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Development and Pilot Study of Chatbot-based  
Sexual and Reproductive Health Literacy Intervention  
for Safe Sexual Behavior Intention  
among Racial and Ethnic Female Adolescents

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Development and Pilot Study of Chatbot-based  
Sexual and Reproductive Health Literacy Intervention  
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## ABSTRACT

### **Development and Pilot Study of Chatbot-based Sexual and Reproductive Health Literacy Intervention for Safe Sexual Behavior Intention among Racial and Ethnic Female Adolescents**

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**Background:** The demand for promoting safe sexual behavior is growing due to the notable disparities in sexual and reproductive health among racial and ethnic female adolescents. However, the inadequate levels of sexual and reproductive health literacy among racial and ethnic female adolescents further exacerbate these disparities. Therefore, this study aims to evaluate the implementation process and potential effects of an intervention designed to promote safe sexual behavior among racial and ethnic female adolescents.

**Methods:** The chatbot-based sexual and reproductive health literacy intervention (BORA: Bot of sexual and reproductive health literacy for adolescents) was developed using intervention mapping, culturally tailored strategies, sexual and reproductive health literacy,

and a chatbot. The study was conducted with a nonequivalent control group pretest-posttest design, comprising 24 Vietnamese adolescent females born in South Korea. The experimental group engaged in free-form chatbot conversations regarding safe sexual behavior over two weeks and received sexual and reproductive health literacy educational modules four times per week (eight sessions). Comparatively, the control group did not receive any intervention. A structured questionnaire was utilized for both the experimental and control groups to assess the potential effects of sexual and reproductive health literacy, safe sexual behavior attitudes, safe sexual behavior subjective norms, safe sexual behavior self-efficacy, and safe sexual behavior intentions before and after the intervention. The experimental group self-reported through a structured questionnaire, and administration data was concurrently collected to evaluate implementation process outcomes such as acceptability, appropriateness, feasibility, and fidelity. The data analysis was conducted using IBM SPSS Statistics version 26.0 and STATA. Descriptive statistics and mixed-effects models were employed for the analysis.

**Results:** The BORA intervention demonstrated considerable levels of acceptability, appropriateness, and feasibility. However, fidelity was relatively low, encompassing adherence rate and participants' responsiveness. The safe sexual behavior intention, the primary outcome of potential effects, in the experimental group did not significantly increase over time compared to the control group. Nevertheless, safe sexual behavior subjective norms and self-efficacy, the secondary outcomes, in the experimental group demonstrated a statistically significant increase over time compared to the control group.

**Conclusion:** The BORA intervention promotes the practice of safe sexual behavior by enhancing subjective norms and self-efficacy. The fidelity of the intervention depends on the chatbot's accurate response rates. Therefore, preliminary research utilizing AI-based open interfaces for extensive data collection and establishing strategies should be conducted to improve the implementation process outcome.

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Key words: Racial and Ethnic Female Adolescent, Safe Sexual Behavior, Sexual and Reproductive Health Literacy, Chatbot, Pilot Study, Implementation Outcome

# I. INTRODUCTION

## A. Backgrounds

Adolescence constitutes the transitional phase from childhood to adulthood, wherein an individual's adherence to safe sexual behavior plays a pivotal role in shaping their subsequent sexual and reproductive health, as well as overall quality of life (World Health Organization [WHO], 2022). Nevertheless, female adolescents who engage in risky sexual behaviors can result in undesired pregnancies, unsafe abortions, and the contraction of sexually transmitted infections (STIs), including human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS). The occurrence of pregnancy and childbirth in female adolescents exerts adverse effects on the health of the mother and newborn child and expedites the rise in detrimental social consequences, encompassing disruptions in education, societal stigma, diminished employment opportunities, and compromised economic empowerment (United Nations Children's Fund, 2022).

Interestingly, racial and ethnic disparities play a significant role in influencing adverse sexual and reproductive health outcomes among female adolescents (Demissie et al., 2022). Among racial and ethnic adolescents who have had sexual experience, 55.9% report safe sexual behavior, while among native Korean adolescents who have had sexual experience, 67.5% report safe sexual behavior (Korea Disease Control and Prevention Agency, 2021). Specifically, 45.8% of female adolescents from racial and ethnic backgrounds engage in safe sexual behavior, compared to 67.7% of native Korean female adolescents. Despite a

notable reduction in the pregnancy rate among racial and ethnic female adolescents, decreasing from 36.3% in 2018 to 14.8% in 2021, it remains substantially elevated compared to the 2.1% rate among native Korean female adolescents, demonstrating a disparity of seven-fold. Empirical studies indicate that disparities in safe sexual behavior among racial and ethnic female adolescents stem from prevalent negative attitudes towards contraception, elevated subjective norms for negotiating contraception with partners, and diminished self-efficacy for engaging in communication about sex with partners (Barral et al., 2020; Carmack et al., 2022; Kamke et al., 2022).

Sexual and reproductive health literacy (SRHL) involves the ability to access, understand, appraise, and apply information pertaining to sexual and reproductive health. (WHO, 2016). This capacity empowers individuals to make informed decisions concerning their sexual and reproductive health, as well as related matters. Improving SRHL has the potential to increase knowledge, motivation, and skills that promote safe sexual behavior. This, in turn, can contribute to reducing the risk of HIV/STIs and preventing unintended pregnancies, early childbearing, and maternal mortality. Promoting SRHL, particularly among adolescents, has been shown to increase the use of contraception (Barchi et al., 2022) and reduce the occurrence of unplanned pregnancy (Alzate et al., 2021; Dongarwar & Salihu, 2019). Therefore, promoting SRHL in adolescence can ensure a healthy transition to adulthood.

Nevertheless, a notable deficiency in SRHL has been discerned across racial and ethnic female adolescents (Le & Yu, 2021; Lirios et al., 2023; Meherali et al., 2022). Racial and ethnic female adolescents encounter challenges in engaging in sexual communication

with their parents, confronting limited access to healthcare services, and contending with prejudiced attitudes from healthcare providers. Consequently, they encounter impediments in obtaining sexual and reproductive health information, relying primarily on peer networks and media sources. Furthermore, disseminating sexual and reproductive health information, which employs medical terminology, presents a comprehensive challenge for racial and ethnic female adolescents. Moreover, their ability to appraise such information is compromised by entrenched cultural customs, beliefs, and traditions related to sexual and reproductive health, thereby hindering the assimilation of crucial knowledge concerning safe sexual behavior. Ultimately, they experience discrimination from healthcare providers in the application of sexual and reproductive health information, coupled with societal taboos regarding sexuality, which impede proactive contraceptive preparations and communication with partners about contraception. Despite the identified negative impact of low SRHL on safe sexual behavior among racial and ethnic female adolescents, there is a gap in the research exploring the SRHL of racial and ethnic female adolescents in South Korea and incorporating it into interventions to promote safe sexual behavior.

Digital technologies, including games, social media, and the internet, are increasingly employed as strategies to enhance SRHL among adolescents (Haruna et al., 2018; Narkarat et al., 2021; Wong et al., 2021). The utilization of digital technologies fosters SRHL among adolescents, positively impacting knowledge, attitudes, norms, self-efficacy, and safe sex behavior. Specifically, utilizing chatbots offers advantages such as accessibility, convenience, neutrality, avoidance of moral judgments, and anonymity, thereby increasing participation rates among adolescents (Maenhout et al., 2021) and improving adherence to

health behavior (Aggarwal et al., 2023). Furthermore, culturally tailored interventions for racial and ethnic female adolescents have demonstrated a positive influence on the use of contraception (Dorsey et al., 2022; Evans et al., 2020a). Intervention mapping, a process that collaborates with adolescents and various stakeholder groups to design interventions, is emerging as a promising tool for addressing issues related to adolescent sexual and reproductive health (Van Lieshout et al., 2018). However, conducting sexual and reproductive health interventions for racial and ethnic populations has faced challenges, such as low attendance and retention rates (Evans et al., 2020a; Joo & Liu, 2021). Therefore, it is essential to conduct pilot studies to identify and overcome barriers by evaluating the intervention implementation processes. This approach enhances internal validity and confirms implementation outcomes, including acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability (Proctor et al., 2011).

In essence, the promotion of safe sexual behavior among racial and ethnic female adolescents necessitates addressing obstacles in accessing, understanding, appraising, and applying sexual and reproductive health information. This, in turn, fosters positive enhancements in safe sexual behavior attitudes, subjective norms, and self-efficacy. The integrated model of health literacy offers insight into how health information influences behaviors and outcomes by navigating the stages of access, understanding, appraisal, and application (Sørensen et al., 2012). Within this model, health literacy is shaped by personal, contextual, social, and environmental factors, evolving into knowledge, motivation, and skills across four pathways—contributing to population-level health in healthcare, disease



prevention, and health promotion. Similarly, the theory of planned behavior delineates a path where attitudes, subjective norms, and perceived control influence the intention of an individual, ultimately guiding behavior (Ajzen, 1991). Simply, the knowledge, motivation, and skills derived from accessing, understanding, appraising, and applying sexual and reproductive health information can exert a positive influence on attitudes, subjective norms, and self-efficacy regarding safe sexual behavior. This, in turn, shapes the intention for safe sexual behavior—a cognitive representation of voluntary effort.

