

ORIGINAL ARTICLE

Effectiveness of Mobile Application Effective in Increasing Adolescent's Knowledge and Attitude Related to Reproductive Health

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ABSTRACT

Introduction: Adolescents constitute an age group considered at risk for experiencing reproductive health issues. Such a condition can be incurred by biological, lifestyle, and environmental factors. Thus, an appropriate method for providing information related to reproductive health for adolescents is required, one of which is by using smartphones. Adolescents are an age group who often use smartphones so that it can be used as media to provide health information. The study aimed to measure the effectiveness of reproductive health applications on adolescents to related knowledge retention and attitude. **Methods:** The study was quasi-experimental in nature and employed a pre-post-test control group design. The intervention and control groups consisted of 42 and 59 respondents, respectively. The intervention group received reproductive health education using an Android application for 4 weeks. Knowledge and attitude were measured three times, namely, pre-intervention test, first post-test 4 weeks after the intervention, and second post-test 2 weeks after the first post-test. The sample comprised students from two junior high schools in Depok and selected using multistage random sampling. Data were analyzed using repeated-measures analysis of variance, Friedman's test, independent t-test, and the Mann-Whitney U test. **Results:** Statistical test results indicated a significant difference in knowledge and attitude between the intervention and control groups ($p < 0.001$). **Conclusion:** Education on reproduction health using the application is effective in retaining the related knowledge and attitude of adolescents.

Keywords: Adolescent, Android application, Attitude, Knowledge, Reproduction

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INTRODUCTION

Adolescence is a transitional period from childhood to adulthood and consists of physical, cognitive, social, and emotional maturation in preparation for adulthood (1). According to the World Health Organization, adolescence is the period from 10 to 19 years old. Meanwhile, according to the Indonesian Ministry of Health Regulation No. 25 of 2014, an adolescent is a citizen aged 10 to 18 years old. However, according to the National Population and Family Planning Board, adolescence ranged from 10 to 24 years old. Therefore, an adolescent is a citizen whose age ranges between 10 and 24 years and experiencing a transition into physical, cognitive, social, and emotional maturation.

Problems related to reproductive health most frequently occur during adolescence. Reproductive health pertains

to a condition of holistic physical, mental, and social well-being, rather than the onset of diseases or weaknesses related to the reproductive system, function, and process (2). In adolescents, reproductive health refers to physical and emotional well-being, which represents the ability to remain healthy and avoid unintended pregnancies, unsafe abortion, sexually transmitted disease (STDs), HIV/AIDS, and sexual abuse (3). The Indonesian Health Demographic Survey Indonesia of 2017 demonstrated that 0.9% of women and 3.6% of men aged 15–19 years have experienced premarital sex for various reasons, such as love (47.1%), curiosity (30.1%), spontaneous occurrence (15.5%), and coercion (2.8%) (4). Data indicate that adolescents' lack of understanding related to healthy life, risks of sexual activity, and ability to decline an unwanted relationship.

Adolescents and young adults aged 15–24 years displayed the highest risk of STDs due to the increased frequency of sexual activity (5). Teenagers in the USA aged 15–19 years that suffered from gonorrhea reached 337.5 cases per 100,000 population (6). Globally, approximately 2.1 million adolescents aged 10–19 years

were living with HIV in 2012 (7). Asia ranked second with 5.1 million cases after Africa with 19.4 million cases, whereas America ranked third with 1.8 million cases (8).

The highest number of HIV cases by region in January-March 2017 in Indonesia, West Java province ranked second with 1,505 cases after East Java 1,614 and followed by DKI Jakarta 1,403, Central Java 1,171 and Papua 861 cases (9). Depok City, which is one of the cities in West Java province, ranks fourth with 158 HIV cases after Bogor with 592 cases, Bandung with 575 cases, and Bekasi with 374 cases (9). Based on these data, it can be said that Depok city adolescents are at risk for experiencing health problems. The author conducted a survey and illustrated that 53% of adolescents lacked knowledge regarding adolescent reproductive development and health, whereas the remaining 47% had sufficient knowledge. Therefore, the current study inferred that adolescents' knowledge related to reproductive development and health remains inadequate.

