



Research Article

Development of Android-based health media applications as promotional media in improving COVID-19 preventive behavior in the community

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ABSTRACT

Corona Virus Disease 2019 (COVID-19) caused by SARS-CoV-2 became a worldwide pandemic. The spread of wrong information causes people to misperceive the information. The massive spread of the virus shows the lack of public knowledge about preventing the transmission of COVID-19. Intrapersonal factors, namely changes in individual behavior, are the main focus of breaking the chain of the spread of COVID-19. This study aims to develop an Android-based health education application for COVID-19 prevention behavior in the community. This research method used an *exploratory design* with an R&D approach which consists of 2 stages. The first stage was making a *prototype* application through 1) Evaluation of public knowledge and attitudes about COVID-19 prevention with a questionnaire in the form of a *google form* to find strategic issues; 2) Development and mapping of *prototype* content through Focus Group Discussions with nurses and expert consultations. The evaluation used a simple random sampling technique on 193 respondents. The second stage was socialization and application feasibility testing on 193 respondents. The results of the first stage were an overview of the implementation of health education that had not been maximized due to the risk of transmission, sufficient knowledge (52.8%), and negative attitudes (63.2%) toward the prevention of COVID-19, as well as a *prototype* system of health education in applications that include prevention COVID-19 prevention. It was followed by the second stage of socialization and application feasibility testing for users. This study concludes that the development of an android-based application supports effective health promotion efforts in conveying information to increase knowledge and attitudes toward COVID-19 prevention.



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INTRODUCTION

Corona Virus Disease (COVID-19) was first reported in Wuhan, Hubei, China, in December 2019, and on March 11, 2020, the *World Health Organization* (WHO) declared that COVID-19 had become a worldwide pandemic (Bedford et al., 2020). The biomedical function of the best curative and preventive treatments for COVID-19 is currently limited (Prompetchara et al., 2020). The current healthcare infrastructure cannot clinically manage the onset of COVID-19 disease (Eaton & Kalichman, 2020). The distribution of health information and the slow disclosure of cases of positive COVID-19 patients causes public perceptions of the risk of virus transmission to be low (Eaton & Kalichman, 2020). The spread of wrong information through social media also causes people to misperceive information (Li et al., 2020). The importance of public understanding of COVID-19 is the main focus of breaking the chain of spread because until now, there has been no proven effective drug or vaccine. The massive spread of the virus shows the lack of public knowledge about preventing the transmission of COVID-19 (Jaga et al., 2020).

Data on the distribution of COVID-19 based on the WHO report as of January 25, 2021, Global as many as 224 countries, confirmed 98,794,942 patients and 2,124,193 died. Positive COVID-19 in Indonesia as of January 25, 2021, as many as 999,256 people, 809,488 recovered, and 28,132 died (WHO, 2021). Based on a survey conducted by SC Nielsen in collaboration with UNICEF to try to explore public attitudes regarding COVID-19 prevention practices in daily life. It shows that only 31.5% of the 2,000 respondents carried out all 3M behaviors (washing hands, wearing masks, keeping a distance), on a

disciplined basis. The remaining 36% did two of the 3M behaviors, and 23.2% did one of the 3M behaviors. The increase in COVID-19 sufferers in Indonesia from day to day shows the lack of public knowledge caused by the implementation of providing health education to the public about COVID-19 has not been carried out optimally (Djalante et al., 2020).

Our public health in dealing with COVID-19 is highly dependent on social approaches and behavior change as strategies to stop transmission (Lotfi et al., 2020). Intrapersonal factors, namely change in individual behavior, as a preventive basis in preventing the transmission of COVID-19. Interventions to change personal behavior patterns are essential in reducing disease spread, including self-isolation and *social distancing* (Eaton & Kalichman, 2020). Behavior consists of knowledge, attitudes, and practices. Knowledge is measured by whether the respondent can identify the causes of disease, transmission, general symptoms, risks, and prevention of COVID-19. Attitude is measured by awareness of social distance in work and worship and learning from home. Practices related to the ability to bring prevention such as washing hands, avoiding not touching the face, procedures for coughing and sneezing, wearing masks and using disinfectants to prevent COVID-19 (Jaga et al., 2020).

The World Health Organization (WHO) states that the best way to prevent and slow down transmission is to obtain information about SARS-CoV-2, the disease it causes, and how it spreads (Gray et al., 2020). Prevention activities are very important to break the chain of transmission of COVID-19 (Jaga et al., 2020). Prevention of COVID-19 transmission can be delivered through the provision of health education. Education is an effort of persuasion or learning to the community so that they are willing to take actions (practices) to maintain



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(solve problems) and improve their health (Gray et al., 2020).