Hence, employing the integrated model of health literacy and the theory of planned behavior as a conceptual framework, this study focused on SRHL as the pivotal concept to determine the safe sexual behavior intention among racial and ethnic female adolescents. To ensure that the specific needs of the target population were achieved, culturally tailored strategies were employed, and a chatbot—preferred by adolescents—served as the delivery mechanism. Additionally, a pilot study was undertaken to assess the acceptability, appropriateness, feasibility, and fidelity of implementing an intervention among racial and ethnic female adolescents, thereby gauging the potential effectiveness of an intervention.

## **B. Purpose**

This study aimed to develop a chatbot-based SRHL intervention to promote safe sexual behavior among racial and ethnic female adolescents and conduct a pilot study to evaluate the process and potential effectiveness of implementing an intervention. The specific purposes of the study:

1. Evaluate the process outcomes (acceptability, appropriateness, feasibility, and fidelity) of implementing a chatbot-based SRHL intervention to promote safe sexual behavior among racial and ethnic female adolescents.
2. Evaluate the potential effectiveness of a chatbot-based SRHL intervention in promoting safe sexual behavior among racial and ethnic female adolescents (SRHL safe sexual behavior attitudes, safe sexual behavior subjective norms, safe sexual behavior self-efficacy, and safe sexual behavior intention).

### **C. Research hypothesis**

The experimental group participating in the chatbot-based SRHL intervention will have higher potential effectiveness over time than the control group, who did not participate.

1. The SRHL in the experimental group will be higher than in the control group.
2. The safe sexual behavior attitude in the experimental group will be more positive than in the control group.
3. The safe sexual behavior subjective norms in the experimental group will be more positive more than in the control group.
4. The safe sexual behavior self-efficacy in the experimental group will increase more than in the control group.
5. The safe sexual behavior intention in the experimental group will increase more than in the control group.

## **D. Definitions of concepts**

### **1. Racial and ethnic female adolescents**

Theoretical definition: It refers to the female adolescent who is the child of a person whose father, mother, or both parents are foreign-born.

Operational definition: It refers to the adolescent children of a woman born in Vietnam who relocated to South Korea for marriage. The adolescents were born in South Korea, were of South Korean nationality, and lived in South Korea.

### **2. Sexual and reproductive health literacy**

Theoretical definition: SRHL is the ability to access, understand, appraise, and apply sexual and reproductive health information (from physical and psychological development to sexual reproductive rights) to address, manage, and promote sexual and reproductive health (WHO, 2016).

Operational definition: SRHL is defined as the ability to access, understand, appraise, and apply sexual and reproductive health information for safe sexual behavior, as measured by Questionnaire of the Sexual and Reproductive Health Literacy developed by Vongxay et al. (2022) and translated into Korean in this study.

### **3. Safe sexual behavior intention**

Theoretical definition: Safe sexual behavior intention is the desire to use contraception to prevent unplanned pregnancy, childbirth, sexually transmitted diseases, and artificial conception.

Operational definition: Safe sexual behavior intention was defined as a score measured by scoring a single question, "If you engage in sexual behavior, how often do you intend to engage in safe sexual behavior (use contraception)".

### **4. Safe sexual behavior attitude**

Theoretical definition: Safe sexual behavior attitude was defined as a positive or negative evaluation of safe sexual behavior in an individual (Ajzen, 1991).

Operational definition: Safe sexual behavior attitude was defined using scores derived from Condom Attitude Scale developed by Kang & Jang (2004).

### **5. Safe sexual behavior subjective norm**

Theoretical definition: Safe sexual behavior subjective norm refers to the degree to which a significant other emphasizes the importance of engaging in safe sexual behavior (Ajzen, 1991).

Operational definition: Safe sexual behavior subjective norm was defined using scores derived from Subjective Norm for Smoking Cessation developed by Primack et al. (2007) and modified by Hwang & Jung (2014).

## **6. Safe sexual behavior self-efficacy**

Theoretical definition: Safe sexual behavior self-efficacy refers to the difficulty and ease of performing safe sexual behavior as perceived by an individual (Ajzen, 1991).

Operational definition: Safe sexual behavior self-efficacy was measured using the Condom Self-efficacy tool developed by Hanna (1999) and translated into Korean by Cha et al. (2008).

## **II. LITERATURE REVIEW**

### **A. Safe sexual behavior among racial and ethnic female adolescents**

Racial and ethnic adolescents possess at least one parent from a different cultural or ethnic background who grew up or currently resides in South Korea (Ministry of the Interior and Safety, 2022). In South Korea, racial and ethnic adolescents are variously referred to as racial and ethnic students (by the Ministry of Education), children of racial and ethnic families (by the Ministry of Gender Equality and Family), and children of foreign residents (by the Ministry of the Interior and Safety). In 2022, the racial and ethnic adolescent population reached 168,645, marking a growth of approximately 3.6 times compared to a population of 46,954 when recorded in 2012 (Ministry of Education, 2022). Thus, racial and ethnic adolescents form 3.0% of the overall adolescent population across different education levels: 111,704 (66.2%) in elementary school, 39,899 (23.6%) in middle school, and 17,042 (10.1%) in high school. Notably, the percentage of racial and ethnic adolescents with parents from Vietnam increased significantly, growing from 7.3% in 2012 to 32.4% in 2022.

The findings from the Korean Youth Risk Behavior web-based Survey<sup>1</sup> conducted among Korean adolescents over the past five years are presented in Table 1 (Korea Disease Control and Prevention Agency, 2021). From 2018 to 2021, the incidence of sexual experience<sup>2</sup> among racial and ethnic adolescents was approximately twice as high as that among Korean adolescents (Park, 2020; Son & Choi, 2020). Specifically, racial and ethnic female adolescents exhibited higher rates of sexual experience compared to their Korean counterparts. The age of the first sexual experience among racial and ethnic female adolescents decreased by 1.22 years, shifting from  $15.95 \pm 2.44$  years in 2018 to  $14.73 \pm 2.51$  years in 2021. Thus, the disparity with the age of Korean female adolescents widened slightly, increasing from 0.52 years in 2018 to 1.36 years in 2021.

The rate of contraceptive use among racial and ethnic female adolescents is also low, at around 50%, compared to native Korean female adolescents (Kwon et al., 2021). Condoms (75.2%) and oral contraceptives (6.57%) were the primary methods used by racial and ethnic adolescents for safe sexual behavior. However, a variety of methods were used, including analyzing menstrual cycles, emergency contraceptive pills, and intrauterine devices (Kwon et al., 2021). Finally, the pregnancy rate among racial and ethnic female

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<sup>1</sup> The Korean Youth Risk Behavior web-based Survey is a nationally representative survey that has been conducted annually since 2010, and its indicators of adolescent sexual and reproductive health are the prevalence of sexual intercourse, the contraceptive use rate among those who have had sexual intercourse, annual sex education (10–21 years), the prevalence of sexual intercourse before entering middle school, the age of first sexual intercourse, and the pregnancy experience rate (10–16, 18, and 21 years).

<sup>2</sup> Excludes missing data and outliers (32% of racial and ethnic adolescents in 2018 had a sexual experience before entering elementary school)

adolescents was approximately nine times higher than among native Korean female adolescents in 2018 and 7 times higher in 2021. Therefore, interventions are needed for racial and ethnic female adolescents to increase these low rates of safe sexual behaviors, incorrect contraceptive use, and high pregnancy rates, which are adverse sexual and reproductive health outcomes.



**Table 1.** Safe sexual behavior status among racial and ethnic and native Korean adolescents (2018~2021)

Variables	2018		2019		2020		2021	
	Racial and ethnic (n=976)	Native Korean (n=58,434)	Racial and ethnic (n=749)	Native Korean (n=36,979)	Racial and ethnic (n=1,065)	Native Korean (n=41,692)	Racial and ethnic (n=1,169)	Native Korean (n=40,146)
Sexual								
experience	81(8.3)	2,950(5.0)	51(6.8)	1,812(4.9)	47(4.4)	1,626(3.9)	59(5.0)	1,787(4.5)
Male	48(4.92)	1,953(3.35)	30(4.00)	1,172(3.17)	19(1.78)	966(2.32)	32(2.74)	1,032(2.57)
Female	33(3.38)	997(1.71)	21(2.80)	640(1.73)	28(2.63)	660(1.58)	27(2.31)	755(1.88)
Age at first								
sexual								
experience	15.29±2.93	16.14±1.92	-	-	-	-	14.78±2.58	16.03±1.88
Male	14.83±3.18	15.95±2.00	-	-	-	-	14.81±2.68	15.98±1.99
Female	15.95±2.44	16.47±1.73	-	-	-	-	14.73±2.51	16.09±1.72
Contraceptive								
use rate	34(42.0)	1,837(62.3)	27(52.9)	1,094(60.4)	24(51.1)	1,106(68.0)	33(55.9)	1,207(67.5)
Male	18(37.5)	1,181(60.5)	17(56.7)	690(58.9)	7(36.8)	653(67.6)	15(46.9)	696(67.4)
Female	16(48.5)	656(65.8)	10(31.3)	404(63.1)	17(60.7)	453(68.6)	18(45.8)	511(67.7)
Pregnancy rate	13(36.3)	40(4.0)	-	-	-	-	4(14.8)	16(2.1)

## **B. Determinants of safe sexual behavior among racial and ethnic female adolescents**

A secondary data analysis employed the 14th Korean Youth Risk Behavior web-based survey (2018) revealed that personal factors (younger age, drinking experience, and substance use), family factors (not living with family), and school factors (not receiving sex education classes) further negatively impacted on safe sexual behavior among 81 racial and ethnic adolescents (Kwon et al., 2021). A secondary data analysis using Youth Risk Behavior Surveillance (2015) also revealed that among 1167 African–American female adolescents and 2365 Hispanic/Latino female adolescents in grades 9–12, alcohol or drug use exerted a detrimental influence on safe sexual behavior (Gleton et al., 2019). As a result of conducting focus groups and in-depth interviews in Kansas, United States, with Latina adolescents aged 14 to 15 on factors influencing safe sexual behaviors, it was found that limited access to sexual and reproductive health information, cultural differences, a lack of sex education, the quality of school sex education programs, and negative personal attitudes toward pregnancy were important negative factors (Barral et al., 2020). Cultural differences included a lack of sexual communication between parents and children due to familial shame and taboos around sex in Latino cultures. A qualitative study that examined multi-level barriers to safe sexual behavior among racial and ethnic adolescents (black, Latino, Asian, biracial, etc.) aged 12–19 in the United States found that they consented to unwanted or risky sexual behaviors owing to a fear of disconnection from their partners (Kamke et

al., 2022). Finally, high condom self-efficacy among racial and ethnic adolescents was found to influence safe sexual behavior positively (Carmack et al., 2022).