Adolescent knowledge about reproductive health can be increased by conducting health education. In Indonesia, The provision of reproductive health education is regulated by law. The provision of communication, information, and reproductive health education is carried out through formal and non-formal education processes as well as youth empowerment activities as peer educators or peer counselors. Research conducted on 309 young women in Saudi Arabia also showed an increase in adolescent knowledge and attitudes after being given reproductive health education (10). Smartphone-based health education has advantages over other educational methods. Smartphone applications have the potential to reduce costs to increase access to health information and improve health knowledge and health outcomes (11).

The use of this application allows the promotion of self-directed learning and self-paced learning which can increase young people's interest in learning (12). The use of a smartphone application on sexual health education on Rohde Island involving 39 young women aged 12-17 as respondents has been shown to be able to increase information on sexual health and have recommended the application as a source for obtaining comprehensive knowledge about sexual health (13).

In Indonesia, health education has been presented in varied modes, such as lecture, discussion, roleplay and simulation, assignment, and peer group. However, studies on smartphone applications as a channel of education have been rare in Indonesia. In contrast, studies on other countries have proved that using smartphones is effective for providing information about adolescent reproductive health. Therefore, the current study aimed to measure the effectiveness of Android

applications on the knowledge retention and attitude of adolescents in relation to reproductive health.

MATERIALS AND METHODS

This research has passed the ethical review by the Ethics Committee of the Faculty of Nursing, Universitas Indonesia with number SK-31/UN2.F12.D1.2.1/ETIK.FIK.2020. The study was quasi-experimental in nature with a pre-post-test control group design. The sample size in this study was calculated using the unpaired numerical comparative test formula. The samples were selected using multistage random sampling, which yielded 42 and 59 respondents for the intervention and control groups, respectively.

The sampling procedure was carried out by randomization in 12 sub-districts in Depok City. The first selected sub-district was used as the intervention group, while the second sub-district was used as the control group. The participants were screened according to the following inclusion criteria: aged 12–16 years, owns a smartphone with an Android operating system, a student in Depok area, willing to participate in the study, and able to read and write.

The questionnaire used was the result of a modification of the previous research questionnaire. The questions are based on the guidebook for the youth health training module published by the Indonesian Ministry of Health. Questions about knowledge in the form of 30 questions about the closure of reproductive health with correct and incorrect answer choices. The minimum and maximum score for the knowledge questionnaire was 0-100. The attitude questionnaire is a Likert scale consisting of 15 questions, with the ranged score was 25-100. Researchers then tested the validity and reliability of the questionnaire among 30 teenagers before the questionnaire was used in the study using the product moment correlation test. Validity test score ranged from 0.485-0.838 for the knowledge questionnaire and 0.510-0.832 for the attitude questionnaire. The score of Cronbach alpha was 0.914 and 0.889 for the knowledge and attitude questionnaire, respectively. This research uses SPSS version 22 software.

The intervention group received reproductive health education using the application for four weeks, whereas the control group did not receive any intervention. Every week, the respondents were given questions related to reproductive health and instructed to answer via WhatsApp. The correct responses were sent to the respondents on weekend. Knowledge and attitude were measured three times, namely, pre-test before the intervention, first post-test four weeks after the intervention, and second post-test two weeks after the first post-test. The application was created based on the handbook on Adolescent Health Care Services and Information Education Communication released by

the Ministry of Health in 2018. The information in the application consists of text and images. The handbook contained information on hormonal and physical changes during adolescence, management of menstrual hygiene, tips for reproductive healthcare, and tips for preventing reproductive health problems, STDs, and HIV/AIDS.

RESULT

The majority of respondents were women (n = 62 [61.4%], coming from high economic status [n = 51 [50.5%]), and with a low level of moral judgment (n = 71 [70.15%])(Table I). According to respondents' age, the mean ages for both groups were 13.7 and 14.6, respectively (Table II). In the beginning of the study, there were no significant differences between two groups for demographic variables except age.

