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Stress Sync: An AI Based Application for Stress Management and Academic Prioritization to Enhance Performance in Oman

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ABSTRACT

College students experience high levels of stress from academic demands and personal pressures. In this paper, "Stress Sync" is proposed as a user-friendly framework for a stress management system tailored especially for college students with the inclusion of an academic task priority list management system. Such a system will help students manage their academic workload while also keeping an eye on their stress levels. Students can receive real-time data on their stress scores which are calculated using data from relevant stress factors, helping them understand on taking proactive and knowledgeable ways of dealing with their academic stress, and look after their mental well-being. Stress Sync offers personalized stress management strategies, uniquely tailored to each student's needs. A strong community virtual network is also part of the framework, which emphasizes providing students with the necessary resources to look after their mental health. The aim of this framework is to encourage students in Oman to navigate their academic challenges in life while also prioritizing their mental well- being.

Keywords: Stress Management Systems, Academic Task Management Systems, Academic stress, Task Priority Management, Stress factors, Academic Task Priority Systems.

INTRODUCTION

Stress serves as a crucial signal to the body, indicating when it is overwhelmed by certain situations beyond its capacity to cope. "Stress can be broadly defined as the response of the body when one cannot adapt to a situation when they feel under pressure or tension." (Li et al., 2023, p. 117). The experience of stress is highly individual, influenced by a collection of psychological and physiological factors which require extensive study to completely understand how it affects people. Coping mechanisms for stress are equally personal and subjective. In Oman, young students experience stress in multitude of ways. Due to the lifestyle changes brought by rapid urbanization and modernization, there is a shift to maintain personal responsibilities for students, which include keeping up with academic workload, family obligations and societal expectations of traditional values, which further intensifies their stress.

Academic Stress Among College Students

Academic stress is a major concern among college students. While students face stress in their personal life, academic expectations are particularly high due to environmental changes. The shift from high school to college or university brings additional obstacles. Students must adapt to an increased pace of study, manage coursework and project deadlines, juggle conflicting work schedules, and balance personal responsibilities. (Olivera et al.,

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2023).

Oman places a strong emphasis on education and academic excellence, as it is a pathway for the young generation to uplift and build a stronger nation that can utilize manpower in various ways. Combined with cultural and familial expectations, where academic performance is seen as a gateway to securing better career opportunities, academic stress adds a layer of pressure on college students. “Overall, irrespective of gender, race/ethnicity, or year of study, students who reported higher academic stress levels experienced diminished mental well-being.” (Barbayannis et al., 2022). In addition, students who have part-time jobs might find it difficult to balance work and life, on top of academic work.

Coping Mechanisms and the Risks of Dangerous Strategies

Healthy coping mechanisms are essential for alleviating stress. College students are particularly vulnerable to developing harmful habits, such as illicit drug use, which can further impede their academic focus and overall well-being (Böke et al., 2019). Some other unhealthy coping mechanisms used by young students today include drug and alcohol use, the use of e-cigarettes, stress-induced eating, insomnia, excessive procrastination, and physical activity. With nicotine being a substance that youngsters can access easily, they often use it as a quick fix for their problems. However, despite its temporary relief, nicotine can quickly lead to addiction.

Students also often neglect taking care of their body with improper dietary and sleep habits, and they neglect their mental health through habits like procrastination which exacerbates their stress.

RELATED WORK

In one of the studies, Chandrasiri et al. (2021) mentioned several factors that have been identified to calculate stress levels. The factors considered are physical factors, behavioral factors such as type of colors liked by the students, physiological factors such as heart rate variability, which has been measured using a built-in sensor. To calculate the stress level, they conducted the study with Swell Dataset along with machine learning algorithm, Random Forest, which is used to extract the results from the sensor to with an accuracy of 99.9975%. The research includes various methods for calculating stress. For instance, lasso regression, which is a linear regression, an approach for performing regression analysis involving factor selection and regularization to improve the statistical model's interpretability and prediction performance with 72.64% accuracy. The study has also compared its proposed system “Mellow” with existing systems like Youper, Calm, Color and Woebot. The comparison of different features makes Mellow a better system as it provides several features to help students cope with their stress, that is lacking in the existing systems. Some of the features are registered doctor details and stress relieving music generator. Unlike other systems, in this study, mellow system was used to conduct daily and weekly questionnaires to find the level of stress: low, moderate, and high; using Perceived Stress Scale. The questionnaires helped to provide recommendations to the users based on their stress levels. According to them, the results of the study indicate that the "Mellow" smartphone app uses modern technology and individualized suggestions to successfully treat each student's unique stress level, providing a complete remedy for college students struggling with stress-related problems. Based on the studies, most of the papers lack solutions to stress issues. However, they provided several solutions to stress in university students in Sri Lanka such as, mini games, art therapy sessions, meditation, journal writings etc. through the “Mellow” application.

