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Psychotherapist Chatbot – a Literature Review

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***Abstract* — The objective of this review is to study different ways to implement a chatbot system which renders around the concept of mental health. The key focus is on detection and recovery of an individual from depression, stress and anxiety. With the increased cases of suicide from depression during the start of pandemic till now, it is important to focus on mental health even more. The study is used to help people overcome depression by oneself using currently emerging technologies. This study is intended to target an audience of 300 million people worldwide. The system detects depression in an individual and also recommends them therapy session catered to their depression level. This study uses python as the base language to create a desktop application. It is designed in such a way that it mimics a psychotherapist.**

***Keywords*— Therapy Chatbot, Psychotherapist.**

1. INTRODUCTION

About 33% of youngsters in the age group of 16-20 are either depressed or stressed during the pandemic in India only found according to a study and 22% of the respondents had shown signs of depression, while anxiety was seen among 15% of the respondents and stress in 10% of them. These symptoms are prevalent all across the globe.

Chatbots have the potential to be useful tools for individuals with mental disorders, especially those who are reluctant to seek mental health advice due to stigmatization. While numerous studies have been conducted about using chatbots for mental health, there is a need to systematically bring this evidence together in order to inform mental health providers and potential users about the main features of chatbots and their potential uses, and to inform future researchers about the main gaps of the previous literature.

Research of online courses on mental healthcare has become active, as the importance of keeping good mental health has been widely recognized. Keeping people's mental health better has even been legislated recently in many countries. This resulted in sudden increase of the number of potential clients for mental counselling, most of whom are not in sick, whereas the number of psychological experts or counsellors who usually carry out counselling does not increase.

To cope with this issue, it is in high demand to provide the means to take care of their mental health by themselves and to utilize the data of people's mental health for more effective collaborative support by experts. And to overcome this situation an anti-depression chatbot is proposed, which detects depression and finds new tricks to motivate the patient and bring them closer to the real world.

According to the findings of a survey most of the youngsters have high depression level followed by anxiety and stress. Youngsters are a major part of the country and it affects the growth of the country if the youngsters themselves have low productivity due to depression. Depression, Anxiety and stress levels in an individual above normal levels are considered to be deadly to the human body and mind and can leads to major repercussion to the body if left untreated.

Main significance of this study is to detect abnormal levels of selected emotions in users that either leads to depression, anxiety and stress or are already above the normal levels to be considered as depression, anxiety and stress. Then according to the results, main focus of the system will be to help in the recovery of the user according to the category they will be assigned to.

2. CONCEPTUALIZING CHATBOT AND MENTAL HEALTH

Therapy chatbots are being developed to cater to health of a user but it is not a replacement for a skilled human therapist according to Bhuvan

Sharma et all. Chatbot can be described as software that can chat with people based on artificial intelligence. These are used to perform tasks such as quickly responding to users, informing them, helping to purchase products and providing better service to customers. Many organizations are now taking initiatives to provide early support for stabilizing mental health of users. Even the products like smart bands and smart watches contain features that can to a certain extent detect the mental health of a user. Chatbots are easy to use from the perspective of human computer interaction and can be trained according to the requirement. Its malleable technology gives a good opportunity to implement ideas accordingly.

3. LITERATURE REVIEW

- From [1], we studied, The counseling technique SAT (Structured Association Technique) method used in industrial clinics to develop a self-mental care course (SAT-VR method) for smartphones and VR, and confirmed its efficacy and safety. The SAT-VR method uses images such as light, color, and shape to change the physical discomfort of the stressful scene to a sensation of good physical comfort, and to relax body tension.

- From [2], we studied, The Patient Health Questionnaire-9 (PHQ-9) is a validated depression rating scale frequenty utilized both in primary care and psychiatry clinics. It over the preceding 2 weeks and is used for screening, diagnosing, and monitoring.

- From [3], we studied, A Chatbot is a program content which leads a discussion through sound-related or printed methods. Such ventures are routinely expected to convincingly recreate how a human would go about as a conversational associate, as needs be completing the Turing test. Chatbots are ordinarily used as a piece of talk structures for various practical purposes including customer organization or information securing tasks.

- From [4], we studied, Chatbots can contribute to the extension of health care services. The aim of this review is to conceptualize the scope and to work out the current state of the art of chatbots fostering mental health.

- From [5], we studied, The DASS-21 has been shown to possess adequate construct validity. The results from CFA modeling indicate that although the three DASS-21 scales index a substantial common factor (i.e. general psychological distress), they also contain variance that is specific to each scale. The reliabilities of the DASS-21 scales are high. The normative data presented here are the only norms derived specifically from DASS-21 items, and were based on a large sample broadly representative of the general adult population.

- From [6], we studied, The criterion and construct validities of DASS-21 in Asian Populations. It shows that Asians tend to have higher levels of collectivistic values which prioritize group goals over individual goals. These cultural values can also impact on how individuals express their emotions.

