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Comparing the effect of LINE-based and WhatsApp-based educational interventions on reproductive health knowledge, attitudes, and behaviors among Triad adolescents: A quasi-experimental study

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Abstract

Background: Adolescent populations face reproductive health challenges. Persisting gaps in Triad Adolescent Reproductive Health (ARH) comprehension and risky behaviors emphasize the necessity of integrating social media apps into health education to address Triad ARH risks among youths. Teenagers commonly use WhatsApp and LINE for social media communication, and determining the effectiveness of these two apps is scarce.

Objective: This quasi-experimental study aimed to investigate and compare the impacts of educational interventions delivered through WhatsApp and LINE platforms on enhancing the knowledge, attitudes, and behaviors of adolescents concerning the Triad ARH.

Methods: A total of 154 senior high school students were randomly recruited from two public schools in Bandung Regency, West Java, Indonesia. These students were divided into two groups: Group A, consisting of 78 students who received material messages using LINE, and Group B, consisting of 76 students who received material messages using WhatsApp. Participants completed a pre-test prior to the intervention and a post-test one month after the intervention. Data were collected using validated questionnaires and analyzed using Chi-square and Wilcoxon tests.

Results: In the LINE group, there was an average increase in knowledge from 15.68 to 20.21, attitudes from 29.05 to 59.12, and behavior from 55.95 to 64.81 before and after the intervention period (p = 0.001). In the WhatsApp group, there was an increase in knowledge from 15.16 to 19.67, in attitudes from 34.71 to 59.54, and behavior from 54.75 to 65.97 before and after the intervention period (p = 0.001). Further analysis showed no significant difference between the LINE and WhatsApp groups in increasing the average level of knowledge (p = 0.973), attitude (p = 0.682), and behavior (p = 0.067) before and after the intervention. However, it was observed that the increase in knowledge and attitude was slightly higher in the LINE group, while the increase in behavior was slightly higher in the WhatsApp group.

Conclusion: This study demonstrates that educational interventions using LINE and WhatsApp both increased the knowledge, attitudes, and behavior of adolescents related to the Triad ARH. This finding is valuable, considering the popularity of LINE and WhatsApp as mobile applications. Leveraging these platforms by nurses and other healthcare professionals can significantly improve adolescents' health, influencing their knowledge, attitudes, and behavior regarding reproductive health.

Keywords

Indonesia; adolescent; reproductive health; attitude; behavior; health knowledge; LINE; WhatsApp; mobile applications; health education

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Background

Bandung Regency, located in the province of West Java, is a part of the metropolitan development region in Indonesia. It is characterized by a notable population growth rate of 0.99% (Statistics Indonesia, 2021a), mostly caused by migration to the Bandung Regency area to find work**.** Bandung Regency is dominated by a population of children and adolescents. The population of the adolescent age group in Bandung Regency (10-19 years) reaches 17.29% (Statistics Indonesia, 2021b). This syndrome contributes to heightened susceptibility among adolescents to a range of diseases and risks, particularly those pertaining to reproductive health. The rise in the adolescent population can give rise to new problems (Susanto et al.,

2016); one of them is the problem of adolescent reproductive health (ARH). ARH has been recognized as an essential health problem in Indonesia (Susanto et al., 2016). The significance of ARH should be appropriately recognized as it has a strong correlation with the future well-being of humanity.

The characteristics of adolescents are having a great sense of curiosity, liking adventure and challenges, trying new things, and taking risky actions without careful consideration (Ministry of Health, 2015; Susanto et al., 2016). The characteristics and behavior of these adolescents require the availability of youth care health services, including ARH services (Ministry of Health, 2015). The primary objective of ARH services is to mitigate and safeguard adolescents against engaging in precarious sexual conduct while concurrently equipping them with the necessary knowledge and skills to lead a wholesome and responsible reproductive existence (Ministry of Health, 2015).

Insufficient understanding and the pursuit of inaccurate information regarding ARH can have adverse effects on teenagers, manifesting as three fundamental risks known as the “Triad ARH.” These risks include sexuality, HIV/AIDS, and the utilization of illicit substances (National Population and Family Planning Board, 2012). Insufficient understanding is identified as a contributing factor to the occurrence of the Triad ARH (Solehati et al., 2022). The inequitable dissemination of ARH information will result in a lack of precise and reliable information available to young individuals (Kosasih et al., 2021). This will force adolescents to try to find access and explore on their own. The acquisition of knowledge has the potential to shape the attitudes and behaviors of individuals in their adolescent years.