### **C. Intervention for improving the safe sexual behavior among racial and ethnic female adolescents**

A previous systematic review of sexual health programs for racial and ethnic (black) female adolescents abroad found that interventions increased safe sexual behavior (Dorsey et al., 2022). They primarily measured condom use directly while also using health literacy, self-efficacy, and verbal communication skills related to condom negotiations across all interventions. However, the social determinants of health, such as racial and ethnic background, suggest that culturally designed interventions should be considered to improve sexual health inequalities in this group. In addition, associations between sexual health interventions and sexual behavior among racial and ethnic (black) adolescents were identified in a systemic review that primarily measured biological (pregnancy, STI infection), psychological (sexual health knowledge, self-efficacy, and intentions), and behavioral outcomes (abstinence, condom use, and several sexual partners) (Evans et al., 2020b). These results confirmed the effects on psychological outcomes (sexual behavior knowledge, self-efficacy, and intentions) and behavioral outcomes (abstinence, condom use). For condom use, interventions were more effective when all participants were present. A meta-analysis of sexual health programs in the United States for Latino adolescents found that 12 studies found improvements in psychological outcome (sexual health

knowledge) and behavioral outcomes (abstinence, condom use, the number of sexual partners) (Evans et al., 2020a). In particular, culturally tailored studies presented medium effect sizes. Finally, another study investigated sex education programs for Asian–American adolescents from 2004 to 2015, where adolescents were provided with a variety of activities, including sexual communication, promoting the use of condoms, and educational outreach to peers, parents, and the community (Lee et al., 2015). These interventions presented positive results compared to the control group, such as increased use of contraception, including condoms, increased sexual knowledge, and increased communication.

Before confirming the effectiveness of the newly developed intervention, a pilot study should precede to assess potential effects on the process and outcomes of intervention implementation. A pilot study is characterized as the small-scale testing of methods and procedures intended for broader implementation (Thabane et al., 2010). The goal of pilot testing is to assess the feasibility or acceptability of an intervention for use in a larger study. Simply, it aims to collect information that will help answer the questions, "Can this intervention be performed?" or "Can a full-scale study be conducted in the way planned?" rather than "Is this intervention effective?" Before pilot testing, the items for assessing feasibility should be defined, and the criteria for determining feasibility should be established. First, the feasibility of the intervention process is assessed. It is assessed by evaluating the recruitment rates, retention levels, eligibility criteria, and possible time and resource issues. Next, possible problems with data management are identified. Then, safety

is evaluated in treatment, whereby the dose level and response are confirmed, and the treatment effect and variance are estimated. In addition, it is vital to conduct pilot testing with the same study group and study design as the main study. Any results related to the effectiveness of the intervention presented should be interpreted as "potential effects."

Since the retention of participants for the entire duration of the intervention is essential to ensure the validity and reliability of the study and to obtain adequate sample power, it is vital to identify the reasons for low attendance and high dropout rates. It is also important to measure the intervention capacity and fidelity of evidence-based interventions, although no intervention process evaluation is conducted, which threatens internal validity. In conclusion, barriers should be identified and removed through an intervention assessment. Proctor proposed eight implementation outcome indicators to measure the effectiveness of an intervention: Acceptability, adoption, appropriateness, feasibility, fidelity, cost, penetration, and sustainability (Proctor et al., 2011). Those outcomes can be measured using a variety of approaches, ranging from qualitative and quantitative surveys and record reviews with various stakeholders (providers, consumers, administrators, and agencies). Depending on the nature of the implementation outcome, the timing of measurements may need to be examined at different periods, such as before, during, and after the intervention.

A systematic review of existing sex education programs for multi-ethnic adolescents found that intervention assessments included measures of attendance, attrition, intervention

fidelity, feasibility, and cost (Evans et al., 2020a). The pilot testing of a chatbot for a coaching program for adolescents measured feasibility (overall usefulness of the chatbot, ease of use, and value of the program) and satisfaction through questionnaires at the end of each of the eight sessions (Gabrielli et al., 2020). In addition, in the pilot testing of a chatbot developed for adolescent health promotion, chatbot transcript analysis and interviews were conducted to assess its feasibility (content, design, and interaction with the chatbot) and ensure that it works as expected in a real-world setting (Maenhout et al., 2021). In conclusion, conducting pilot testing to determine the results of intervention implementation is essential to improving health behaviors and health problems in the group.

Nevertheless, no sexuality education programs have been presented in the country for racial and ethnic female adolescents. The literature review suggests that interventions to promote safe sexual behaviors need to be culturally tailored and developed to include practical skills related to condom use, knowledge, self-efficacy, and condom negotiation.

## **D. Strategies for improving the safe sexual behavior among racial and ethnic female adolescents**

### **1. Sexual and reproductive health literacy**

Sexual and reproductive health literacy (SRHL) involves the capability to access, comprehend, evaluate, and apply information on sexual and reproductive health, enabling individuals to make informed decisions that address their specific sexual and reproductive health needs and concerns (WHO, 2016). SRHL can increase knowledge, motivation, and skills to delay risky sexual behavior, support safe sexual behavior, and reduce the risk of HIV/STIs as a health outcome while also preventing unintended pregnancy, early childbearing, and maternal death. Specifically, SRHL in adolescents improves their knowledge, attitudes, norms, and self-efficacy (Wong et al., 2021), increases contraceptive use (Barchi et al., 2022), and reduces the chance of unplanned pregnancies (Alzate et al., 2020; Dongarwar & Salihu, 2019).

In studies with adolescents, SRHL has been defined as sexual literacy (Alzate et al., 2020), contraceptive literacy (Barchi et al., 2022), sexual health literacy (Haruna et al., 2018), pregnancy health literacy (Santisouk et al., 2020), reproductive health literacy (Ma et al., 2021), and sexual and reproductive health literacy (Dongarwar & Salihu, 2019; Narkarat et al., 2021; Vongxay et al., 2019) (Table 2). SRHL has been defined as knowledge, skill (personal, cognitive, social), ability, understanding, motivation, competence, and confidence. The specific SRHL process was to access, understand, appraise, and apply. The objective of SRHL was to make healthy decisions in sexual

relationships or about sex (e.g., choose effective contraception methods) through informed decision-making to cope with sexual and reproductive health problems. Information on sexual and reproductive health is included, ranging from sexual behavior, contraception, correct use, teenage pregnancy, reproductive health determinants, behavioral risk factors, and health service utilization. Thus, SRHL at an adolescent age can be described as the achievement of knowledge, confidence, and skills of an individual to apply their socio-cognitive ability to access, understand, appraise, and apply sexual and reproductive health-related information to make healthy sexual decisions within sexual relationships.

However, low levels of SRHL have previously been identified in racial and ethnic female adolescents (Le & Yu, 2021; Lirios et al., 2023; Meherali et al., 2022). Notably, racial and ethnic female adolescents experienced cultural and structural disparities in access to sexual and reproductive health information. Racial and ethnic adolescents were unable to communicate about sex with their parents in cultures where sex was taboo. Sexuality education in schools was lacking, and regional disparities meant there were no accessible places from which sexual and reproductive health information could be obtained. Additionally, barriers to access included public stigma about adolescents using services for sexual and reproductive health information. Therefore, racial and ethnic female adolescents accessed sexual and reproductive health information primarily through mass media, the internet, YouTube, and friends (Bleakley et al., 2018). However, they experienced difficulties in understanding and accepting the sexual and reproductive health information they received. The evaluation of sexual and reproductive health information among racial



and ethnic adolescents was additionally shaped by the customs and traditions associated with this domain. For example, attitudes that view premarital sex and pregnancy as sinful promote shaming of safe sexual behavior. Moreover, YouTube was used as the primary source of sexual and reproductive health information, although it was reported as a difficult source to trust. Thus, cultural taboos against sex outside of marriage and discriminatory attitudes by healthcare providers in the application of sexual reproductive health information led to traditional methods being the most viable contraceptive or abortifacient treatment. In addition, females were willing to visit a clinic for sexual and reproductive health services but could not, owing to communication difficulties with their parents. Finally, failure to convince a partner to use contraception and a lack of contraceptive preparation led to unsafe sexual behavior. Cultural differences in racial and ethnic groups also affect beliefs regarding illness, how people experience symptoms and emotions, and ultimately, self-care behaviors and treatment decisions (Mantwill & Schulz, 2017). Thus, differences in cultural backgrounds among racial and ethnic female adolescents can lead to low levels of SRHL, which in turn prevents them from achieving the cognitive factors that lead to safe sexual behavior.