- From [7], we studied, Depression is a major health concern encountered by nurse practitioners working in an array of health care settings. Many current guidelines and articles on this topic recommend using the Patient Health Questionnaire-9 (PHQ-9) as a screening tool. Nurse practitioners should have a sophisticated knowledge of this tool.

- From [8], we studied, Integration of user experience with a sophisticated and cutting-edge technology to deliver content is necessary to redefine online interventions in youth mental health.

- From [9], we studied, Digital-SAT method enables the self-guided mental healthcare based on the SAT method without the guidance of the counsellor using the system. In the digital-SAT method, original questions for the emotional stabilization therapy were subdivided to provide one question at a time, and the questionnaire was simplified. Chatbot course based on this digital-SAT method was developed.

4. METHODOLOGY

The methodology is outlined as follows:

1. *Explanation:* The existing approaches to develop the anti-depression psychotherapist chatbot are:

    - Structured Association Technique (SAT)

- Patient Health Questionnaire (PHQ-9)
- Depression, Anxiety, Stress Scale - 21 (DASS-21)

In above methods SAT, PHQ-9 are used to detect depression , anxiety and stress level in individuals through question and answer sessions with users, and DASS-21 is used to help create a recovery session .

a) Structured Association Technique(SAT):

This is an interview style counselling technique developed by Munakata [1][9]. It uses language stimuli obtained through dialogue with a counsellor to act on thoughts and visual stimuli obtained by images to quickly identify unrecognized real feeling leading to depression.

Techniques for reducing stress and solving problems include SAT imagery method, which consists of emotional stabilization therapy, behavioral modification therapy, problem solving therapy and so on. counselor reviews the client's main complaint, stress conditions, psychological characteristics, and progress and effectiveness of counseling, selecting and administering appropriate techniques. Takeshi Kamita developed a digital-content technique using the emotional stabilization therapy.

b) Patient Health Questionnaire(PHQ):

The PHQ-9 is one module of the larger Patient Health Questionnaire, an assessment that patients can complete to screen for mental health conditions. The PHQ-9 screens specifically for signs or symptoms of depression, and its nine short and simple questions are built on the criteria for depression.

The PHQ-9 evaluates the following areas:

- Loss of interest and pleasure in doing things
- Feeling depressed or hopeless
- Difficulty with sleeping (either sleeping too much, falling asleep, or staying asleep).
- Feeling fatigue or lacking energy
- Overeating or loss of appetite
- Feeling like a failure or that you have disappointed your family or yourself
- Difficulty concentrating, such as when you're watching television or reading the news
- Moving or speaking so slowly, or the opposite—speaking so quickly and being fidgety
- Thinking you'd be better off dead, or wishing you could hurt yourself somehow

For each statement, the person is asked how often they have experienced that issue in the last two weeks: not at all, several days, more than half of the days, or almost all of the days.

This 10th question is answered if any of the above statements are answered with a "yes": How hard is it for you to do your work, take care of things at home, or get along with others? Answer choices are: not at all, somewhat difficult, very difficult or extremely difficult.

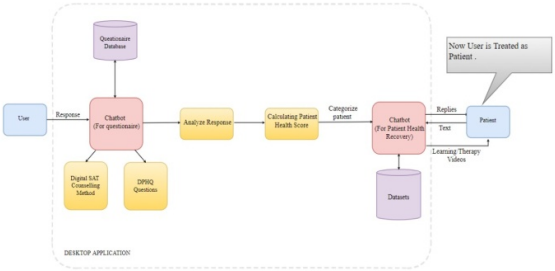
c) Depression Anxiety Stress Scales(DASS-21):

Lovibond and Lovibond devised the Depression Anxiety Stress Scales (DASS) as a research instrument. Later scholars developed the psychometric structure of DASS in statistical ways, theoretically claiming that depression, anxiety, and stress could be sub-dimensions of a higher-order mental factor, later called Psychological Distress (Henry and Crawford, 2005).

The unique advantage to use DASS with the psychometric structure of Psychological Distress was that simultaneous interactions/complications of depression, anxiety, and stress could be examined in the data analysis, which could allow researchers to yield more comprehensive findings in their studies. However, later studies which tried to validate DASS included substantial problems which could not guarantee the validity of DASS yet.

2. *Diagrams:* Below are the Architecture and Use Case diagrams used to design the system needed for simulation of the problem statement.

Architecture Diagram:-



Architecture Diagram Explanation:-

- The first chatbot consists of Chatbot Questionnaire Session which contains questions based on the smile and image test of SAT, also questions from DPHQ and DASS-21. Based on the calculation of the answers given in Questionnaire and Words used by the patient, a unique patient score will be calculated. And according to the score they will be categorized into Normal, Moderate or Severe Category.
- Patient gets redirected towards the second chatbot consisting of Recovery Session which uses Chatbot for conversation (based on the category of the patient). It is used to maintain user motivation for daily and repeated use in the current session. The effects of stress reduction and motivation. Therapy and motivational videos for the patient who is suffering from depression, anxiety and stress are also provided.

