



Original Article

Effectiveness of Shining Mind- A Smartphone App to Increase Mental Health Literacy Among College Students

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Abstract: Background: Mental illness is a global public health challenge, particularly in low- and middle-income countries such as Vietnam. Improving mental health literacy was found to be associated with early detection and treatment of mental illness and increased help-seeking behaviors. With the development of information technology (IT), IT applications such as websites and mobile applications have become essential tools for mental health literacy intervention. Though there has been a number of mobile apps delivering psychotherapies, little focus on mental health literacy interventions. **Aims:** The study aims to a) evaluate the feasibility of a mobile-based mental health literacy intervention called Shining Mind and b) assess the effectiveness of the Shining Mind app in improving mental health literacy among college students. **Methods:** The study used randomized control trial design with two groups: experimental group (N = 68) and control group (N = 84). **Results:** The average number of times of accessing Shining Mind was 22.97 per student (SD = 25.13) with one student (1.47%) never logging into the app. In terms of quality, the app was rated moderately good by participants (M = 3.3, SD = 0.6). Regarding mental health literacy, the results showed that there were group effects over time regarding depression and bipolar recognition, social anxiety labelling, stigma and parent help-seeking intention.

Keywords: Mental health literacy, mobile apps, Shining Mind, students, Vietnam.

1. Introduction

1.1. Mental Health as a Public Health Issue

Mental health is a serious public health issue that needs to be addressed in the world generally and in Vietnam particularly. According to World Health Organizations [1],

around 450 million people in the world are affected by emotional and behavioral problems, and about 25% of families in the world has at least one family member that is suffering from mental disorders. It is also one of the leading causes of death and disabilities in the world [1]. In Vietnam, the prevalence rate of mental illness among children and adolescents is 13%, which means that around three million Vietnamese children and adolescents are

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suffering from mental health issues and need mental health services [2].

Research has shown that mental illness affects not only the individuals with mental disorders but also their families and the society [3-6]. Because of the detrimental effects of mental illness on multiple levels, great effort is mobilized in promoting and improving mental health in both high income and low- and middle-income countries, including increasing access to mental health care. For instance, Australia has funded 108 projects aiming to improve access to mental health in both urban and rural settings, helping more than 14,000 people in the rural areas of Australia receiving the appropriate mental health care with relatively low cost [7]. Several low- and middle- countries such as Vietnam, India, Kenya and Zimbabwe have started using the task-shifting model in order to address the lack of human resources in mental health, increasing access to mental health services in these countries [8-10].

However, increasing access to mental health care services alone is not sufficient. Gulliver, Griffiths & Christensen [11] has shown that one of the major barriers that prevent people from seeking help and using mental health care services is low mental health literacy. Therefore, it is also important to raise public mental health awareness and literacy in order to improve public mental health.

1.2. Mental Health Literacy

The development of the mental health literacy (MHL) construct was based on the construct of health literacy, which is the ability to “obtain, process and understand basic health information and services need to make appropriate health decisions” [12].

Jorm et al. [13] defined MHL as an ability to recognize specific mental disorders, causes/risk factors and treatment for mental illness to promote recognition and appropriate help-seeking [13]. Currently, MHL has been expanded to include the following aspects: i) knowledge of mental illness prevention; ii) recognition of signs and symptoms of mental

disorders; iii) knowledge of help-seeking and treatments options for mental illness; iv) understanding of self-help strategies for minor problems; and v) skills to provide first aid support for people with mental illness [14]. Kutcher et al. [15] also developed their definition of MHL to include the following components: i) knowledge of gaining and maintaining good mental health; ii) ability to decrease stigma about mental illness; and iii) the ability to seek help effectively. Compared to Jorm’s definitions, Kutcher et al.’s definition also addresses mental illness stigma reduction.

Mental Health Literacy Intervention

As MHL is essential for any mental health promotion and intervention, improving MHL recently has received increasing attention. There are four approaches to MHL intervention: i) whole-of community campaigns; ii) intervention based in educational settings; iii) mental health first aid training; and iv) internet-based interventions [14]. As the internet and technology continues to develop and the number of internet and technology users is growing, internet-based interventions can be a major resource for MHL interventions.

