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A Platform for Emotional Evaluation and Psychological Support: Development and Usability Evaluation using SUMI

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ABSTRACT

Mental illness has been ranked as one of the diseases with the highest number of cases globally. Generally, an individual can only be diagnosed with mental illness by undergoing proper medical procedures by the experts. On the other hand, due to the presence of different beliefs in various cultures and ethnicities, an individual is also claimed to have mental illness by the assumptions made based on the symptoms that the individual is having. This is additionally contributed by feelings of reluctance and being reserved, where the individual would subsequently resort not to go for a proper medical assessment. Therefore, to overcome this problem, this present project was developed as a real-time platform for users with mental health conditions to freely share their problems. Specifically, a rule-based algorithm of Depression Anxiety Stress Scales (DASS) was implemented in the Emotional Evaluation and Psychological Support (PEEPS). Furthermore, a real-time platform for PEEPS was developed and the effectiveness of the whole system was evaluated by using the Software Usability Measurement Inventory (SUMI). The development of the project would benefit the users to evaluate their own level of depression, stress and anxiety through the DASS test and get necessary counselling through the chat feature. According to the results collected, it was shown that the users were satisfied with the PEEPS application. This application is certainly relevant for governmental and non-governmental institutions that are interested in supporting and improving mental health-related issues. Future studies may consider modifying the machine learning technique to anticipate mental health issues as well as adding a few other elements to the application, such as personalized feedback or patient recommendations.

1. Introduction

Mental health, as portrayed by the World Health Organization (WHO), is a state of well-being in which an individual realizes his or her own abilities to cope with the normal stresses of life, work productively, and contribute to his or her community. Mental illness refers to all diagnosable mental disorders involving significant changes in thinking, emotion, and/or behaviour, which often makes it difficult to cope with life's daily demands and routines [1]. Besides, mental health problems can affect

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anyone regardless of age, sex, income, or race [2-4]. Conditions such as depression, anxiety, bipolar disorder, and schizophrenia are the most common types of mental illnesses and may disrupt a person's routines as well as affect his mental health [5,6]. As mental health disorders should not be avoided or concealed by those who are experiencing them, it is advisable to seek professional help early [7].

Normally, individuals with mental illnesses are often labelled and stigmatized by society for their behaviours and appearance as deviating from societal norms [8]. In a study by [9] involving ten informants (two health professionals, three working adults who used to suffer from mental illness and five healthy adults) who were approached and interviewed, individuals with mental illnesses are commonly referred to as religious practitioners or shamans, rather than health professionals. In addition, the Asian communities tend to associate mental illnesses with the term 'insanity' or 'illness of the soul' and this will eventually make the family members feel humiliated. Subsequently, the impact of the stigma may affect the person as an individual as well as their functions in society [10].

Hence, there is a need to raise awareness of the importance of understanding mental illnesses in the community, including Having an early detection of the symptoms which can be identified by a number of measures, including answering a set of questionnaires which is called DASS (depression, anxiety, and stress) [11]. The DASS questionnaire is a longer version of its original set which is DASS-42 and the shorter version is DASS-21. In maximizing the differences between the symptoms of depression and anxiety, the DASS-42 scale is designed in order to identify common features of stress [12]. It consists of three subscales (namely DASS 21-D for depression, DASS 21-A for anxiety, and DASS 21-S for stress) with seven questions for each subscale [12]. The reliability and validity of each instrument are highly accurate according to past research [13]. However, results may vary based on the cultures, backgrounds and geographical locations.

The DASS instruments are helpful in determining the mental illness that a person is suffering from. Hence, taking this as an advantage, a support system called PEEPS (Platform for Emotional Evaluation and Psychological Support) is introduced with the aim of giving support and encouragement through a system which integrates with real-time communication. In this study, the evaluation of the PEEPS application will be tested by using the Software Usability Measurement Inventory (SUMI) which provides a global usability score and measures users' experiences of working with the software interface in five quality components such as effect, efficiency, helpfulness, control, and learnability [14]. The next section of this paper will present the methodology, results, findings and conclusion.

2. Methodology

The objective of this study is to design and develop a real-time psychological support platform encompassing the DASS-21 evaluation. The methodology of this research is divided into three phases which are requirement analysis, design and development, and evaluation of the system.