In conclusion, disparities in SRHL among racial and ethnic female adolescents arising from diverse cultural backgrounds have a detrimental effect on safe sexual behaviors. Therefore, it is crucial to prioritize efforts to enhance SRHL among racial and ethnic female adolescents.

**Table 2.** Concepts and definitions of sexual and reproductive health literacy

Concepts	Authors (year)	Design	Setting	Population	Definition			
					Ability	Process	Related information	Objective
Sexual literacy	Alzete et al. (2020)	Secondary analysis	Colombia	Female adolescents Aged 13-19	Knowledge		sexuality-related topics	
Contraceptive literacy	Barchi et al. (2022)	Cross-sectional	Botswana	Male and female adolescents Aged 14-19	Knowledge		Contraception, correct use of condoms	To make healthy decisions in sexual relationships
Sexual health literacy	Haruna et al. (2018)	RCT	Tanzania	Male and female lower secondary school students Aged 11-15	Knowledge and skills			To make safe sexual choices
Pregnancy health literacy	Santisouk et al. (2020)	Cross-sectional	Lao PDR	Male and female adolescents Aged 15-19	Ability	Access, understand, appraise, and apply	Teenage pregnancy prevention	Into informed decision making
Reproductive health literacy	Ma et al (2021)	Intsrument developme nt	China	Unmarried adolescents Aged 16-25	Ability	Access, understand, appraise, and apply	Determinants of reproductive health, behavioral risk factors, and utilization of health services	
Sexual and reproductive health literacy	Dongawar et al (2019)	Cross-sectional	Latin America	Female adolescents Aged 15-19	Understand		Risk of pregnancy, effective contraceptive methods	
	Vongxay et al (2019)	Cross-sectional	Lao PDR	Male and female high school students Aged 15-19	Knowledge, motivation, and competences	Access, understand, appraise, and apply	Sexual and reproductive health-related information	To cope with Sexual and reproductvie heatlh problems
	Narkarat et al (2021)	Quasi-experiment al design	Thailand	Female secondary school students Aged: x	Cognitive and social skills			To develop a positive sexual behavior.

Four interventions targeting SRHL were implemented among adolescents (Table 3) (Haruna et al., 2018; Narkarat et al., 2021; Thongkorn & Chaimongkol, 2023; Wong et al., 2021). All four studies employed a randomized controlled trial (RCT) design and were performed in Thailand (n=2), Tanzania (n=1), and Hong Kong (n=1). Participants comprised adolescents spanning from middle school to college, including both males and females (n=1), exclusively females (n=1), and couples (n=1). The intervention aimed to assess the effectiveness of a game, mobile messaging, a web-based SRHL intervention, and a school-based program. Each intervention was spaced 1 to 3 weeks apart and ranged in length from 1 to 24 weeks, with each being delivered for 30 to 120 minutes. Each intervention was provided using a school computer lab (n=1), online (n=2), and school and online (n=1). The intervention was delivered through computer-based games (n=1), social media (n=2), and web-based programs (n=1). The variables being measured included SRHL (adolescent sexual health literacy tests, sexual health literacy), social cognitive factors (knowledge, attitude, norm, and self-efficacy of condom use), and health behaviors (pregnancy prevention behavior, consistency of condom use, sexual risk behavior). The contents of the SRHL intervention were: (1) sexual responsibility and decision-making (sexual consent); (3) peer pressure; (4) prevention of STDs, STIs, HIV, and AIDS; (5) harmful practices and sexual violence; (6) cervical cancer; (7) teen pregnancy and contraception.

A key strategy in all four studies was using digital technologies: gamification, Facebook, LINE, and an interactive web-based program. Gamification utilized gaming mechanisms, including badges, leaderboards, and point systems (Haruna et al., 2018), and delivered sexual health education animations based on the SRHL process through SNS

(Narkarat et al., 2021). Furthermore, a web-based program provided information, feedback, scenario-based videos, and questions and answers on STIs, cervical cancer, and contraception (Wong et al., 2021). Finally, communication was conducted through LINE (Thongkorn & Chaimongkol, 2023). The results of the intervention confirmed that improvements in SRHL occurred in all interventions, with positive changes in attitude, norms, and self-efficacy observed at 3 months among socio-cognitive factors and positive changes in all health behaviors, except consistent use of condoms.

All four interventions showed increased levels of SRHL, as well as increased knowledge, attitudes, norms, self-efficacy, and safe sexual behaviors. All these studies utilized digital technologies, such as games, social media, and the internet. Therefore, it calls for interaction-based interventions that emphasize increasing proactive health behaviors among racial and ethnic female adolescents by utilizing digital tools that are accessible from anywhere, considering the digital capabilities of the adolescent group.

**Table 3.** Sexual and reproductive health literacy intervention

Authors (year)	Design (setting)	Purpose	Participants	Theory	Used ICT	Procedure				Results
						Duration	Space	Contents	Components	
Haruna et al (2018)	RCT (Tanzania)	To investigate the extent to which GBL and gamification can improve the sexual health education	Lower secondary school students aged 11-15 N=120	Activity Theory Theory sociocultural learning theory	Gamification with UNITY5  GBL with Moodle	40-min Once a week For five weeks  40-min a week for five weeks	Computer lab	<ul style="list-style-type: none"> <li>Sexual responsibility and decision-making</li> <li>Peer pressure</li> <li>Prevention of STDs, HIV, and AIDS;</li> <li>Harmful practices and sexual violence.</li> <li>Unwanted pregrnany</li> <li>Contraception</li> </ul>	Badges /Point system/ Quiz/ Leaderboard  Badges/ Point system/ Quiz/ exercises/ Play game	• SRHL (+)
Narkarat et al (2021)	RCT (Thailnad)	To evaluate the effects of mobile messages to improve sexual and reproductive health literacy	Female Secondary Schools students N=128	None	Facebook & LINE application	For 24 weeks 3 per week	Online	<ul style="list-style-type: none"> <li>Cervical cancer</li> <li>Sexually transmitted infections</li> <li>Sexual coercion</li> <li>Condoms</li> <li>Sexual consent</li> </ul>	Animation message (infographic, picture, real-life example)	SRHL (+)
Wong, J et al (2021)	Multi-center RCT (Hong Kong)	To examine the effects of an interactive web-based sexual health literacy program to promote safe sex practice	Female University students N=781	Health Belief Model Continuum of Conflict and Control theory	Interactive web-based	Once 30 min	Online	<ul style="list-style-type: none"> <li>Cervical cancer</li> <li>Sexually transmitted infections</li> <li>Sexual coercion</li> <li>Condoms</li> <li>Sexual consent</li> </ul>	Self-check/ Give information and videos/ Personal feedback/ Reflect on benefits or barriers	Primary outcome: consistency of condom use (-) Secondary outcomes (3 month): knowledge, attitude, norms, self-efficacy (+)
Thongkorn et al (2023)	RCT (Thiland)	To evaluate the effects of school-based intervention for pregnancy prevention	Secondary school female students aged 13~15 Their boyfriends aged 15~18 N=37 dyads	Information-Motivation-Behavioral Skills Model	None  LINE application	For 4 weeks Once a week (120 mins)  For 2 weeks Once a week (60 mins)	School  Online	<ul style="list-style-type: none"> <li>Sexual risk,</li> <li>Teen pregnancy,</li> <li>Prevention</li> </ul>	Games/ group discussions/ video clip/ role-playing/ practical demonstration/ online search activities/ media critique Communicating	SHL (+) Pregnancy prevention behavior (+) Sexual risk behavior (+)

## 2. Chatbot

Chatbots, also known as conversational agents, are dialogue systems that enable natural language conversations with users via voice, text, or both. Chatbots can be deployed as mobile apps on smartphones, making them available around the clock. As they become convenient digital communication channels, their potential as a tool to promote health behavior change is increasing (Aggarwal et al., 2023). Adolescent groups also favor chatbots for their anonymity and connection to adolescent culture (Maenhout et al., 2021). In addition, interventions delivered to adolescents using real-time, interactive chatbots ranged in duration from one week to four weeks, with daily to twice-weekly intervals (Gabrielli et al., 2020; He et al., 2022).

Building on these advantages, chatbots can facilitate conversations about intimate topics, such as safe sexual behavior and family planning, providing a personalized, non-judgmental, safe space. In India, a chatbot called SnehAI was developed to provide sexual and reproductive health information to young people (Wang et al., 2022). Based on Facebook Messenger, SnehAI consisted of five categories: Introduction, video, story, game, and helpline, which were presented as hyperlinks, images, or short videos, depending on the topic selected. As a result of analyzing how the chatbot was used over five months, nearly half of its use was for questions or conversations outside of the five categories suggested by the chatbot. Topics included safe sexual behavior (sexual consent, etc.), contraception (birth control pills, abortion), reproductive health (periods, discharge, etc.), and adolescent sexual health issues (daydreaming, masturbation, pornography, STIs). "Planned Parenthood," a non-profit organization providing sexual and reproductive

healthcare, sexuality education, and information, developed a chatbot in 2019 known as “Roo” to provide a place for female adolescents to ask questions<sup>3</sup>. “Roo” provides personalized, immediate, and accurate information to female adolescents and connects them to health educators if they require urgent assistance. In South Korea, Sunil Bigdata High School and the AHA Seoul Youth Culture Center developed "Songa," an artificial intelligence chatbot for consulting on sexual problems<sup>4</sup>. Users can freely ask questions, and sexual health information is provided through various information and education documents.