Web-based Intervention

There have been several web-based interventions that aim to improve MHL. For instance, BluePages and MoodGYM are two websites that have been evaluated its effectiveness. BluePages is a psychoeducational website that provides information about depression, while MoodGYM is a website that delivers CBT through five modules [16]. It was showed that these two web-based interventions helped improve some aspects of MHL. Christensen, Griffiths and Jorm [17] found that both BluePages and MoodGYM enhanced the level of knowledge about different types of treatment for depression in the study participants substantially compared to the control condition. A study on a multilingual website about depression also showed that web-based intervention can increase depression literacy in immigrants in Australia [18]. Some other studies have also explored the

effectiveness of other web-based intervention platforms on literacy of other mental illness. Roy et al. [19] found that after using a website that provided information on PTSD, both military service members and their families got significantly greater number of correct questions compared to prior of using the website. The results from Rotondi et al. [20] also showed that web-based intervention helped increase knowledge about diagnosis schizophrenia in people with schizophrenia and their informal support people, but not other aspects of knowledge about schizophrenia.

Besides websites providing information about mental health, some studies also examined the effects of web-based intervention in form of digital game-based intervention. Reach Out Central (ROC) is web-based digital game that aims to support youth mental health by improving their ability to identify and develop stress coping skills [21]. The results showed that web-based educational game helped increase MHL, and willingness in help seeking. However, the study only used three items to assess knowledge about depression and stigma [21]. Therefore, the effectiveness of this program on improving mental health literacy needs to be further examined.

Mobile App-based Intervention

Another approach for digital-based mental health intervention is mobile application-based interventions. Even though there is no mobile app-based mental health literacy intervention, this is a potential approach. According to the Statista Research Department [22], within five years (from 2014-2019), the number of smartphone users increased from 1.5 billion to 2.5 billion users. The growing number of phone users means that more and more people have access to mobile applications (apps) in general and mental health apps in particular. In addition, according to Boulos, Brewer, Karimkhani, Buller, and Dellavalle [23] and Franko and Tirrell [24], about 20% of smartphone users download health-related mobile apps on their phones and use them daily (as cited in [25]). Do et al. [25] also examined the receptiveness and preference among Vietnamese youths and young adults towards health-related

apps. The study found that among smart-phone users, only 14.1% downloaded a health-related application to their phones. This might be because there were not many free health related apps. However, more than half of those users (66.4%) found those apps helpful, and most of them felt satisfied with these apps.

According to Kieu and Dang [26], most mental health-related apps for mobile focus on psychotherapy interventions such as CBT, DBT and stress management skills. There has not been any mobile phone application that focuses on MHL intervention. This study aims to: i) present the development of Shining Mind- a mobile app to improve MHL specific to emotional problems, for Vietnamese college students; ii) to assess the feasibility of using Shining Mind for students; and iii) to assess the outcomes of Shining Mind itself.

2. Development of the Shining Mind App

In order to develop the Shining Mind app, we i) conducted a literature review on mobile apps in mental health and MHL interventions; ii) worked with the design team to come up with the design of the app; iii) conducted a survey with 10 students about the design of the app; iv) modified the design and features of the application to make it more convenient and suitable for the targeted audience (students); and v) prepared content of the application.

Shining Mind focuses only on emotional problems (depression, anxiety disorders and bipolar disorder). It provides users knowledge and information about anxiety disorders and mood disorders. The app is designed for the most two commonly used mobile operating systems: Android and iOS.

Shining Mind includes the following components (Figure 1):

- News: This component provides updated daily news related to mental health. News articles included in this section are written in lay language.
- From A-Z: This section provides basic and accurate knowledge about emotional

disorders such as definitions, sign and symptoms, treatments, resources, etc.

- **30 Days:** This is a section that provide daily lessons for users about different emotional disorders in form of infographic or videos.

- **Library:** This section contains additional documents or research articles about emotional disorders.

- **Quiz:** Users can go to this section and answer quiz questions to test their knowledge about these disorders.

- **Diary:** Users can record and update about their mood changes.

- **SOS:** This section provides addresses of mental health care services that users can contact if they need professional help.

- In order to increase the interaction between users and the application, notifications for the *30 Days* and *Diary* sections were sent out every day; notifications for the *News* sections were sent out every three days, and notifications from Quiz section were sent out every week. The information and news articles on these sections were selected and translated into Vietnamese from reliable sources such as NIMH, HelpGuide.org, New York Times, etc.