Table I. Respondent Distribution Based on Sex, Parents' Income, and Moral Judgement Stage in Junior High School Adolescents in Depok March-May 2020 (n=101)

Variable	Intervention Group		Control Group		p value
	n	%	n	%	
Sex					0.010
Male	13	31	26	44.1	
Female	29	69	33	55.9	
Total	42	100	59	100	
Economic Status					0.242
Low	12	33.3	36	61	
High	28	66.7	23	39	
Total	42	100	59	100	
Moral Development					0.797
High	2	4.8	0	0	
Moderate	8	19	20	33.9	
Low	32	76.2	39	66.1	
Total	42	100	59	100	

Table II. Respondent Distribution Based on Age in Junior High School Adolescents in Depok March-May 2020 (n=101)

Variable	Group	n	Mean	Min-Max	SD	CI 95%	p value
Age	Intervention	42	13.67	12-15	0.687	13.45-13.88	0.444
	Control	59	14.64	13-16	0.804	14.43-14.85	

The results pointed to significant differences in average knowledge scores before intervention, after intervention, and knowledge retention in the intervention group (p < 0.001). The largest mean gap scores for knowledge were obtained before and after intervention. In addition, a significant difference was observed in attitude toward reproductive health before and after intervention (p <

0.001) (Table III). The minimum and maximum scores for knowledge before intervention were 43.33 and 76.66, respectively. After the intervention, the minimum and maximum scores for knowledge were 40.00 and 83.33 (Table III).

Table III. Difference in Knowledge and Attitude Before and After Intervention and Retention About Reproductive Health in the Intervention Group of Junior High School Adolescents in Depok (March-May 2020 [n = 101])

Variable	Intervention groups			Control groups		p value
	Mean	SD	p value	Median	Min-Max	
Knowledge						
Pre-intervention	55.16	8.43	0.001	63.33	43.33-76.67	0.322
Post-intervention	74.68	7.97		63.33	40.00-83.33	
Retention	70.82	10.31		60.00	43.33-86.67	
Attitude						
Pre-intervention	83.80	5.90	0.001	83.22	83.22	0.001
Post-intervention	89.95	4.1		83.67	83.67	
Retention	87.26	5.37		81.34	81.34	

Alternatively, no significant difference was observed in average knowledge scores before intervention, after intervention, and knowledge retention in the control group. Statistical tests on attitude resulted in a p value of 0.001 (p < 0.05), which showed a significant difference in average scores for attitude toward reproductive health before intervention, after intervention, and attitude retention (Table III).

After intervention, the average scores for knowledge were 74.68 and 62.99 with standard deviations of 7.97 and 9.56 for the intervention and control groups, respectively. The result of the statistical tests indicated a significant difference in the average scores for knowledge after intervention (p < 0.05) (Table IV). For knowledge retention, the average scores reached 70.84 and 61.01. The result of the statistical tests found a significant difference in knowledge retention between both groups.

The mean attitude of adolescents after intervention in the intervention group was 89.96 (SD 4.14) while in the control group was 83.67 (SD 6.44). The statistical test results showed a significant difference in the mean attitude after education in the intervention and control groups (p value < .05). The mean retention of adolescent attitudes in the intervention group was 87.26 while in the control group it was 81.34. The results of statistical tests show that there is a significant difference in attitude retention in the intervention group and the control group (Table IV). Variables of age and economic status have a significant relationship with the retention of adolescent attitudes (p value < 0.05).

Table IV. Difference in Knowledge and Attitude Between Control and Intervention Groups in Junior High School Adolescents in Depok (March–May 2020 [n = 101])

Variable	Group	n	Mean	SD	p value		
Knowledge	Post-intervention	Intervention	42	74.68	7.97	0.001	
		Control	59	62.99	9.56		
	Retention	Intervention	42	70.82	10.31		0.001
		Control	59	61.01	11.30		
Attitude	Post-intervention	Intervention	42	89.96	4.14	0.001	
		Control	59	83.67	6.44		
	Retention	Intervention	42	87.26	5.4		0.001
		Control	59	81.34	7.41		

DISCUSSION

The results pointed to significant differences in average knowledge and attitude scores before intervention, after intervention, and knowledge retention in the intervention group. The result of the statistical tests found a significant difference in knowledge retention between both groups (p value <0.05). The results of statistical tests show that there is a significant difference in attitude retention in the intervention group and the control group (p value <0.05)

Adolescent health education using the application significantly improved their knowledge and attitude about reproductive health. This finding was consistent with that of Puspa et al. (2017), who demonstrated changes in adolescents’ knowledge about reproductive health after receiving health education in the intervention group (14). Meanwhile, the control group who received booklets did not display any significant difference. This finding was similar to the finding of Brayboy et al. (2016), who noted an improvement in adolescents’ knowledge after receiving health education using a smartphone application for two weeks (13). A study conducted in Ghana indicated a significant difference in knowledge among female adolescents regarding reproductive health after receiving health education using mHealth for three weeks (15). In addition, this finding was in line with a study on adolescents in Malaysia, which found an improvement in attitude after receiving health education using a website for 2 months (16).

