

Mental Health Promotion and Prevention of Adolescent Depression through a Chatbot

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สุขภาพจิตนับว่าเป็นเรื่องสำคัญสำหรับวัยรุ่น วัยรุ่นไม่เพียงแต่ต้องแบกรับความรู้สึกและความคาดหวังจากครอบครัว และยังต้องเผชิญปัญหาความสัมพันธ์กับคนรอบข้าง สื่อดิจิทัลจึงเป็นช่องทางหนึ่งที่วัยรุ่นอยู่ใช้ในชีวิตประจำวัน และยังมีบทบาทในการป้องกันหรือลดความเสี่ยงปัญหาทางด้านสุขภาพจิต การวิจัยนี้มีวัตถุประสงค์เพื่อวิเคราะห์ประสบการณ์ของวัยรุ่นเกี่ยวกับการส่งเสริมสุขภาพจิตและการป้องกันโรคซึมเศร้า และเพื่อออกแบบ chatbot สำหรับการส่งเสริมสุขภาพจิตและการป้องกันโรคซึมเศร้า จากผลการวิเคราะห์ประสบการณ์ผู้ใช้ การวิจัยนี้ใช้วิธีวิจัยประสบการณ์ผู้ใช้และการวิจัยการออกแบบ การดำเนินการวิจัยแบ่งเป็น 2 ระยะ ได้แก่ ระยะที่หนึ่ง การวิเคราะห์ประสบการณ์ของวัยรุ่น โดยใช้การวิเคราะห์เอกสารและการสัมภาษณ์วัยรุ่นจำนวน 20 คน ที่กำลังเรียนในระดับมัธยมศึกษาตอนต้น 10 คนและมัธยมศึกษาตอนปลาย 10 คน และระยะที่สอง การออกแบบ chatbot ระยะนี้ใช้กระบวนการคิดออกแบบ (design

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thinking process) เพื่อพัฒนาให้เกิดต้นแบบ และสามารถนำไปใช้ให้เหมาะสมกับบริบท โดยเก็บข้อมูลจากวัยรุ่นจำนวน 40 คน และการประเมินความเหมาะสมจากผู้เชี่ยวชาญด้านสุขภาพจิต ด้านการส่งเสริมสุขภาวะ ด้านการพัฒนาการเรียนรู้วัยรุ่น ด้านการวิจัยการออกแบบ และด้านวิทยาการคอมพิวเตอร์ การวิเคราะห์ข้อมูลใช้การวิเคราะห์เนื้อหา ผลการวิจัยพบว่า แนวโน้มวัยรุ่นเข้ารับบริการปรึกษาด้านสุขภาพจิตเพิ่มขึ้น ทั้งนี้วัยรุ่นมีความต้องการพูดคุยหรือได้รับคำปรึกษาผ่านสื่อดิจิทัล ซึ่งวัยรุ่นทุกคนที่ให้ข้อมูลใช้เวลาในการพูดคุยผ่านไลน์แอปพลิเคชันระหว่าง 2-6 ชั่วโมงต่อวัน สำหรับ chatbot ที่พัฒนาขึ้นใช้ LINE Application มีความเหมาะสมอยู่ในระดับดีสำหรับใช้ส่งเสริมสุขภาพจิตและการป้องกันโรคซึมเศร้าของวัยรุ่น

คำสำคัญ: การส่งเสริมสุขภาวะ โรคซึมเศร้า การป้องกันโรคซึมเศร้า แซตบอต

Abstract

Mental health is an important factor associating with all individuals, especially adolescence. Teenagers not only have to manipulate with their different feelings but also expectations from families and relationship problems. Social media has a big role on each day of teenagers. For instance, its capability of preventing or reducing the risk of mental health problems. The purpose of this research was to analyze the experiences of teenagers regarding the promotion of mental health and prevention of Major Depressive Disorder and to design a chatbot for improving mental health and averting depression of adolescents, as adolescents nowadays access to technology more than in the past. The applications of information technology influence their communication as well, since it allows them to communicate with others more than their face-to-face

