

[+ Journal Menu](#)[PDF](#)[Article Sections](#)

Special Issue





Mobile Collaborative Technologies and Data Science for Smart Systems

[View this Special Issue](#)

Research Article | Open Access

Volume 2019 | Article ID 9517321 | <https://doi.org/10.1155/2019/9517321>[Show citation](#)

A Chatbot System for Mental Healthcare Based on SAT Counseling Method

Takeshi Kamita  ¹ **Tatsuya Ito**¹ **Atsuko Matsumoto**² **Tsunetsugu Munakata**³ and **Tomoo Inoue**  ⁴[Show more](#)**Academic Editor:** Filippo Gandino**Published:** 03 Mar 2019

Abstract

In recent years, mental health management of employees in companies has become increasingly important. As the number of psychotherapists is not enough, it is necessary for employees to be able to keep their mental wellness on their own. A self-guided mental healthcare course using VR devices has been developed, and its stress reduction effect has been validated previously. This study proposes a new version of the course using smartphones and chatbots to enhance its convenience for use and to maintain user motivation for daily and repeated use. The effects of stress reduction and motivation maintenance were acknowledged.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

the means to take care of their mental health by themselves and to utilize the data of employees' mental health for more effective collaborative support by experts.

In order to realize such means, firstly, Kamita et al. [1–3] started to have converted the SAT (structured association technique) counseling method [4] into a digital content and developed a self-guided mental healthcare system with wearing a VR (Virtual Reality) head-mounted display (HMD) and eventually obtained good stress relief evaluation.

However, when using VR in a company, it is assumed that a dedicated HMD will be installed in a shared location, such as a healthcare room or relaxation room. Due to the limited location available, it was impossible for employees to use anytime when they wanted to reduce their daily stress or solve problems, and there were problems in their practicability. In the SAT method of therapy, visual stimulation with images encourages intuitive associations and inspiration, and the effect is established by frequent stimulation with repeated viewing of the images [5, 6]. Continuous use of the self-guided mental healthcare course is important, but motivation to promote the use of course for employees who do not necessarily actively engage in self-care is a challenge.

Therefore, we propose a self-mental healthcare course using chatbot (Chatbot course) on LINE, a SNS platform that is commonly used as a communication tool using a widely used smartphone terminal from the viewpoint of practicality and motivation. In this study, we conducted a comparative intervention experiment with the Chatbot course and nonchatbot course built as web contents (Web course) to investigate the efficacy of chatbot in a self-guided mental healthcare course from the two perspectives of whether the Chatbot course performed on a smartphone without the use of VR would also have a stress reduction effect and whether chatbot induction would enhance user motivation.

2. Related Works

2.1. Use of a Smart Phone for Mental Healthcare

In recent years, research studies have been conducted to apply psychotherapy to digital contents and use them with mobile devices as a complementary tool for treatment and counseling, or a training tool. Research studies on one of the major psychotherapy, cognitive behavioral therapy (CBT), have especially progressed [7–9], and there are many commercially available mobile applications [10]. In the CBT session, the counselor modifies the negative cognitive distortion of the client through dialogue with the client to encourage positive thinking and behavioral change. After the session, clients are given a home work called the diary or column method in which they write their daily thoughts and the counselor analyzes them in the next session for use in therapy. The CBT application is mainly digital content of this homework part and does not cover the entire CBT process. Therefore, it is hard for users to realize effect of stress reduction or stress problem solving in one-time use. While it may be an effective auxiliary tool for professional support, in case of using as a self-guided tool, users are required to be fully aware of the program and to maintain a high level of motivation to continue using it.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

on events with negative cognition. However, one-time use of Mood Mint is not intended to reduce stress or solve problems, so the user will continue to train repeatedly without knowing the stress-reducing effect. As with CBT applications, users themselves are required to maintain motivation. Mood Mint uses a system to provide point incentives for the token economy [13] as a method to encourage its use.

Mindfulness stress reduction using meditation (MBSR) and mindfulness cognitive therapy (MBCT) are also increasingly used in research and psychological clinics in Europe and the United States [14, 15] and are widespread in Japan [16]. In the United States, changes in brain function were measured after 8 weeks of meditation, confirming the effectiveness of meditation [17]. MBSR refers to the “state of focus here,” which is conducted in groups and individuals in combination with sedative meditation, walking meditation, and breathing techniques. Research and development on digital content of meditation has been advanced [18], and “Headspace” [19] is available in the smartphone application. In this application, courses are provided for each purpose, such as anxiety and depression, and the user performs 10 to 30 10-minute sessions per course in accordance with voice guidance. However, because some of the functions of therapy are implemented, and the main objective is to guide meditation, a single practice is not implemented with a sense of the effectiveness of stress reduction or problem solving. Thus, as with CBT and CBM applications, users themselves need to maintain high motivation. Some studies have found that meditation poses a risk of increasing discomfort and pain [20], and some aspects of the study aim require careful handling as a self-care tool.