The proportion of girls aged under 15 who have had sex remained static or increased in five of the six Latin American countries surveyed (Liang et al., 2019). The prevalence of unhealthy sexual behavior among unmarried teens tends to grow. In Belgrade, the reproductive health of adolescent girls is at risk of being disrupted by their sexual behavior, low acceptance of a healthy lifestyle, lack of responsibility in sexual relations, and high prevalence rates of unwanted pregnancies and sexually transmitted diseases (Sedlecki et al., 2001).

The findings from the Demographic and Health Survey, with a specific focus on the ARH component, indicated that the majority of individuals who engage in their initial dating experiences fall between the age range of 15 to 17 years. Around one-third (33.3%) of female adolescents and slightly over one-third (34.5%) of male adolescents initiated romantic relationships before age 15. There is concern that adolescents may lack sufficient life skills during this developmental stage, rendering them vulnerable to engaging in unhealthy dating activities, including premarital sexual activity (Ministry of Health, 2015). 19.1% of male adolescents and 2.5% of female adolescents have had premarital sex out of curiosity (57.5% of males), it just happened (38% of females), and was forced by a partner (12.6% of females) (Ministry of Health, 2015).

Data from Statistics Indonesia (2013) showed that around 72% of teenage girls and 80% of adolescent boys stated that holding hands was the thing they did the most in courtship, 48% of adolescent boys and 30% of teenage girls reported kissing behavior, and 30% of male adolescents and 6% of female adolescents touch sensitive body parts (Statistics Indonesia, 2013). Young men aged 20-24 years (11%) and young women (7%) agreed to have premarital sex. In general, young men (8%) and young women (2%) have had sexual intercourse (National Family Planning Coordinating Board et al., 2018). Risky sexual behavior in adolescents can cause problems with sexually transmitted infections (STIs). The highest incidence of STIs occurs in adolescents, especially female adolescents in the 15-29 age group. It is alleged that currently, in Indonesia, there are 2.6 million abortions every year. As many as 700,000 of them are teenagers (Adjie, 2013).

One additional issue that poses a significant threat to the younger population is the prevalence of drug misuse and the spread of HIV/AIDS. The use of illegal drugs in adolescents is found to be less than 1% in female adolescents and 4% in male adolescents (Statistics Indonesia, 2013). HIV/AIDS is also an ARH problem. The number of HIV cases for the period 2010 to 2019 was 349,882. West Java is ranked third with a cumulative number from 2010 to 2019 of 38,853 (Ministry of Health, 2017). Approximately 46% of female adolescents and 59% of male adolescents know that limiting the number of sexual partners to only one can reduce the risk of contracting HIV. Adolescents’ knowledge of how HIV/AIDS is transmitted is concerning. A majority of unmarried female participants between the ages of 15 and 24 retain the belief that HIV can be spread through mosquito bites and the sharing of food. Men’s knowledge of HIV is no better than women. Only 13% of female adolescents and 12% of male adolescents have comprehensive knowledge about HIV (Statistics Indonesia, 2013). Therefore, knowledge, attitudes, and behaviors related to Triad ARH are key factors in ARH.

The challenges encountered by adolescents serve to validate the notion that the existing measures aimed at safeguarding adolescents from sexual issues, HIV/AIDS, and substance abuse are insufficient in their effectiveness. To promote personal health and safety among adolescents, it is imperative to provide them with comprehensive education regarding the prevention of premarital sexual activity, HIV/AIDS transmission, and the potential hazards associated with drug use. Equipping adolescents with this knowledge may effectively safeguard their physical and mental well-being, fostering a healthy lifestyle.

The growing prevalence of problematic teenagers is a hindrance to the successful attainment of several developmental goals among individuals in this age group. These tasks include physical growth, mental and emotional development, spiritual maturation, and adolescents’ social growth and development (National Population and Family Planning Board, 2012). Prevention efforts are needed against the Triad ARH problem by strengthening education. Efforts are required to increase knowledge, attitudes, and behaviors related to Triad ARH by education via smartphones.

Today’s technology can be integrated into health education programs in the easiest, fastest, and most effective ways (Gonenc et al., 2021). Several active smartphone applications are gaining popularity among the masses and are introducing new forms of teaching by enabling students and teachers to easily share information on LINE (Gonenc et al., 2021). Students can access educational materials easily with more flexibility, while teachers can communicate with students remotely regardless of space and time (Callaghan & Bower, 2012; Cetinkaya, 2017; Gasaymeh, 2017; Schroeder &

Greenbowe, 2009; Wang et al., 2012). Smartphones allow individuals to participate in various online activities, such as surfing the web, playing video games, or engaging in social networks (Chen et al., 2020). The use of smartphones in education will attract the attention of teenagers, one of which is LINE and WhatsApp.