In another study, Lee et al. (2022) considered ultra short term HRV analysis as the main factor after making a comparison with other factors. It has been thought of as a useful factor as it provides real- time feedback and is less time-consuming than traditional HRV assessments: “According to Thomas Wyss et al., the HR, an ANS indicator, is initially high during acute mental stress situations and decreases as the stress situation continues. These results indicate that the response of the sympathetic nervous system to acute mental stress not only responds rapidly, but also adapts to a stress stimulus due to ANS homeostasis.” They used LOSOCV as a stress classification. This is very closely related to real-world problems, hence making it a more accurate method compared to other methods of classification.

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PRELIMINARY INVESTIGATION

Stress can be caused by a wide range of factors, including biological elements like sleep quality, food, and underlying health issues, as well as cognitive ones. Key stress indicators such as pulse rate and heart rate variability (HRV) can be measured with IoT devices such as smartwatches, chest bands, and Arduino boards (Chalmers, 2021). These devices can provide useful information that can be linked into the StressSync system, which includes a website as well as an Android mobile application. StressSync also contains a task scheduling mechanism that prioritizes academic tasks based on importance.

When a user's stress score crosses a certain threshold, indicating elevated stress levels, StressSync recommends individualized stress management solutions based on personal needs and preferences. If a user's stress score is favorable, StressSync encourages them to prioritize their academic tasks appropriately.

In comparison to other systems, StressSync has several distinct advantages. For instance, the integration of IoT devices facilitates real-time monitoring of physiological stress indicators, offering users accurate and fast feedback on their stress levels. Additionally, StressSync's focus on individual stress management approaches ensures that users receive targeted help that addresses their specific stress patterns.

Technology-based solutions are popular among the youth today. Having digitalized solutions could help users to receive help proactively and reactively, which can be based on different situations. These solutions can also be optimized to learn about the user's stress relief strategies and coping mechanisms to prepare them for upcoming stress situations (Jingar, 2022).

METHODOLOGY

The methodology we used for this research is qualitative research methodology which involved preparing questionnaires, distributing surveys to participants, and interviews with mental health clinics to gain qualitative data. Reading and comparing literature reviews of similar systems were also utilized to gain a better understanding of stress management systems.

RESULTS (DATA ANALYSIS)

Linear scales (from 1-5, ranking from low to high) and pie charts are given below, which is a small section of the results taken from the survey conducted to get public opinion about the proposed framework.