routine. Basing on these behavioral changes due to technological advancements, chatbot was selected as an approach for accessing teenagers' lives. This study is a User Experience and Design Research with 2 main phases involved: the Teenager Experience Analysis phase and the Design Thinking phase. During the Teenager Experience Analysis phase, a documentary was viewed by 20 teenagers consisting of 10 from the lower secondary level and the other 10 from the upper secondary level. During the Design Thinking phase, the prototypic chatbot was developed in line with the given context. Data collection methods are designed and evaluated in terms of appropriateness by professionals in Mental Health, Health Promotion, Development of Learning in Teenagers, Design Research, and Computer Science field. After data is collected from 40 adolescents and analyzed, the result reveals that the trend of teenagers receiving mental health counseling services is higher. Teenagers demand to talk and be advised through digital media. The teenagers engaged in health counseling services spend their time between 2 to 6 hours per day on the LINE Application. Since teenagers expect chatbot to be their emotional support and respond advices immediately, chatbot is designed to serve their needs. For the developed chatbot which is based on the LINE Application is well suited for mental health promotion and effectively prevents Major Depressive Disorder in adolescents as well.

Keywords: mental health promotion, prevention, Major Depressive Disorder, chatbot

Introduction

There are approximately 322 million patients with Major Depressive Disorder which can be calculated as about 4.4% of the world population. According to the survey conducted by the Department of Mental Health, it is revealed that there are approximately 1.5 million patients with Major Depressive Disorder in Thailand (Thai Health Promotion Organization, 2020). Thai teenager (aged 11-15) is the third group of Major Depressive Disorder patients, which is 11.5 percent. Additionally, Thai teenagers have a 3% higher risk of getting depression due to ineffective feeling management, parental expectations, and stress in education (Thai Health Promotion Organization, 2020; Wang et al., 2016). To live and attempt to reach goals among competitive circumstances, adolescents need to express their feelings to deduct stress (feeling of emotional or physical tension as a result of a particular situation which could contribute to frustration, angeriness, and nervousness) and feelings of worthlessness which sometimes could be vital (Abd Razak et.al., 2019; Ma et al., 2018).

Major Depressive Disorder is caused by chemicals in the brain and genetic inheritance (Robles et al., 2005). Five external factors that could result in depression are: (1) Long-distance relationships accruing loneliness that leads to depression (Cao et al., 2020; Eastwood et al., 2018); (2) Lowered self-esteem caused by changes of work aspects and values; (3) Life without nature including changes in eating habit, rest and exercise patterns; (4) Inability to deal with problems with cognitive skills under proactive circumstances (Robles et al., 2005); and (5) Toxic shame and emotional fragility directly caused by dysfunctional families (Parker and Roy, 2001; Stirling et al., 2015).

Several studies claimed that individuals under stress or depressive condition demand attentive listeners as they could help reduce the risk of suicide committing. Thus, utilizing social media to be a virtual listener and a mental health advisor could be a good alternative (Burger et al., 2020; Linder, 2020; Teesson et al., 2020). Chatbot, regardless of any differences in online platforms, can promote mental health by preventing stress and depression (Vaidyam et al., 2019). Most chatbots are found on Facebook. However, one of the most popular commercial chatbot platforms is LINE which is expected to be used in the healthcare field. LINE's chatbot can work as a robot listening to users, gathering personal information, and providing a variety of information.

Social media plays an important role in both human-to-human relationships and humane daily basis. To be more specific, teenagers veridically make relationships in the visual world and mentally grow in there (Vaidyam et al., 2019). LINE application is a well-known communication app among Thai people allowing users to send free messages and make free calls. According to LINE Thailand statistic, there are 69 million mobile internet users, and 45 million of them are LINE users (LINE Thailand, 2020). A number of chatbot is based on LINE platform, as it provides easy-to-use features, such as navigation bar and automatic interaction with users. Since there is a gap of knowledge that LINE chatbot has never been tested as a means to ease MDD in teenagers, the development of a LINE chatbot for mental health promotion and preventing Major Depressive Disorder in teenagers is needed. Experience research methodologies (user experience: UX research) will give insightful understanding about persona. Design research includes 5 design thinking processes: emphasizing, defining problem,

ideating, testing, and prototyping. These processes help create a chatbot with specific features (Wongwanich, 2020). This research comprises two objectives: (1) To analyze the experiences of teenagers about mental health promotion and prevention of depression, and (2) To design a chatbot for improving mental health and averting depression from user experience analysis. The developed chatbot can be an emotional support in various aspects by listening to personal mental problems as well as providing information about health and adolescents including techniques of relaxation and stress relief. The results of this research will be the prototypes that direct the development of a chatbot for mental health promotion and lowered risk of stress caused by depression. Besides, conclusive information about design principles for teenage counseling will be produced.