WhatsApp and LINE are some of the devices that teenagers like. The Internet has become important for teenagers. Today's teenagers are the ones who use electronics the most and are the most diligent in using social networking sites (Vlachopoulou & Boutsouki, 2014). Teenagers often use social media platforms like LINE and WhatsApp to communicate. LINE is a popular mobile application widely used for promotion (Ramadanty & Widayanti, 2020). LINE is the fastest-growing and dominant mobile messaging application in many developing countries (Kunaboot et al., 2015). LINE is most popular in Japan, Indonesia, India, and Thailand (Kunaboot et al., 2015). Several studies on LINE usage have been carried out, such as investigating the relative contribution of psychological and social factors in predicting various levels of LINE usage (Chen et al., 2020), English spelling learning experience through the LINE App mobile for college students (Shih et al., 2015), activities related to classroom-related activities, and exploring the factors that might influence students' intentions to use LINE (Van De Bogart & Wichadee, 2015). In this study, the respondents used were high school teenagers. The teenage respondents consider that when using devices such as cell phones, there must be assistance, especially for children up to 13 years old, maybe ten years old, or small children; they must be accompanied (Kominfo, 2018). Currently, smartphones are widely used for learning, especially in high school.

Another popular mobile application is WhatsApp, which is easy to use and fast (Ahad & Lim, 2014; Gasaymeh, 2017). WhatsApp has advantages such as working on multiple platforms (Android, iOS), being free and interactive, allowing sending messages to multiple recipients, and being customizable (Ceci, 2018). WhatsApp is a program that is suitable for use in the educational process. In the field of health education, several programs have integrated WhatsApp into teaching and learning to evaluate its effect (Krishnan et al., 2017; Ventola, 2014), explore the impact of using WhatsApp on student education (Cetinkaya, 2017), determine the effects of sexual education on the level of sexual knowledge and sexual myths in female midwifery students (Gonenc et al., 2021), examines the domestication of WhatsApp among young people (Ahad & Lim, 2014), find out the lecturer's perspective on the use of WhatsApp to support the teaching and learning process (Gachago et al., 2015), comparing the WhatsApp service to traditional SMS (Church & Oliveira, 2013), comparing the effectiveness of teaching via WhatsApp and booklets on the learning rate and emotional status in healthy women related to breast cancer.

Previous research shows that students accepted WhatsApp to support online learning during the COVID-19 pandemic (Mulyono et al., 2021). Another study regarding the choice of LINE social media among Bandung City teenagers revealed that 180 people had used LINE social media for more than six months (Rani & Ali, 2019). Although studies in the literature have investigated the use of WhatsApp and LINE in teaching and learning, there are no studies investigating the effectiveness of using WhatsApp and LINE in increasing adolescents' knowledge, attitudes, and behavior regarding the Triad ARH. For this reason, research is needed regarding the integration of applications such as WhatsApp and LINE in the Triad ARH health education method and evaluating the results, which can bring a new dimension to the educational model and make an essential contribution to youth. This study aimed to investigate the comparative effect of education provided via WhatsApp or LINE in increasing the knowledge, attitudes, and behavior of adolescents related to the Triad ARH in Indonesia.

Methods

Study Design

A quasi-experimental research design was employed in this study.

Setting

This research was conducted at two senior high schools in Bandung Regency, West Java, from March 2018 to December 2018. Smartphones are currently widely used by high school students, and social media platforms such as WhatsApp and LINE are commonly employed for learning. The choice of this location was motivated by the observation that several behavior studies did not support ARH. Additionally, the high risk of adolescents experiencing reproductive health problems is attributed to the significant migration to this area and its status as a metropolitan development area of Bandung. The Dayeuhkolot District, with a population density exceeding 10,000 people/km^2, has one of the highest population densities (Bappeda Kabupaten Bandung, 2015).