2.2. Mental Healthcare Using a Chatbot

Chatbot, a program that automatically talks through texts and voices, has been developed since ELIZA [21] was developed in 1966.

In 2016, the development environment was opened as a messaging function of two social networking service platforms, Facebook (“Facebook” is a registered trademark of Facebook, Inc.) [22] and LINE [23], which enabled us to offer chatbots through SNS.

Chatbots in the field of mental health care have been developed to support interpersonal skills as a training component of a depression treatment program rather than therapy [24]. In addition, chatbots specialized to cope with stress problems have been also studied. Based on the Perceptual Control Theory, a self-help program MYLO in the form of a chatbot has been developed. In comparison with ELIZA on MLYO effectiveness, MYLO and ELIZA led to relief of pain, depression, anxiety, and stress and MYLO was thought to be more useful for problem solving [25].

Besides that, an automatic conversational chatbot “Woebot” using Facebook messenger has been developed based on CBT [26]. As a result of an evaluation experiment using “Woebot” for college students, it was found that the participants’ depressive symptoms were significantly reduced. They commented that using “Woebot” was more receptive than traditional therapies. However, same as the CBT application mentioned above, Woebot does not cover the whole process of CBT but mainly provides programs of psychoeducation for stress coping. Users are required to maintain their motivation for a certain period of time before the

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

3. SAT Method

3.1. Overview of SAT Method

The SAT method is an interview-style counseling and therapy techniques developed by Munakata [4]. Unlike conventional counseling technique, which uses language stimuli obtained through dialogue with a counselor to act on thoughts, the SAT uses visual stimuli obtained by viewing image images to quickly identify unrecognized real feelings and desires by functioning associations, inspiration, and intuition. The SAT method consists of several techniques. Techniques to clarify the problem and characteristics of the client and to motivate the client to solve the problem include temperament coaching method, health coaching method, and emotional clarification method to clarify intrinsic emotional needs. 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. The counselor reviews the client’s main complaint, stress conditions, psychologic characteristics, and progress and effectiveness of counseling, selecting and administering appropriate techniques. We developed a digital-content technique using the emotional stabilization therapy.

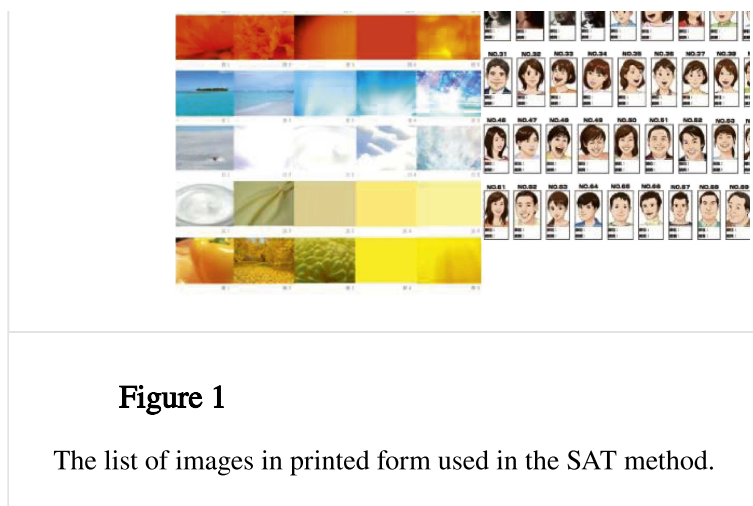
3.2. Emotional Stabilization Therapy

The emotional stabilization therapy is a technique that can be used to reduce or solve daily stress problems, such as current problems, problems in the past, and alleviate physical symptoms, and can be administered for oneself if trained during counseling or by a training seminar. The counselor throws structured questions (Table 1) to the client, who then replies or enhances his or her image in his or her mind, and proceeds with the treatment. First, the person should be reminded of a stress situation, and aversive feelings associated with discomfort may trigger the sensation of discomfort by the body, such as a stomach stick or chest stuffiness. This is followed by focusing attention on body discomfort and providing an image of mild warm lights printed on paper media (Figure 1), which allows the client to select a comfortable image and to recall an image of the light that is surrounded and healed by the body discomfort (the light imaging method) [5]. In addition, a list of smile face images that symbolize joy is presented, allowing the client to select the images that the client likes, and to recall the sense of security and safety that the client enjoys and protects. Hence, self-affirmation and stress reduction can be achieved by encouraging the client to recognize his or her own persistence and captivity, changing his or her sense of perception to change the meaning and interpretation of the problem, and allowing the client to anticipate a constructive outlook for solving the problem (the surrogate representation imaging method) [5].

