# Design and Validation of a Mobile Depression Application for Young Adults through Expert Review

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| ARTICLE INFO | ABSTRACT |
|---|---|
| <br><br> | Since the COVID-19 pandemic started, the number of young adults experiencing depression has increased. Most of them need help, but they are not aware that they have the symptoms of depression because they lack knowledge about depression. It is one of the reasons why the number of people with depression keeps escalating. Thus, this study aims to design and validate the design elements of an anti-depression mobile application named Happy Path. This mobile application is aimed at helping young adults handle negative emotions that may lead to depression. The most effective therapeutic approaches, Cognitive Behaviour Therapy and Beck Depression Inventory are adopted in Happy Path to deliver therapeutic content through the application. Thus, this paper describes the design and validation procedure for the anti-depression mobile application through the expert review method. After the experts evaluated the mobile application, several modifications were made based on their comments to improve the effectiveness of the application. Based on the findings of the expert review, it was found that the design of Happy Path is suitable for depressed people among young adults. The finalised prototype will be used in the future actual data collection. |

## 1. Introduction

Currently, mental health issues are viewed globally as significant social challenges and economic burdens [1,2]. The number of people suffering from mental illnesses escalates at a fleeting rate annually. The increasing number of mental health patients and the necessary efforts to improve the present mental health system worldwide have incurred skyrocketing expenditures [3,4]. Therefore, many experts believe that it is required to urgently provide efficient and cost-effective mental health treatment, which has emerged as a pressing concern among public healthcare systems worldwide [5].

Among existing mental illnesses, depression and anxiety are the most disabling disorders among university students [6,7]. Recently, depression has been observed to begin early in life [8,9]. According to World Health Organisation (WHO), depression is a feeling or an emotional disorder that

can affect one's function at home, work, or school [11]. This type of illness can affect people from all walks of life irrespective of age, health background, residential area or social position. Mental illness has increased in these recent years and has emerged as the leading cause of disorder in many countries, including Malaysia [11,12].

Since the coronavirus outbreak (COVID-19) was declared a world pandemic, the number of people affected by depression has increased [13]. It has also been reported that the prevalence of depression among university students has been relatively high, between 14.0% and 30.7% [14]. Most universities worldwide have substituted their face-to-face classes with online remote learning to contain the spread of the virus. Because of this substitution, more than 80% of higher education students did not go to their educational institutions. The most recent study by Ref. [15] indicated that implementing online remote learning in Malaysia during this pandemic triggered various mental illnesses, including depression, among university students. University students show a high potential to experience depression due to the difficulties faced caused by online remote learning and stressful events in the university environment. If the students do not receive proper treatment for their depression, it can lead to disability and, even worse, suicide [16].

Therefore, an anti-depression mobile application named Happy Path was developed in this study to help young adults to overcome their depression levels. To date, mobile applications can influence youth's daily activities, including monitoring our health [17]. The use of mobile technology in the delivery of therapeutic content is not a new thing. It is because mobile application in health care provides various benefits such as increased time of attention, immediate date processing, friendly design and cost-effectiveness [18]. Hence, using a mobile application to deliver therapeutic content for depression is very suitable. However, there is also a need to validate the design elements in mobile applications to ensure the application can meet the users' requirements. Therefore, the validation process was conducted in this study to validate the design elements and enhance the effectiveness of the Happy Path application.

