Effectiveness of "Rasaku" Mood-Monitoring App to Prevent Depression Tendency among College Students

Vania Ardelia[1], Endang Lestari[2], Amjodti Laily Agindaris[3], Rayyan Nur Fauzan[4]
[1,2,3]*Department of Psychology, Faculty of Education, Universitas Negeri Surabaya, Indonesia*
[4]*Department of Informatics Engineering, Faculty of Engineering, Universitas Negeri Surabaya, Indonesia*
vaniaardelia@unesa.ac.id, endang.20020@mhs.unesa.ac.id, amjodti.20027@mhs.unesa.ac.id, rayyannur.20075@mhs.unesa.ac.id

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Abstract : Depression is known as a common and severe mental disorder due to its high prevalence in the world, especially among emerging adult college students. This possibly due to the transitional period which emerging adult students experienced in academic, social, or economic aspects. Inability to overcome this developmental period could potentially cause depression symptoms. Additionally, the stigmatization of mental disorders also exacerbates emerging adult students' intention to seek help. Therefore, technology with its rapid development were expected to contribute in preventing depression, one of which through mood-monitoring app. This study aimed to assess effectiveness of "Rasaku" mood-monitoring app to prevent depression tendency among college students. A quasi-experimental study with two-group pre-test post-test conducted with 51 participants assigned in the experimental and control groups for 1-week period. Participants were college students with age between 18-25. Data were analyzed using paired sample t-tests. Results showed no significant differences in the usage of mood-monitoring app in the experimental group. Thus, "Rasaku" app might be less effective in preventing depression symptoms among emerging adult college students. Albeit it is important to note that this was a pilot study to test the app effectiveness, therefore current results could be used as reference for future studies.

INTRODUCTION

Depression has been known as a mental disorder characterized by depressed mood, loss of interest or pleasure, feelings of guilt or low self-esteem, sleep disturbances, loss of appetite, low energy and difficulty concentrating (World Health Organization, 2023). This disorder can have an impact on various aspects of individual life such as economic, social, and educational aspects which result in a decrease in quality of life (Ahmed et al., 2020). Depression is also reported as one of the common and severe mental disorders due to its high prevalence in the world population (World Health Organization, 2023). Furthermore, the prevalence of depression were found to be higher in women than men (National Institute of Mental Health, 2023).

Students were one of the population groups that known as vulnerable to depression due to their developmental stages which were in the transition process (Ahmed et al., 2020). Most university students were currently in the emerging adult stage of development, which refer to individuals aged between 18-25 years old (Arnett, 2000). At this stage, individuals were faced with various transitions and choices such as education, love, work, and perspective on the world (Ardelia & Dewi, 2018). The emerging adult stage differed from adolescence because emerging adults were able to explore various things in their lives to determine what interests them (Arnett, 2014). Specifically, various things related to academic, social, and

economic life remained as new challenges that students must go through. On top of that, the emergence of the Covid-19 pandemic changed the lecture scheme to look for hybrid or combine online and offline meetings, where this practice has never been done before in the education system, thus requiring massive adaptation for students. Therefore, the inability to cope with stress and these challenges can trigger stress that leads to symptoms of depression (Hasanah et al., 2020).

Various studies showed varying data regarding the prevalence of depression in university students. Some studies show that the tendency of depressive symptoms in college students ranges from 10.2% to 71.2% (Christensson et al., 2011; Kumar et al., 2012). Furthermore, research conducted by Putranto et al. (Putranto et al., 2021) stated that 40% of research respondents had moderate to severe anxiety, 72% showed symptoms of depression, and 53% of respondents had moderate to poor mental health. Another study conducted by (Santoso et al., 2020) on nursing students found that there were 25.7% of students who experienced mild mood disorders; 8.1% experienced low depression; 0.7% experienced moderate depression; 12.2% experienced severe depression; and as many as 0.7% experienced extreme levels of depression.

Depression in university students is known to be significantly related either positively or negatively to marital status, gender, age, family problems, social support, economic conditions, and academic achievement (Ahmed et al., 2020). Therefore, students who have a tendency to depression can result in class absenteeism, not being able to complete assignments and exams properly, to drop-out or expulsion from university (Othman et al., 2019; Teh et al., 2015).

With the vulnerability of university students to depressive symptoms, unfortunately there are still many students who do not care and do not seek help for their situation. This is partly due to the stigmatization that is still given to people with mental disorders (Ahmed et al., 2020). Moreover, data shows that around 75% of young people with mental health problems do not get the treatment they should (Berry et al., 2020). Therefore, various kinds of preventive and intervention programs are made to be able to overcome this problem, one of which is by using mental health applications (see Dubad et al., 2021).