Table 1

Question items comparison defined in SAT and Digital-

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.



4. Digital-SAT Method

In the emotional stabilization therapy, the counselor checks the treatment effect from conversation with the client, color of face, gestures, etc., asks the client condition, induces eye closure, and returns to the previous procedure if the effect is judged to be insufficient. The digital-SAT method enables the self-guided mental healthcare based on the SAT method without the guidance of the counselor 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 (Table 1). The Chatbot course based on this digital-SAT method was developed.

4.1. Structure of Digital-SAT Method

Based on the structure of the SAT method, the composition and procedures of the digital-SAT method are classified into three categories: (1) to clarify the problem and characteristics of the client and to motivate the client to solve the problem (assessment part), (2) to reduce stress and solve problems (solution part), and (3) to learn psychological knowledge for maintaining mental wellness and increasing resilience against mental disorder (learning part). In this study, we deal with assessment part and solution part.

4.1.1. Assessment Part

In the assessment part, a mental characteristic check test (Table 2) is conducted, using the SAT six psychological scale to measure the mental condition and characteristics and record the changes before and after the use of the course.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

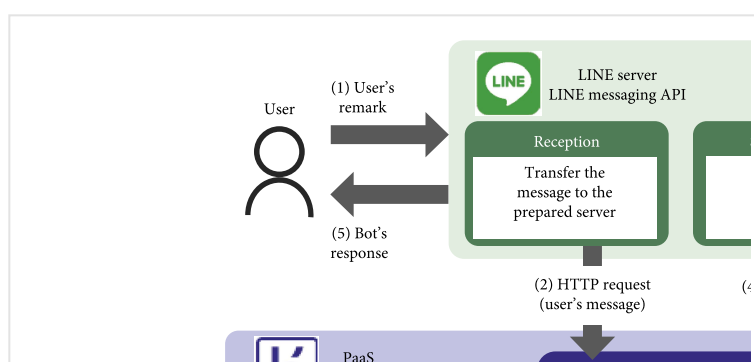
The solution part follows the digital-SAT method questions in Table 1. First, the stress currently held (Q.1-1, 2, and 3) is recalled, and the aversion to the stress is illustrated by color and shape (Q.2-1, 2), which stimulates perception of body discomfort and is clearly visualized by concrete numerical images of the degree of stress (Q.3-1, 2, and 3). Next, the physical discomfort is relieved by using light images (Q.4-1 and 2), and a smile face image is used to foster a sense of security and safety (Q.5-1 and 2), and stress levels are reduced (Q.6-1). Subsequently, conditions with reduced stress responses can provide positive personality images and encourage the perception that different ways to catch stress problems are encountered (Q.7-1, 2, and 3). In addition, by choosing one of the most worrisome smile face images and imagining messages that the person with the smile face gives to user's self, the user can remember the words the user needs in the context of stress (Q.8-1 and 2) and finally, confirm and terminate the extent to which the initial stress problem was encountered (Q.9-1, 2, and 3).

5. Implementation of the Chatbot Course

In the conventional self-mental care method, withdrawal of users is the biggest problem [35, 36]. Even in the SAT method, frequent stimulation of smile face images can improve the mental health improvement effect and the practice of course repeating is important. To solve this problem, we devised the Chatbot course using a chatbot with conversational guidance. In this research, we adopted LINE which is widely used as a chat tool in Japan and developed a self-mental care system for practicing the Chatbot course.

5.1. System Configuration

Figure 2 shows the configuration of this system. The numbers in the figure show the flow of data processing. As a chat tool, we provide a chatbot service on the LINE application of the most popular SNS service in Japan. A chatbot application server is built on a commercial HEROKU ("Heroku" is a registered trademark of Heroku, Inc.) server [37], and LINE server is provided by LINE. And, the Messaging API [38] program provided by LINE is used for servers' linkage. The Messaging API is an application programming interface that allows data to be exchanged between the chatbot application server and the sending and receiving server of LINE.



We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

5.2. Start Screen

The user adds the LINE @ account of the chatbot. Select the added chatbot from the list on LINE's "Friends" screen and press the "Talk" button on the next screen to display the start screen (Figure 3). The function menu at the bottom of the screen has three buttons, "Start," "Questionnaire," and "Help". Click "Start" to start the course. When "Questionnaire" is pushed, it transits to the web page screen (Figure 4) of the mental characteristic check test of the assessment part.



Figure 3

Start screen.