With advances in software and mobile technology, mobile applications have become an important element in everyday life. The use of mobile health applications makes health information easily accessible (Ming et al., 2020). Health education efforts need an attractive strategy to be easily accepted, one of which is health education with android-based media. One of the studies using smartphones during the COVID-19 pandemic is a smartphone-based COVID-19 self-test study using respiratory sounds. Telemedicine can be the key to controlling the COVID-19 pandemic, and the development of smartphones as self-testing respiratory monitoring applications, where users can check respiratory sound patterns through the application (Faezipour & Abuzneid, 2020). Research conducted on the application of smartphone technology during the pandemic as an extension of telemedicine has significantly impacted the COVID-19 pandemic, playing a key role in medicine, patient referral, consultation, and other health care (Iyengar et al., 2020).

The provision of health education media based on Android as an alternative to promotive and preventive efforts to address the lack of knowledge, attitudes, and practices of the community in the prevention COVID-19. It is expected to increase the awareness and interest of respondents so that respondents can adopt the behavior. The digital era is access that can be used as a learning method to provide knowledge about COVID-19, because access is affordable and easy to operate. Through an Android-based health education application, it is expected to increase knowledge and attitudes toward preventing COVID-19. Therefore, this study aims to develop an Android-based health education application for COVID-19 prevention behavior in the community.

METHOD

Research methods

This study used an *exploratory design* with a *research and development* (R&D) approach. Research and development (R&D) served to validate and develop products. The development research model was the development of health education applications based on the Android system. This study also used a research design that consisted of two stages. The first stage was an exploratory, descriptive survey of the development of an intervention model. The second stage was socialization and testing to prepare recommendations.

In the first stage, the researchers explored information from the informant's point of view to evaluate the factors that led to the lack of knowledge and attitudes toward preventing COVID-19 in the community and what interventions had been carried out before to improve preventive behavior. Followed by compiling and developing a health education model to enhance COVID-19 prevention behavior.

The researcher started by finding strategic issues regarding evaluating COVID-19 prevention behavior in the community. In this stage, the researcher aims to explore, understand and collect information and data about: (1) The evaluation of community knowledge and attitudes about COVID-19 prevention, (2) The evaluation of interventions that have been implemented by health services to improve COVID-19 prevention behavior, (3) The process of compiling and developing an android system-based health education model for COVID-19 prevention behavior. The second phase of the research flow is (1) The socialization of Android-based health education applications about COVID-19 prevention behavior, (2) Trial and



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assistance to the community in using the application. The research instrument was a questionnaire evaluation sheet in the form of a *google form* about knowledge and attitudes of preventing COVID-19, a questionnaire evaluating the implementation of health education interventions at the Mulyorejo Health Center. Data analysis used descriptive analysis.

Inclusion and Exclusion Criteria

Inclusion criteria (1) People aged 31 – 45 years, (2) Can communicate verbally well, (3) Can read and write and speak Indonesian well, (4) Have an *Android smartphone* and be able to operate it. Exclusion criteria (1) The patient is sick with COVID-19 or other aggravating diseases, (2) Has severe cognitive impairment, (3) Has impaired consciousness.

Population and Sample

People in the Mulyorejo Health Center area who have android and are able to operate it. Aged 31-45 years and a sample of 193 respondents using the G-Power Analysis technique, (2) The population of participants in the first phase of FGD activities consisted of multidisciplinary (Head of Mulyorejo Health Center, COVID-19 Nurse, IT Expert), (3) The population of participants in expert consultation activities are experts in the field of COVID-19 in Indonesia (Lung Specialist Doctors).

RESULTS

Characteristics of stage I respondents

This research was conducted at the Mulyorejo Public Health Center in Surabaya, East Java Province. The initial stage in research phase I is to evaluate and examine the strategic issues contained in the research site. The characteristics of the respondents in this study were obtained by descriptive analysis of the

respondents' demographic data from March to April 2021. This phase I research involved people with health conditions in the working area of the Mulyorejo Health Center, namely in Mulyorejo Village, Kejawan Putih Tambak Village, and Manyar Sabrangan Village as many as 193 respondents. Characteristics of respondents from male gender 106 respondents (54.9%) and female 87 respondents (45.1%). The age of respondents 31-38 years 59.6% and 39-45 years 40.4%, last education did not go to school 2.6%, elementary school 8.3%, junior high 28%, high school 48.1%, and college 13%.