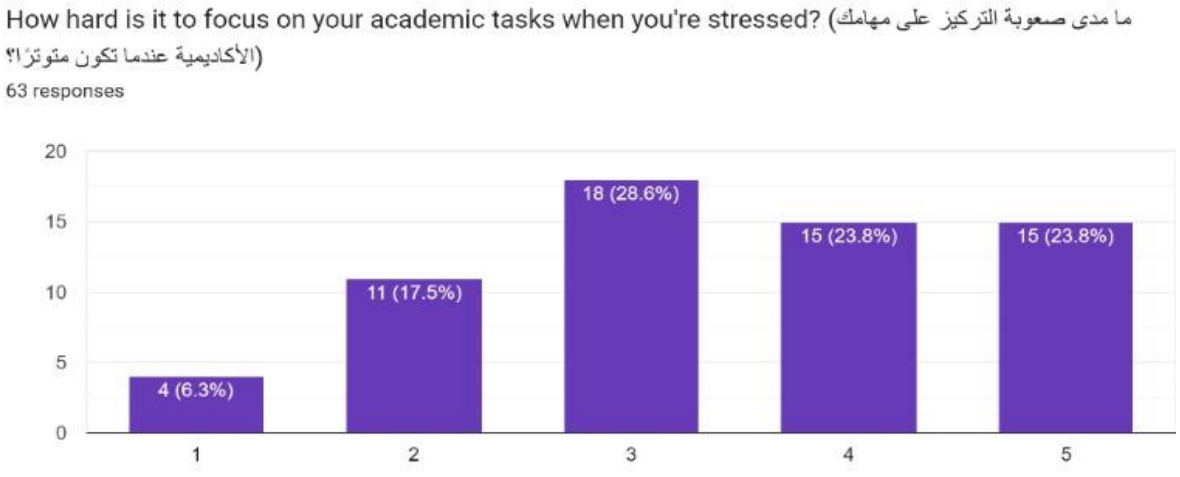

Figure 1: Linear scale for the level academic focus of students when they are stressed.

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Figure 2: Pie chart showing whether students use applications to track academic tasks.

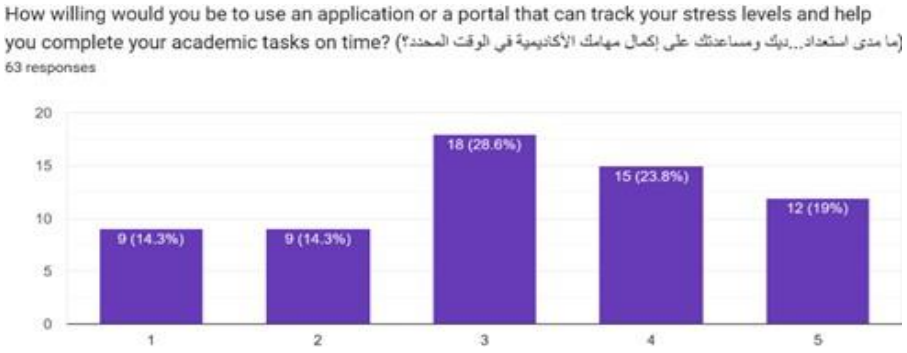

Figure 3: Linear scale showing the interest of students in using the proposed system.

From Figure 1, it is observed that 76.2% of people chose scales (3-5) indicating that academic stress is a prevalent matter for college students in Oman. Figure 2 shows that while 74.6% don't use academic planning applications, this habit has been developed among a niche of students who would be likely to use tracking applications. Figure 3 gives a neutral reading into how likely people would use such a system, which brings the need of increasing the awareness of stress management in the community. It shows that mental health needs more prioritization from the people in Oman.

From the interview with 'Whispers of Serenity', mental health professionals gave their knowledge about the demographic of college students and how they react to stress. College students have been found to engage in habits like 'doom scrolling' on the internet, smoking and other forms of nicotine use, and consuming high levels of caffeine. They suggested healthy coping strategies which involved mindful breathing exercises, journalling, body scans, calming music-guided meditation, and practicing regular self-care.

Overall, the responses indicate that college students would hugely benefit from such a proposed system, which would add beneficial value to their lives. From the interviews conducted, it was found that there was a need to educate students on how much stress affects minds and bodies, and to use technological advancements to aid stress management.

PROPOSED TECHNOLOGICAL ADVANCES IN STRESS MANAGEMENT

In today's technological world, virtual reality (VR), wearable devices, and machine learning are widely used in creative ways to offer people more immersive and useful applications. These technologies offer unique and novel concepts for managing stress. A proposed framework for a stress management system includes an academic task priority navigator, allowing students to track and manage their stress levels alongside their academic responsibilities.

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The framework would include:

1. Stress score calculator: This would help them receive real-time information on their stress levels through data from stress factors relevant to college students.

2. Academic task priority navigator: This allows students to manage their academic workload while monitoring their stress in the process. By having insights into their academic responsibilities, they can make informed decisions based on a priority order.

3. Wearable stress monitors: Integrating wearable devices that track physiological indicators of stress like pulse data can provide students accurate information to track their stress triggers.

4. Stress reduction using virtual reality (VR): Virtual reality technology can create immersive surroundings that encourage relaxation and reduce stress using calming landscapes and soothing music which will provide students with a virtual getaway from academic stresses.

5. Insights based on machine learning: Using machine learning algorithms to learn patterns between students' stress levels and their academic performance could be useful to recommend personalized strategies to combat their stress.