Hence, chatbots offer advantages such as accessibility (regardless of location and time), convenience (immediate provision of needed information), neutrality (free from moral judgment and non-discriminatory), and anonymity (for users who do not wish to be identified) in delivering sexual reproductive health information. This highlights the potential of chatbots as valuable tools for implementing interventions that promote safe sexual behavior among racial and ethnic female adolescents.

### **3. Culturally tailored intervention**

A culturally tailored intervention means “adjusting the study design, materials, and other components of the intervention to reflect cultural needs and preferences at the population level” (Torres-Ruiz et al., 2018). Kreuter et al. (2003) suggested five culturally appropriate strategies for promoting health. First, programs and materials should be framed

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<sup>3</sup> Planned Parenthood. <https://www.plannedparenthood.org/learn/roo-sexual-health-chatbot>

<sup>4</sup> <https://www.sedaily.com/NewsView/22V6AKFQP9>

in ways that appeal to specific groups (peripheral), and the perceived relevance of health issues should be enhanced by presenting evidence of their impact on specific groups (evidential). Subsequently, enhancing the accessibility of educational programs and materials involves delivering them in the predominant or native language of a specific group (linguistic). Then, through directly relying on the experiences of members of specific groups (constituent-involving), ultimately, health-related issues are deliberated within the framework of the broader social and cultural values and characteristics inherent to the target audience (sociocultural). As a result of analyzing culturally tailored interventions for racial and ethnic groups, constituent-involving strategies were the most common, followed by linguistic, socio-cultural, evidential, and peripheral strategies (Torres-Ruiz et al., 2018).

Furthermore, research examining the essential elements of culturally tailored interventions for racial and ethnic groups suggests the following (Im & Chee, 2021): First, respecting cultural uniqueness means specifically meeting culturally unique needs with a research question helpful for addressing the problems of a particular cultural group and their interest in improving their lives. Second, understanding cultural contexts involves understanding and considering the specific cultural context of the health and illness-related experiences of the participants involved in the research. Third, appropriate cultural examples should be used, and fourth, the intervention process should be flexible, requiring flexibility both in terms of time and in terms of the preferences of the participants. Fifth, multiple languages should be adopted, ensuring that cultural nuances are recognized in the translation process, not simply providing multiple language options. Sixth, bilingual and/or culturally matched research team members should be included to ensure that the phenomena of the culture are fully understood and that standards of mutual respect are



established. They also make an essential contribution to recruiting and retaining participants as gatekeepers. Finally, “engaging community consultants and research participants” as stakeholders can help gain feedback on the intervention and gain support to recruit and retain participants.

Consequently, these culturally tailored interventions are culturally respectful, participant-centered, and effective in promoting healthy lifestyles (Evans et al., 2020a; Joo & Liu, 2021). Moreover, when delivered through technology, they increase access to low-cost, effective, and timely health outcomes by increasing access to services (Joo & Liu, 2021; Kamke et al., 2022); strategies should be reflected throughout the intervention process.

#### **4. Intervention mapping**

Intervention Mapping (IM) serves as a protocol for crafting tailored interventions through community-based participatory research, as outlined by Bartholomew et al. (2016). Through the adoption of an iterative approach, IM offers a systematic structure for the comprehensive development of interventions, spanning from problem identification to problem-solving. IM is a methodology developed to help design systematic, evidence-based intervention programs and has been used in various health-related intervention studies both domestically and internationally (Park et al., 2021).

IM consists of six steps. The first step is a logic model of the problem, where a planning group is created to discover the problem of the target population by conducting a needs assessment. The second step is the logic model of change, where a matrix for change is constructed based on expected outcomes, objectives, and determinants. The third step is

program design, where the program details are designed. The fourth step is program production, where the production plan is prepared, drafted, and pre-checked. The fifth step is the program implementation plan, which involves finding the stakeholders who will adopt, implement, and sustain the actual program and creating an implementation plan. Finally, the sixth step is the program evaluation plan, where process and effect evaluation plan are completed.

### III. THEORETICAL FRAMEWORK

The theoretical framework for this study was constructed by integrating the Integrated Model of Health Literacy (2012) by Sørensen et al. with the Theory of Planned Behavior by Ajzen (1991) (Ajzen, 1991; Sørensen et al., 2012).

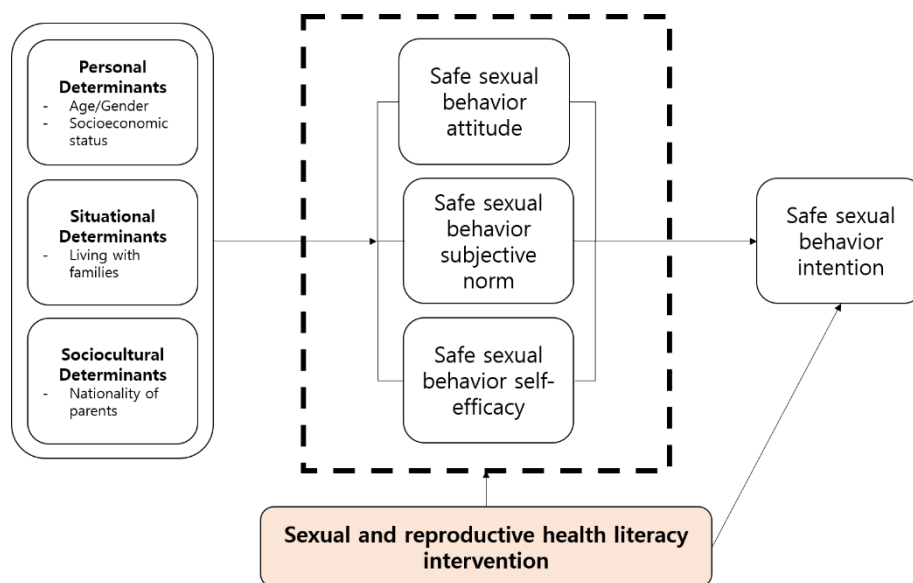
The Integrated Model of Health Literacy integrates medical and public health perspectives to comprehensively address health literacy. It delineates the factors, both proximal and distal, influencing health literacy, along with the pathways connecting health literacy to health outcomes. The model's core focuses on competencies related to accessing, understanding, appraising, and applying health-related information. This involves four essential competencies: (1) the proficiency to seek, find, and obtain health information; (2) the capability to comprehend the accessed information; (3) the competence to interpret, filter, judge, and evaluate the accessed health information; and (4) the ability to utilize the information for communication or decision-making to maintain and enhance health. In addition to the health literacy component, the model presents key antecedents and outcomes. Health literacy is influenced by various factors, categorized into distal factors such as social and environmental determinants (demographics, culture, language, social systems, etc.), proximal factors, encompassing personal determinants (age, gender, race, socio-economic status, etc.), and situational determinants (social support, family influences, etc).

Factors that influence health literacy include distal factors such as social and environmental determinants (demographics, culture, language, social systems, etc.), proximal factors, including personal determinants (age, gender, race, socio-economic status, education, occupation, employment, income, literacy, etc.), and situational determinants (social support, family and peer influences, media use, and physical environment).

The Theory of Planned Behavior is a social cognitive theory designed to forecast health behaviors. Its principal concepts include attitude toward behavior, subjective norms, perceived behavioral control, behavioral intention, and behavior. Attitude toward behavior is shaped by an individual's positive or negative evaluation of a specific behavior, while subjective norms pertain to the perceived social pressure encouraging or discouraging engagement in a particular behavior. Perceived behavioral control reflects the perceived difficulty or ease with which an individual can perform a specific behavior. Behavioral intention, a direct determinant of behavior, serves as a cognitive representation indicating whether an individual voluntarily endeavors to participate in a particular behavior.

First, the four factors of the integrated model of health literacy were selected: antecedents, literacy, outcomes, and health domains. The cognitive and behavioral factors of the theory of planned behavior were selected, and the theory integration process was conducted. The connection between the theoretical system and the operational system was confirmed through substitution. The theoretical framework of this study is explicated in Figure 1. Antecedents, encompassing personal (age, gender, socioeconomic status), situational (residency with family), and social and cultural (country of origin of parents)

factors, exert influence on safe sexual behavior attitude, safe sexual behavior subjective norm, and safe sexual behavior self-efficacy. These factors subsequently contribute to the formation of safe sexual behavior intentions. Additionally, interventions targeting sexual and reproductive health literacy directly impact attitudes, subjective norms, self-efficacy, and intentions related to safe sexual behavior.



**Figure 1.** Research framework on sexual and reproductive health literacy intervention

## IV. METHODS

This study consisted of two phases: The first phase involved developing an intervention for promoting safe sexual behaviors, and the second phase focused on evaluating the intervention process and potential effects. The initial phase of intervention development was systematically performed following intervention mapping (IM) steps 1 to 6 (Step 1: Logic model of the problem, Step 2: Logic model of the change, Step 3: Program design, Step 4: Program production, Step 5: Program implementation plan, Step 6: Evaluation plan), as outlined in Table 4 (Bartholomew et al., 2016).