Characteristics of FGD participants

Participants consisted of 1 Head of the health center, 3 nurses who handled COVID-19, and 1 IT expert. Most of the participants were female (80%), aged 31-45 years (80%), with last education D3/Diploma (60%), years of work 10-20 years (60%), and contract employment status (60%). This shows that FGD participants have sufficient work experience, so they are expected to be able to provide education and advice to meet the needs in the preparation of developing Android-based health media applications as promotional media to improve COVID-19 prevention behavior in the community.

Results of the evaluation of the health education system

Evaluation of the health education system at the Mulyorejo Health Center was carried out on 193 respondents using a questionnaire in the form of a *google form*. Assessment of the implementation of the provision of health education related to COVID-19 carried out by the Mulyorejo Health Center Surabaya found that the provision of health education by the lecture method (16.6%), the highest respondents explained that they had never received health education about COVID-19 from the health center (83.4 %). The media used



were leaflets (13%), and the highest number of respondents explained that they had never received health education media about COVID (87%). Implementation time < 1 time a month (16.6%) duration < 15 minutes (11.9%). The place of implementation is in the health center (13%) and in the market (3.6%).

Most of the respondents explained that they had never received health education about COVID-19 from the health center. The health education method found that nurses did not provide health education with lectures, discussions, or direct demonstration methods due to the risk of COVID-19 transmission. Respondents also received information about COVID-19 from social media (WhatsApp, Facebook, Instagram, Twitter), television and radio. A small number of respondents received health education when they were at the health center with loudspeakers or when they were in markets and crowded places where nurses went around in ambulances and explained about COVID-19 with loudspeakers.

Results of the evaluation of knowledge and attitudes of preventing COVID-19

Evaluation of community knowledge and attitudes towards COVID-19 was carried out on 193 respondents who were in the Mulyorejo Health Center working in Mulyorejo Village, Kejawan Putih Tambak Village, and Manyar Sabrangan Village. The evaluation of respondents' knowledge and attitudes towards COVID-19 used a questionnaire in the form of a google form. Most respondents have sufficient knowledge (52.8%) and a negative attitude (63.2%) toward COVID-19 prevention.

Android-based health education media application development

Based on the results of the evaluation of the implementation of the health education intervention system, knowledge and attitudes of the community towards the prevention of

COVID-19 disease that has been carried out, several findings of strategic issues will be discussed in the FGD. (1) The implementation of health education is still not maximized for all communities. The health education method found that nurses did not provide health education by lecture, discussion, or direct demonstration methods due to the risk of COVID-19 transmission. So that most respondents did not receive health education regarding COVID-19, (2) There is no effective media in providing health education, the media used such as leaflets are at risk of COVID-19 transmission. (3) Most of the respondents showed sufficient and insufficient knowledge and negative attitudes related to the prevention of COVID-19 disease.

Focus Group Discussion (FGD) and Expert Consultation

Recommendations from the FGD related to the development of Android-based health education media applications as promotional media in improving COVID-19 prevention behavior in the work area of the Mulyorejo Health Center Surabaya are (1) Health education methods about COVID-19 prevention with the proper method without gathering mass or meeting face to face to minimize the transmission of COVID-19, (2) Effective and efficient health education media, easy to obtain and easy to understand, are needed in providing health education interventions so that they can improve COVID-19 prevention behavior in the community, (3) Health education materials are made in a language that simple, planned according to the needs of the community, (4) The method of developing an Android-based health education media application as a promotional media is deemed appropriate as an effort to increase public knowledge and attitudes regarding COVID-19 prevention. After conducting the FGD phase I, the researchers then arranged the development of an Android-



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based health media application through literature study and expert consultation.

Expert consultations were carried out to obtain input from the results of literature studies, field studies and FGDs that have been carried out and implemented into the development of Android-based health education media applications as promotional media in improving COVID-19 prevention behavior. The expert consultation activity was carried out with one expert lecturer who is an expert in the field of COVID-19, namely dr. Afrita Amalia Laitupa, Sp.P through the whatsapp application and zoom meeting was held on 26-31 April 2021. The results of expert consultations (1) Development of android-based health education media applications must be easy to obtain, understand and apply. The systematics used are according to standards, the descriptions are explained in detail in easy-to-understand language, (2) the nature of the program must be in the form of information that can be updated or updated according to scientific developments, (3) the user guide module is made in easy-to-understand language, systematic in accordance with writing rules that have been set along with relevant references, (4) Android-based applications can be accessed by everyone and applications can be downloaded for free, (5) Using points so that they are interesting and easy to understand such as the understanding of COVID-19, risk groups that need to be monitored, how to prevent COVID-19, 5 important things to prevent COVID-19, increase immunity/immunity, apply cough and sneeze etiquette, keep distance/limit physical interaction, self-isolate, avoid stress and stay optimistic, prevention of COVID-19 in transportation public, prevention of COVID-19 in educational institutions, prevention of COVID-19 in religious activities, prevention of COVID-19 in shopping malls.