Differences in Stress and Major Depressive Disorder (MDD)

What differentiates stress from Major Depressive Disorder is emotional expression of individuals. Individual with stress may express emotion and the emotion expressed could be sensed by individuals' intimates. Stress may temporarily affect the body's physical and mental health balance. On the other hand, individuals with Major Depressive Disorder normally have self-disdain and chronic stress which eventually may result in permanent brain and body dysfunction (Chae et al., 2014; Robles et al., 2005).

Level of stress or Major Depressive Disorder (MDD)

Level of stress or Major Depressive Disorder can be divided into 4 stages.

(1) Low-stress level; an individual is capable of managing the problems causing stress positively. Appropriate amount of stress can have positive impacts on working.

(2) High-stress level; this stage is between a patient's condition and normal persons', and the individual in this stage is likely to try solving the problem

(3) The initial stage of depression; effectiveness of work or school, relationships, emotions, thoughts, behaviors will be affected directly.

(4) Major Depressive disorder, the patient is at risk of self-mutilating, committing suicide, and assaulting surrounding people (Chae et al., 2014; Rohde et al., 2013). LINE chatbot is expected to help users who are in the first two stages, as further stages require medical professionals and treatments. Chatbot can be considered as the prevention for occurrences of further stages.

Major Depressive Disorder treatments and preventions

Consulting with physicians is required. Further treatment includes long-term medication, and the curative effect is to eliminate the roots of the problems. Symptoms should be continuously observed by oneself. Antibiotics should not be taken unnecessarily. Exercising can prevent Major Depressive Disorder, as well as treating moderate depression (Hankin, 2020).

Relationship and positive communication among families and surrounding people are required to avert depression. Communication amidst family members can, for example, be done by using communication technology, as some family members may not be capable of having

physical relationship. Those who are under the condition need the family help immediately. Acceptance and good listening are very crucial for accumulating self-esteem and are needed to be done among family members and intimates. Activities of oneself and between family member is another useful alternative (Hankin, 2020; McCarthy et al., 2018).

Methods

The interview was conducted during COVID-19 lockdown. “User Experiences Research Method and Design Research” was used which were divided into 2 phases. Phase 1, Empathize and define problems, the user experience method was done by analyzing data from papers and interviewing the sample of the targeted group. The sample consists of 10 lower secondary students and 10 upper secondary students chosen randomly from Thai students in Bangkok as a representation of average Thai teenagers. The interview was done by asking several questions about their emotions and feelings about daily lives in the past, private matters, and family. The example questions are “How are you feeling?”, “What noticeable emotions have you experienced in the past?”, “Have you ever got stressed or anxious about something and how did you deal with it?”, “Why did it happen?”, “What do you usually do in your free time?”, “What activities do you prefer when getting bored (phycological state arising when individuals feel disinterested in their surroundings)?”. The analysis done in this phase gave design principles for improving mental health and preventing depression.

Phase 2 is an ideate operation and the prototype production, using conclusive design principles for promoting mental health and preventing