## 2. Methodology

The methodology for this study involves three main phases. Figure 1 illustrates the three methodological phases utilised to achieve the main purpose of this study. The first methodology was literature analysis, conducted to collect vital and relevant information about this study. Next, the Happy Path application was developed using the information gathered in the previous phase. Then, the critical evaluation process was conducted in the final phase to ensure that the mobile application's design elements and therapeutic content were effectively developed for young adults, who are the target users. The evaluation process to assess the mobile application involved three experts in the selected areas. The expert review technique was employed in the evaluation process, as suggested by authors in Ref. [19,20].
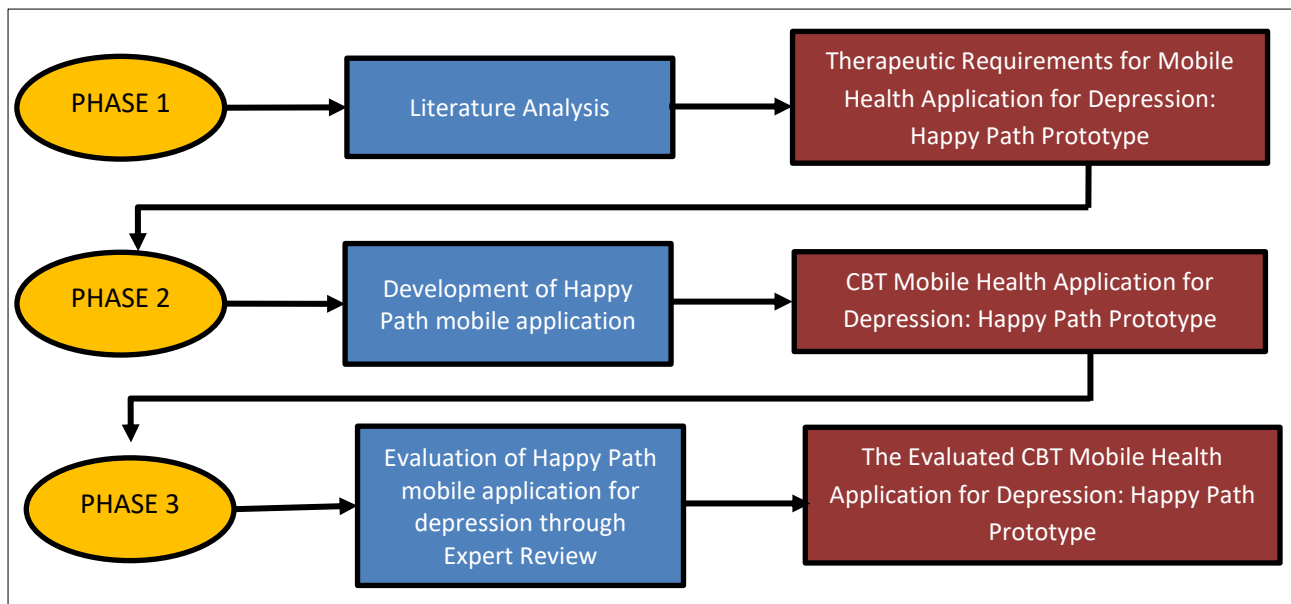
**Fig. 1.** Research phases of the study

This study started with the literature analysis to identify the suitable therapeutic requirements to be adopted in the depression mobile application. It is vital to use a reliable therapeutic technique to ensure the suitability of the mobile application with its purpose because the mobile application was designed for young adults suffering from depression. Hence, a suitable design and therapeutic approach must be carefully identified for the mobile application. Next, the development process was conducted in the second phase. The information gathered in Phase 1 was used as a guideline in designing the anti-depression mobile application during the development process. In phase 2, the development of the CBT Mobile Health Application called Happy Path commenced as depicted in Figure 2. The development process of Happy Path consisted of three stages, which were Pre-Production, Production and Post-Production [21]. The development process for Happy Path is discussed in detail in Section 4.
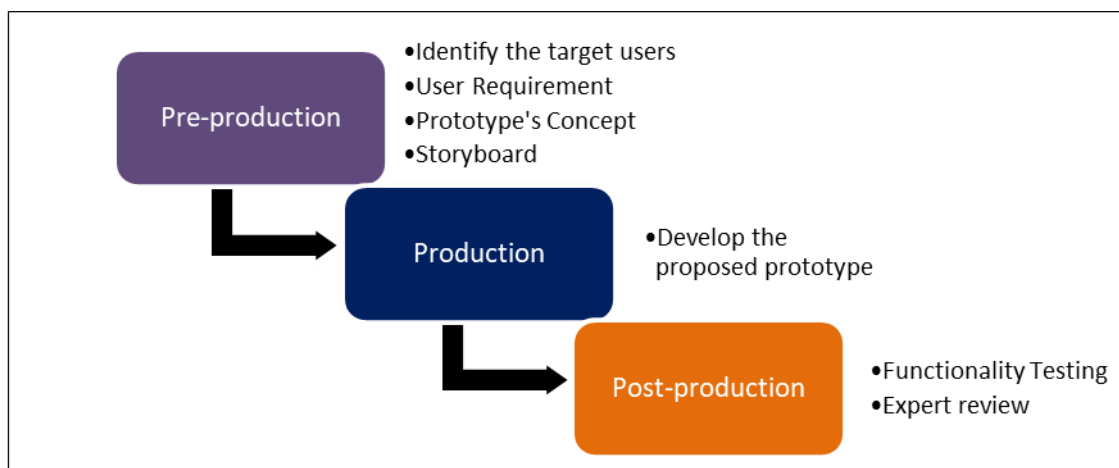