Samples/Participants

In this study, the sample of schools recruited used a purposive sampling method, which was adjusted to the criteria, namely in areas that have the highest number of teenagers in Bandung Regency and have a risk of problems with early marriage, use of illegal drugs, and HIV/AIDS in the community. Data reports from the Regional Government of Bandung Regency include areas in Cileunyi and Rancaekek sub-districts in West Java. The sample in this study was 157 high school teenagers based on the effect size of 0.52. Three withdrew from the study, so the final result was 154 students. After determining the location of the study setting, the sample was selected using a stratified random sampling technique; namely, the number of samples taken was based on the class strata in the school, then the sample chosen to represent the class was taken randomly. Inclusion criteria were active students, being in good health, those who volunteered to participate in the study, those who had not received any education regarding Triad ARH, and obtaining approval from their parents. The group division of the LINE application and WhatsApp application was determined by simple random sampling at each school.

Instruments

Questionnaires were used to collect data, especially to assess knowledge, attitudes, and behaviors related to Triad ARH. The questionnaires were adapted from the WHO questionnaire and translated into Indonesian (Anggraeni et al., 2018; Cleland

et al., 2001). The reliability measure yielded Cronbach's alpha values of 0.87 for knowledge, 0.61 for attitude, and 0.63 for behavior. The validity was tested in 20 samples in previous research, resulting in values of 0.54–0.80 for knowledge, 0.43–0.65 for attitude, and 0.55–0.82 for behavior (Solehati et al., 2022).

Knowledge includes the meaning of ARH, physical characteristics of primary sex changes, male reproductive organs, understanding of wet dreams in men, penile function, impact of masturbation, ways to avoid premarital sex behavior, the reproductive organs of women, menstruation, the impact of unwanted pregnancy on adolescents, HIV/AIDS, ways of transmitting HIV/AIDS, preventing HIV/AIDS transmission, body systems being attacked by the HIV, drugs, the impact of drug use, how to avoid drug abuse). Knowledge is divided into two categories: if it is less than the mean, it is poor; if it is more than the mean, it is good. Knowledge included 20 questions (multiple choice questions) with four options (one correct and three wrong answers). The possible scores ranged between 0 and 20. The wrong answers were assigned a score of 0, and the correct answer was assigned a score of 1. The overall mean score was used for the final analysis of knowledge.

Attitudes include statements regarding the attitude of adolescents about sex without marriage: whether it is permitted to have sex without being legally married, everybody is allowed to have premarital sex, sex is part of love that does not require to be limited by the bond of marriage, discussion with peers in overcoming ARH problems, having sex outside is wrong and violates the norm, the importance of maintaining virginity for adolescent girls, sexual relations make couples get to know each other more, parents should not be too tightly monitoring the adolescents' relationships, behave more openly and willing to tell their parents, adolescents commonly undertake the use of illegal drugs, the use of illegal drugs is a way to strengthen friendships). Attitude was divided into two categories: "does not support" if the score is less than the mean, and "supports" if the score is more than the mean. The items for attitude were measured using the 4-point Likert scale. The scale was 4 = strongly agree; 3 = agree; 2 = disagree; and 1 = strongly disagree. Negative questions were transformed ('strongly disagree' was coded as 4, while 'strongly agree' was coded as 1). The possible scores ranged between 12 and 48 (12 items). The overall mean scores for attitude were also used for the final analysis. The higher the participants' attitude score, the more favorable their attitude toward Triad ARH.

Behaviors include behavioral statements regarding having sex as an expression of sincere love for a boyfriend, having sex before legally getting married, changing sex partners, maintaining virginity is not important, using illegal drugs when having problems, inviting friends to use illegal drugs, reminding friends about the dangers of drugs). Behavior was divided into two categories: "does not support" if the score is less than the mean, and "supports" if the score is more than the mean. The items for behavior were measured using the 4-point Likert scale. The scale was 4 = always; 3 = often; 2 = sometimes; and 1 = never. Negative questions were transformed ('never' was coded as 4, while 'Always' was coded as 1). The possible scores ranged between 7–28 (seven items). The overall mean scores for attitude and behavior were also used for the final analysis. The higher the behavior score, the more favorable they were of Triad ARH.

Interventions

Respondents were divided into two groups: the LINE group, who were given Triad ARH education via LINE (n = 78), and the WhatsApp group via WhatsApp (n = 76). High school adolescent respondents were given education regarding adolescent reproductive health via social media applications (for one month). The first education was conducted face-to-face using interactive lecturing and adolescent reproductive health videos. The second and third education sessions were conducted via WhatsApp and LINE, where students were given PowerPoint presentations on adolescent reproductive health. The fourth education was provided via WhatsApp and LINE, where students were given video shows related to adolescent reproductive health, the same as the first meeting. On WhatsApp and LINE, students were given space for open questions and answers (Q & A) answered by the research team. Before and after the intervention, knowledge, attitudes, and behavior were measured.