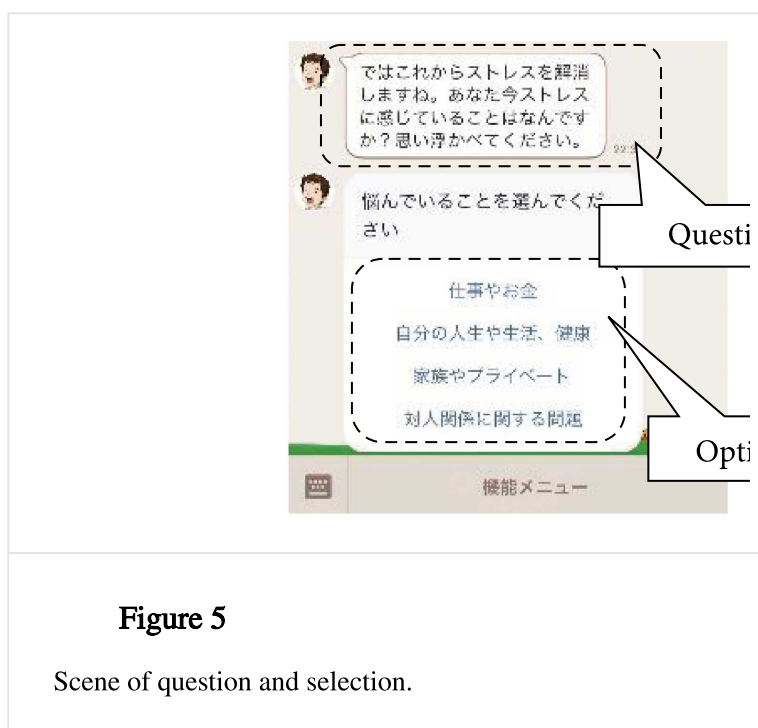
We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

5.3. Assessment Part

The limitations of the features that can be implemented on the chat screen preclude, for example, the ability to select from a list of multiple options and images. The mental characteristics check test used by the Assessment part consists of 80 questions and is created on the web page (Figure 4). When the user pressed the button with the URL link on the chat screen, the user moved to the test page and when the test was completed, the end button at the top of the screen was pressed to return to the chat screen.

5.4. Solution Part

The Solution part, along with the question procedure in Table 1, will provide the user with a series of questionnaires by a chatbot, and the user will be free-written or answered by choice (Figure 5). Following the user's response, the next question will be automatically presented, and a chatbot will induce progression. Images such as light image (Table 1, Q.4-2) and smile face image (Q.5-2) were viewed, and the selected image was displayed as large as possible on the screen in a scene where good image was obtained (Figure 6). Since the list of options that can be displayed on the chat screen is restricted to characters (Figure 5), the image selection scenes of Q.2-1 (aversive image selection), Q.2-2 (aversive image selection), Q.4-1 (light image selection), and Q.5-1 (smile face image selection) that need to be selected from the image list were moved from the chat screen (Figure 7) to the Web page (Figure 8).



We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.



Figure 6

Scene of selected images viewing.

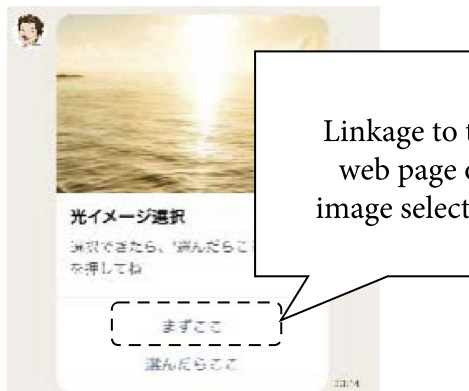
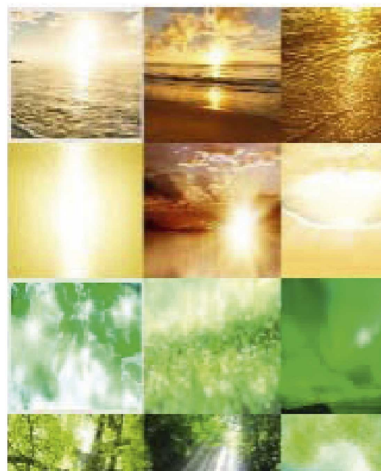


Figure 7

Scene of image selection.



We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

6. Experiment

A comparative experiment was conducted to assess the stress reduction effect by using the Chatbot course with smartphones and the motivation to the courses and investigate the effectiveness of chatbot in the self-guided mental healthcare course. A control group will use another self-guided mental healthcare course built by web pages without a chatbot (Web course). The Web course was also conducted using smartphones to control experimental conditions.

This experiment was carried out with the approval of the ethics review committee in Faculty of Library Information and Media Science, University of Tsukuba (Notification No. 29-137).