Mental Health and Stress Management in Oman

While students frequently utilize electronic tools such as calendars and to-do list applications to handle their academic workload, these tools place little emphasis on mental well-being. In Oman, where the importance of mental health is still being recognized, there is a critical need for integrated solutions that prioritize both academic task management and stress management (Alharti et.al, 2023). The fast-paced college setting poses challenges for individuals who want to build good stress management skills. Traditional stress management techniques, which are support from family and friends, meditation, and entertainment may not be sufficient to handle complex stress experienced by college students in Oman. Stress management systems tailored according to the specific stress factors of college students, particularly those in Oman, which will be obtained by collecting data from local students will play a vital role in enhancing the well-being and academic success of the next generation. By incorporating mental health concerns into academic task management tools, these systems will provide a space which addresses both psychological and academic needs.

Use Case Diagram

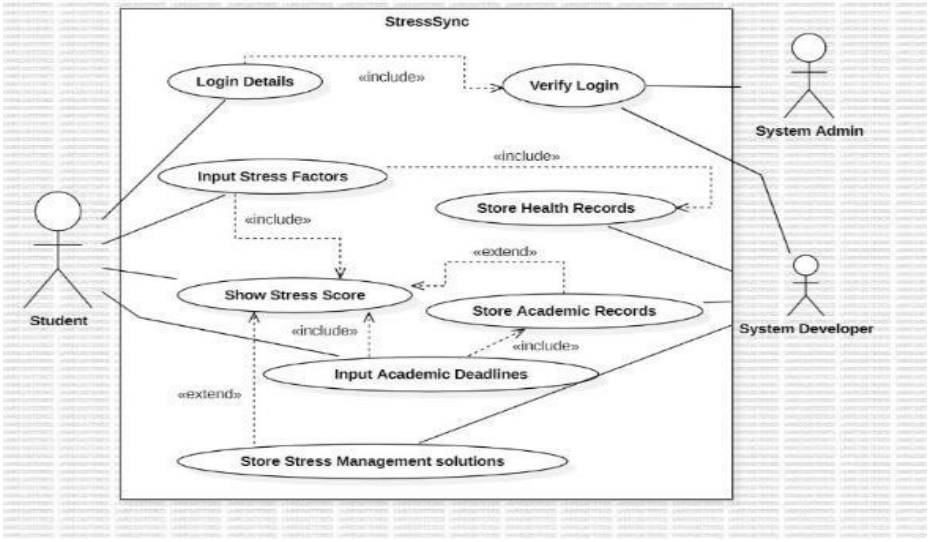

Diagram 1: A Use Case Diagram for the proposed system. Stress Sync

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The above is a use-case diagram demonstrating the proposed StressSync. The primary actor is the student that has to login to the account, input stress factors, such as, diet, water intake, sleep routine, illness, and input academic deadlines, which is considered as the main stress factor. Upon input of stress factors and academic deadlines, the system will automatically calculate the stress score. Depending on the stress score, the system will provide the student with stress management solutions. As the student inputs stress factors, the system will update health records and academic records, which will be monitored by the system developer, but can be viewed by the student as well. The system admin handles the login credentials of the student to maintain privacy and security.