LINE Education Group

Students in this group received education about the Triad ARH through LINE. Educational content includes basic concepts of ARH and Triad ARH, what is ARH and Triad ARH? sexual health and sexual myths, sexual health in adolescence, risky Triad ARH behaviors, etiology of Triad ARH, risk factors of Triad ARH, adverse effects of the Triad ARH, decision-making skills reproductive health and reproductive rights, sexuality/drugs/HIV-AIDS-related universal values, and theories of sexual identity development are carried out using video. Material on anatomy of the female and male reproductive systems, sexual (myths and facts, what is risky sexual behavior, harmful effects of risky sexual behavior, physiology of sexually transmitted diseases, things to do to prevent risky sexual behavior), HIV/AIDS (myths and facts, what is HIV/AIDS, adverse effects of drugs, HIV/AIDS, signs of HIV/AIDS, things to do to prevent HIV/AIDS), drugs (myths and facts, what are drugs, adverse effects of drugs, things to do to prevent of drugs), decision-making skills are carried out using slide and video files.

The LINE group was created by researchers, with the researcher serving as the administrator. Selected students were invited to join the LINE group, and only those who received invitations could become participants. Once the educational program had commenced, no new participants were allowed. All sessions took place online via LINE, fostering an environment where interaction among friends and research was encouraged through the platform. Slide files created for education were converted into PDF documents, and videos were sent to students in LINE education groups over four weeks: the initial week of education featured videos related to ARH, while the second and third weeks utilized PowerPoint presentations on the Triad ARH, and the fourth week consisted of educational content delivered through videos on the Triad ARH. Students were given an opportunity to ask open questions and answers, with the research team addressing these inquiries. After sending content portions to students, the research team consistently returned to answer questions via LINE. Subsequently, students engaged in discussions among themselves. The "read message" indicator on the LINE application was used to monitor participation within the LINE education group. Students who had not read messages during LINE education were reminded by the

research team to participate, ensuring maximum effort for the full involvement of all students in the LINE education group. Before and after the intervention, knowledge, attitudes, and behaviors related to the Triad ARH were assessed.

WhatsApp Education Group

All learning objectives were designed following the same structure as in the LINE education group method. Students in this group received an educational program mirroring the content of the LINE education group program through WhatsApp. WhatsApp groups were established, with the research team as administrators. Invitations were extended to selected individuals to join this group, allowing only those invited to become members. No new participants were permitted to participate after the educational program had commenced. All sessions were conducted online via WhatsApp, fostering an environment that encouraged peer interaction and research. Slide files initially prepared for conventional education were converted into PDF and MS Word documents and disseminated to students in WhatsApp education groups for four weeks. After sharing portions of the content with students, the author revisited to address student inquiries via WhatsApp. Subsequently, students engaged in discussions among themselves. The participation of students in the WhatsApp education group was also monitored using the "read message" indicator within the WhatsApp application. Students who hadn't read messages during the WhatsApp education sessions received reminders from the research team to encourage their participation. Maximum effort was made to ensure the full involvement of all students in both LINE and WhatsApp educational groups. Before and following the intervention, measurements were taken for knowledge, attitudes, and behaviors related to the Triad ARH.

The questionnaire was self-administered to the students, and each was filled out in 40 minutes. The researcher briefly introduced the research objectives and guided the respondents on how to fill out the questionnaire. Filling out the questionnaire was explained on the first page, with characteristic data on the second page of the questionnaire. Ethical approval from parents was carried out by providing a statement and approval letter to the student's parents one week before the implementation of the research. The consent letter was given to the teacher by the research team to be conveyed to the parents through the students who were selected as respondents. The consent letter signed by the parents was returned via the student to the teacher three days before the research was carried out, and then the teacher gave it to the research team. Data were collected after obtaining written approval from each respondent's parents and teacher. Respondents completed the questionnaire accompanied by the research team and their respective homeroom teachers. Respondents were asked to fill out a knowledge, attitude, and behavior questionnaire with a choice of the four answer items provided. While filling out the questionnaire, the research team and homeroom teacher supervised it, and the space and seating of the respondents were arranged to avoid discussions between students during data collection so that discussions were not allowed between fellow students or between students and their teachers. All respondents willing to participate in the study were given merchandise in the form of stationery and souvenirs. The names of all participants were not disclosed.