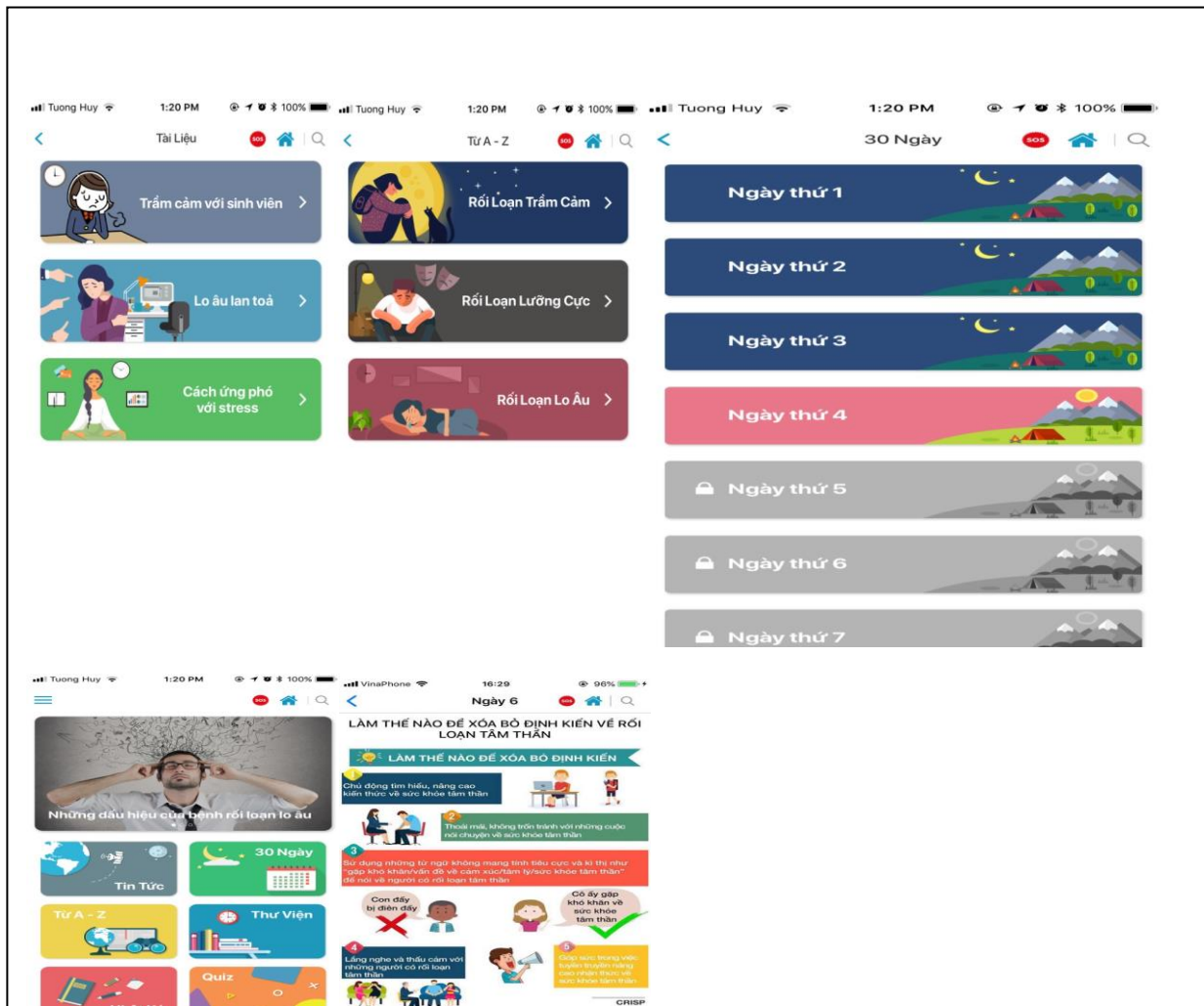


Figure 1. Screenshots/images from the Shining Mind application.

3. Feasibility and Outcome Study

3.1. Methods

This feasibility and outcome study used randomized control trial design with 2 groups: experimental group and control group.

3.1.1. Participants and settings

152 college students aged from 19 to 22 years old participated in the study. Participants were divided into 2 groups: control group not using Shining Mind (N = 84); and experimental group-using the Shining Mind application (N = 68). The students at the experimental group received specific link and account with ID to download the app to their smart phone.