2.1 Requirement Analysis

The main goal of requirement analysis is to identify the essential elements needed to create any mobile application or digital mental health support solution. In this study, we gathered the requirement by using two methods which are primary and secondary data sources. Our secondary data sources were accumulated from articles, journals and newspapers related to the previous and current works on mental health assistance. The PEEPS features were applied based on a case study that was conducted in our previous work [15].

The primary sources, which were gathered from a survey of a total of 100 respondents, were based on our previous work. Based on the analysis, we discovered that some of the respondents did ask their parents, siblings, or friends for assistance. However, none of the respondents asked any experts for their professional advice even though they hoped to do so. In addition, 30% of the respondents who reported having mental health problems chose not to seek assistance for a variety of reasons;1) feeling embarrassed, 2) no one can help, 3) it will go naturally, 4) not knowing where to go, and 5) fear of public perception. The results of the survey were used to determine the requirements.

1) Offer therapy for mental health: The respondents felt that a system where appropriate lifestyle choices and mental health activities would be recommended and communication directly with medical specialists, as a type of virtual therapy, would be preferable.

2) Offer support for mental health: More than 60% of the respondents would enjoy conversing with someone who would pay attention to them and reply.

3) Offer evaluation for mental health: Some of the respondents stated “I would like to know the level of my mental health easily with one finger click”.

4) Offer anonymity for mental health conversation: more than 60% of the respondents did not share their thoughts with others due to embarrassment and fear of public perception. They rather have a platform that can seal their identity from others.

2.2 Design and Development

Based on the requirement analysis, a use case diagram for the development of PEEPS is proposed as shown in Figure 1. The PEEPS system consists of two access levels which are public and counsellor that are required to register first before logging in to the system. The public can make a call, send a message, view self-care, and take a DASS test after logging into the system. For the counsellors, they can view the information about the public and get a message. Table 1 simplifies the use case description of the proposed application.

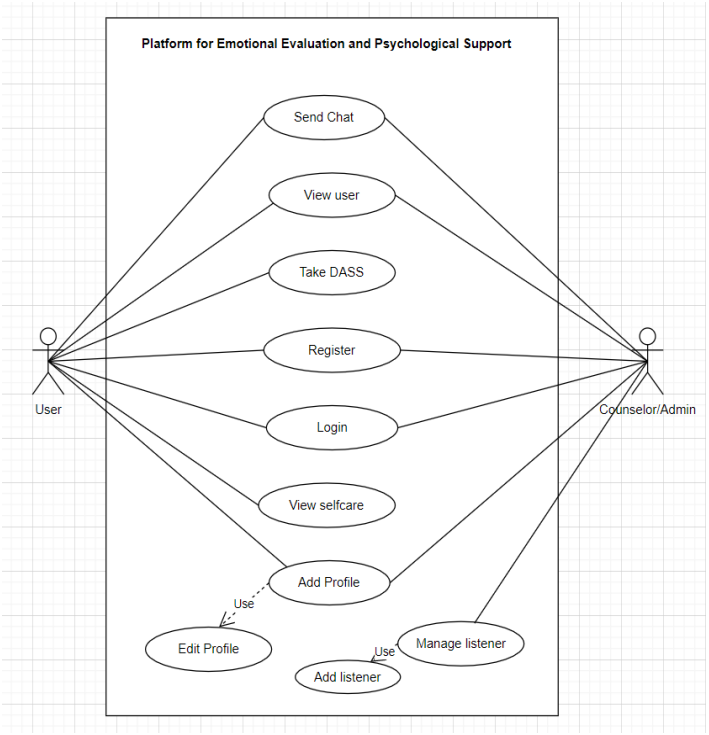

Fig. 1. Use case diagram

In order to begin, the user must input his or her email address and password to establish an account. After successfully creating a new account, the user can log in to the system by entering their email address and password as well as saving their profile after logging in. Before choosing a chat partner based on gender, the user may first view the list of counsellors and other users.

In order to take the DASS test, the user must first read all of the screening test information. Once the questions have been submitted, the user can view their score and results. Additionally, the user can select from the options for the self-care feature, including creating notes, reading quotes, viewing book recommendations, and listening to music.

Table 1
Use case description

Use Case	Description
Login	The user must login by entering the username and password to the PEEPS system.
Register	The user must sign up to create the account
Edit Profile	The user can change their username, gender, age, email
View User	The user can view the list of the counsellors and public that are available for the session.
Send Message	The user can send a message to the counsellor or public that they choose.
Take DASS	The user can take a DASS test
View Self-care	The user may view quotes and books available, listen to music and add daily notes.