**Fig. 2.** Development process of Happy Path (phase 2)

Upon the completion of the development process, the proposed prototype was assessed to ensure the application was suitable for its target users. The expert review method was conducted to evaluate the mobile application for evaluation purposes. Three experts from various areas were selected for this expert review process. Online consultation using the WebEx platform was utilised

during the evaluation process. The experts were required to use the prototype and evaluate it based on two main components: the design and the user interface quality and information arrangement. Interview sessions were adopted in the expert review process to gather adequate feedback from the experts. The feedback received could help the researchers to improvise the proposed prototype.

## 3. Literature Analysis

The second phase of this study involved literature analysis and requirement analysis. It is crucial to conduct these two analyses to perform accurate decisions during the design and development of Happy Path. The most effective therapeutic approaches, namely Cognitive Behaviour Therapy (CBT) and Beck Depression Inventory (BDI) were identified in the literature analysis.

Based on the literature analysis, it was found that the majority of mobile health applications have adopted CBT. This therapeutic approach is a well-known technique and among the most effective therapeutic approach. Figure 3 shows the three main components of CBT, namely Thoughts, Behaviours and Emotions. CBT is also recognised as a Gold Standard not only in depression treatment but also in other mental health treatments [22]. To date, CBT has been used in the treatment of various types of mental illnesses, such as depression [23], anxiety [24], phobia [25] and many more. It is clearly shown that CBT is the most reliable therapeutic approach for most mental illnesses and is suitable for various mental health treatments. CBT is effective for face-to-face treatment and is electronically adaptable, such as on a website or mobile application.
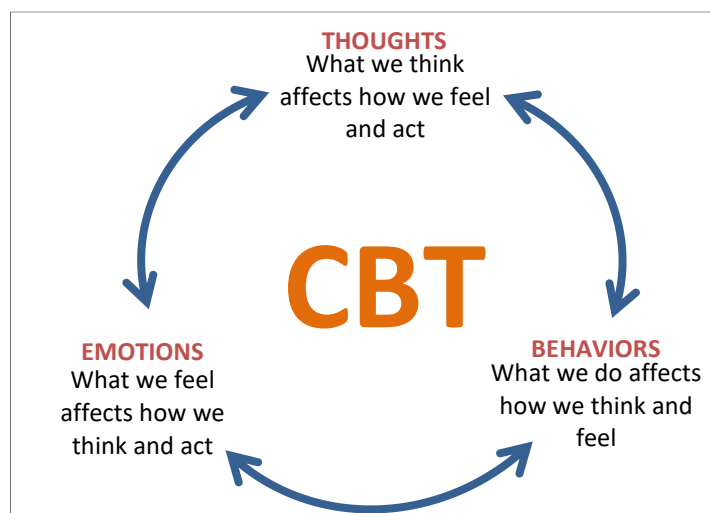


**Fig. 3.** The cognitive behaviour therapy

Based on several recent studies, it can be seen that most researchers strongly agree that adopting CBT in mobile health intervention could help increase the effectiveness of the treatment, especially among young patients. Furthermore, mobile health as an intervention in treatment has shown promising outcomes [26]. The research evidence of CBT's effectiveness for depression has exhibited promising results, thus appearing as a reason for many researchers to opt for CBT as the best approach, even in mobile health interventions.

Other than CBT, this study also adopted the depression inventory to help the target users to conduct self-measurement of their depression level. Different types of depression inventories have distinct measuring scales. In this study, Beck Depression Inventory (BDI) was adopted. Like CBT, BDI is also a well-known gold standard for depression. BDI refers to a self-score inventory that was

developed for measuring the severity of depression, which is appropriate for young adults [27]. The questions used in BDI are also easy to interpret for the users.

## 4. The Development of Happy Path

As mentioned in Section 2: Methodology, the development process for the proposed prototype, called Happy Path, involved general prototype development, consisting of three phases: 1. Pre-production; 2. Production; and 3. Post-production. The detailed activities for each phase are listed in Table 1.