3.1.2. Measures

Feasibility: Feasibility was assessed based on the following indicators: i) participants' number of times accessing Shining Mind; and ii) participants' evaluation of the quality of Shining Mind.

To assess the frequency of access, a function designed on the app to track the frequency of logging into the app by each student. To assess the participants' evaluation of the quality of Shining Mind, a 5-point Likert questionnaire (1 = completely disagree, 5 = completely agree) was developed. Four aspects of Shining Mind were assessed: i) the quality of the content (e.g., *"The content of the app is easy to understand"*, *"The content of Shining Mind is helpful"*); ii) features (e.g. *The app interface is attractive"*); iii) levels of usefulness (e.g., *"I often used the Shining Mind app during the past month"*; and iv) applicability of Shining Mind (e.g., *"I will introduce Shining Mind to other people"*).

MHL: Several scales were used to measures mental health literacy on emotional problems.

- Mental Disorder Recognition Scale (MDRS): Jorm's survey questions about mental illness recognition were used. Four vignettes describing symptoms of depression, bipolar, social anxiety disorder, or generalized anxiety disorder were presented to participants. Participants were asked to i) recognize if the

case described in each vignette had mental health problems; ii) labelling the case a specific mental disorder [27, 28].

An example of a vignette (social anxiety) was "L, 21 years old. When the school started last year, L became shy, timid and had only one friend. L really wants to have friends, but she is afraid that she would say something stupid or annoying when being around people. She rarely talks with classmates or speaks out. She can become very anxious, red face or even vomit if she has to answer a question or talk in front of the class. At home, she feels more relaxed, talks with her parents but becomes silent when there is a guest visiting. She refuses picking the phone or going out for events. She knows that her anxiety is irrational, but she could not control it". The questions were i) if L has a mental health problem; ii) If yes, what mental health problem is. Participants selected options among anxiety disorder, depression, bipolar, Substance Abuse, Personality Disorders. Ratings of each vignette were on 2-point scale: 1 for correct and 0 for incorrect.

- Literacy on emotional problems were measured by using 3 scales: Depression Literacy Questionnaire (D-lit) [16], Anxiety Literacy Questionnaire (A- Lit) [29] and Bipolar Disorder Knowledge Scale (BDKS) [30]. D-Lit scale includes 22 items that measure depression literacy. For each item, participants answered with "correct," "incorrect" or "don't know." Each correct response receives one point. The scale is scored from 0 to 22, with higher scores indicating greater literacy. Examples of the D-Lit items were *"Loss of confidence and poor self-esteem may be a symptom of depression"*, *"Sleeping too much or too little may be a sign of depression"*.

A-Lit includes 22 items that measure anxiety disorders literacy. Ratings of A-Lit were similar to D-Lit. Examples of the A-Lit items were *"Irritability may be a symptom of anxiety disorder"*, *"Too much worry is the main symptom of anxiety disorder"*. Both D-Lit and A-Lit have good internal consistency Cronbach's alpha, 0.7 and 0.76 respectively.

BDKS involves 25 items. Ratings of BDKS were similar to D-Lit and A-Lit. Cronbach's alpha for the scale was 0.77.

Stigma was measured by the Beliefs Toward Mental Illness Scale (BMI). The 21-item scale assesses negative stereotypical views of mental illness. BMI composes 3 subscales: dangerousness, poor social skills and incurability. Participants rated each item on a 5-point Likert scale (1 = completely disagree, 5 = completely agree). The higher scores indicate the more stigmatized. The scale's Cronbach's Alpha is 0.89 [31].

Help Seeking Intention was measured by a 10 item General Help Seeking Questionnaire (GHSQ): The scale measures the help-seeking intention of an individual if they have a mental health problem (e.g. parent, friend, doctor, phonenumber, etc.). Participants rated on a 5-point Likert scale (1 = completely disagree, 5 = completely agree). The scale's Cronbach's Alpha is 0.55 [29].

3.1.3. Procedures

Participants were randomly assigned into two conditions: i) not receiving any kinds of interventions (control group) (N = 84); ii) using the Shining Mind app (experimental group) (N = 68).