The need for digital mental health prevention and intervention programs has increased in recent years. There are various types of programs to improve mental health digitally, including web-based interventions, telepsychiatry, and mood-monitoring apps (Grist et al., 2017). Mood-monitoring is a significant part of Cognitive Behavioral Therapy (CBT) which is a tool to track symptoms, feelings, and behaviors on an ongoing basis (Matthews & Doherty, 2011). Several studies with an ecological momentary assessment (EMA) design have shown that mood-monitoring can improve mental health outcomes and engagement in therapy in young people (Dubad et al., 2018). Mood-monitoring can also have several positive impacts including increased individual self-awareness (Reid et al., 2011), which can then indirectly reduce depressive symptoms in young people (Kauer et al., 2012).

Furthermore, emerging adults are one of the highest age groups as internet users. Based on a survey conducted by APJII (Indonesian Internet Service Providers Association), in 2021, 77.02% or 210,026,769 of the total population of 272,682,600 Indonesians used the internet. Furthermore, the population in the teenage range, namely 13-18 years old and 19-34 years old, experienced an increase in the frequency of internet usage during the pandemic with 53.26% and 7.98% respectively (APJII, 2022). With reference to the number and increase in the frequency of internet users, the use of mental health applications will be more attractive to young people because it can avoid stigma from others, does not take much time, cost, place, and does not require various kinds of facilities and infrastructure. In addition, most people now always carry their devices with them, so the development of applications on devices can be

used anytime and efficiently (Faurholt-Jepsen et al., 2015).

To date, there are almost 10,000 mental health apps offered commercially (Torous et al., 2019), but many have not explored the effectiveness of these apps, especially for preventing depressive tendencies in college students. Therefore, this study aims to examine the effectiveness of the mood-monitoring application "Rasaku" to prevent depressive tendencies in college students. This study hypothesized that the use of the mood-monitoring application "Rasaku" can reduce the tendency of depressive symptoms in college students.

METHOD

Participants

This study used a purposive sampling technique in which this technique took subjects in accordance with predetermined criteria. Subject recruitment was carried out through pamphlets distributed through social media. Participant inclusion criteria are: 1) 18-25 years old; 2) Active undergraduate students; 3) Owned an Android-based smartphone device; and 4) Willing to participate in the study. While the exclusion criteria for this participant are: 1) Not an active undergraduate student and 2) Having a smartphone device that is not Android-based.

Participants who were willing to take part in the study will be asked to fill out informed consent. Before data collection was carried out, the researcher calculated the sample size needed in this study using G*Power. Based on the G*Power calculation formula, to get a power of 0.8 and a moderate effect size, at least 25 participants each in the experimental group and control group were needed to get a total of 50 participants. This study has passed the ethical test and was approved by the Ethical Review Committee of the Faculty of Nursing, Universitas Airlangga (Number 2760-KEPK).

Instruments

This study used two instruments, namely the Depression Anxiety Stress Scale-21 (DASS-21) and the Rasaku Mood-Monitoring Application. DASS-21 (Lovibond & Lovibond, 1995) is a questionnaire containing 21 statements used to measure the level of tendency of a person's symptoms of depression, anxiety, and stress in the last seven days. The scale is a shortened version of the DASS 42. Furthermore, since this study focuses on measuring the tendency of depressive symptoms, it will only focus on the Depression subscale. One example of an item on the Depression subscale is "I can't feel any positive feelings at all". The score for each item is 1 and is calculated by summing each score in the respective subscale, then multiplying by two as the DASS-21 is a shortened version of the DASS-42. The higher the score on each subscale, the higher the tendency on that aspect of the subscale. The DASS-21 has good internal consistency with a Cronbach's Alpha of 0.74 (Moya et al., 2022).

The Rasaku Mood-Monitoring Application is an Android-based application designed and developed by this research team to record daily mood history (Figure 1). This application contains two features, namely "Record Your Mood" where users choose one of five moods, namely happy, sad, angry, excited, and tense, which are represented in the form of emoticons. Then the second feature is "Your Mood History" where users can see the history of moods that have been recorded since they first downloaded this application. In the "Record Your Mood" feature, users can log moods with a 10-12 hour gap between the first and second mood log.