**Table 1**
Descriptions of each phase in the Happy Path development process

| Pre-production | i. | Identify the target users |
|---|---|---|
| | ii. | User Requirement: analysed the user needs |
| | iii. | Determine the applicable features |
| | iv. | This includes the concept, font style, colour and navigation button |
| | v. | Design the storyboard |
| Production | i. | Design and develop the user interface |
| | ii. | Organise the navigation structure |
| | iii. | Develop the depression mobile application with its full function |
| Post-production | i. | Check the functionality of Happy Path |
| | ii. | Expert review |

In the pre-production phase, preparation and planning activities were conducted to ensure the smooth running of the development process. Identifying the target users at the early stage of development is crucial because different age groups have distinct requirements for handling depression. In this study, young adults in higher educational institutions were the target users of the anti-depression mobile application. The user requirement for the target users was identified through user analysis. The most common problems faced by this group that had led to depression were investigated. The information gathered through the investigation was used to determine the concept of the proposed prototype, Happy Path. The applicable features, such as type of content, colour, font style and navigation buttons, were also determined. At the end of this phase, a storyboard was produced to be used in the next phase.

The process continued with actual development based on the final document released in the previous phase (i.e., storyboard). The anti-depression mobile application was designed and developed using the storyboard as the guideline. Multimedia elements such as graphics, texts, video, audio and animation were compiled to produce an authentic look of Happy Path. Adobe Animate was utilised as the primary development tool in this study.

In the final steps, the evaluation process was conducted. It began with an initial assessment, whereby the research team analysed the functionality by checking and testing the overall functionality of the mobile application, including testing the navigation structures to ensure all buttons and links were operational. In addition, the multimedia elements adopted in the prototype were also tested and examined to ensure they ran well with the actual mobile display. After testing the functionality, three experts from two different subject areas (multimedia and psychology) reviewed the proposed mobile application. The involvement of multimedia experts is vital to validate the design elements in the mobile application, such as layout arrangement, navigation and interface design. Meanwhile, a psychology expert is also required to validate the content in the mobile

application to ensure the suitability of the utilised content for the university students who were the target users.

## 4.1 Happy Path User Interface

This section describes the appearance of the Happy Path mobile application, as depicted in Figure 4-6. Figure 4 shows the design of the home page interface in Happy Path. In the home page interface, the users can click five buttons to reach five different contents: 1. About; 2. Relaxation Technique; 3. Goal Achievement; 4. Depression Test; 5. Help. The About page provides information about Happy Path as an introduction to the users, as illustrated in Figure 5. In this display, the users are provided with a brief explanation of the mobile application. Next, the Relaxation Techniques page provides users with techniques to reduce their depression levels. By utilising the Goal Achievement menu, the users can set their daily goals to improve their lifestyle and beat their state of depression. The highlight of this application is the Depression Test menu, which allows users to measure their depression level. The results of the Depression Test are categorised into four ranges based on the Beck Depression Inventory. The users can also click on the Help menu, which provides information on how the Beck Depression Test works in this mobile application. Figure 6 illustrates how Beck Depression Inventory is adopted in the proposed mobile application.
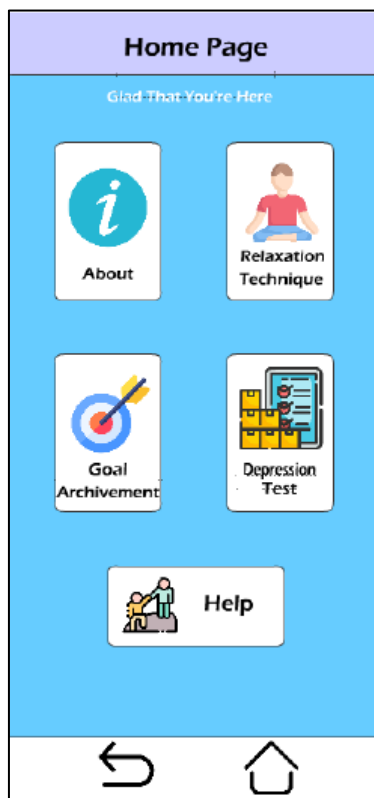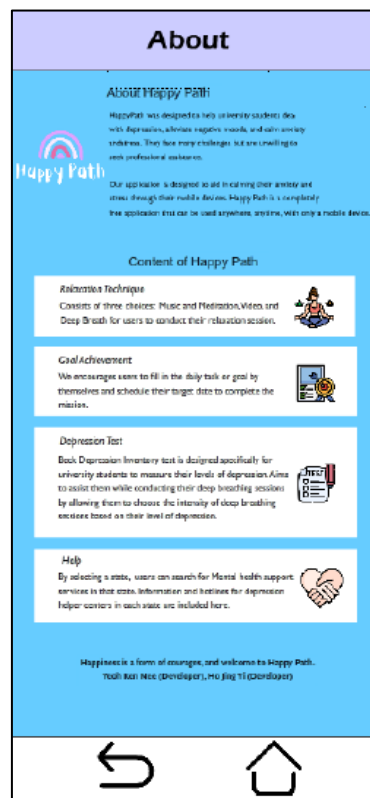