After being assigned into two groups, participants were asked to complete questionnaire related to MHL (T1). Consent forms were

obtained prior to the study. After the baseline survey, the participants in experimental group were instructed to download and install the app on their phones. Only students in the experimental group received the link to download the app with the specific account with ID. The participants in this group daily received notifications related to mental health through the app. The control group did not receive any kind of information related to mental health. After 35 days (T2), all participants completed the endline survey with the same MHL questionnaire, and the Shining Mind group completed the feasibility questionnaire.

3.1.4. Data analysis

Descriptive statistics were computed for all measures. General Linear Model (GLM) were conducted to compare scores on outcome measures (MHL, Help-seeking Intention, Stigma) between the intervention group and the control group at T1 and T2. The dependent variables were outcome measure scores at T2; baseline T1 scores were control variables, and Group (control vs experimental) was fixed effect, as a categorical independent variable (Table 1).

4. Results

4.1. Feasibility

Frequency of access

Table 1. The frequency accessing Shining Mind by participants

Number of times	Sample size (N)	Minimum value (Min)	Maximum value (Max)	Mean (M)	Standard Deviation (SD)
	68	0	133	22.97	25.13

The number of times that students accessed to the application varies from 0 to 135 over 35 days. Overall, the average number of time of accessing Shining Mind Mind was 22.97 per student (SD = 25.13), indicating that on average, students used the app less than one time per day. One student (1.47%) never logged into the app.

Quality Evaluation

Table 2 shows the experimental group's ratings of the following aspects: quality of the

content, app's features, levels of its usefulness and applicability of the app. The Shining Mind Mind app were evaluated moderately good by the students.

Mental health literacy

Scale scores (Mean, SD) of MDRS (Recognition as a vignette case as mental health problems and labelling specific mental disorder) by intervention group and control group at T1 and T2 are reported in Table 3.

Table 2. Experimental Group's ratings of quality of Shining Mind

	Mean (M)	Standard Deviation (SD)
Content	3.57	0.47
Features	3.07	0.51
Levels of usefulness	3.07	0.63
Applicability	3.49	0.81
Total	3.3	0.6

Table 3. Mental Health Recognition Scale Scores' Mean (SD) at T1 and T2 mean (SD) by 2 groups

Scale	Timepoint	Experimental Group (M, SD)	Control Group (M, SD)
MDRS Recognition-Social Anxiety	T1	0.94 (0.23)	0.97 (0.15)
MDRS Recognition- General Anxiety Disorder		0.83 (0.34)	0.91 (0.27)
MDRS Recognition- Depression		0.86 (0.37)	0.82 (0.38)
MDRS Recognition- Bipolar		0.92 (0.26)	0.92 (0,25)
MDRS Recognition-Social Anxiety	T2	0.92 (0.26)	0.96 (0.18)
MDRS Recognition- General Anxiety Disorder		0.89 (0.3)	0.89 (0.31)
MDRS Recognition- Depression		0.89 (0.3)	0.84 (0.38)
MDRS Recognition- Bipolar		0.85 (0.35)	0.86 (0.33)
MDRS Labelling-Social Anxiety	T1	0.75 (0.44)	0.72 (0.45)
MDRS Labelling - General Anxiety Disorder		0.86 (0.35)	0.78 (0.41)
MDRS Labelling- Depression		0.45 (0.5)	0.42 (0.49)
MDRS Labelling - Bipolar		0.3 (0.46)	0.3 (0.47)
MDRS Labelling-Social Anxiety	T2	0.73 (0.45)	0.83 (0.38)
MDRS Labelling - General Anxiety Disorder		0.8 (0.4)	0.78 (0.41)
MDRS Labelling- Depression		0.61 (0.5)	0.37 (0.48)
MDRS Labelling - Bipolar		0.39 (0.5)	0.31 (0.46)

MDRS-Range of scale is 0 (false) and 1 (correct).

In the GLM models evaluating the effect of the Shining Mind app, regarding recognition level of mental health problem, MDRS Depression and MDRS Recognition for Bipolar showed significant group effects over time ($F(1,147) = 12.86, p < 0.001, R^2 = 0.08$; $F(1,148)$

$= 4.48, p < 0.05, R^2 = 0.03$ respectively), favoring the experimental group who reported higher level of recognition. Regarding level of labelling a specific disorder, MDRS- Labelling Social Anxiety showed significant group effects ($F(1,123) = 8.2, p = 0.05, R^2 = 0.06$;

The scale scores of literacy of depression, anxiety and bipolar at T1 and T2 by 2 groups were reported in table 4.

