

Psyche – Mental Health Application for Students based on Cognitive Behavioral Therapy

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Abstract:- The emotional and mental health of a student is one of the most important aspects when it comes to a student's success. In modern times, we find that many students go through stress and depression due to many reasons; some of them being, not able to cope up with the hectic lifestyle of their education curriculum or having family responsibilities at an early stage of their life. In India, there seems to be a problem of people not giving equal attention to mental health as much as they give it to physical health, leading to which mental health is largely neglected. The need to educate people especially students is the need of the hour and there seems to be a shortage of mental health experts or professionals' expertise in Cognitive Behavioral Therapy. Our paper focuses on proposing a web application, which has an integrated virtual assistant expertise in Cognitive Behavioral Therapy. Through our application, we aim to not only educate people on Cognitive Behavioral Therapy but also bridge the gap between students and mental health experts.

Keywords:- Cognitive Behavioral Therapy; Mental Health; Students; Psychiatrists; Virtual Assistant; Automatic Thought Challenges;

I. INTRODUCTION

A. Background

India is currently in the midst of a mental health crisis. Many people seem to prevent themselves from seeking help due to stigmas around mental health. Students are often neglected and dismissed when they try to open and share their problems with their parents, which eventually leads to thinking that is more negative. The deficiency of mental health experts in India; fewer than two for every one Lakh people makes it even more difficult for people to get mental

support [1]. Students these days go through various sets of challenges, which affects their mental well-being. This leads to a devastating impact on their mental health. COVID 19 has made the mental health crisis even worse; According to the Indian Psychiatry Society, 1 in every 5 Indians face mental illness [1]. The need to educate people in the field of mental health is the need of the hour, which can eventually help them improve their mental state of health.

B. Cognitive Behavioral Therapy

Cognitive Behavioral Therapy is a short-term therapy technique, which helps people in finding new ways in changing their thought process. This technique helps in reducing stress, reducing depression, coping with academic pressure, and facing lots of other common mental health challenges. According to Cambridge Dictionary, Cognitive Behavioral Therapy can be defined as "A treatment that helps people to deal with problems by changing the way they think about them" [2]. If we break down the word Cognitive Behavioral Therapy, Cognitive refers to anything and everything that goes in your mind including memories, thoughts, images, whereas Behavioral refers to everything that a person does and lastly, Therapy refers to a systematic approach to combat a specific problem or an illness. As a matter of fact, Cognitive Behavioral Therapy is a form of psychotherapy, which focuses on modifying dysfunctional thoughts, emotions or behaviors by investigating and uprooting negative or irrational thoughts [3].

Now, Cognitive Behavioral Therapy is purely based on the understanding that feelings, thoughts, and emotions are inter-connected to one another, leading to which negative thoughts can trap you in a vicious cycle [4]. The focus of CBT sessions is to change these negative thoughts to improve the way a person thinks. CBT sessions usually last from 45-60 minutes where the person will usually have a

session with the therapist once every 2 weeks. The entire aim of Cognitive Behavioral Therapy is to teach the person to apply various skills that he/she have learned during the treatment in their daily life. This should help them manage their problems and avoid them from having negative and irrational thoughts, which would influence their lifestyle [4].

II. LITERATURE REVIEW

According to the American Psychological Association, Cognitive Behavioral Therapy is a concept of mental health treatment, which has been illustrated to be constructive for a wide range of mental issues like anxiety, depression and physical and mental problems. In many research studies, Cognitive Behavioral Therapy has been illustrated to be as constructive as, or more constructive than, other forms of mental and psychological treatments [7].

The author discusses the use of Natural Language Processing and other AI techniques to provide therapy to those suffering from mental illnesses [2]. They talk about a predictive modelling technique and mention some key inferences for treating social anxiety symptoms. Furthermore, they devise an implemented solution to deliver their methodology following various features and techniques of Cognitive Behavioral Therapy. The paper gives a comprehensive setup description along with the analysis of the results. This paper focused on a very important point that Internet based interventions are much more easily accessed and flexible and they can also be delivered at low cost to a larger population [2].