PEEPS includes the DASS-21 evaluation test as one of the features which allow the user to evaluate their mental health state and the counsellor to analyse the patient's needs based on the DASS-21 results. According to a study done in Australia, the DASS-21 was reported to be a low-cost scale that is also simple to use. It was, nevertheless, demonstrated to be useful in identifying variations in people with depression and anxiety disorders [16].

The DASS-21 evaluates the signs of stress, anxiety, and depression [17]. It consists of three subscales with 7 questions each (DASS 21-D for depression, DASS 21-A for anxiety, and DASS 21-S for stress), each with seven items (DASS 21-S). Each response is given a score on a 4-point Likert scale, with 0 meaning "did not apply to me at all," and 3 meaning "applied to me very much." Each subscale's score, as well as the overall DASS 21 score, are added together. Figure 2 depicts the DASS-21 algorithm used in this application. The proposed DASS-21 structure has been verified by the expert.

Based on the conceptual design, a mobile application known as PEEPS is developed. Flutter is used as a User Interface (UI) software development tool for the proposed application. PEEPS UI consists of four main functions; 1) profile, 2) chat, 3) DASS, and 4) Self-Care. The screenshots of the main function are presented in Figures 3,4,5 and 6. The development of this application is divided into eight modules for public users and nine modules for counsellors. The module consists of login, register, edit profile, send messages, take DASS, view user get message, manage user registration and manage counsellor.

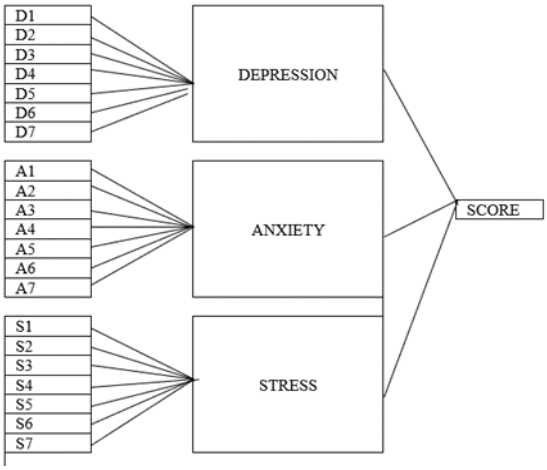

Fig. 2. DASS-21 Algorithm

2.3 Evaluation of the System

The evaluation of the system is based on our proposed hypothesis.

1) The PEEPS is helpful to the end user
2) The user feels they are in control while using PEEPS.
3) PEEPS is easy to learn.
4) The PEEPS was thought to be user-friendly by its users.
5) The PEEPS was deemed useful by the users.

In order to prove the hypothesis, the Software Usability Measurement Inventory (SUMI) was used to evaluate the usability of the PEEPS application. SUMI consists of a 25-item questionnaire that measures users' perception of the efficiency, affect, helpfulness, control, and learnability of a system [18,19].

1) The participant's demographic information: A total of 33 participants—15 men and 18 women—with ages ranging from 20 to 45 were sought out for the evaluation study. Twenty of them were undergraduate students and thirteen were working in various government and non-government organizations. Internet and smartphone usage were both commonplace among the participants. None of them had ever utilized PEEPS or any other mental health-related applications.

2) Evaluation procedure: The SUMI questionnaire, as previously indicated, consists of 50 items, each of which has five possible replies (5-strongly agree, 4- agree, 3-undecided, 2- disagree and 1-strongly disagree). The participants were given statements to respond to regarding how they felt after using the app. Following the completion of the questionnaires, the findings of the SUMI questionnaire were analysed using the "Statistical Package for the Social Science" (SPSS version 16). The modified SUMI questionnaire uses a scale from 1 to 5 as its measurement units. The lowest scale is 1 and the highest scale is 5. One sample t-test output provided the results and findings. The standardization database has an average score of 50 and a standard deviation of 10. Given that the standards database is made up of successful commercial products, a system that receives a score in the 40–60 range is equivalent to most of these items in terms of usability. The results of the SUMI questionnaires are discussed in the next section.

