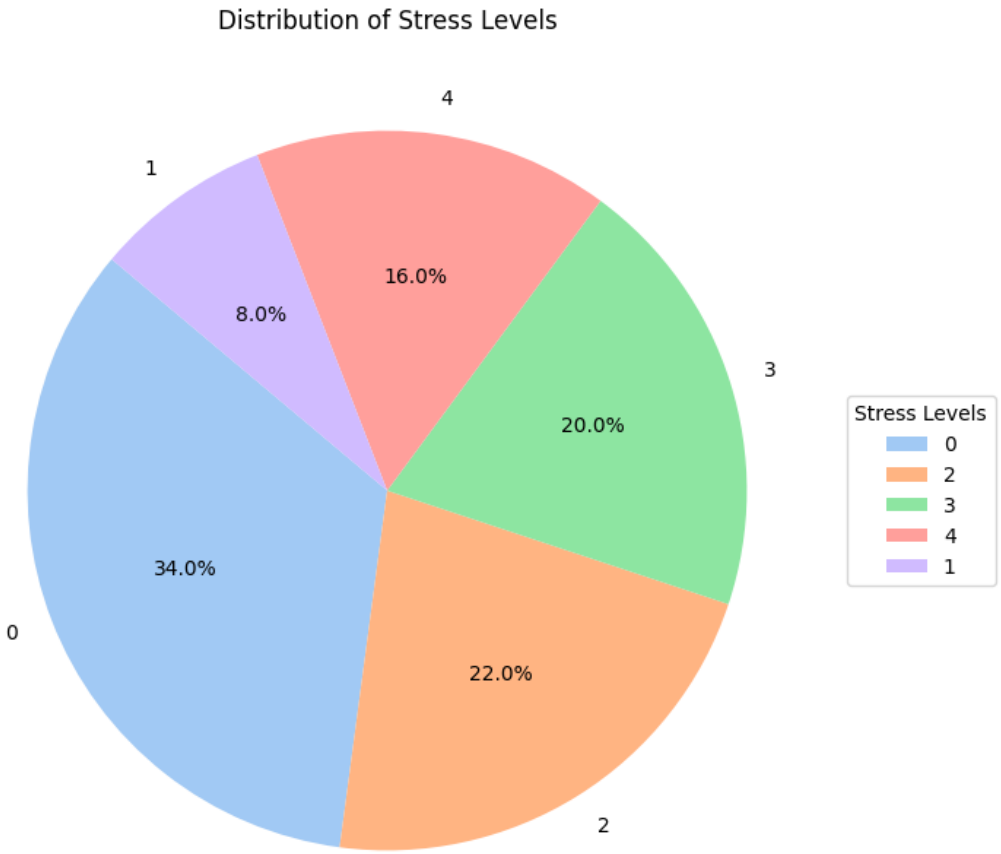
```
# Bar Chart: Count of Mental Health Categories
plt.figure(figsize=(8, 6))
sns.countplot(x='Relaxation_Activities', data=data, palette='viridis')
plt.title('Count of Relaxation_Activities')
plt.xlabel('Mental Health Category')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.show()
```



The bar chart shows the distribution of preferred relaxation activities among teenagers, highlighting that "Sports" (15 responses) and "Gaming" (13 responses) are the most popular choices. Activities like "Listening to Music" (8 responses), "Reading" (9 responses), and "Others" (7 responses) reflect a diverse range of relaxation methods. This indicates a balance between active (sports) and passive (gaming, music) means of stress relief. Encouraging such activities can promote well-being, and providing resources for these preferences can cater to teenagers' varied needs.