6.1. Web Course

According to the digital-SAT method procedure (Table 1), the Web course was implemented on web pages to be the same as page configuration of the Chatbot course consisting of the scene of question and selection and the scene of selected images viewing. In implementing a Web course, the start page is displayed when the user starts the Web browser and logs in on the login page using the ID and password. Click Menu on this page to move to the Assessment or Solution part page. The Assessment part used the same check test page as the Chatbot Course (Figure 4). According to the digital-SAT procedure, the Solutions part implements and displays the situations of questions/choices (Figure 9, corresponding to Figure 5) and image viewing (Figure 10, corresponding to Figure 6) on each page.

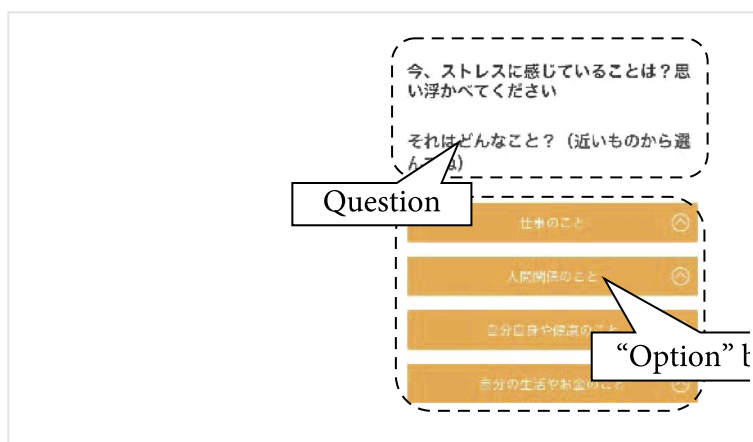


Figure 9

Scene of question and selection for Web course.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

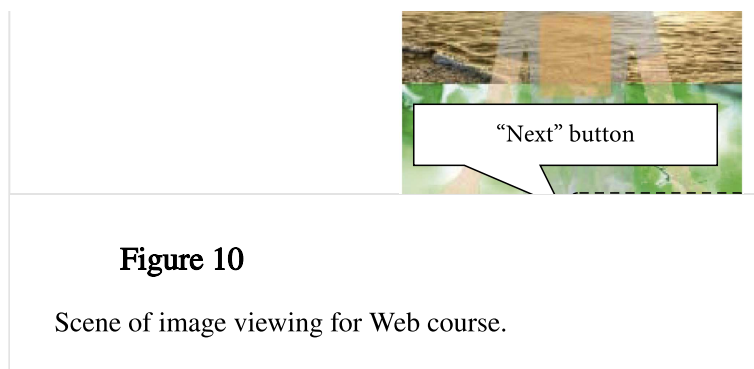


Figure 10

Scene of image viewing for Web course.

The difference between the two courses is that when a user reads a question sentence presented by the blow out of the chat, responds and selects, the order is automatically displayed with the next blow and the development of the scene proceeds, while the Web course is developed by the user reading the question text at the top of the screen, depressing the option button (Figure 9), and then pressing the “Next” button at the bottom of the screen and sending the page (Figure 10).

6.2. Procedure

Twenty-seven college students were selected as participants and randomly assigned to two groups, the Chatbot course and the Web course (Chatbot course: $N = 15$, male 6, female 9, name, average age 24.80 years, $SD = 1.57$, Web course: $N = 12$, male 6, female 6, average age 25.33 years, $SD = 3.37$). The experiment was conducted in accordance with following procedure:

- (1) Explanation of this study (10 min)
- (2) Survey of stress condition by the mental characteristics test on web page (15 min)
- (3) Explanation of the SAT methodology and the way of using the course (30 min)
- (4) Implementation of the course (10 min)
- (5) Survey of stress condition by the mental characteristics test and motivation to use the course by a questionnaire of TAM model (see Section 6.3) (20 min)

6.3. Measurement

The stress reduction effect was evaluated using the stress characteristic check test consisting of SAT psychological scales (Table 2), and the user’s motivation to use the course (the effect of improving the motivation to use) was evaluated using a questionnaire created based on the technology acceptance model (TAM) which is a human behavior model that predicts and explains the usage behavior of the information system (7 levels of the Likert scale) [39]. In this model, perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (AU), and behavioral intention to use (BI) as factor leading to user’s system use are measured for user’s motivation.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

7. Result

First, we performed Mann–Whitney’s U test to determine whether there were differences in stress condition before the course between the two groups (Table 3). No significant difference was found in any of the scale scores. It was found that there was a significant difference in the score changes of self-esteem, STAI, and SDS in the Chatbot course (self-esteem: $p = 0.024$, STAI: $p = 0.038$, SDS: $p = 0.043$).