Data Analysis

Univariate (percentage) analysis was used to identify the participants' sociodemographic characteristics. Chi-square was used to identify the homogeneity of the participants. Meanwhile, the Wilcoxon test was used to analyze the significant differences between pre-and post-test interventions. The significant level was set at 0.05. The SPSS version 22 program was used for data analysis.

Ethical Consideration

This research was approved by the Kesbangpol Bandung Regency and the Research Ethics Committee of Padjadjaran University (Certificate Number: 1085/UN6.KEP/EC/2018). Informed consent was obtained from the teacher and all the parents of the respondents. Participation was voluntary. In this study, respondents could leave the research until data collection was concluded, and there was no compulsion to participate until the end. The researcher kept the respondent's data confidential.

Results

A total of 154 participants answered the questionnaire. **Table 1** shows that the majority of respondents in the LINE group were 17 years old (75.6%), the majority were female (61.5%), the majority were Sundanese (84.6%), the majority were Muslim (97.4%), the majority were looking for information from the internet (79.5%), the majority have a habit of seeking health information (88.5%), and the majority have never heard of the term Triad ARH (94.9%). It can also be seen that in the WhatsApp group, the majority of respondents were 17 years old (71.1%), the majority were female (57.9%), the majority were Sundanese (88.2%), the majority were Muslim (96,1%), the majority seek information from the internet (78.9%), and the majority have a habit of seeking health information (89.5%), the majority have never heard of the term Triad ARH (96.1%).

Table 2 shows that, before the intervention, 52.6% of respondents in the LINE group possessed good knowledge, 75.6% held an unsupportive attitude, and 50% had unsupportive behavior concerning the Triad ARH. Post-intervention, these percentages changed: 53.8% had good knowledge, 53.8% had an unsupportive attitude, and 52.8% showed supportive behavior. Similarly, in the WhatsApp group, 50% of respondents had a good knowledge level before the intervention, 52.6% displayed a less supportive attitude, and 53.9% had supportive behavior in relation to the Triad ARH. Post-intervention, these figures shifted to 89.5% having good knowledge, 56.6% having a supportive attitude, and 65.8% showing supportive behavior.

Table 3 provides further analysis, revealing significant differences in the average levels of knowledge (p = 0.001), attitude (p = 0.001), and behavior (p = 0.001) within the LINE group before and after the intervention. Additionally, it demonstrates significant differences in the average levels of knowledge (p = 0.001), attitude (p = 0.001), and behavior (p = 0.004) within the WhatsApp group before and after the intervention.

Table 1 The respondents' characteristics and homogeneity of senior high school students (*N* = 154)

Characteristics	LINE group (*n* = 78)		WhatsApp group (*n* = 76)		*p*
	f	%	f	%	
Age (years)					0.19
16	8	10.3	8	10.5	
17	59	75.6	54	71.1	
18	11	14.1	14	18.4	
Gender					0.38
Female	48	61.5	44	57.9	
Male	30	38.5	32	42.1	
Race					0.69
Sunda	66	84.6	67	88.2	
Jawa	8	10.3	7	9.2	
Others	4	5.1	2	2.6	
Religion					0.50
Islam	76	97.4	73	96.1	
Kristen	1	1.3	2	2.6	
Buddha	0	0.0	0	0.0	
Hindu	1	1.3	1	1.3	
Media information that is often seen					0.54
TV	14	17.9	12	15.8	
Radio	2	2.6	2	2.6	
Internet	62	79.5	60	78.9	
Newspaper/magazine	0	0.0	2	2.6	
The habit of seeking information about health					0.84
No	9	11.5	8	10.5	
Yes	69	88.5	68	89.5	
Ever heard of the term Triad ARH					0.72
Ever	74	94.9	73	96.1	
Never	4	5.1	3	3.9	

Table 2 Frequency distribution of knowledge, attitudes, and behavior levels (*N* = 154)

Variable	LINE group (*n* = 78)				WhatsApp group (*n* = 76)			
	Pre-intervention		Post-intervention		Pre-intervention		Post-intervention	
	f	%	f	%	f	%	f	%
Knowledge								
Poor	37	47.4	36	46.2	38	50.0	68	89.5
Good	41	52.6	42	53.8	38	50.0	8	10.5
Attitude								
Does not support	59	75.6	42	53.8	40	52.6	32	42.1
Support	19	24.4	36	46.2	36	47.4	43	56.6
Behavior								
Does not support	39	50.0	37	47.4	34	44.7	26	34.2
Support	39	50.0	41	52.6	41	53.9	50	65.8