**Table 4.** Steps and tasks of intervention development in this study

Step	Tasks
1. Logic model of the problem	<ul style="list-style-type: none"> <li>• Establish and work with a planning group</li> <li>• Conduct a needs assessment to creat a logic model of the problem</li> <li>• Describe the context for the intervention including the population, seeting, and community</li> <li>• State program goals</li> </ul>
2. Logic model of change	<ul style="list-style-type: none"> <li>• State expected outcomes for behavior and environment</li> <li>• Specify perfomance objective for behavioral and environmental outcomes</li> <li>• Select determinants for behavioral and environmental outcomes</li> <li>• Construct matrices of change objectives</li> <li>• Creat a logic model of change</li> </ul>

**Table 4.** Steps and tasks of intervention development in this study (Cont'd)

Step	Tasks
3. Program design	<ul style="list-style-type: none"> <li>• Generate program theme, components, scope, and sequence</li> <li>• Choose theory- and evidence-based change methods</li> <li>• Select of design practical applications to deliver change methods</li> </ul>
4. Program production	<ul style="list-style-type: none"> <li>• Prepare plan for program materials</li> <li>• Draft messages, materials, and protocols</li> <li>• Produce materials</li> <li>• Pretest</li> </ul>
5. Program Implementation plan	<ul style="list-style-type: none"> <li>• Identify potential program users (implementers, adopters, and maintainers)</li> <li>• Design implementation interventions</li> </ul>
6. Evaluation plan	<ul style="list-style-type: none"> <li>• Write effect and process evaluation questions</li> <li>• Develop indicators and measures for assessments</li> <li>• Specify the evaluation design</li> <li>• Complete the evaluation plan</li> </ul>

The intervention was structured according to accessing, understanding, appraising, and applying sexual and reproductive health literacy (SRHL) as a core concept (WHO, 2016). Culturally tailored strategies were reformulated and applied to develop an intervention that considers the characteristics of participants from racial and ethnic backgrounds (Im & Chee, 2021; Kreuter et al., 2003) (Table 5). The culturally tailored strategies reconstructed in this study for racial and ethnic female adolescents are 1) considering cultural context, 2) providing cultural evidence, 3) having flexibility, 4) cultural translation, and 5) engaging stakeholders.

**Table 5.** Culturally tailored strategies in this study

<b>Culturally tailored strategies</b>	<b>Definition</b>
Considering cultural context	Fully understanding the cultural values, characteristics, and phenomena of the participants to meet cultural relevance (whether the research question helps to improve the problems and lives of specific cultural groups).
Providing cultural evidence	Presenting culturally relevant, evidence-based information to increase the perceived relevance of health issues to specific groups.
Having flexibility	Planning the intervention flexibly to meet the needs of the specific cultural group for the intervention.
Cultural translation	Adjusting the language to the specific culture to improve the accessibility of the participants and to obtain relevant and reliable data.
Engaging stakeholders	Utilizing the experiences of members of the socio-cultural environment, including the specific target, meaning all aspects of the target's culture are respected.

Finally, considering that sexuality is a sensitive topic, a chatbot was implemented as the delivery tool to ensure that personal space and anonymity were maintained. The second phase consisted of conducting a SRHL intervention to promote safe sexual behavior according to the evaluation plan finalized in Step 6 of the IM before evaluating the implementation process and the potential effectiveness of the intervention.



## **A. Intervention mapping Step 1: Logic model of the problem**

### **1. Planning group**

In the initial task of Step 1, the imperative was to establish and collaborate with a planning group comprising stakeholders of the program (Bartholomew et al., 2016). Moreover, culturally tailored strategies, including “engaging stakeholders” and “considering cultural context,” were employed to establish a planning group capable of offering experience and appropriate feedback in developing an intervention.

The planning group for this study comprised the intervention developer, racial and ethnic female adolescents, foreign-born married immigrant women, school nurses, community service providers, and health researchers. Initially, the researcher selected teen pregnancy and asked, “What is a health issue faced by adolescents?” Accordingly, the priority population was narrowed to racial and ethnic female adolescents. The pregnancy experience among racial and ethnic female adolescents was approximately seven times higher than for Korean adolescents (Korea Disease Control and Prevention Agency, 2021). A planning group, including stakeholders, was assembled to develop this intervention. The planning group included an intervention developer, racial and ethnic female adolescents, marriage migrant women, health teachers, community-based racial and ethnic adolescent-related service providers, and professionals. The planning group reconfirmed that teen pregnancy was “a health issue faced by racial and ethnic female adolescents.” Moreover, the target population was further narrowed to female adolescent children of Vietnamese-

born married migrant women since they exhibited the largest distribution and growing trend in South Korea (Im & Chee, 2021; Ministry of Education, 2022).

## **2. Needs assessment**

The second task in Step 1 of the IM process involved strategizing and executing a needs assessment analysis concerning health and quality-of-life issues and their underlying causes (Bartholomew et al., 2016). This task applied the "considering cultural context" and "engaging stakeholders" strategies to conduct focus group interviews (FGIs) of racial and ethnic female adolescents and stakeholders in their socio-cultural environment to reconfirm the determinants of safe sexual behavior previously identified in a review of the literature.

### **2.1 Literature review**

#### **2.1.1 Research design**

This study was designed as an integrated literature review study on articles that examined the determinants of safe sexual behavior among racial and ethnic female adolescents in South Korea and abroad.

#### **2.1.2 Research procedure**

Following the guidelines proposed by Whittemore and Knafl (2005), the study was conducted in five stages: Program identification, literature search, data evaluation, data analysis, and data presentation (Bartholomew et al., 2016; Whittemore & Knafl, 2005). The

research question proposed was, “What are the factors that influence safe sexual behavior of racial and ethnic female adolescents?” The article inclusion criteria comprised 1) peer-reviewed articles published in Korean or international journals, 2) articles on adolescent females from a racial and ethnic background, and 3) articles of studies that used safe sexual behavior as a dependent variable. The exclusion criteria consisted of 1) articles of studies on adolescents with a disease and 2) articles on sexual minorities. Only articles published in journals in the past five years were searched for in PubMed, Embase, CHINAL, and Cochrane for international articles and Research Information Sharing Services (RISS) for Korean articles databases. The search was performed using combinations of search terms: (multicultural or racial or ethnic or minorities) AND (adolescent\* or youth or student\* or child\*) AND (sexual behavior or contraceptive\* or condom).

### **2.1.3 Results**

From the integrated literature review used to identify the determinants of safe sexual behavior among racial and ethnic female adolescents, a total of six studies were included in the final analysis. The study populations consisted of racial and ethnic adolescents in South Korea (n=1) and those in other countries (n=5), which comprised Mexico (n=1) and the United States (n=4). Research designs included secondary data analysis (n=2), cross-sectional (n= 2), qualitative interviews (n=1), and focus group interviews (n=1).

The determinants of safe sexual behavior among racial and ethnic female adolescents were attitude, subjective norm, and self-efficacy (Table 6). Specifically, there was a negative attitude towards contraception, which was formed by religious, cultural, familial,

and social reasons. There was a social culture that equated contraception to abortion and labeled women who talked about contraception as promiscuous. Moreover, the subjective norm remained that woman with sexual experience dishonored their families, while the opinion that women should maintain their virginity negatively impacted attitudes toward contraception. There was also a negative attitude from a social perspective toward women proactively preparing contraceptives. Furthermore, racial and ethnic female adolescents were found to have a high subjective norm for compromising with their partner about contraception, meaning accepting the opinion of the partner when pressured to engage in risky sexual behavior. Lastly, concerning self-efficacy, they expressed difficulties in possessing contraceptives during daily life and communicating with their partner over the use of contraception.

**Table 6.** Determinants derived through literature review.

<b>Determinants</b>	
Attitude	Feeling shamed for suggesting safe sexual behavior
	Feeling uncomfortable when communicating with a partner about condoms
	Embarrassment using the word “condom”
	Feeling embarrassed buying condoms
Subjective norm	Tolerating and complying with pressure from a partner to engage in risky sexual behavior
	Weighing the values of partners, peers, parents, and society more heavily when deciding on safe sexual behavior
Self-efficacy	Poor communicative abilities when discussing safe sexual behavior with their partner

## 2.2 Focus group interviews

### 2.2.1 Research design

This study applied a multiple-category design to conduct seven FGIs with racial and ethnic female adolescents, marriage migrant women, and relevant professionals to reconfirm the determinants of safe sexual behavior among racial and ethnic female adolescents and factors related to SRHL derived through the literature review (Krueger & Casey, 2014).

## **2.2.2 Participants**

### **1) Racial and ethnic female adolescents**

Racial and ethnic female adolescents participating in the FGIs adhered to the same inclusion criteria outlined in the pilot study. Participants were female middle school students aged 14 to 16 born in South Korea with Vietnamese mothers. In alignment with the guidelines for conducting FGIs with adolescents, as Kruger and Casey (2014) recommended, the groups were structured to maintain a maximum two-year age difference among participants. Participants were recruited using purposive and snowball sampling from middle schools and multicultural centers. Based on the recommendation that there should be at least three focus groups, ideally having 5 to 8 participants each, the study selected three groups with 5 to 6 racial and ethnic female adolescents per group.