The paper sets some groundwork by introducing the most common mental health issues like Stress, Anxiety, and Depression [6]. Many chemicals, that are responsible for triggering various brain activities, are released based on our daily routine, food intake, emotional state, and many other such factors. Changes and negligence towards these activities can cause irregularity in quantity and timing. This disruption can seriously botch our mental health in harsh ways. The author takes note of all these in his research to put forth the complete analysis of some of the causes of mental issues in human beings. There are many screening tests to show whether one has the above-mentioned problems or not. They can help a therapist to be well acquainted with the patient’s condition and give their results in form of a score as well as a legend so that the test-taker can identify how serious his/her condition is.

One of the papers reports about the famous Cognitive Behavioral Therapy. Apart from the techniques, the author also elaborates on the concept of core beliefs, and many such sub-concepts of CBT. The penultimate paragraph of this paper describes the major elements of the system design of the application developed by the authors. User responses and feedback have also been provided to show how well accepted and useful the application has proven to be. In the existing methodologies, the researchers are yet to work on large data and it is estimated that collaborating with a psychiatrist could help in bringing more accurate results [6].

The author devises an experimental trial program with the help of ICBT or Internet-based Cognitive Behavioral Therapy, where he measures the quality of life, degree of global improvement, measures of general anxiety and depression, and then conducts the therapy in a particular technique [5]. Then he elaborates upon every detail of events and conditions that took place when conducting an internet-based CBT and face-to-face CBT [5]. It was demonstrated with an experimental trial. The author explains the developed regression analysis to find the covariance and then compares it with its alternates that were acquired by changing some key parameters. A detailed flowchart showing the whole procedure and resultant observations at each step is also included.

The author puts forth the motion that the modern use of computerized Cognitive Behavioral Therapy can help in enhancing the use of this technique largely [4]. He elaborates on its use and shares points on the value of these test results. Furthermore, he shared his weekly plan scheme and the techniques he has proposed for each unit of the given period. The author has used data from the Global Burden of Diseases, Injuries, and Risk Factors Study, to calculate the various attributes effecting the mental health [1]. He points out all the possible causes that, according to him, may be the sole reasons for deteriorating mental health among today’s generation. Next, he describes the entire setup of the research study and presents a case definition wherein he shares an overview of the nature and type of test cases he has included in his trials.

Several methodologies were employed in conducting studies of various apps based on a similar concept. While the wearing down effect of these apps varied due to different methodologies and intervention times, others compared the results of their users after using their application with the help of questionnaires. Our application, although has a similar concept but has been implemented with a combination of features that are unique with respect to another set of functionalities that are offered by applications in this market today. Following are the group of top applications in this domain being compared with our application on certain parameters in Table. 1.

	Psyche	Sanvello	Mood Diary	MoodFit	HeadSpace
Psychiatrist Session	Yes	Limited	No	No	No
Virtual Psychiatrist	Yes	No	No	No	No
ASPMT Screening	Yes	Premium	No	Yes	Yes
Track Mental Progress	Yes	Yes	Yes	Yes	Yes
Backed by Research	Yes	Yes	No	No	Yes

Table. 1. Comparison of various Applications

III. PROPOSED SYSTEM

With the erratic pace of life and displaced balance in diet, mental disorders like Anxiety, Stress, Physical and Mental Tiredness are the most prevalent issues faced by students these days. The most prominent cause of mental disorders among students is Exam Stress.

Despite being aware of the fact that they are suffering from some mental health problems, only a minority of the population actually resort to seeking treatment and therapy. Two major reasons behind it are; firstly, Social Embarrassment and secondly, the High Fees of a Psychiatrist. The teenage years of students signify a crucial transitory phase that they experience while straddling towards adulthood. Yet the neglected attitude to such debilitating issues have continued to significantly increase the risk of mental and emotional disorders in teenagers. Often these behavioral and mental disorders are associated with bad habits, low academic performance, phobias and suicidal thoughts as well. However, the most prominent cause of mental disorders in adolescents is Exam Stress.