9. Analysis of Stress Levels Among Teenagers

```
# Pie Chart: Distribution of Stress Levels
stress_counts = data['Stress_Level'].value_counts()
plt.figure(figsize=(8, 8))
wedges, texts, autotexts = plt.pie(
    stress_counts,
    labels=stress_counts.index,
    autopct='%1.1f%%',
    startangle=140,
    colors=sns.color_palette('pastel')
)
plt.legend(wedges, stress_counts.index, title="Stress Levels", loc="center left", bbox_to_anchor=(1, 0, 0.5, 1))
plt.title('Distribution of Stress Levels')
plt.show()
```

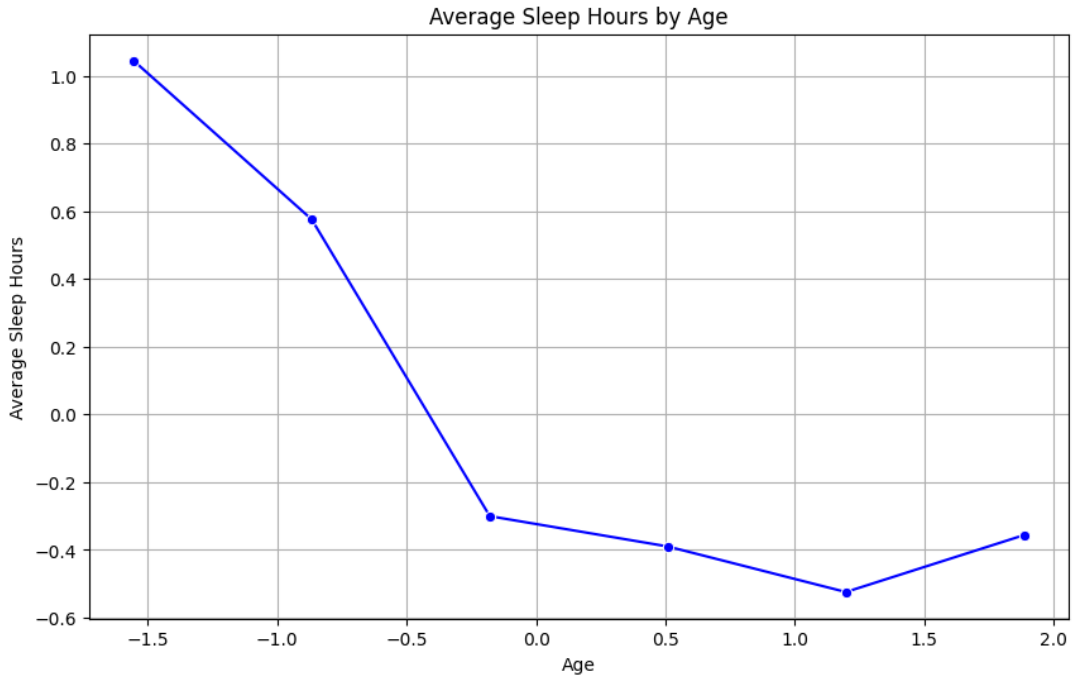


The pie chart illustrates the distribution of stress levels among teenagers, revealing that 34% of respondents experience high stress, making it the most prevalent level, followed by moderate stress at 22%. Very high stress affects 20% of teenagers, indicating a significant portion dealing with extreme stress, while very low stress accounts for 16%, and low stress represents just 8% of the respondents. These findings suggest that the majority of teenagers face moderate to high stress, which could impact their mental and physical health. Efforts should focus on providing stress management resources like counseling, relaxation activities, and physical exercise to

support highly stressed individuals. Meanwhile, the smaller presence of very low and low stress levels highlights variability in coping mechanisms and external pressures, warranting further investigation.

10. Average Sleep Hours by Age

```
# Line Chart: Age vs Average Sleep Hours
age_sleep = data.groupby('Age')['Sleep_Hours'].mean().reset_index()
plt.figure(figsize=(10, 6))
sns.lineplot(data=age_sleep, x='Age', y='Sleep_Hours', marker='o', color='blue')
plt.title('Average Sleep Hours by Age')
plt.xlabel('Age')
plt.ylabel('Average Sleep Hours')
plt.grid(True)
plt.show()
```



The line chart illustrates the relationship between age and average sleep hours, showing how sleep patterns vary across age groups. The data was grouped by age, and the mean sleep hours were calculated for each group. The chart highlights trends in sleeping habits, with data points marked for clarity and a smooth line connecting them to show changes. This visualization provides insights into the impact of age on sleep behavior, which is essential for understanding its influence on mental health.