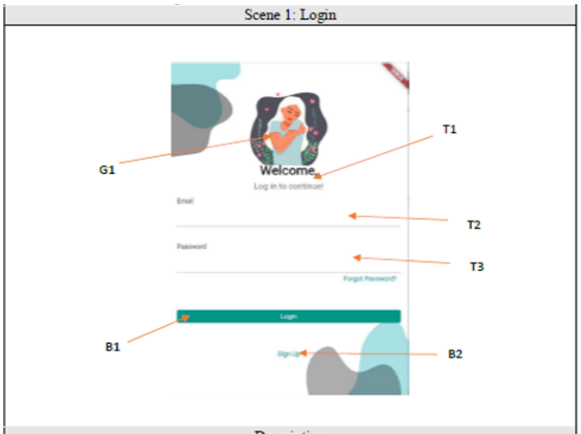

Fig. 3. A Screenshot of the login page

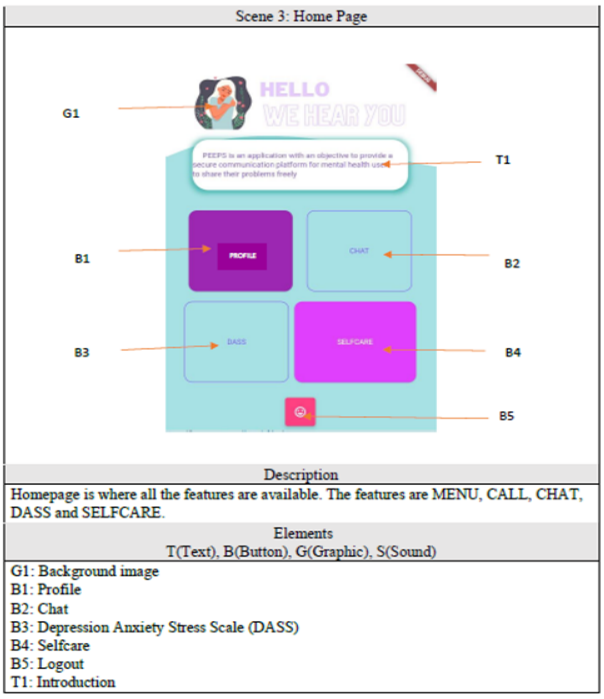

Fig. 4. A Screenshot of the homepage

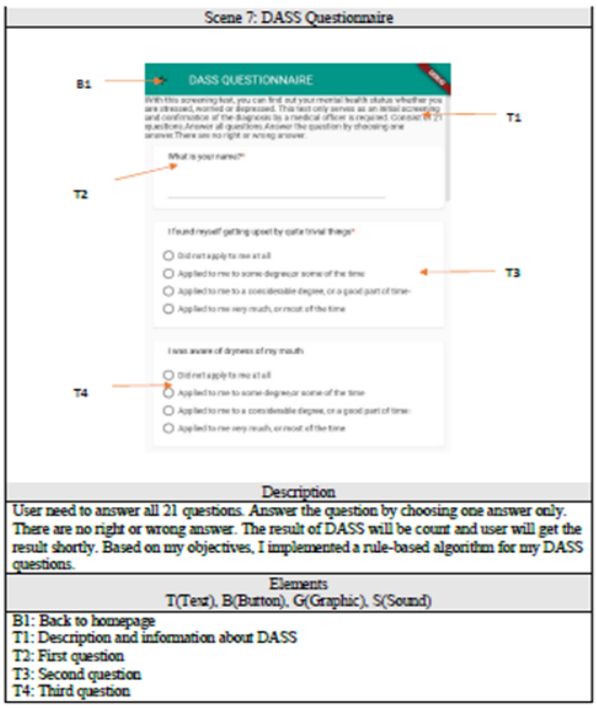

Fig. 5. A screenshot of the DASS questionnaire

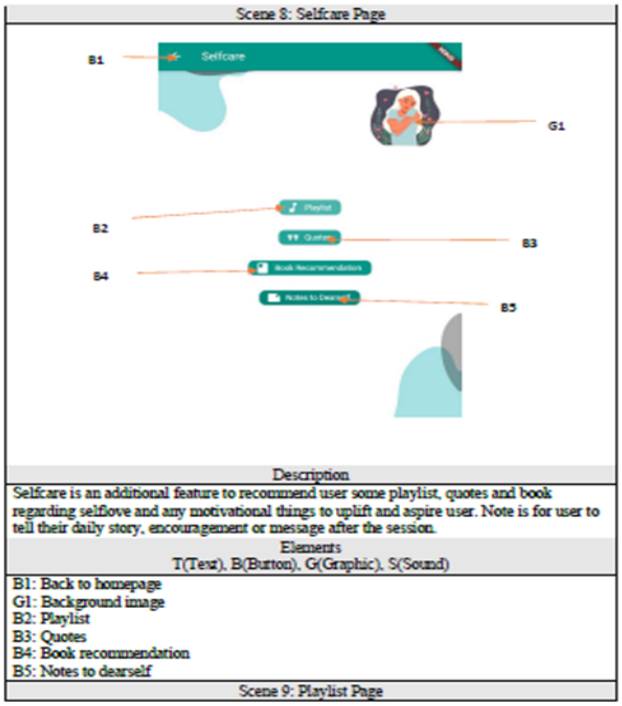

Fig. 6. A screenshot of the selfcare page

3. Results

The findings from the SUMI evaluations are displayed in Table 2 in terms of median level. This level was produced from each of the five usability subscales: helpfulness, controllability, learnability, efficiency, and affect. They were also derived from the global usability scale.

Table 2
SUMI questionnaire results

Scale	Mean
Global, n=33	45
Efficiency	49
Affect	49
Helpfulness	48
Control	46
Learnability	35

Based on Table 2, the higher mean values/scores were obtained for the Affect, Helpfulness, Control and Efficiency subscales, while the lowest values/score were shown by the Learnability subscale. In terms of the usability sub-scales, the findings were found to be consistent and the scores obtained were above the acceptable range [20].

The five sub-scales of respondents' usability were evaluated using the findings of this usability testing. Any system that consumers can utilize effectively is a good system as they would feel satisfied using this application and experience its effectiveness and efficiency while executing a task. Besides, the results also suggest that the hypotheses were correct. All hypotheses were developed based on the five criteria of customer satisfaction. The results are consistent and hence deemed to be significantly true.

Based on the results, The PEEPS application was proven to be helpful and it also easily controlled. On the other hand, the aspects of “Efficiency” and “affect” showed the highest mean scores compared to other aspects. However, it is not simple to learn for inexperienced users. Therefore, some modifications had to be focused on learnability due to its low median score.

In addition, the user interface must be improved by the designers in order to increase control and learnability through better navigation and informative features. The ratings for control were the ones that spread the least, indicating that a majority of the respondents were either unsure or disagreed with control of the user interface. Hence, the PEEPS application has to respond more quickly, and there is a need to be an easier way to move from one task to another.