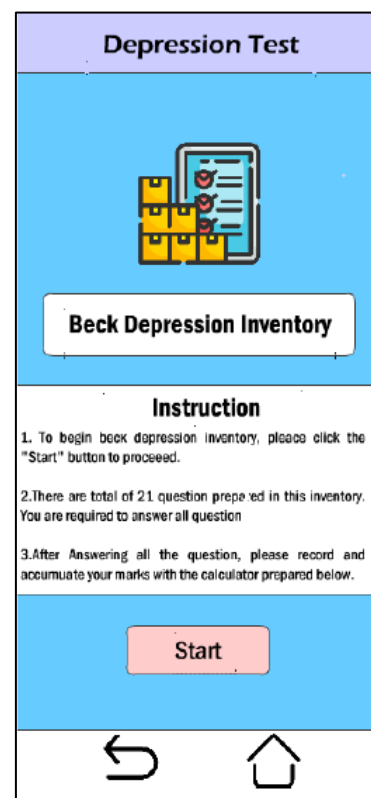**Fig. 4.** The home page screen    **Fig. 5.** The about screen    **Fig. 6.** The depression test screen

## 5. Results and Discussion

As discussed earlier, the expert review method was utilised to validate the design elements and therapeutic contents in the Happy Path mobile application. Three experts were selected for this validation purpose based on their fields of expertise (i.e., multimedia and psychology). The

multimedia experts were required to validate the design elements, and the psychology expert validated the therapeutic content. The CBT mobile application for depression was evaluated in terms of (i) user interface, (ii) information arrangement and (iii) quality. This expert review used a set of closed-ended interview questions as the main instrument. However, during the process, the experts were welcome to give any additional comments. The data analyses for each item are elaborated in the following sub-sections.

## 5.1 User Interface

Table 2 describes the list of questions for the User Interface component. For the first question, only one expert agreed that the colour combination used in the Happy Path was suitable for depressed people. However, most suggested using different colours to make the text easier to read.

**Table 2**
The user interface questions component

| No | Questions |
|----|-----------|
| Q1 | Does the colour combination in Happy Path suitable for depressed people? |
| Q2 | Does the user interface appropriate? |
| Q3 | Does the overall user interface design in Happy Path suitable? |

For Q2, only one expert agreed that the user interface was appropriate for a depression application. The experts suggested that text in the About screen was replaced with other multimedia elements such as video or audio because the screen was too wordy with too much information provided. One of the multimedia experts was satisfied with the simplicity of the user interface; however, the expert recommended that the button design and the colour selection for the foreground and background should be changed to give a professional look to the mobile application. In addition, the expert suggested that other videos be provided to ensure the anti-depression mobile application would be more user-friendly so that the users can choose to view the videos based on their preferences.