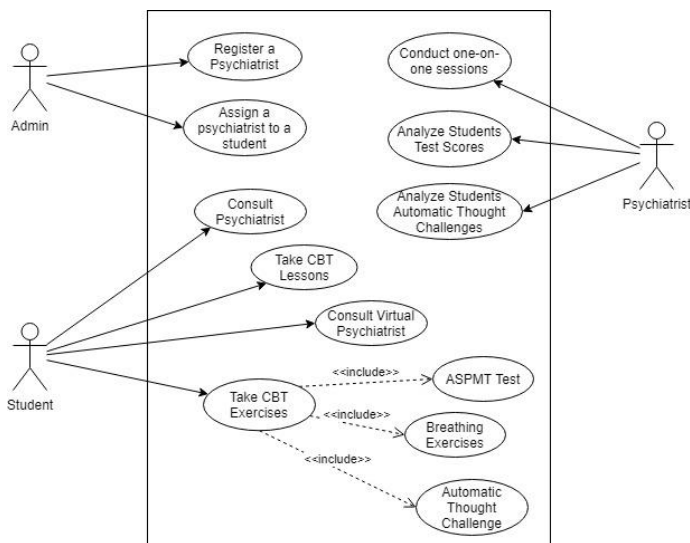


Fig. 1. Use Case Diagram

Hence, there was a need to design a system that would help students overcome their mental disorder due to Exam Stress by exploring various parameters like anxiety levels, stress levels and physical and mental tiredness. Therefore, this paper aims to propose a mental health application, which uses Cognitive Behavioral Therapy techniques and methods along with a Virtual Psychiatrist to bridge the gap between students and psychiatrists.

The project’s main aim is to develop an application that is specifically designed to cater to the mental issues and maladies experienced by students. The primary focus of this system revolves around screening the students for common yet widely ignored mental issues like depression, anxiety, stress, mental and physical tiredness caused due to Exam Stress. We then focus on breaking down all the mental issues to its bare minimum and individually giving it the much-required attention by providing CBT sessions via a dedicated

AI virtual psychiatrist. This Virtual Psychiatrist creates a therapeutic conversation flow, much alike to what one would receive in the office of an actual psychiatrist, but much easily accessible and on your fingertips anytime and anywhere. The conversations and sessions strictly follow the CBT techniques and methods of coping with Exam Stress, commonly faced by the students of today’s generation. Along with CBT sessions with a virtual psychiatrist and regular assessment via our ASPMT assessments, we also give the student the amenity of booking a chatroom session with a certified psychiatrist on our web application. A dedicated chat room will be provided via a room code where you can interact with the psychiatrist, discuss your issues, and seek consult and remedial solutions.

IV. SYSTEM FEATURES

A. Student Module

- 1) **Cognitive Behavioral Therapy Lessons:** This module emphasizes on providing awareness of mental ailments and its treatment using Cognitive Behavioral Therapy for Students. It comprises various lessons that are taught using a video based teaching method along with a descriptive paragraph. This module will display many types of Cognitive Behavioral Therapy aspects to the students with the help of a dedicated video guided approach along with some theoretical information to cater to the student’s queries. This Module will not only let students learn about Cognitive Behavioral Therapy but also gain in-depth knowledge about various techniques and methods related to Cognitive Behavioral Therapy. This module was designed with the purpose of spreading awareness about the unspoken yet common mental disorders.
- 2) **Cognitive Behavioral Therapy Exercises:** This module emphasizes on providing various Cognitive Behavioral Therapy exercises to the student through which they are not only able to analyze their mental health but also help them in improving their mental health. This module contains different features such as ASPMT Tests, Breathing Therapy, and Automatic Thought Challenges.
 - a) **ASPMT Tests:** This module focuses on providing various screening tests based on various mental illnesses. The student will have the option to opt for various screening tests like PHQ-9, GAD-7, ISI, and OCI-R; that is provided by our application. The students will be able take different tests regarding depression, stress, anxiety, physical and mental tiredness which will eventually help the student to analyze his/her mental health. The results of the various ASPMT Tests will help the assigned psychiatrist analyze the student’s mental health as well.
 - b) **Automatic Thoughts Challenges:** This module is based on the idea of negative thoughts confrontation and self-realization. Students often get various negative thoughts and these negative thoughts can trap students in a vicious circle and make them believe that they are

doomed to always feel this way. Therefore, the main goal of the Automatic Thought Challenge module is to help students break out of this vicious circle by guiding the students to the path of self-realization. This module is a guided approach towards eliminating negative thoughts in students by countering negative thoughts and core beliefs.