Table 3 Differences in average of knowledge, attitudes, and behavior about the Triad ARH before and after intervention (*N* = 154)

Variable	LINE group (*n* = 78)			WhatsApp group (*n* = 76)		
	Mean rank	Z	*p*	Mean rank	Z	*p*
Knowledge	37.59	-7.199	0.001	34.34	-6.867	0.001
Attitude	37.50	-7.525	0.001	41.82	-3.259	0.001
Behavior	37.82	-7.423	0.001	39.18	-5.163	0.001

Table 4 shows that the average increase in knowledge level after the intervention in the LINE group was 102.32, while in the WhatsApp group, it was 52.03. The analysis results indicate a significant difference in the average increase in knowledge level between the LINE and WhatsApp groups after the intervention period (p = 0.001). Regarding the attitude variable, it reveals that the average increase in attitude after the intervention in the LINE group was 73.53. In contrast, in the WhatsApp group, the average increase in attitude was 81.58. The analysis results show no significant difference in the average increase in attitude after the intervention between the LINE and WhatsApp groups (p = 0.26). However, the attitude level was slightly higher in the WhatsApp group than in the LINE group. In the behavioral variable, it indicates that the average increase in behavior after the intervention in the LINE group was 74.20, while in the WhatsApp group, the average increase in behavior was 80.89. The analysis results show no significant difference in the average increase in behavior between the LINE and WhatsApp groups after the intervention (p = 0.35). However, it is observed that the increase in behavior was slightly higher in the WhatsApp group than in the LINE group.

Table 4 Differences in the average of knowledge, attitudes, and behavior related to the Triad ARH between groups of LINE and WhatsApp after the intervention (N = 154)

Variable	Mean Rank	*Z*	*p*
Knowledge			0.001
LINE group (*n* = 78)	102.32	-7.435	
WhatsApp group (*n* = 76)	52.03		
Attitude			0.26
LINE group (*n* = 78)	73.53	-1.127	
WhatsApp group (*n* = 76)	81.58		
Behavior			0.35
LINE group (*n* = 78)	74.20	-.935	
WhatsApp group (*n* = 76)	80.89		

Discussion

None of the students in this study had received a formal Triad ARH education. Triad ARH education is not part of the curriculum in Indonesia. The majority of respondents had never heard of the term Triad ARH, both in the LINE and WhatsApp groups. The results showed an increase in the level of knowledge, attitudes, and behavior in the group that was given the intervention via LINE and WhatsApp. The results of the further analysis found a significant difference in increasing the level of knowledge of those who were given intervention via LINE, while there was no significant difference in the level of attitude and behavior, both in the group LINE or WhatsApp.This happens because these two social media are the media teenagers prefer for communicating socially with their surroundings. LINE application users have become popular and numerous in society, especially in Asia, such as WeChat in China or KakaoTalk in South Korea, while LINE in Japan has evolved from a single-purpose chat application to a do-it-all platform for daily cultural and economic activities (Steinberg, 2020). So, this application becomes a multi-purpose and interesting tool for various things.

However, it appears that the increase in knowledge and attitudes was slightly higher in the LINE group than in the WhatsApp group. Meanwhile, the behavior increased slightly in the WhatsApp group than in the LINE group. This shows that LINE and WhatsApp educational interventions influence adolescents' knowledge, attitudes, and behavior. LINE and WhatsApp have the same effect, and neither is better or worse. Thus, it is indicated that providing education through LINE and WhatsApp could significantly increase knowledge, attitudes, and behavior, possibly because today's youth need the information on Triad ARH. The preferred source of information depends on the kind of information to be conveyed (Nobelius et al., 2010). The information provided by researchers using the internet was adjusted to the habits of the respondents in this study, where the majority had the habit of seeking information about something from the internet, both in the LINE and WhatsApp groups. This shows that teenagers like the acquisition of information through the internet. According to Nobelius et al. (2010), one of the preferred sources is accurate sexual and reproductive health information, which comes from trained and media-based communities.

Information provided via the internet can influence knowledge, attitudes, and behaviors related to Triad ARH because teenagers can easily access the internet. LINE's mobile application is the most used in many Asian countries, outperforming Messenger, WeChat, and Instagram (Steinberg, 2020). LINE's main functions include exchanging text messages, photos, videos, and audio for free voice-over-Internet Protocol conversations, video conferencing, and interacting with private connections and public accounts (Statista Research Department, 2017). LINE is very popular in Asia (Chen et al., 2020), including Indonesia. LINE users in Indonesia are dominated by teenagers, the largest internet users in Indonesia (Nurrahman, 2017). Therefore, providing education related to the Triad ARH using LINE was effective in this study because teenagers love this application. This happens because the method preferred by education recipients will increase interest in listening to the contents of the educational message.