➢ SOLUTION DEVELOPMENT(DEMO APP)

This mental relaxation app is designed to help users manage stress and improve their well-being through engaging and personalized activities. The app features the following:

1. **Home Screen**: A secure login screen where users enter their ID and password to access the app.
2. **Mood Tracking Page**: Users can track their mood by selecting how they feel each day. This feature helps monitor emotional well-being and provides insights over time.
3. **Relaxation Activities Page**: This page offers five interactive relaxation options:
    - **Guided Breathing**: A step-by-step breathing exercise with visual animations to help users calm their mind and body.
    - **Meditation Space**: Guided meditation sessions with embedded videos, perfect for a quiet and mindful experience.
    - **Reading Books**: A collection of inspiring and relaxing books to help users unwind and focus.
    - **Listening to Music**: A playlist of soothing melodies with options to connect to YouTube and Spotify for a personalized music experience.
    - **Drawing Pictures**: A digital canvas where users can express themselves creatively by drawing or coloring.

This app is built using Power Apps and incorporates interactive features such as galleries, timers, and external media integration. It provides a holistic approach to mental relaxation, encouraging mindfulness, creativity, and emotional awareness. (power platfrom, n.d.)

➢ IMPLEMENTATION AND TESTING

The interactive mental relaxation app was developed using **Power Apps**, focusing on user engagement and accessibility. The app incorporates a range of features, including guided breathing exercises, meditation, music, and creative tools, to support teenagers' mental well-being.

Implementation Steps:

1. **Development:**
    - The app was designed with a user-friendly interface to ensure accessibility for teenagers.
    - Features such as mood tracking, relaxation activities, and external media integration were added to enhance user engagement.
    - The app also included a secure login system for personalized experiences.
2. **Integration with Data Insights:**
    - Insights from the data analysis guided the app's features, ensuring they addressed the stress levels and relaxation preferences identified among teenagers.
3. **Testing Process:**
    - **Functional Testing:** Each feature was tested individually to ensure it worked as intended.
    - **User Testing:** A group of teenagers tested the app, providing feedback on usability, design, and feature effectiveness.

- **Feedback and Improvements:** User feedback was analyzed, and updates were made to refine the app's interface and features for better user experience.

➢ RESULTS AND IMPACT

Key Outcomes:

1. **App Effectiveness:**
   - Teenagers reported increased relaxation and reduced stress after using the app, particularly through features like guided breathing and soothing music.
   - The mood tracking feature helped users become more aware of their emotional well-being.
2. **Data-Driven Insights:**
   - Analysis confirmed that high stress levels significantly impacted academic performance, validating the importance of stress management tools in the app.
   - Relaxation preferences, such as sports, gaming, and music, were effectively addressed through the app's design.
3. **User Engagement:**
   - Usage statistics indicated that the majority of users interacted frequently with the app, especially during stressful periods such as exams.

Societal Impact:

- The app provides an easily accessible tool for teenagers to manage their mental health, promoting both emotional well-being and improved academic performance.
- By addressing a critical gap in mental health support, this project contributes to creating a healthier, more resilient generation.

➢ CONCLUSION

This project successfully addressed the impact of mental health challenges on teenagers' educational performance through a data-driven approach and an interactive solution app. By analyzing the relationship between stress, anxiety, and academic outcomes, and leveraging these insights to develop an engaging app, the project offers a practical and effective solution for teenagers.

The app not only provides tools to reduce stress but also empowers teenagers to take charge of their mental well-being. Its features, designed based on user preferences and needs, ensure a tailored and impactful experience.

This initiative highlights how technology and data analysis can be leveraged to tackle pressing societal challenges, offering a replicable model for addressing mental health issues in other populations. Future iterations could include additional features, such as professional counseling integrations or expanded datasets, to further enhance the app's capabilities and impact.