- c) **Deep Breathing Therapy:** This module provides a guided approach towards deep breathing for Students. The graphical animation on the dedicated webpage assists the student to timely inhale and exhale which will help the student to relax leading to which their mental health improves. The main idea of this module is to make sure that the student feels calm and relaxed after using this particular feature.
- 3) **Virtual Psychiatrist Session:** This is the module where the students will be able to take Cognitive Behavioral Therapy sessions from a virtual psychiatrist powered by IBM Watson. This module will allow students to access a virtual psychiatrist expertise in Cognitive Behavioral Therapy, which will conduct sessions with the student to help him/her manage different types of stress disorders. The main idea of this module is to understand the students problem and then recommend Cognitive Behavioral Therapy techniques to the student for him to manage his/her mental health.
- 4) **Psychiatrist Session:** This is the module where the students will be able to access the privilege of seeking help from mental health psychiatrists via a dedicated chatroom. Here the user can share all their problems regarding their mental health and get diagnosed and helped by a professional without the hassle of travelling to meet one. This comprises a chatroom interface where students can interact with a certified psychiatrist, discuss, and resolve their issues that are responsible for their mental disorders. In order for the student to use this feature of the web application, the student will have to send a request to the admin for allocation of a psychiatrist.

B. Psychiatrist Module

- 1) **Analyse ASPMT Tests:** This is the module where the psychiatrist will be able to analyse the ASPMT Test results of various students, which are assigned to him. This analysis will help the psychiatrist understand the mental health of a particular student, which will help the psychiatrist take necessary steps to improve the mental health of the student.
- 2) **Analyse Automatic Thoughts Challenges:** This is the module where the psychiatrist will be able to analyze the Automatic Thought Challenges of various students, which are assigned to him. This analysis will help the psychiatrist understand the mental state of mind of a specific student, which will help the psychiatrist take necessary steps to remove negative and irrational thoughts from the mind of the student.

- 3) **Schedule Student’s Session:** This is the module where the psychiatrist will be able to schedule sessions with a specific student. This will eventually send a mail to the student with the necessary details regarding the session; the main idea of the session is to improve the mental health of the student.

C. Admin Module

- 1) **Add a Psychiatrist:** This is the module, which will allow the admin to register a psychiatrist into the system. This module ensures that only verified and authenticated psychiatrists are inducted into the system. Through this, all the necessary details of the psychiatrist will be added into the system.
- 2) **Assign a Psychiatrist:** This is the module, which will allow the admin to assign a registered psychiatrist to a registered student. This module will ensure that the workload of a specific psychiatrist is controlled and managed by allotting him a specific number of students.

V. IMPLEMENTATION

Our Proposed model, Psyche, a Mental Health Application is focused on managing and improving mental health of students using Cognitive Behavioral Therapy. The Three main entities involved in the system are:

- The Student
- The Psychiatrist
- The Admin

The entire application is divided into client-side logic and server-side logic. The entire client-side logic is based on ReactJS whereas the server-side logic is based on NodeJS and ExpressJS. The system database is based on a cloud-based service i.e., MongoDB Atlas. The virtual psychiatrist, which is integrated in the system, is based on IBM Watson. The entire application is hosted and deployed on Heroku.

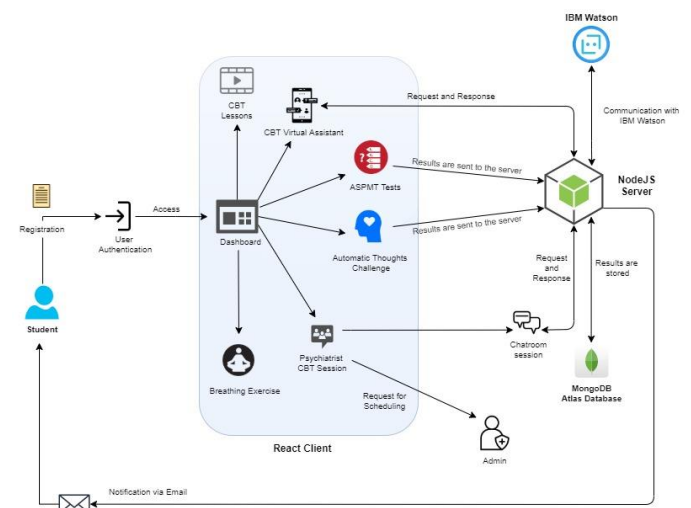


Fig. 2. Student Architecture Diagram

In Fig. 2, the architecture diagram of the student module is shown; firstly, the student needs to register on our application using his/her personal details, which gets stored