Social networking applications are the most used and fastest-growing applications among various smartphone users; the top two popular applications in the world are WhatsApp and Facebook Messenger (Richter, 2016). WhatsApp is a messaging application that is free, fast, and easy to use and is commonly used among college students (Ahad & Lim, 2014; Gasaymeh, 2017). Studies show that WhatsApp can be used effectively to achieve various goals, create fast connections, and maintain coordination in education (Gachago et al., 2015; Gasaymeh, 2017). It is one of the most suitable programs to be included in the educational process (Gonenc et al., 2021). Ahad and Lim (2014) revealed that young people view WhatsApp as a 'convenient' communication application in everyday life. WhatsApp can help increase connections in informal and formal contexts, facilitating reflection and coordinating students (Gachago et al., 2015). WhatsApp allows mobile users to send text messages to individuals or groups of friends free of charge (Church & Oliveira, 2013). All of the above makes the education provided to youth via WhatsApp effective.

Based on the findings of our study, LINE and WhatsApp can be alternatives for health promotion, especially regarding the Triad ARH, because they are not limited by space and time. So far, the Indonesian people have had problems with access to information, which has resulted in a lack of information that they receive, resulting in poor knowledge. Knowledge can affect a person's attitude. Attitude is related to ARH behavior, both in boys and girls (Susanto et al., 2016). Lack of access to information will also affect ARH behavior (Susanto et al., 2016). According to Nobelius et al. (2010), information sources are related to reproductive health behavior. By providing Triad ARH information via LINE and

WhatsApp, it is hoped that all youth can access this information quickly and evenly.

The existence of adolescents is a national asset that the government and society should pay attention to in a systemic way so that they can optimize their developmental tasks according to their age stages—seeing the extensive number of youth as the next generation of the nation needs to be prepared to become healthy human beings physically, spiritually, mentally, and spiritually. Prevention efforts are needed against their Triad ARH problem in the form of strengthening education. Besides that, it is not only enhancing the field of education for children and adolescents, but another thing that is also important is peer group support so that they complement, remind, and support each other to improve ARH.

An effective model for adolescents is needed to increase the knowledge, attitudes, and behavior related to the Triad ARH. This model is applied via the internet because the internet is a mass medium that is widely used and easily accessible by teenagers. Based on the research results, providing education using LINE and WhatsApp both influence the level of knowledge, attitudes, and behavior of adolescents, so schools can apply education using these two tools to their students to improve their health, especially in preventing problems caused by the Triad ARH. This research for nursing implies that nurses or health workers can use LINE and WhatsApp to improve health and prevent disease, especially to influence the level of knowledge, attitudes, and behavior of adolescents regarding reproductive health.

Limitations

This study has several potential limitations to our research results, namely that the sample size was limited to two high schools in the Bandung district. This study did not involve teachers as a sample. Developing further research within the broader reach of Senior High School and including teachers is essential. The researchers could not control the information that came or was received by students other than the LINE application or WhatsApp application. However, researchers always communicate and remind them to conduct educational programs through these two applications.

Conclusion

The study revealed that educational interventions utilizing the LINE and WhatsApp mobile applications had an impact on adolescents' knowledge, attitudes, and behavior regarding the Triad ARH. This finding holds significance as both LINE and WhatsApp are highly popular mobile apps. Implementing an information dissemination program through technology applications involving peer groups of adolescents, parents, and teachers is essential to advance research in this area. These findings remain relevant today due to the continued widespread use of these applications. Hence, leveraging these applications can be beneficial in future health education initiatives.

Declaration of Conflicting Interest

The authors declared no conflict of interest in this study.

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Authors' Contributions

CEK: validation, investigation, resources, data curation, writing original draft, reviewing and editing manuscript, visualization, supervision, project administration, and funding acquisition. TS: formal analysis, investigation, reviewing and editing manuscript, visualization, and project administration. IM: software and resources, reviewing and editing the manuscript. All authors were accountable in each step of the study, and they read and agreed to the published version of the manuscript.

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Data Availability

The datasets generated and analyzed in this article are available from the corresponding author.

Declaration of Use of AI in Scientific Writing

There is nothing to declare.

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