Table 4. Mean (SD) of measures on knowledge about emotional problems at T1 and T2 by 2 groups

Scale	Timepoint	Experimental Group	Control Group
D-Lit	T1	11.56 (2.78)	10.35 (3.05)
	T2	11.10 (3.87)	9.93 (3.18)
A-Lit	T1	9.74 (2.65)	9.4 (2.97)
	T2	10.10 (3.59)	8.9 (3.14)
BDKS	T1	9.54 (4.09)	8.83 (3.82)
	T2	10.25 (4.71)	8.52 (4.32)

D-Lit; A Lit, BDKS-Range of scale is 0 (false) and 1 (correct). The higher score the better.

In the GLM models evaluating the effect of the Shining Mind app, there were no group effects for all 4 measures.

Stigma

In the GLM models evaluating the effect of the Shining Mind app, stigma showed significant group effects (Table 5), with the experiment group having less negative stigma than the control group from T1 and T2.

Table 5. Results of inferential analyses of BMI scales

Scale	F test	R ²
BMI-Dangerousness	F(1,148)=9.52**	0.06
BMI-Poor Skills	F(1,148)=15.76****	0.1
BMI-Incurable	F(1,148)=8.48**	0.054
BMI Total	F(1,148)=19.12****	0.11

*p < .05, **p < .01, ***p < .001, ****p < .0001

Help-Seeking Intention

There were no significant differences within the intervention group at T1 and T2 regarding

Help-Seeking Intention. In the GLM models evaluating the effect of the Shining Mind app, only one out of 10 item of help-seeking intention (*seeking for help from parent*) showed significant group effect, with experimental group being less seeking for help from parent over time than the control group (F(1,143) = 9.6, p < 0.01, R² = 0.63)

5. Discussion

This study's aim was to develop and pilot the mobile app Shining Mind to improve MHL, specific to emotional problems (depression, anxiety disorders and bipolar disorder) among students. Though there has been increasing interest in the use of smartphone on mental health intervention, this study was among the first focusing on MHL. The Shining Mind consisted of various functions such as news related to mental health, library with basic and accurate knowledge about emotional disorders, quiz, diary, etc. Participants in the experimental group evaluated it moderately good regarding content, features, usefulness and applicability in real life. However, on average, the frequency of using the app within the intervention period (35 days) was rather low. Several possible explanations could be considered. Firstly, the process of installing the Shining Mind could cause participants uncomfortable to use it frequently. Since this app was designed for research purpose, it was not on Apple Store or Google Store and the participants had to go through several steps in order to install it. This complicated installation process might make the participants feel inconvenient and not wanting to use the app often. Secondly, lack of interest in and motivation on mental health could influence their behavior of logging into the app daily. Lastly, regarding the design of the app, the amount of information in the app might be too much/too large for users. The app was designed mainly to provide information, there was a lack of interaction between the app and the users. It is believed that if the app would be designed in game format, it may attract more attention and interaction from the users.

The study reported findings examining the outcomes of the Shining Mind app on students' mental health knowledge, attitudes and help-seeking intention. Findings showed that there were group effects regarding depression and bipolar recognition, social anxiety labelling, stigma and parent help-seeking intention. The significant impact of the Shining Mind on students were reported on stigma. The experimental group had less negative stigma on mental health problems than the control group. This result was consistent with previous studies regarding the effect of web-based and app-based MHL intervention (e.g., BluePages, MoodGYM) [16].

This study had some limitations. First, the sample size was small, and limited in one university. This limited number may not be representative of all the students in Hanoi or Vietnam. Second, the intervention period lasted for 35 days, which was a relatively short period of time, without follow-up. Finally, the study assessed mental health knowledge and attitude outcomes but not behavioral outcomes such as self-care and help-seeking.

6. Conclusion

To our best knowledge, this study was the first one in Vietnam focusing on mobile application-based MHL intervention in Vietnam. The findings are promising in term of feasibility and indicate that mobile app intervention might be a potential method and tool to improve public MHL among students. Further studies on mobile-based intervention for MHL (e.g, game format) needed to be encouraged and invested.

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