Table 3

Stress characteristic check scores before and after using the courses (Chatbot course: $N = 15$; Web course: $N = 12$).

Regarding the score of the questionnaire based on the TAM model, the average scores for all scores in the Chatbot course were higher than the Web course (Table 4). The result of the Mann–Whitney’s U test on the scores showed that there was a significant difference in the score of PEOU ($p = 0.030$) and BI ($p = 0.027$) and a significant trend in the score of PU.

Table 4

The score of the questionnaire based on the TAM model (Chatbot course: $N = 15$; Web course: $N = 12$).

8. Discussion

First, it was confirmed that there was no significant difference between the Chatbot course group and the Web course group in the six scale scores before the course was implemented and that the group was not a group with different stress characteristics. The two groups are then compared.

According to the evaluation criteria of the SAT method (Table 2), the self-esteem score in the Chatbot course group before the course is in the “lower” level and STAI score is in the “much higher” level. In the interpretation of the SAT method, the low self-esteem and the inability to positively evaluate oneself predispose people to anxiety, even if problems arise in front of the eyes, because they are unable to tackle positively and are unable to make prospects. Continued high anxiety is associated with increased depression

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

reduction effect. Improvements in these indicators are justified by the interpretation of the SAT method because of improved self-esteem, reduced anxiety, and decreased depression.

Self-esteem, STAI, and SDS scores are indicators of the state of stress and are relatively variable depending on the contemporary state. On the other hand, self-repression behavioral trait and difficulty in recognizing emotions are less variable than the above-mentioned three scales as representations of stress-producing personality traits. In the clinical setting of the SAT method, improvement of these indicators is one of the objectives of modifying the perception of stress, resolving problems, and increasing stress tolerance. Although the mean scores for self-repression behavioral trait and difficulty in recognizing emotions in the Chatbot course group decreased, no significant difference was found and no improvement was seen as the criteria changed. A latest survey using our VR course confirmed improvements to the deeper characteristics of stress traits such as self-repression behavioral trait and difficulty in recognizing emotions other than self-esteem, STAI, and SDS. In the Chatbot course, no significant difference in the effect on the stress personality trait could be confirmed, so it can be said that all improvements have been made. Alternatively, this could be a limitation of the Chatbot course performed on a small smartphone 2D screen.

Regarding the evaluation of the motivation to use the system by TAM, PEOU and BI were higher in the Chatbot course than in the Web course. In PEOU's "It's easy to learn to use this system," "I think it is easy to master this system," "I think it is easy to use this system" 3 total points and BI's "I will use this system in the near future," "I believe that the interest in this system will increase in the future," "Recommend to use this system for others" 3 total points, a significant difference was observed at the total points of the two question items. In addition, a significant trend was seen at the total point of the five question items of PU. These results suggest that Chatbot course may be more motivated than the Web course. In the Web course, although the same self-SAT procedure was implemented, no significant differences were found for any scale. Taken together, Chatbot's support suggests that motivation to use could be focused on the care process itself and exerted a stress-reducing effect. Given the importance of focusing on the care process itself, it may be substantiated that the intrusive view of the VR course produced higher levels of concentration and had a higher stress reduction effect.

Compared with VR, a smartphone-based Chatbot course offers considerable convenience and has the advantage of inducing Chatbot that allows users to guide self-care without being aware of it. This is a useful training tool. Some users who are familiar with this method may prefer to be able to perform it at their own pace, do not need Chatbot guidance, and may find it easier to use the Web course. In our other recent survey, a significant reduction in the STAI scale has been confirmed with the 2-week implementation of the Web course. It is possible to use VR to deepen the sense and understanding of its effectiveness, and then to repeat training in the Chatbot course and the Web course.

Future research firstly aims to develop tools that will be more effective by deepening research on how to use and combine tools. Further, the system, gathering data through using these tools and providing actual mental health condition of users to specialists, such as industrial doctors or counselors, for collaborative support, could be developed in the next stage. In addition, it should be mentioned that people who can use these courses are limited to users who can use SNS and smartphones.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

In this study, the SAT method was converted to digital contents; a self-guided mental healthcare course and a system using a chatbot were developed, and a comparative evaluation experiment was conducted with a Web course without a chatbot as a control group. The results of the experiment show the possibility that the use of the chatbot enhances user's motivation and supports to reduce stress and is effective in the self-guided mental healthcare course. However, the sample of users in this study is small, and the user's motivation and stress reduction effect were evaluated based on one-time use of the course. 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.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

This manuscript is an extended version of the paper presented at the 2018 International Workshop on Collaborative Technologies and Data Science in Smart City Applications.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