in MongoDB Atlas. Once a student registers on our platform, the student receives a mail confirming the registration. The student can then use his/her credentials to access our application. The student is allotted a JWT token when he/she logs in our application. Through this JWT token, the student will be able to avail all the features of the application using his personalized dashboard where the student can also see his progress in terms of mental health. The student module consists of various React components where each component renders a particular feature of the application. Now the different features that the student gets on his dashboard would be CBT Lessons to educate him more about Cognitive Behavioral Therapy, then the Watson Assistant which will act as a Virtual Psychiatrist, then comes the ASPMT Tests where we have 4 types of Tests on our platform namely, PHQ-9, GAD-7, OCI-R and ISI, then comes the Automatic Thought Challenges through which the student will be able to challenge his/her negative thoughts, then the student will also have a breathing therapy session and lastly the feature of a chatroom where the student can communicate with a psychiatrist.

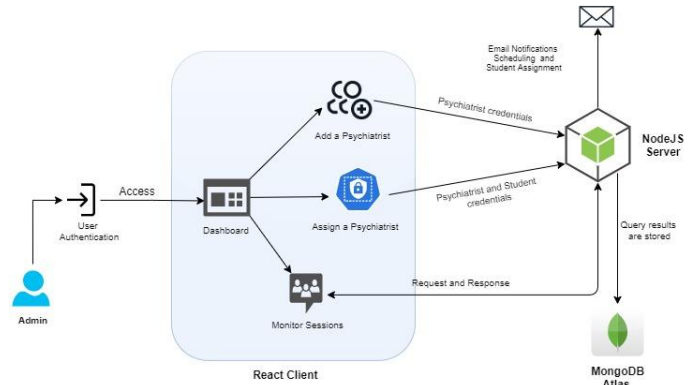


Fig. 4. Admin Architecture Diagram

In Figure 4, the architecture diagram of the admin module is shown; the admin has its own credentials through which he/she is able to access the various admin features of the system. The admin has the responsibility of authenticating and registering a psychiatrist in the system. Besides that, the admin also has the right to assign a particular psychiatrist to various students. Lastly, the admin has its own dashboard through which the admin will be able to monitor the entire application.

VI. RESULTS AND DISCUSSIONS

To peruse and create a detailed analysis of the performance of our project, we deployed our application online and introduced it to a small set of population for beta testing and feedback. As seen in Fig. 5, our testing population consisted of 67 students with ages 20 and 21. From an overwhelming number of responses and constructive criticism, we were able to curate the following statistics that describe our achieved results.

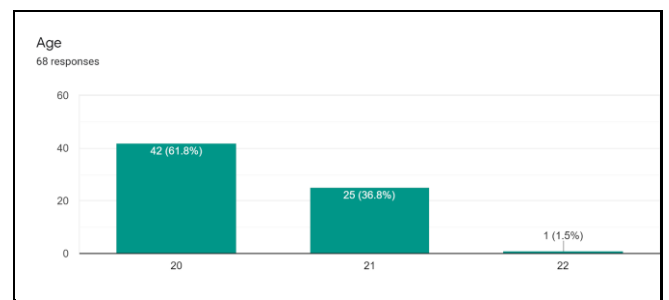


Fig. 5. Age Group of Sample

In Fig. 3, the architecture diagram of the psychiatrist module is shown, here the admin of the application has the functionality to register and authenticate a psychiatrist into the application. Once a psychiatrist is authenticated and registered into the application, the psychiatrist can use his/her credentials to avail the features of the psychiatrist module. The psychiatrist is allotted a JWT token when he/she logs in our application. Through this JWT token, the psychiatrist will be able to avail all the features of the application using his personalized dashboard. The psychiatrist module consists of various React components where each component renders a particular feature of the application. Now the different features that the psychiatrist gets is analyzing the ASPMT Tests and Automatic thought challenges of various students that are assigned to him. In addition, the psychiatrist would be able to schedule CBT sessions with specific students on a specific time.

According to Fig. 6, about 94% of the total population found our application easy to navigate through. When such questions were asked regarding the usability and interaction with the functionalities of our application, more than 75% of students showed their appreciation and acceptance towards the flow of our application and various modules. The adequate positioning of all functionalities on the dashboard page of our application indeed catered to the needs of the majority.