Prototype

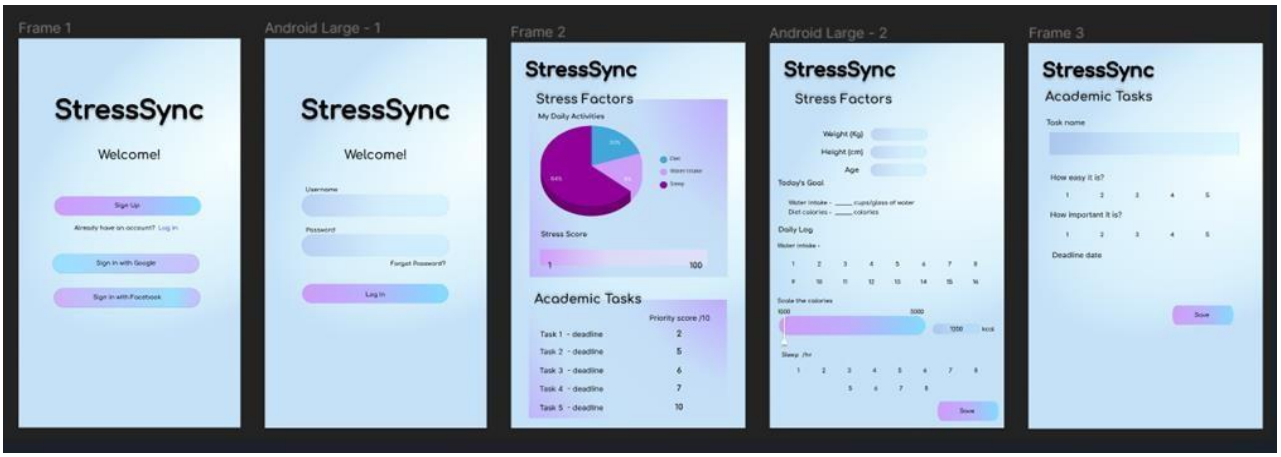

Diagram 2: A proposed prototype for Stress Sync

The above displayed is a prototype of proposed StressSync. The first page is the sign-up page when a user first uses the app. Next is the login page after registration of the student. The account is created to migrate the data and store it in the database easily. The third page displays all the interactive elements, it displays the stress score with diet, exercise water intake and sleep percentage on daily basis. Furthermore, the academic tasks are listed below according to their priority score. The task with highest priority is listed at the top.

CRITICAL EVALUATION OF SIMILAR WORK

The article titled “Machine Learning based Academic Stress Management System” by B. Thanasekhar, N. Gomathy, A. Kiruthika and S. Swarnalaxmi, published in 2019 11th International Conference on Advance Computing.

The article addresses how academic stress levels among university students can be managed and observed in real-time via wearable biosensors and machine learning. The study takes on a combination of IoT devices and machine learning methods to manage and observe academic stress. The biosensors are used to collect the physiological data which is later analyzed via machine learning procedures to identify the stress levels, on which they provided recommendations of actions that can be taken to reduce their stress based on the stress levels. The authors gathered data from a sample of 25 students who were selected randomly. The subject was asked to wear the biosensors that tracked their heart rate and pulse rate. Data is collected with 15 mins intervals, while university students followed their normal day to day routine. Data collected is transferred to the student mobile phones and then to the cloud storage in the form of CSV for analysis. The data gathering period is for 6-8 months. They authors have provided data through descriptive statistics and graphs, cluster analysis, and Stress Score Computation. From the article it is concluded that stress level can be identified and observed in the student by analyzing the physiological data. There is a relationship between stress and academic performance. The study identifies the ideal student who can manage stress and perform well in academics. Theories used to support the research conclusions are stress theory that link the physiological response to stress level such as activations of

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parasympathetic and sympathetic nervous systems. Machine learning models and clustering methods are used to analyze and categorize stress data. They used data science to support the technical aspects of the study. Behavioral psychology connects stress management and academic performance.

The article conclusion is generally reasonable by data presented and given the followed methodology. Using the wearable sensor to observe stress is a relevant approach that supports the aim of the article. The sample size used is narrow to 25 students can limit the generalization of the findings hence to make the conclusions valid requires detailed study with diverse sample size. However, the article has a similar idea to our project StressSync. The article is beneficial to us by providing a methodology on how to collect data on stress and analyze it via IoT devices. The article also supports our objective of how heart and pulse rate are linked with stress management. For improvements of increasing the accuracy of the system, considering more psychological and physiological factors such as sleep patterns and diet could have played a significant role.

CONCLUSION

The proposed framework 'Stress Sync' is a stress management system which gives researchers and developers ideas, creative solutions, knowledge about mental health and covers various aspects related to lives experienced by college students. In Oman, stress and stress management are still topics that need wider discussions to briefly educate the people on taking care of their mental health. This becomes an even more important matter for college students in Oman, who take on academic workload on top of managing their personal lives.

This framework is one that takes different stress factors, both biological and psychological ones, to calculate the stress levels of college students, according to which they would be able to focus on academic tasks which would be arranged on a priority basis. The framework also includes personalized stress management techniques which use technology. Pulse data is a key stress factor for StressSync which was studied through literature review. Systems similar to StressSync were also studied and critically examined.

The research uses data collection methods in the form of surveys to gain public opinion. It was found that around 76.2% of college students experience stress to certain serious degrees. This provides reasoning for the need to develop such a system. The prototype for StressSync provides a visual outlook on parts of the framework. This framework will help future researchers and implementers gain much valuable knowledge from the perspective of college students, which can later be broadened to stress management applicable to other demographics in Oman.

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