1. T. Kamita, A. Matsumoto, T. Munakata, and T. Inoue, "Realization of self-guided mental healthcare through the digital content based on the counseling technique SAT method," *IPSJ Transactions on Digital Content*, vol. 6, no. 2, pp. 32–41, 2018.
View at: [Google Scholar](#)
2. T. Ito, T. Kamita, A. Matsumoto, T. Munakata, and T. Inoue, "Virtual reality course based on the SAT counseling method for self-guided mental healthcare," in *Proceedings of 2018 IEEE International Conference on healthcare Informatics (ICHI)*, pp. 299–306, New York City, NY, USA, June 2018.
View at: [Google Scholar](#)
3. T. Ito et al., "A self-guided mental healthcare digital content for smartphone VR based on the counseling technique SAT method," *IPSJ SIG Technical Report*, vol. 2018, no. 37, pp. 1–8, 2018.
View at: [Google Scholar](#)

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

hardships toward true life career?" *Journal of Health Counseling*, vol. 15, pp. 1–12, 2009.

View at: [Google Scholar](#)

7. P. J. Batterham, A. L. Cleave, L. Farrer, S. M. McCallum, and V. W. S. Cheng, "FitMindKit : randomised controlled trial of an automatically tailored online program for mood, anxiety, substance use and suicidality," *Internet Interventions*, vol. 12, pp. 91–99, 2018.

View at: [Publisher Site](#) | [Google Scholar](#)

8. K. H. Ly, E. Janni, R. Wrede et al., "Experiences of a guided smartphone-based behavioral activation therapy for depression: a qualitative study," *Internet Interventions*, vol. 2, no. 1, pp. 60–68, 2015.

View at: [Publisher Site](#) | [Google Scholar](#)

9. D. Bakker and N. Rickard, "Engagement in mobile phone app for self-monitoring of emotional wellbeing predicts changes in mental health: MoodPrism," *Journal of Affective Disorders*, vol. 227, pp. 432–442, 2018.

View at: [Publisher Site](#) | [Google Scholar](#)

10. J. Torous, D. K. Levin, M. L. Ahern, and M. L. Oser, "Cognitive behavioral mobile applications: clinical studies, marketplace overview, and research agenda," *Cognitive and Behavioral Practice*, vol. 24, no. 2, pp. 215–225, 2017.

View at: [Publisher Site](#) | [Google Scholar](#)

11. Y. Hakamada and H. Tagaya, "Cognitive biases in anxiety and depression: emergence of cognitive bias modification approach," *Japanese journal of biological psychiatry*, vol. 22, no. 4, pp. 277–295, 2011.

View at: [Google Scholar](#)

12. "Mood Mint," December 2018, <http://www.biasmodification.com/>.

View at: [Google Scholar](#)

13. F. B. Dickerson, W. N. Tenhula, and L. D. Green-Paden, "The token economy for schizophrenia: review of the literature and recommendations for future research," *Schizophrenia Research*, vol. 75, no. 2-3, pp. 405–416, 2005.

View at: [Publisher Site](#) | [Google Scholar](#)

14. -Z. Jon Kabat, "An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results," *General Hospital Psychiatry*, vol. 4, no. 1, pp. 33–47, 1982.

View at: [Google Scholar](#)

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

16. Y. Kimura, "Literature review of mindfulness training," *Doshisha Women's College of Liberal Arts Annual Reports of Studies*, vol. 67, pp. 79–82, 2016.
View at: [Google Scholar](#)
17. R. A. Gotink, R. Meijboom, M. W. Vernooij, M. Smits, and M. G. M. Hunink, "8-week Mindfulness Based Stress Reduction induces brain changes similar to traditional long-term meditation practice-a systematic review," *Brain and Cognition*, vol. 108, pp. 32–41, 2016.
View at: [Publisher Site](#) | [Google Scholar](#)
18. I. H. Bennike, A. Wieghorst, and U. Kirk, "Online-based mindfulness training reduces behavioral markers of mind wandering," *Journal of Cognitive Enhancement*, vol. 1, no. 2, pp. 172–181, 2017.
View at: [Publisher Site](#) | [Google Scholar](#)
19. "Headspace," December 2018, <https://www.headspace.com/>.
View at: [Google Scholar](#)
20. J. R. Lindahl, N. E. Fisher, D. J. Cooper, R. K. Rosen, and W. B. Britton, "The varieties of contemplative experience: a mixed-methods study of meditation-related challenges in Western Buddhists," *PLoS One*, vol. 12, no. 5, Article ID e0176239, 2017.
View at: [Publisher Site](#) | [Google Scholar](#)
21. J. Weizenbaum, "ELIZA: a computer program for the study of natural language communication between man and machine," *Communications of the ACM*, vol. 9, no. 1, pp. 36–45, 1966.
View at: [Publisher Site](#) | [Google Scholar](#)
22. "Facebook," December 2018, <https://www.facebook.com/>.
View at: [Google Scholar](#)
23. "LINE," December 2018, <https://line.me/ja/>.
View at: [Google Scholar](#)
24. D. Elmasri and A. Maeder, "A conversational agent for an online mental health intervention," in *Proceedings of International Conference on Brain Informatics*, pp. 243–251, Omaha, NE, USA, October 2016.
View at: [Publisher Site](#) | [Google Scholar](#)
25. H. Gaffney, W. Mansell, R. Edwards, and J. Wright, "Manage your life online (MYLO): a pilot trial of a conversational computer-based intervention for problem solving in a student sample," *Behavioural and Cognitive Psychotherapy*, vol. 42, no. 6, pp. 731–746, 2014.