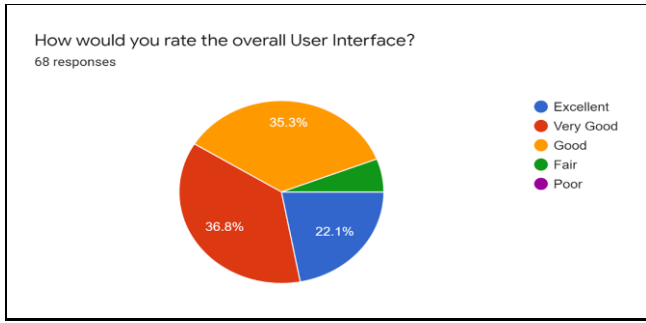


Fig. 6. User Interface

Coming to the ASPMT tests, our target audience found its extremely efficient in providing a clear prognosis after completing the screening tests. As suggested in Fig. 7., this module could efficiently produce accurate results 91% of the time. Our main objective while developing this application was to provide CBT sessions to everyone in such a way that they can access it from their portable devices at all times. Our virtual psychiatrist module proved to be more than consistent enough to serve this purpose. 85% from Fig. 8. keeps the evidence that our testing population found this module really helpful and easy to operate.

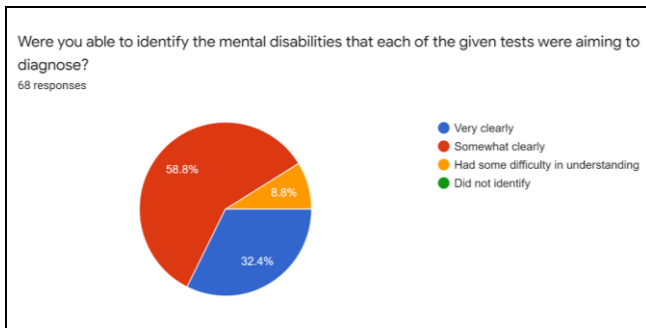


Fig. 7. Mental Health Assessments

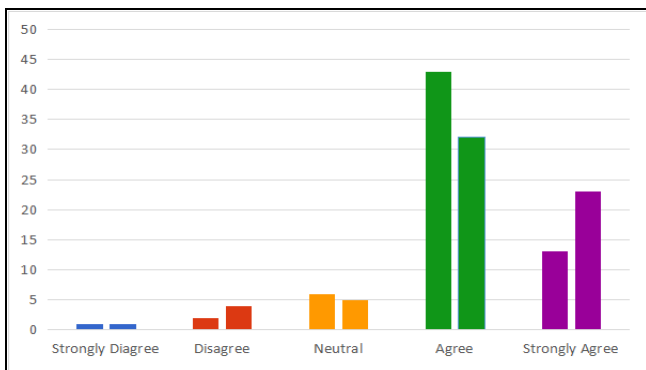


Fig. 8. Virtual Psychiatrist Session

During our research, we found that there is a scarcity of awareness about mental health issues and various techniques to cope with it. Keeping this in mind, we had developed certain modules like the CBT sessions and exercises and the audience could not agree more with us. Approximately 98% of the students felt that our module clearly satisfied the purpose of educating them with CBT techniques. This analysis from Fig. 9. can be used to easily deduce the fact that our application was successful in becoming the first application to fill this void in this domain.