Even though there are some critics of the reliability of DASS-21, this present study discovered DASS-21 to be an overall item with a high internal dependability. Nonetheless, with the exception of the depression subscale, none of its subscales (DASS-A and DASS-S) exhibited sufficient internal reliability, as demonstrated by Cronbach's alpha. However, ordinal alpha indicated strong internal reliability for all DASS-21 subscales. Researchers have now agreed that ordinal alpha is the best measure of internal reliability for Likert-type data. Our findings implied that the DASS-D, DASS-A, and DASS-S subscales have excellent internal reliability for screening prevalent mental illnesses within our research scopes. In order to increase the reliability of the DASS-21 evaluation result, the evaluation result will be reviewed by the psychologist/ counsellor as per the user's request. The mental health professional is one of the major actors in PEEPS as a platform for post-answering DASS-21in order to mitigate any inaccuracy of early self-screening.

Furthermore, enhancement of the mental health evaluation method should be done instead of using only DASS-21 surveys to validate the user's mental health condition. Furthermore, mental health screening tools such as PYRATS, GDS, and Beck Scale will be other alternatives to be explored as part of the mental health evaluation, in order to increase the evaluation accuracy of PEEPS.

4. Conclusions

The system methodology presented in this paper for the development of a mental health support system known as PEEPS is plausible. It provides a better platform for any patient or user who suffers from a mental health crisis through the integration of real-time communication and the DASS-21 evaluation. The application had been successfully developed and evaluated using the SUMI methodology. Additionally, the results and findings of the study gave important information for the producers and designers of related applications to know how users learn in interacting with the system and how effective their approaches are. Besides, this application is certainly relevant for the governmental and non-governmental bodies that are interested in supporting and improving mental health-related issues.

The researchers have also identified a few limitations of this present study. First of all, this application has not been widely used. Second, there were not enough people recruited for the evaluation study including the mental health experts. Finally, there was only one application of the approach, which is the SUMI approach, used to evaluate the usability of the produced application with median levels as a reference. Future studies may consider modifying the machine learning technique to anticipate mental health issues and adding a few other elements to the application, such as personalized feedback or patient recommendations.

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