Moreover, the intervention retained attitude and knowledge retention two weeks post-intervention. This finding was in line with Chi et al. (2015), who pointed to knowledge improvement after intervention in comparison with the control group. The result of the statistical tests indicated no significant difference in adolescents’ knowledge at three weeks follow-up with post-test (17). No decrement was noted for knowledge

retention and attitude probably because the information given was clear.

A study on the development of an application related to contraception used by African-American female adolescents showed that the application was approved, easy to use, and informative (18). The adolescents stated that smartphones are easy to use and provide a clear layout and information (19,20). A cross-sectional study on 250 adolescents in Ghana revealed that the Android application is the second most used smartphone function after phone call (21).

Health education using smartphone applications became effective because the information given was appealing for adolescents. Text messaging was another smartphone feature that was appealing to them and motivated them to learn more about reproductive health (22). The finding of the present study indicated that smartphone applications can become a solution for the provision of reproductive health information. Moreover, surveyed female adolescents in Rhode Island and found that the average use of smartphones is 5–7 h on weekdays, 7.6 h at night, and 13.1 h on weekends, which supports the finding of the current study (13).

Nurses should focus on the improvement of knowledge and attitude related to adolescent reproductive health. This aspect is important because such an improvement can lead to a better behavior in reproductive health. One material in the application offered tips on appropriate reproductive hygiene. From this information, the adolescents became concerned about the cleanliness of reproductive organs and prevention of diseases, such as STDs and HIV/AIDS. Without proper treatment, STD can cause infertility. Thus, the study expected that adolescents in Indonesia can be spared from reproductive health issues and produce a healthy and productive generation.

The Android application provided information related to the reproductive growth and development of adolescents. This type of information was provided to enable them to understand the changes they may experience during this period, which may lead to less confusion with the changes in their body. In this regard, appropriate information will influence their attitude in dealing with the changes in their body, whereas a positive attitude will prevent them from engaging in risk-taking behaviors, such as exploring these changes alone or with the opposite sex.

Furthermore, the finding indicated that male adolescents obtained lower scores on knowledge (i.e., 3.7) after controlling for age, income, and stage of moral development. This finding was in line with a study conducted in Tehran and found that male adolescents obtained lower scores on knowledge compared with female adolescents. This finding also indicated that

female adolescents were more defiant regarding premarital sex than male adolescents (23). Mustapa et al. (2015) performed a review of the literature in Malaysia and illustrated that female adolescents were more concerned with reproductive health issues compared with male adolescents (24). After controlling for age, sex, and economic status adolescents with higher stages of moral development displayed higher scores on knowledge (i.e. 4.3). Moral development emphasized individual ability in moral decision making related to the good or bad value of something.

Adolescents have many considerations about the pros and cons and select the good ones to do. The present study revealed that advanced knowledge was accompanied by advanced moral development. Therefore, adolescent moral development should be additionally considered to maintain knowledge retention. The majority of the respondents were at a stage of low moral judgment, which indicated that they had a low ability in judging the good and bad aspects of certain issues.

The finding revealed that age, sex, economic status, and moral development influenced knowledge retention in 14.5% of the participants, whereas the remainder was influenced by other factors. This result indicated that many other factors can influence the knowledge retention of adolescents. The qualitative study revealed that adolescents relied on peers for information related to reproductive health and assumed that having many sexual partners and being involved in premarital sex were common and normal (25).

CONCLUSION

Reproductive health education using Android applications is effective for improving knowledge and attitude about adolescent reproductive health. Furthermore, health education is effective in retaining knowledge post-intervention. This educational method can be recommended as a method for the reproductive health education for adolescents. This research can be used as a basis for nurses in developing media and the right way to convey reproductive health information, so as to prevent reproductive health problems. Technology-based nursing education must continue to be developed in accordance with the needs of society and current technological developments. This supports education in the 4.0 industrial revolution era.

The limitation of this research is the implementation of pre-test and post-test. The test was carried out using a google form due to the Covid 19 pandemic which closed all schools in Depok. This causes a lack of control from researchers when teenagers fill out questionnaires.

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