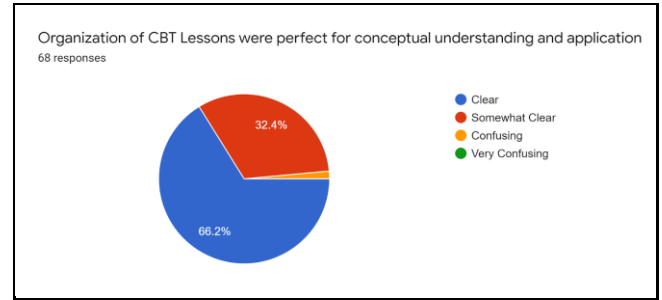


Fig. 9. Cognitive Behavioral Therapy Lessons

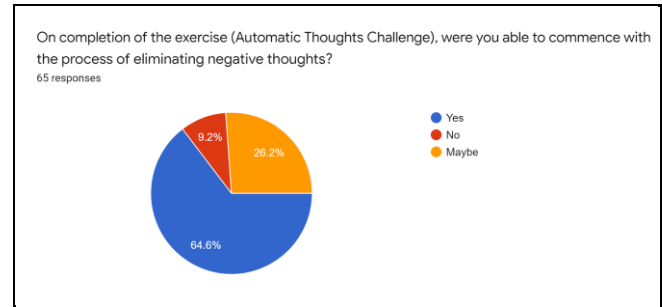


Fig. 10. Cognitive Behavioral Therapy Exercises

We also provided the CBT exercise namely the Automatic Thoughts Challenge and Deep Breathing to see how our users felt about it in terms of relevance and usability. As seen in Fig. 10, 70 to 90% of the participants really approved of its relevance and found it clearly fulfilling its purpose. Earlier during a research survey, we found that along with a virtual psychiatrist, the presence of a physical psychiatrist would greatly help students in overcoming their mental problems. Therefore, we developed a chat room that would connect the student in need with a certified and verified psychiatrist on a one-to-one basis. Our testing population highly appreciated this feature as more than 85% of the participants found this functionality helpful as shown in Fig. 11.

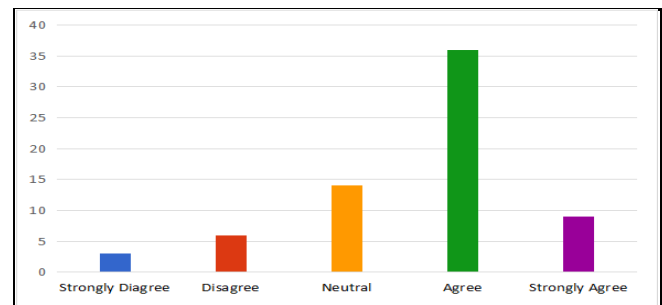


Fig. 11. Psychiatrist Session

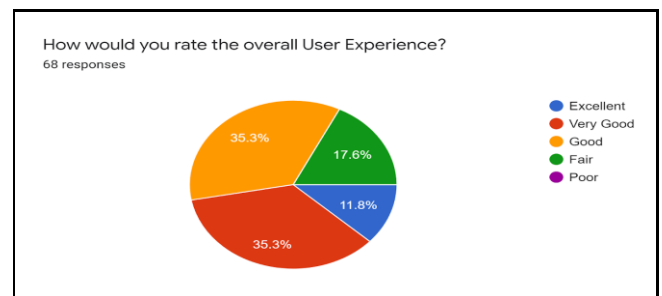


Fig. 12. User Experience

Overall, Fig. 6. and Fig. 12 shows that our project was able to deliver a good user experience to more than 90% of participants and 80% of the participants positively rated our UI. With that being said we were also offered a fair share of criticism showing us where all there was a scope for improvement.

VII. CONCLUSION AND FUTURE SCOPE

Health is not a single dimensional term. It is associated with all the aspects of physical, mental and social well-being. Unfortunately, in many countries particularly India, mental health is not given the same importance as physical health. Particularly, many students in India suffer from mental health problems like Anxiety, Stress, Physical and Mental Tiredness. Even though many people in India know that, they are suffering from some mental health problem they will not go and visit a psychiatrist. Two major reasons behind this scenario are, the exorbitant fees that a psychiatrist charges and people finding it socially embarrassing to visit a psychiatrist. This paper proposes a system - Psyche, which would help students by exploring various mental disorder parameters that are caused due to exam stress and help them overcome it by Cognitive Behavioral Techniques.

The idea of this project is to deliver a solution to curb the mental health ailments caused by Exam Stress by providing technologically advanced solutions combined with ease of access to Students. Yet in the course of development, we found certain mental issues that are yet to be targeted and require equal importance during treatment. Also, with the constantly evolving technological dependency towards mobile phones, we hope to translate our project into a mobile application. Our Virtual Assistant, although well trained, still needs some improvement in terms of accuracy and in attending multiple types of cases. Therefore, we aim to improve the virtual assistant's scope of problem solving along with its efficiency. Therefore, as a part of our future work, we will be concentrating our efforts on expanding the project scope to other teenagers and adults for any mental health maladies.

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