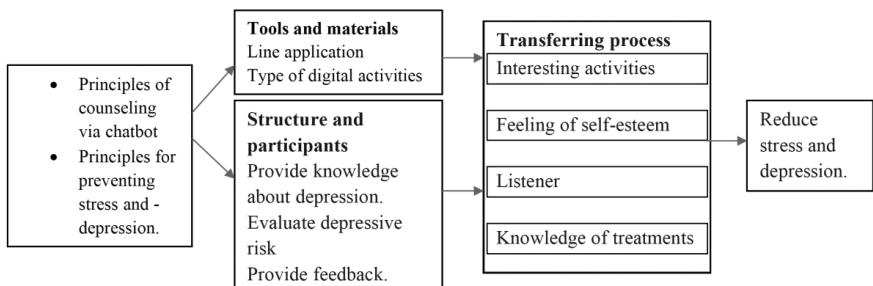
depression from user experience analysis and theoretical concepts from related papers. In this phase, the prototype production was done based on the holistic prototype and process development model, including Clarification of the task, Conceptual design, Embodiment design, and Detail design respectively (Schork and Kirchner, 2018). Information gathered in phase 1 was arranged in order to create purposes and main concept of the chatbot that serve the needs of the users. Structural and detail design were planned, and finally, the production of LINE chatbot was conducted on LINE Business ID website. Available graphics, including infographic and menu bar, were created on Photoshop. Consequently, the samples were categorized into group based on the level of stress in accordance with the interview results. The prototype test was conducted three times on 2 control groups; depression risk samples and risk-free samples in order to adjust the prototype. 5 professionals in 5 different fields, including Mental Health, Health Promotion, Development of Learning in Teenagers, Design Research, and Computer Science, were asked to verify the suitability, interestedness, accuracy, and possibility of usability. The apparatus of the research is the interviewing topic about the prototype. Examples of questions used for the interview are: (1) Is the prototype interesting?; (2) What should be improved?; (3) Do you understand the prototype and its objective?; and (4) How do you feel when using the prototype? The verification criteria consist of a 5-rating scale: (1) Excellent, (2) Good, (3) Fair, (4) Uncertain, (5) Poor, open-ended questions, and suggestions.

Results

The results of the research, divided by the objectives, revealed that:

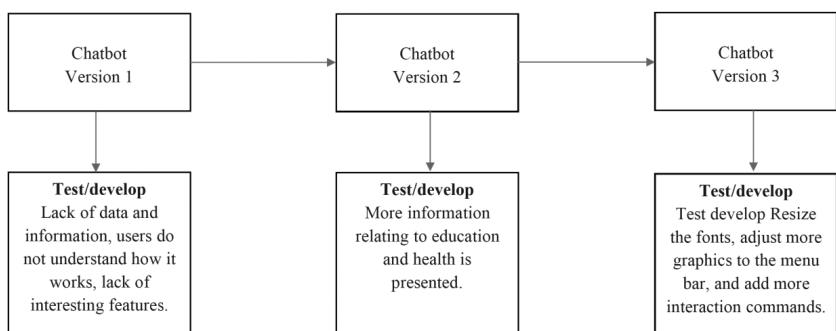
1. Lower and upper secondary school students needed friends during the COVID-19 crisis which they quarantined. They wanted to do other activities apart from reading books. Besides, adolescents had difficulty with managing lack of interest and anxiety relating to current situations, adaptation to online learning, and changes in educational programs. Having repeated daily lives at home, not could teenagers notice they were having stress and what level of stress they had.
2. According to the prototype design of mental health promotion and depression prevention, by using user experience analysis and design principles obtained from document analysis, teenagers should have a friend as a counselor, and have extracurricular activities. They should be informed about their stress levels along with knowledge about prevention, or treatments relating to Major Depressive Disorder in case of being at risk of having the condition. Therefore, LINE-based chatbot should provide information about Depression, Major Depressive Disorder self-examination, activities suggestion, and information about teenagers. Chatbot's operation must have positive communication and a private data collection system. The design principle is shown in figure 1.

Figure 1 Conjecture mapping for designing the prototype



Results of 3-time mental health promotion and Major Depressive Disorder prevention prototype test can be concluded as figure 2.

Figure 2 Result of prototype test from 20 targeted sample



Verification results for the professionals showed that the prototype appeared to be possible for implementation at a good level, as shown in table 1.

Table 1 Results of Prototype Evaluation from Professionals

Evaluation from Professionals	Mean	SD	Level
Suitability	4.63	0.32	Good
Interestedness for adolescents	4.75	0.50	Good
Appropriateness of content	4.75	0.50	Good
Accuracy of information	4.50	0.58	Good
Effectiveness of provided activities	4.50	0.58	Good
Possibility of using in practice	4.63	0.48	Good
Practicality	4.50	0.58	Good
Understandability	4.75	0.50	Good
Convenience	4.50	0.58	Good
Presentation for further treatments	4.75	0.50	Good