It was also highly suggested by the experts that the users should be clarified that the test is mandatory, which means the users must evaluate their depression level using the Beck Depression Inventory (BDI). Meanwhile, for the final question about User Interface, all experts agreed that the overall user interface was suitable. However, the colour combination still needed to be improved to make the user interface design more attractive to the target users. Figure 7 shows the results for the user interface component.
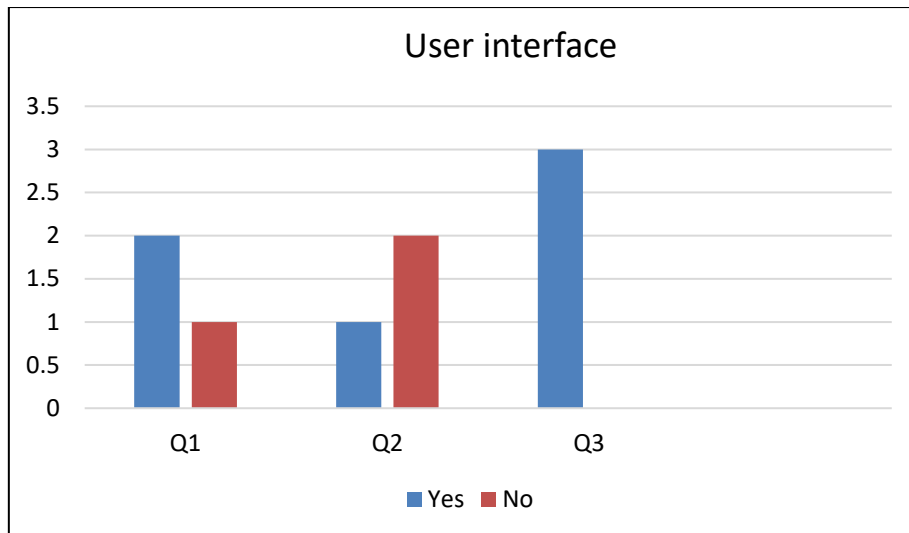
**Fig. 7.** Results for the user interface component

## *5.2 Information*

Table 3 enlists three questions that appear in the second component of the expert review questions. First, regarding the use of audio in the mobile application, all of the experts agreed that the use of audio was suitable for depressed people. According to an expert in psychology, the use of music for depression people could change their mood to a positive vibe.

**Table 3**
Information arrangement questions component

| No | Questions |
|---|---|
| Q1 | Does the use of audio as an information medium in Happy Path is suitable for depressed people? |
| Q2 | Does the information in Happy Path neatly arrange? |
| Q3 | Does the user instruction in the mobile application clear to the users? |

Secondly, all experts also agreed that the information arrangement was neatly arranged, and users could easily find information. However, the experts commented in section 5.1 that the arrangement could be improvised by modifying the user interface design. Finally, for Q3, the psychologist expert claimed that it was important that the user instructions in the depression test were clarified to the user before they attempted to answer the depression inventory. Therefore, the BDI is an essential element in the depression mobile application. Figure 8 illustrates the analysis of the component of information arrangement.
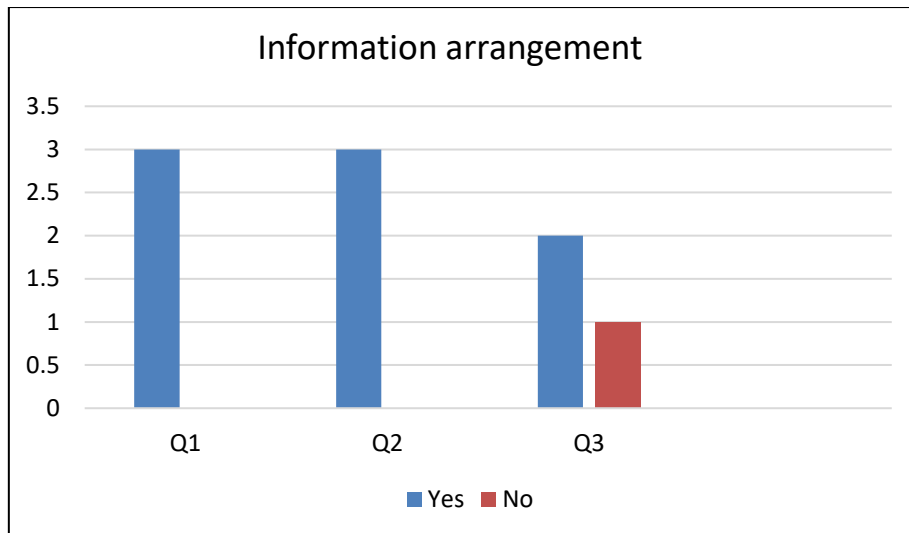
**Fig. 8.** Results for information arrangement component

*5.3 Quality*

In the third component, Quality, the experts were asked about the overall quality of Happy Path regarding media usage, which they reflected as appropriate. They agreed that the number and types of media, such as video, audio, animation and graphics, which were the tools embedded in the application in delivering the information, could also be effectively used by depressed people.