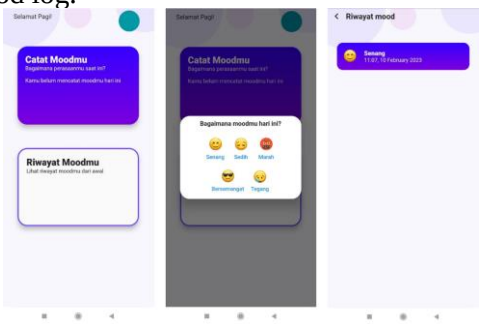

Figure 1: "Rasaku" App Feature Display

Research Design

This study used a quasi-experimental design with a Two Group Pretest-Posttest Research Design (Dubad et al., 2021; Yugistyowati et al., 2022) consisting of non-equivalent experimental and control groups to measure the effectiveness of the Rasaku application by comparing the two groups (Figure 2).

Figure 2: Summary of Research Design

Each experimental and control group joined a WhatsApp group created by the researcher. This was done to provide initial information and instructions for the next week. Before starting the treatment, the experimental group will be given information first on how to download and use the application. Furthermore, the experimental group and control group filled out the pretest on the first day of the experiment.

In the experimental group, the treatment given was to fill in the "Record Your Mood" feature on the application twice a day with a 10-12 hour gap between the first and second mood logs. Users can choose one of five moods namely happy, sad, angry, excited, and tense which are represented in the form of emojis (Church et al., 2010). The treatment was carried out for 7 days and on the last day the group will fill in the post-test. Every day, the researcher will remind through the WhatsApp group to record the participant's mood. The application system has been made so that participants record their mood with a minimum gap of 10 hours, so that the "Record Your Mood" button cannot be selected if it is less than this period. On the seventh day, the experimental group will record their mood as usual and complete the post-test.

While the control group in this study is in the form of a waiting-list where participants will be promised a delayed treatment, namely after the treatment to the experimental group is completed (Furukawa et al., 2014). However, this waiting-list method will be in the form of deception, namely the control group is only promised treatment but the researcher will not provide any treatment to the control group. The control group still fills the pre-test and post-test together with the experimental group.

Research Variables

The independent variable in this study is the Mood-Monitoring Application "Rasaku" which is a technology for recording daily mood history. This application contains two features, namely "Record Your Mood" and "Your Mood History". The dependent variable in this study is the tendency of depressive symptoms in college students as measured by the Depression Anxiety Stress Scale-21 (DASS-21).

Analysis

Data analysis will be conducted with the help of the Jamovi program for macOS version 2.3.21 (Navarro & Foxcroft, 2018). To answer the hypothesis of this study, the data will be analyzed using the paired sample t-test technique. This analysis is used by comparing the results of the same subject under different circumstances.

RESULTS

Descriptive Statistics Analysis

There were 52 participants in this study, which were randomly divided into an experimental group (n = 26) and a control group (n = 26). However, before the data collection began, 1 participant in the experimental group withdrew. The final number of participants in the experimental group was 25 people and 26 people in the control group. All participants in the experimental and control groups have given their consent to participate in this study.

The results of descriptive analysis showed that the average age of participants in the experimental group and control group was 20.4 and 20.5 respectively. Furthermore, the majority of the participants in this study were female and were 2020 college students. There was a significant difference in the age distribution between the two groups (Table 1). In addition, there was no significant difference between the two groups in the scores of each subscale in the DASS-21 (Table 2).

Table 1: Demographic data of experimental and control groups

Variable	**Experiment Group (n = 25)**		**Control Group (n = 26)**		***p***
	n	**%**	**n**	**%**	
Sex					1.00
Men	3	12	3	12	
Women	22	88	23	88	
Age (*mean*, SD)	20.4	0.96	20.5	0.71	< .001
18	1	4	0	0	
19	2	8	2	8	
20	11	44	9	35	
21	8	32	14	54	
22	3	12	1	4	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
Class of					< .001
2017	0	0	0	0	
2018	0	0	0	0	
2019	3	12	2	8	
2020	15	60	21	81	
2021	1	4	1	4	
2022	6	24	2	8	

Table 2: DASS-21 pre-test scores on the Depressive subscale

Variable	**Experiment Group (n = 25)**		**Control Group (n = 26)**		***p***
	Mean	**SD**	**Mean**	**SD**	
Depressive	10.72	6.11	9.69	6.44	0.66

Since this study focused on testing the effectiveness of mood-monitoring apps in preventing depressive symptom tendencies, only the Depressive subscale of the DASS-21 will be reported. In the experimental group, the mean pre-test score on the Depressive subscale was 10.72 (SD = 6.11) and 9.52 (SD = 8.68) in the post-test. Although there was a decrease in scores on Depressive symptom tendency, this change was not significant (p = 0.327; Table 3). In other words, there is no significant change in the use of Rasaku mood-monitoring applications to prevent the tendency of depressive symptoms in college students. In contrast, the control group showed an average pre-test score of 9.69 (SD = 6.44) and post-test score of 9.92 (SD = 7.74). The depressive subscale scores in the control group actually increased from pre-test to post-test although not significantly.