### **2) Parents**

The inclusion criteria for parents participating in the focus group included women born in Vietnam who came to South Korea through marriage, mothers of female adolescents aged 14 to 16 born in South Korea, and individuals capable of effective communication in Korean. The participants were recruited using purpose and snowball sampling, with workers from the multicultural family support center and the multicultural community serving as gatekeepers during participant recruitment. The parent-focused group comprised two sessions, each with 5–6 participants.

### **3) Professionals**

The inclusion criteria for professionals participating in the focus groups consisted of professionals from relevant organizations with at least one year of experience managing the health of racial and ethnic female adolescents. Purposive and snowball sampling methods were used to recruit the professionals. The professional focus groups were set to two groups with 5–6 participants per group.

#### **2.2.3 Measurements**

The semi-structured interview guide (Table 7) was developed based on a literature review of the determinants for safe sexual behavior and SRHL among racial and ethnic female adolescents (Vamos et al., 2020; Vamos et al., 2022). The guidelines for this study were developed based on previous recommendations by Krueger and Casey (2014). The FGIs began with an introductory question before proceeding to the main questions. The main questions consisted of determinants that influence safe sexual behavior among racial and ethnic female adolescents, experiences related to accessing, understanding, appraising, and applying sexual and reproductive health information, preferred safe sexual behavior educational content, and chatbot composition.

**Table 7.** Main questions of focus group interviews

Themes		Sample questions
Determinants		What are the factors that influence safe sexual behavior among racial and ethnic female adolescents?
Sexual and reproductive health literacy	Access	From where and whom do you obtain information related to safe sexual behavior, including pregnancy, contraception, and induced abortion?  When seeking information, what is important to you and what worries you?
	Understand	When you found the information, was it easy to understand? Why was it difficult to understand? What information was easy to understand?
	Appraise	How did you appraise whether the information you found is accurate or not?  When appraising information, what do you consider to be important?
	Apply	How do you apply the information you found? What difficulties do you have when applying the information?
Contents		What should be included to promote safe sexual behavior among racial and ethnic female adolescents?
Need and preference for chatbot-based program		What information should the chatbot provide?
		What should be the format of information provided by the chatbot?
		What are the methods that can ensure continued use of the chatbot?
		What functions should the chatbot have?



#### **2.2.4 Data collection**

After confirming that the participants met the inclusion criteria for the FGIs, the researcher explained the objectives and procedures and obtained their consent. For adolescents, the researcher contacted their parents to provide a verbal explanation and to obtain parental consent. Subsequently, demographic characteristics, available interview times, and a convenient interview location (offline or online) were confirmed. Before beginning the FGIs, participants were informed that the content of the FGI would be kept confidential and that each question was opinion-based, with no right or wrong answers. Participants were also informed that the interviews would be recorded. After each focus group, the researcher transcribed the interviews, referring to the recordings and the field notes taken by the assistant.

#### **2.2.5 Data analysis**

Deductive content analysis was used to evaluate the data (Elo & Kyngäs, 2008). Deductive content analysis is a research method used to analyze qualitative data based on pre-existing categories or theories. This method is often used when researchers aim to test or validate existing theories, concepts, or hypotheses within the data. Initially, the researcher developed an unconstrained categorization matrix based on the determinants of safe sexual behavior (attitude, subjective norm, and self-efficacy) and SRHL processes (access, understand, appraise, and apply). Then, the transcripts were re-read and coded according to the categories. Simultaneously, new concepts were developed for aspects that

did not fit into the categorization matrix, according to the principles of inductive content analysis.

## 2.2.6 Results

### 1) Demographic characteristics of participants

A total of 37 people participated in the FGIs, including 15 racial/ethnic female adolescents, 12 mothers, and 10 professionals (Table 8). The fathers of the adolescents were of Korean nationality. The mothers of the female adolescents had various occupations, including production worker (n=3), translator (n=1), counselor (n=2), office worker (n=1), and business owner (n=1). Most professionals were health teachers who cared for the adolescents involved (n=6), while others were counselors or educators in multicultural centers (n=3) and sex education centers (n=1).

**Table 8.** Demographic characteristic of focus group interviews

Participants		Variables	N(%) or Mean±SD
Racial and ethnic female adolescents (n=15)	Age	14	6 (40.0)
		15	4 (26.6)
		16	5 (33.3)
	Father's nationality	South Korea	15 (100.0)
		Living area	
		Seoul	5 (33.3)
Parents (n=12)	Age	Busan	5 (33.3)
		Kyeonggi-do	5 (33.3)
		30's	9 (75.0)
		40's	3 (25.0)
			37.58±3.80

**Table 8.** Demographic characteristic of focus group interviews (Cont'd)

Participants	Variables	N(%) or Mean±SD
Professional (n=10)	Living area	Seoul 6 (50.0)
		Busan 6 (50.0)
	Living year in South Korea	16.50
	Purpose to come to South Korea	Marriage 12 (100.00)
	Job	Housewife 4 (33.3)
		Working 8 (66.7)
	Childrens' age	14 4 (33.3)
		15 3 (25.0)
		16 5 (41.7)
	Age	30's 5 (50.0)
		40's 2 (20.0)
		50's 3 (30.0)
		42.20±8.93
	Gender	Male 2 (20.0)
		Female 8 (80.0)
	Job	Health teacher 6 (60.0)
		Multicultural center 3 (30.0)
		Sexual education center 1 (10.0)
	Working area	Seoul 2 (20.0)
		Busan 3 (30.0)
		Kyeonggi-do 2 (20.0)
		Incheon 1 (10.0)
		Kyeongbuk 1 (10.0)
		Daejeon 1 (10.0)
	Experience year	15.00

Note. SD=Standard Deviation

## 2) Results of focus group interviews

The deductive content analysis results on the determinants of safe sexual behavior among racial and ethnic female adolescents, SRHL level and status, required sexuality education content, and needs and preferences for chatbot-based intervention are presented in Table 9 and Appendix 2.

Regarding attitudes, participants expressed feeling embarrassed when publicly purchasing contraceptives, such as in convenience stores and pharmacies, due to negative social views on a woman's sexual behavior. Furthermore, mothers expressed shame when suggesting contraception to their male partners due to the negative gender roles whereby women should suggest contraception. Experts have also highlighted that racial and ethnic female adolescents may view contraception as a nuisance, which could negatively impact their safe sexual behavior. Regarding subjective norms, racial and ethnic female adolescents reported being unable to negotiate contraception and subsequently engaging in risky sexual behavior due to the fear of disapproval from asking their partners. Furthermore, when safe sexual behavior was suggested to a boyfriend, one participant was afraid that her boyfriend would think she was promiscuous, meaning she remained silent and followed his suggestion. In relation to self-efficacy, participants also stated that it was difficult to accurately refuse when their boyfriends suggested they engage in risky sexual behaviors. An opinion that the mothers agreed was a problem with the established social norms.

In terms of access, participants mentioned that they naturally started to access sexual and reproductive health information while hanging out with their peers. Furthermore, it

was explained that they search for information they are curious about through online platforms such as SNS. It was mentioned that although sex education is provided in schools, it is focused on explanation due to a passive sexual culture. In addition, experts expressed that racial and ethnic female adolescents do not receive sexuality education at home due to language communication difficulties. Furthermore, they noted a lack of current support systems for obtaining sexual and reproductive health information, which is compounded by their racial and ethnic background. Experts have noted that racial and ethnic female adolescents may have a limited understanding of sexual and reproductive health information delivered in schools due to language barriers. Furthermore, there is a lack of understanding of the importance of contraception. When evaluating sexual and reproductive health information, participants rely heavily on the opinions of their peers. It was also mentioned that people receive inaccurate sexual and reproductive health information through digital media. Furthermore, it was noted that the existing gender role stereotypes of mothers are transmitted to their children. Finally, regarding application, participants noted that racial and ethnic female adolescents are not adequately prepared with contraception in advance for safe sexual behavior. Moreover, it was mentioned that in situations of sexual behavior, refusal to engage in risky sexual behavior is sometimes interpreted as consent.

Regarding messages that should be included in the education for safe sexual behavior, participants first mentioned the need to provide detailed information about the locations that sell contraceptives. Additionally, they emphasized the need to practice using contraceptives, both in person and virtually. It was also suggested that a strong message be

conveyed to reinforce the importance of contraception. Furthermore, it was noted that unintended pregnancy and parenthood can lead to adverse consequences, such as economic difficulties. Lastly, participants emphasized the need to inform people about healthy heterosexual relationships.

Most participants preferred the chatbot to have a friendly tone, similar to a friend. Additionally, to improve understanding, it was suggested that information be presented through visual materials, such as photos and videos, rather than via text. It was also recommended that a user-friendly platform be implemented to ensure the chatbot is used effectively. Additionally, the participants suggested functions such as counseling and quizzes to encourage engagement. Finally, experts have suggested that culturally tailored services are necessary to overcome language barriers for adolescent females from diverse backgrounds.