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

27. M. Rosenberg, *Society and the Adolescent Self-Image*, Princeton University Press, Princeton, NJ, USA, 1965.
28. T. M. Munakata, T. Takeshi, K. Yojiro et al., *A Comparative Study on the Family Environment and Mental Health of Japanese and American Youth*, Scientific Research Report in Ministry of Health, Labour and Welfare, Tokyo, Japan, 1987.
29. C. D. Spielberger, *STAI Manual*, Consulting Psychologist Press, Palo Alto, CA, USA, 1970.
30. W. W. K. Zung, "A self-rating depression scale," *Archives of general psychiatry*, vol. 12, no. 1, pp. 63–70, 1965.
View at: [Publisher Site](#) | [Google Scholar](#)
31. K. Fukuda and S. Kobayashi, *SDS Manual*, Sankyobo, Kyoto, Japan, 1973.
32. T. Munakata, *Health Counseling Encyclopedia*, Nissoken Syuppan, Tokyo, Japan, 1999.
33. T. Munakata, *Health and Disease From the View Point of Behavioral Science*, Medical Friend Co. Ltd., Tokyo, Japan, 1996.
34. T. Munakata, "The science of mind recollection, communication, and conversation," *Health Counseling*, vol. 3, no. 6, pp. 94–102, 2001.
View at: [Google Scholar](#)
35. K. M. Melville, L. Casey, and D. J. Kavanagh, "Dropout from internet-based treatment for psychological disorders," *British Journal of Clinical Psychology*, vol. 49, no. 4, pp. 455–471, 2010.
View at: [Publisher Site](#) | [Google Scholar](#)
36. J. Nicholas, J. Proudfoot, G. Parker et al., "The ins and outs of an online bipolar education program: a study of program attrition," *Journal of Medical Internet Research*, vol. 12, no. 5, p. e57, 2010.
View at: [Publisher Site](#) | [Google Scholar](#)
37. N. Middleton and R. Schneeman, *Heroku: Up and Running: Effortless Application Deployment and Scaling*, O'Reilly Media, Inc., Newton, MA, USA, 2013.
38. "LINE messenger API," December 2018, <https://developers.line.me/ja/services/messaging-api/>.
View at: [Google Scholar](#)
39. D. D. Fred, R. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: a comparison of two theoretical models," *Management science*, vol. 35, no. 8, pp. 982–1003, 1989.
View at: [Google Scholar](#)

We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

medium, provided the original work is properly cited.

More related articles

Stress among Portuguese Medical Students: A National Cross-Sectional Study

Maria João Oura | Ana Raquel Moreira | Paulo Santos

A Chatbot System for Mental Healthcare Based on SAT Counseling Method

Takeshi Kamita | Tatsuya Ito | ... | Tomoo Inoue

A Novel Search Ranking Method for MOOCs Using Unstructured Course Information

Weiqiang Yao | Haiquan Sun | Xiaoxuan Hu

A Chatbot System for Mental Healthcare Based on SAT Counseling Method

Takeshi Kamita | Tatsuya Ito | ... | Tomoo Inoue

 Download other formats ✓

 Order printed copies →



Follow us:



> About us

> Contact us



We are committed to sharing findings related to COVID-19 as quickly as possible. We will be providing unlimited waivers of publication charges for accepted research articles as well as case reports and case series related to COVID-19. Review articles are excluded from this waiver policy. [Sign up here](#) as a reviewer to help fast-track new submissions.

➤ **Print editions**

➤ **Authors**

➤ **Editors**

➤ **Reviewers**

➤ **Hindawi XML Corpus**

➤ **Open Archives Initiative**

[Privacy Policy](#) | [Terms of Service](#) | [Responsible Disclosure Policy](#) | [Cookie Policy](#) | [Copyright](#)