Table 3: Change in DASS-21 score on the Depressive subscale

Variable	**Pre-test**		**Post-test**		***p***
	Mean	**SD**	**Mean**	**SD**	
Depressive					
Experiment	10.72	6.11	9.52	8.68	0.327
Control	9.69	6.44	9.92	7.74	0.840

Based on the paired sample t-test results, there was no significant change in depressive subscale scores between the experimental group (mean = 9.52; SD = 8.68) and the control group (mean = 9.92; SD = 7.65). Therefore it can be said that the alternative hypothesis was rejected, in which there was no difference in the tendency of depressive symptoms in the experimental group and the control group (t(24) = -0.19, p = 0.853).

Table 4: Differences in DASS-21 post-test scores on the Depressive subscale

Variable	**Experiment Group (n = 25)**		**Control Group (n = 26)**		**Mean Differences**	***p***
	Mean	**SD**	**Mean**	**SD**		
Depressive	9.52	8.68	9.92	7.65	- 0.40	0.853

DISCUSSION

This study aims to examine the effectiveness of the mood-monitoring application "Rasaku" to prevent the tendency of depressive symptoms in college students. Based on the analysis, it was found that there was no significant difference between the experimental group and the control group on the depressive subscale score. Furthermore, no significant difference was found in the pre-test and post-test in both groups. Based on these results, it can be said that the mood-monitoring application "Rasaku" tends to be less effective in preventing depressive symptoms in college students.

The results showed that there was no significant difference between the experimental group and the control group on the depressive subscale post-test score. This finding is in line with the results of research conducted by Dubad et al. (2021) who did not find a significant increase in positive mood in the use of mood-monitoring applications in young people. In contrast, the results of this study are not in line with research conducted by Kauer et al. (2012) who found that emotional self-awareness applications that include mood-monitoring were able to significantly reduce depressive symptoms in young people.

In line with the results of Ross et al. (2008) and Faurholt-Jepsen et al. (2015), this study also found no significant changes in the pre-test and post-test scores of the depressive subscale in the experimental group. However, the mean score showed a decrease from pre-test to post-test. The absence of significant differences in this study may be due to the duration of data collection. Where data collection in this study was only carried out for seven days while previous studies on average tested the effectiveness of mood-monitoring applications with a duration of 1 to 6 months (Lauritsen et al., 2017; Van der Watt et al., 2018). Therefore, future research can develop effectiveness test protocols with a longer duration.

In addition, participants' non-compliance in recording mood can also be one of the causes of the ineffectiveness of this application. This is in line with the study of Dubad et al. (2021) who found that participants' participation in using mood-monitoring applications was only due to involvement in the study and not because of their desire to improve their mental health. Therefore, this finding can inform future research to test the effectiveness of mood-monitoring apps that focus on individual engagement with the app.

Furthermore, the results found in this study may also be due to the validity and reliability of the "Rasaku" application. Since this application was specifically designed for this research, which is expected to be developed on an ongoing basis, its validity and reliability have not been tested. So this can be a suggestion for further research to conduct effectiveness and validity tests on the "Rasaku" application in more detail.

This study has the advantage of being one of the studies that focuses on testing the effectiveness of mood-monitoring applications to prevent the tendency of depressive symptoms in college students. However, this study also has some weaknesses. Among them was the duration of the study which tends to be short so that it can be a factor in the low significance of the research results. Future studies with similar studies can be organized with a longer duration so that the effectiveness of the application can be better tested. In addition, this study was also conducted entirely online, where instructions and communication were given through WhatsApp. This could be a factor in the researcher's lack of control to monitor the standardization of participants during data collection. Future research can adopt a hybrid or offline scheme to ensure the effectiveness and standardization of data collection.

CONCLUSION

This study found that mood-monitoring applications are less effective in reducing depressive symptoms in college students. This is known because there was no significant change between pre-test and post-test depressive

subscale scores in the experimental group. However, there was a decrease in the average depressive subscale score that can only be generalized to the participants of this study.

To the best of the researchers' knowledge, this study is one of the first studies to develop a mood-monitoring application and test its effectiveness to prevent the tendency of depressive symptoms in university students, especially in developing countries. The development of technology, including mood-monitoring mental health applications, can be an alternative to prevent the emergence of mental disorders. Hopefully, the results of this study can be an initial step that contributes to further research to conduct effectiveness and validity tests on the "Rasaku" application in more detail. So that the "Rasaku" application can be valid and reliable and become an alternative for emerging adults to improve the quality of their mental health.

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