*5.4 Evaluated CBT Mobile Application for Depression: Happy Path*

This study decided to redesign the user interface of the Happy Path mobile application based on the analysis done on the experts' comments and suggestions gathered through the expert review. Figure 9-11 describe several samples of the user interface design for Happy Path after the amendments were done. As illustrated in the figures, the user interfaces were redesigned with new colours selection. Cool and warm colours were used in the user interface to give appealing effects to the users [28]. The buttons were also redesigned with a more professional appearance to enhance users' attention and further increase users' level of experience [29].

It is also agreed that in the initial design, too much text was used in the About display. Therefore, the About screen also redesign to avoid the interface appearing too wordy to the target user. The modified version of the About screen uses videos and icons to deliver the information effectively to the users. Utilising video elements to replace the text elements seems like a good suggestion from the experts. According to Vaghefi *et al.,* [30] users will interact with difficulty in a mobile application if too much text is used in the user interface. The arrangement of overall user interfaces and style of the navigation system in the Happy Path also rearranges after receiving comments and suggestions from the experts.
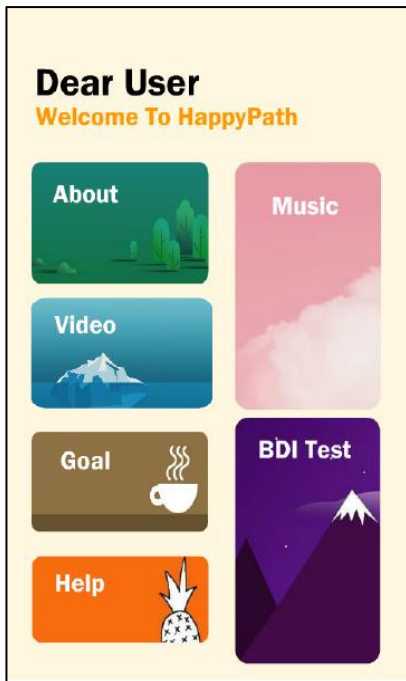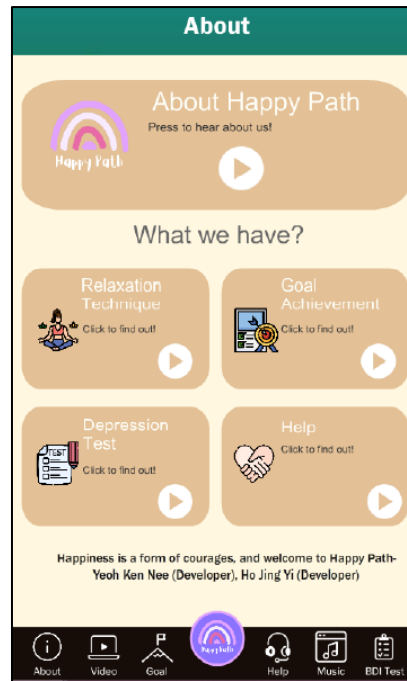
**Fig. 9.** The home display after amend



**Fig. 10.** The about display after amend



**Fig. 11.** The BDI display after amend

*5.5 Overall Discussion*

Based on the findings discussed in previous sub-sections, it was found that colour combinations used in the initial designs of Happy Path yielded the possibility to have low user engagement among the target users. The design of the navigation system was also relatively poor and not systematically arranged, which could lead to user frustration. It should have a consistent navigation structure and reduce the complexity to ease users to traverse the mobile application [30,31]. A sound navigation system could lead to the successful usability of the application. The instructions in Happy Path were also unclear and confusing for users, and thus, it was necessary to redesign the user interface with clear instructions to achieve user needs [32,33]. Most of the experts' comments also highlighted the importance of using a good combination between foreground and background. A recent study by Ref. [28] indicated that a good high contrast between foreground and background could enhance user experience.

## 6. Conclusion

In conclusion, the main objective of this study, which is to validate the design elements of the proposed depression mobile application, Happy Path, has been fulfilled through expert reviews. The proposed mobile application can assist young adults in overcoming their depression. It can enhance their prevention skills, promote a healthier lifestyle, and avoid negative thinking that may lead to depression. This study can be a driving factor for enhancing young adults' negative emotions management skills. The findings of this study can help mobile application designers to design a mobile application for depressed people.

Moreover, Happy Path can also be utilised as an assistive treatment tool in a clinical setting. However, the limited number of experts involved during the validation process tends to be the limitation in this study. Therefore, more mental health experts should be involved in future research to produce more accurate outcomes.

## Acknowledgement

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