Test the validity of android-based health education media applications

The trial of developing an Android-based health education media application as a promotional medium in improving COVID-19 prevention behavior in the Mulyorejo Health Center Surabaya work area based on a questionnaire filled out by respondents in phase 2 research. The components of quality *functionally, reliability, usability, efficiency, and portability* inform that all respondents (100%) stated that the feasibility of the Android-based health education media application regarding the prevention of COVID-19 from the respondent's point of view is good in terms of function, efficiency, feasibility and ease of use. The application is considered to be able to achieve the goal of increasing knowledge and attitudes to prevent COVID-19. The features presented by the application help make it easier for patients to get information regarding the prevention of COVID-19 disease. Using the application is very easy, it can be downloaded for free on the play store.

DISCUSSION

Evaluation of Health Education Implementation

Evaluation of the implementation of health education provided by Mulyorejo Health Center Surabaya was carried out using a questionnaire in the form of a google form which had been tested for validity and reliability. The evaluation of the implementation of health education based on six components, namely the method, the media used, the time of performance, the place of implementation, and the content of health education, has been carried out by the Mulyorejo Health Center but the evaluation results illustrate that the provision of health education to the community has not been carried out optimally due to the risk of COVID-19



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transmission so that the method used is not with discussions, lectures or demonstrations directly orally or face to face due to the prohibition on gathering mass and the high number of COVID-19 transmissions. The provision of health education still does not use effective media that can minimize the risk of COVID-19 transmission. Education on the prevention of COVID-19 was only given at the beginning of the pandemic by distributing leaflets, masks and hand sanitizers. The health center nurse provides education by using loudspeakers in an ambulance. The public explained that they got information from social media such as Facebook, Twitter and Instagram.

Health education interventions are defined as helping patients gain the knowledge, skills, tools, and confidence to be active in their care so that they can achieve their self-identified health goals (Gray et al., 2020). The results of previous studies indicate the successful implementation of the mobile health application that supports health workers by providing education about COVID-19, self-assessment, and the ability to monitor their own health (Timmers et al., 2020). The results of the observational cohort study showed that between April 1 and April 20, 2020 a total of 6,194 people downloaded the application, the self-assessment functionality was frequently used to check health status, a total of 5,104 people answered questions and 242 of them showed severe symptoms, 102 users contacted service providers, health which then resulted in 91 contacts. Application users said they were satisfied with the information in the application (mean scale 8.0-10) and appreciated the application's functionality from the symptom assessment (mean 8.0-10) (Timmers et al., 2020).

Evaluation of Public Knowledge on COVID-19 Prevention

The research shows that the results of respondents' knowledge of COVID-19 prevention before being given an android-based application intervention are mostly classified as sufficient knowledge (52.8%). This knowledge includes general knowledge about the meaning of disease, clinical signs and symptoms, modes of disease transmission, and COVID-19 prevention behavior. This level of knowledge can be influenced by several factors, including the education level of most respondents and having a secondary education background related to the ability to seek and understand information. Knowledge is the result of knowing, which occurs after people sense certain objects; sensing occurs through the human senses, namely the senses of sight, hearing, smell, taste, and touch. Most of the knowledge is obtained from the eyes and ears. Knowledge is a guide in shaping one's actions (Notoatmodjo, 2014). Knowledge can be categorized as good, sufficient or less (Nursalam, 2017).

Low knowledge can make it difficult for someone to form behavior because knowledge or cognitive is a very important domain in shaping a person's actions that are influenced by the learning process (Lee et al., 2021). Behavior that is based on knowledge will be more lasting than behavior that is not based on knowledge. One factor that influences the health education process is the media used to convey messages. If there are no media, the results achieved in health education are less than optimal (Alrasheedy et al., 2021).

Based on the description above, respondents' insufficient knowledge and lack of knowledge



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about COVID-19 prevention prior to intervention based on android applications was due to the lack of attractive health media use strategies and the use of media that pose a risk of COVID-19 transmission, resulting in a lack of public understanding about COVID-19 prevention.