Use Case Diagram:

Use Case Diagram Explanation:

It's a Desktop Application, which upon starting will give a Login/Welcome Page. User needs to enter some basic information like name, age and gender. Once the credentials are entered the user will be redirected to the questionnaire session. The questions will be based on DSAT, DPHQ and DASS-21. According to the answers of the user, he will be either categorized into normal, moderate or severe category. And according to the category assigned, the recovery Chatbot will get trained. Also there is module for therapy videos, which will help in the speedy recovery of the patient.

5. RESULTS

Altogether 9 studies were examined thoroughly that confirmed to the topic of mental health and chatbots. The major questions encountered in most of papers were: *Is it possible to create a clinical chatbot for reducing the ever increasing rate of depression among younger generation in today's world?* The chatbot can help to certain extent reduce the work of a psychotherapist by doing certain task among a larger audience at the exact same time so that the psychotherapist gets more time to address the problem of the patient in less time.

6. DISCUSSION

From [1], smartphone VR is introduced highly efficient but very expensive.

From [2], PHQ-9 is a tool for screening depression among patients with chronic diseases and PHQ-2 can be used in a busy primary care clinic but it needs to be followed up by another assessment, so PHQ-9 is preferable in our case.

From [3], did not integrate messaging platform with the chatbot.

From [4], more research is needed to improve the contents of Chatbot for psychological counseling and therapy.

From [5], we found that only limited number of patients which were admitted in SUD was included in the report.

From [6], result fluctuates depending on the socio-cultural context where the instrument is administered.

From [7], PHQ-9 can only be used for clinical practices and research purpose.

From [8], future studies include individualize therapy suggestions using linguistic analysis of newsfeed posting.

From [9], future studies should include an increase in the number of participants and a survey on the continued use of the course over a period of time.

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8. REFERENCES

[1]Atsuko Matsumoto, Takeshi Kamita, Tsunetsugu Munakata, Makoto Komazawa, Kenichi ITAO, Tomoo INOUE, Applied human informatics (AHI), vol.1,No.,2018,"Stress Reduction Effect in Female Managers of a Self-Guided Mental Healthcare VR Content for Smartphone Based on the SAT Counselling Technique: A Psychological Scale and Heart Rate Variability Analysis".

[2]Arvin Bhana, Sujit Rathod, One Selohilwe, Tasneem Kathree, "The validity of the Patient Health Questionnaire for screening depression". Article in BMC Psychiatry, 2015, 10 pages, DOI: 10.1186/s12888-015-0503-0'.

[3]Bhuvan Sharma, Harshita Puri, Deepika Rawat, "Digital Psychiatry – Curbing Depression using Therapy Chatbot and Depression Analysis", Proceedings of the 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT 2018) IEEE Xplore Compliant - Part Number: CFP18BAC-ART; ISBN:978-1-5386-1974-2.

[4]Eileen Bendig, Benjamin Erbb, Lea Schulze-Thuesinga and Harald Baumeistera, "The Next Generation: Chatbots in Clinical Psychology and Psychotherapy to Foster Mental Health – A Scoping Review", August 20, 2019, DOI: 10.1159/000501812.

[5]Ilse N. Beaufort, Gerdien H. De Weert-Van Oene, Victor A.J. Buwalda, J. Rob J. de Leeuw, Anna E. Gourdriaan , "The Depression, Anxiety and Stress Scale (DASS-21) as a Screener for Depression in Substance Use Disorder Inpatients: A Pilot Study - European Addiction Research 2017",DOI: 10.1159/000485182.

[6]Juan Aníbal González-Rivera *, Orlando M. Pagán-Torres and Emily M. Pérez-Torres "Depression, Anxiety and Stress Scales (DASS-21): Construct Validity Problem in Hispanics" , European Journal of Investigation in Health Psychology and Education 2020, 10, 375–389; doi:10.3390/ejihpe10010028.

[7]Patrick O'Byrne, "Screening for depression: Review of the Patient Health Questionnaire-9 for nurse practitioners", 2018, 7 pages, DOI: 10.1097/ JXX.0000000000000052.

[8]Simon D'Alfonso, Olga Santesteban-Echarri, Simon Rice, Greg Wadley, Reeva Lederman , Christopher Miles, John Gleeson5 and Mario Alvarez-Jimenez ,"Artificial Intelligence- Assisted Online Social Therapy for Youth Mental Health", Quantitative Psychology and Measurement-Frontiers in Psychology, June 02,2017, DOI-10.3389/fpsyg.2017.0796.

[9]Takeshi Kamita, Tatsuya Ito, Atsuki Matsumoto, Tsunetsugu Munakata, Tomoo Inoue, "A Chatbot System for Mental Healthcare Based on SAT Counselling Method". Mobile Information Systems Volume 2019, Article ID 9517321, 11 pages, doi: 10.1155/2019/9517321.