Conclusion and Recommendations

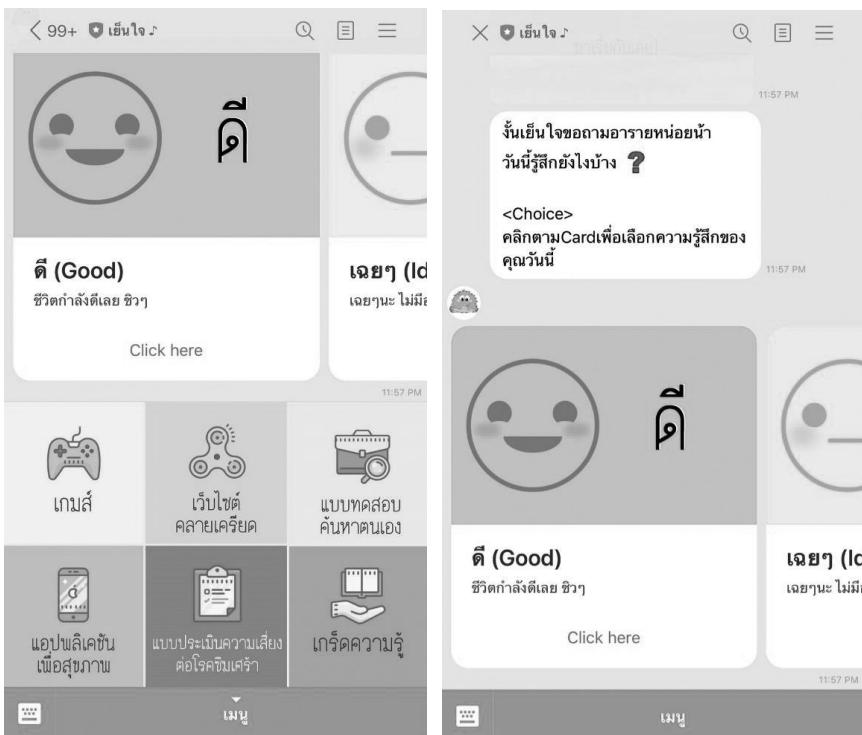
The results of the research concluded that improving mental health and preventing depression, the chatbot should be interesting and build up user self-esteem. It should provide information about the risk of stress and depression, and suggest extracurricular activities, such as games, stress-relief websites, aptitude-test quiz, health applications, depression risk test, and beneficial knowledge, for reducing stress. Also, listening to users' problems is one of the necessary features (Hankin, 2020).

Moreover, COVID-19 crisis would still affect individuals' lives in long-term, as the condition have not been eradicated yet. Thus, being awareness of the condition and social isolation would be expected to

remain in the society as well as teenagers' behaviors relating to this unpredictable situation.

The key issue of this research is the usage of user experience analysis to design innovation for teenagers by analyzing the interests and behavior about the technological usage of teenagers. The development of chatbot was done by gathering comments and recommendations from the prototype test conducted on the users and utilizing this information to adjust and improve features of chatbot, such as the editing text size and adding more information relating to health as well as global news. The chatbot was designed to meet the demands of teenagers in secondary school who now receive pressure and expectations from the social environment by providing automatic advices responding to the key word input and using attractive design, including colours and media. Teesson et al. (2020) claimed that intervention design by using online communication can help users to prevent stress and anxiety. Utilizing Chatbot as a friend to talk and an adviser is an alternative for adolescents who want to release their stress privately (Linder, 2020; Vaidyam et al., 2019).

Figure 3 Interface of LINE chatbot “Yen Jai”



For further research aiming to allow the chatbot to interact more with the users, it should be developed to have an automatic text forming feature (Vaidyam et al., 2019). Additionally, researchers need to gather all possible keywords for the chatbot to detect and create appropriate replies in each case. awareness of potential consequences to users' feelings must be considered. This research also provided contacts, such as mental consulting hotlines and psychologists, in which the users will be able to receive advice immediately and directly.

This research required many stages of prototype development and it had not been used in practice. The researchers suggest that in

case it is used in practice, feedback should be collected and tracked for formative evaluation. Those feedbacks are needed to be used for adjusting the prototype contributing to innovation success. According to Wongwanich (2020), which proposed that design research methods can be used for innovation development and implementation so that the innovation can be utilized genuinely and effectively.

The chatbot is suggested to be used in educational institutions as a counseling tool, which may require further menu adjustments suiting to school policies.

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