Evaluation of Public Attitudes towards COVID-19 Prevention

The research shows that the results of respondents' attitudes towards preventing COVID-19 before being given an android-based application intervention are mostly classified as negative (63.2%). Social attitudes can influence a person's negative attitude because social attitudes are formed from the social interactions experienced by individuals. Social interaction means more than just social contact and relationships between individuals as members of social groups. In social interaction, there is a mutually influencing relationship between individuals and one another. There is a reciprocal relationship that also affects the behavior patterns of each individual as a member of society (Azwar, 2015).

This is in accordance with the opinion of Allport (1954) that attitude is a kind of readiness to react to an object in certain ways. The readiness in question is a potential tendency to react in a certain way when an individual is faced with a stimulus that requires a response. After someone knows the stimulus or object, the next process will assess or behave towards the stimulus or health object. A person's negative attitude toward an object is a feeling of being unsupportive or *unfavorable* to the object (Alrasheedy et al., 2021).

Based on the description above, the negative attitude of respondents before the intervention

of android-based applications was caused by a lack of knowledge and could affect a person's attitude. In addition to knowledge, the methods or methods used in conveying messages or programs also affect a person's attitude change, coupled with the lack of interaction between the community and health center staff due to the risk of COVID-19 transmission. The lack of interaction causes respondents to receive less stimulus regarding the prevention of COVID-19 disease, the stimulus in question is the provision of health education regarding the prevention of COVID-19. The existence of a positive attitude before being given an intervention could be because respondents previously received information from social media and mass media.

Application Development for Android-Based Health Education Media Applications

Compilation of the development of an Android-based health education application regarding the prevention of COVID-19 in the community in the working area of the Mulyorejo Health Center by finding strategic issues presented in FGDs with professional health workers at the health center. This strategic issue was obtained from filling out a questionnaire evaluation sheet regarding the implementation system of health education interventions at the Mulyorejo Health Center Surabaya, as well as evaluating community knowledge and attitudes toward COVID-19 prevention. The results of the FGD showed that there were several strategic issues raised, including: the implementation of health education is still not optimal for all communities, the methods used are one-way and conventional and there is a risk of COVID-19 transmission if gathering mass or explaining directly orally to the community without social distancing, the media used is still limited due to the risk of transmission if distributing leaflets or media in paper form, the material provided is not planned, current health education carried



out by the health center is delivered orally using loudspeakers with a mobile ambulance or when the community comes to the health center, there is no effective media in providing health education that minimizes the risk of COVID-19 transmission, most of the respondents show sufficient and insufficient knowledge and negative attitudes regarding the prevention of COVID-19 disease, this is because the community almost never gets Health education related to the prevention of COVID-19 from the health center, the public gets information from social media and mass media whose truth is not guaranteed.

Along with the development and advancement of technology, many applications in smartphones can be used as a medium for providing health education to improve health behavior (Timmers et al., 2020). The successful implementation of a *mobile health* application supports health workers by providing education about COVID-19, self-assessment, and the ability to monitor their own health (Timmers et al., 2020).

Researchers developed an Android-based health education media application based on the results of literature studies, FGDs, and expert consultations. Recommendations from the FGD for efforts to improve community behavior toward preventing COVID-19 by developing an effective and efficient method, easy to obtain and easy to do, so as to provide information to the public on the importance of preventing the transmission of COVID-19. The interactive application of how to prevent COVID-19 is deemed appropriate to meet health education needs and improve preventive behavior by considering the risk of COVID-19 transmission. The development designed by the researcher was presented and offered to the respondents. This application is an android-

based application that can be installed on smartphones up to Android version 9. This application is already available on the *google play store*, by doing search by typing ways to prevent COVID-19 and can be downloaded for free with a memory size that is not too large. This application contains information about COVID-19, understanding the disease, clinical signs and symptoms of the disease, modes of transmission, and methods of disease prevention.

CONCLUSION

The implementation of health education at the Mulyorejo Health Center has been running but has not been maximized and does not have special media due to the high risk of transmission of the COVID-19 disease. The method of implementing health education is carried out by traveling around using an ambulance assisted by loudspeakers. The respondent's knowledge about COVID-19 is in the sufficient category, and the respondent's attitude towards COVID-19 is in the negative category. Android-based health education media applications were developed through literature studies, FGDs, and expert consultations to produce media that provide more effective and efficient health education interventions. This application consists of a health education menu that contains the understanding of the disease, clinical signs and symptoms of the disease, modes of disease transmission, and methods of disease prevention. The use of this application is installed on an Android-based smartphone. This application can be used as a medium for health promotion and as a guide for preventing COVID-19 in the community.



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