**Table 9.** Categories derived through focus group interview

Main category	Generic categories	Sub-categories	Participants		
			A	P	E
Safe sexual behavior determinants	Attitude	Feeling shamed for initially suggesting safe sexual behavior	O	O	
		Feeling embarrassed buying condoms	O	O	
		Safe sexual behaviors are not important	O		O
	Subjective norm	Complies with a partner's opinion when negotiating safe sexual behavior	O	O	
		Difficulties negotiating with the partner about safe sexual behavior	O		O
	Self-efficacy	Accesses information related to safe sexual behavior through peers	O		O
		Cannot obtain information related to safe sexual behavior from parents	O	O	O
		Cannot obtain information related to safe sexual behavior from school	O	O	O
		Obtain information related to safe sexual behavior through the media	O		O
		Lack of support system for obtaining information related to safe sexual behavior		O	O
Sexual and reproductive health literacy	Understand	Lack of understanding about the importance of safe sexual behavior	O		O
		Language barrier			O
	Appraise	Appraise based on peer opinion			O
		Influenced by parent's cultural background			O
		Accept information from the media at face value	O	O	O
		Appraise based on various criteria (source, comparison, experts)	O	O	

*Note.* A = Adolescents; P = Parents; E = Experts.

**Table 9.** Categories derived through focus group interview (Cont'd)

Main category	Generic categories	Sub-categories	Participants		
			A	P	E
Content for sexual education	Apply	Clearly expressed refusal to the partner	O	O	O
		Need for consent before safe sexual behavior	O		O
		Need to communicate about safe sexual behavior in advance	O		O
		Need to purchase contraceptives in advance	O		
		Contraception: significance, locations for buying contraceptives., methods, additional benefits (STI Prevention), and consequences of risky sexual behavior (pregnancy, teen parenthood, financial hardship)	O	O	
	Methods	Healthy relationship	O		
		Practical education	O		
		Practice contraception in virtual situations using technologies such as VR and artificial intelligence			O
	Preference	Friendly tone of voice	O		O
		Diversity of materials (photos, videos)	O	O	
	Functions	Diversity of functions (counseling rooms, quizzes)	O		O
		Easily accessible platform (app, messenger-based)			O
		Customized service in national language			O

*Note.* A = Adolescents; P = Parents; E = Experts.



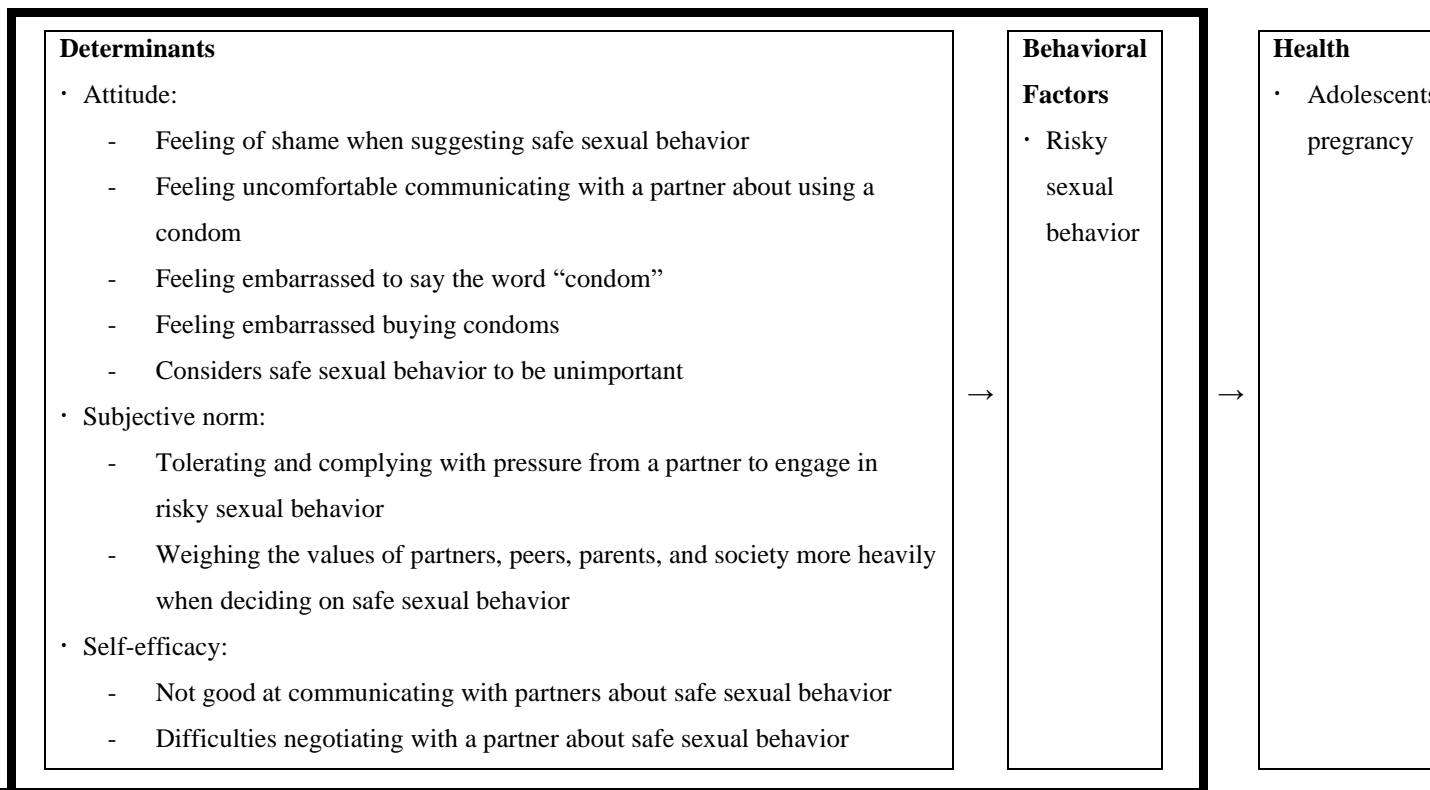
### 3. Context for the intervention

The third task in Step 1 of the IM process involves comprehending the contextual factors pertinent to the intervention, encompassing the population, community, and setting. (Bartholomew et al., 2016). The intervention context was confirmed by applying strategies of "considering cultural context" and "having flexibility." Although the racial and ethnic female adolescents in this study received sexuality education in school, Korean sexual culture is not conducive to openly asking questions and discussing sexuality. According to the interview results and planning group's opinions, it was concluded that chatbots are easily accessible to racial and ethnic female adolescents. Additionally, the planning group could conduct a chatbot-based SRHL intervention; thus, chatbots were selected as the delivery tool for the intervention.

As a result of an asset assessment to conduct the chatbot-based SRHL intervention, social environments were identified: A community of married immigrant women, a multicultural family support center, a religious organization, an association of health teachers, and a multicultural adolescents center. In the information environment, the bulletin boards at the multicultural family support center, and the school was identified as communication channels that could be used to activate the intervention. Utilizing trust relationships in the social environment was expected to be crucial for intervention development and implementation.

#### **4. Program goals**

The concluding task in Step 1 of IM involved establishing a connection between the needs assessment and the program and evaluation planning, thereby delineating specific program goals (Bartholomew et al., 2016). The goal was to decrease the incidence of teen pregnancies. However, the provided evaluation time frame was not long enough to assess the effect of the intervention on these health outcomes. Instead, the planning group focused on safe sexual behavior intention as a proxy program goal (Figure 2). Therefore, post-intervention, the primary program objective was to achieve a higher level of safe sexual behavior intention in the experimental group compared to the control group.



*Note.* The square box with the darker line is the part of this study.

**Figure 2.** Logic model of problem in this study

## **B. Intervention mapping Step 2: Logic model of the change**

### **1. Stating behavioral and environmental outcomes**

The initial undertaking in Step 2 of IM involved articulating the anticipated program outcomes for health behaviors and environmental conditions with the aim of enhancing health and quality of life (Bartholomew et al., 2016). In this study, the health behavior of racial and ethnic female adolescents was defined as the health promotion behavior of using contraceptives to practice safe sexual behavior, with the targeted behavioral outcome being a "safe sexual behavior intention".

### **2. Specifying performance objectives**

In the second task of IM Step 2, the objective was to decompose behavioral and environmental outcomes into distinct performance objectives (Bartholomew et al., 2016). To elucidate the behavioral outcome in this study, "increase in safe sexual behavior intention among racial and ethnic female adolescents increases," specific performance objectives were delineated. Subsequently, these performance objectives were derived following the integrated model of health literacy (Sørensen et al., 2012) (Table 10). The integrated model of health literacy encompasses skills associated with accessing, understanding, appraising, and applying health-related information. Access involves the proficiency to locate, access, and acquire health information, while understanding pertains to the capability to comprehend the accessed health information. Appraisal entails the competence to interpret, assess, and evaluate the acquired health information. Finally,

application refers to the ability to communicate and utilize information for decision-making to enhance and maintain health. Competencies related to this process have been specified as performance objectives.

**Table 10.** Performance objective of this study

Behavioral outcome	Performance objectives
Increase the safe sexual behavior intention	PO 1. Access the information related to safe sexual behavior. PO 2. Understand the information related to safe sexual behavior. PO 3. Appraise correctly the information related to safe sexual behavior. PO 4-1. Apply informed and safe sexual behavior—prepare safe sexual behavior. PO 4-2. Apply informed and safe sexual behavior—negotiate safe sexual behavior. PO 4-3. Apply informed and safe sexual behavior—communicate about safe sexual behavior.

### 3. Selecting personal determinants

In the second step of IM, the third task involved identifying significant and modifiable determinants in health behavioral and environmental outcomes. (Bartholomew et al., 2016). This study initially reviewed the list of determinants derived from the needs assessment to select determinants based on appropriate theories. Personal determinants identified through the literature review were further refined during focus group interviews. The final selected determinants were attitudes, subjective norms, and self-efficacy (Table 11).

**Table 11.** Determinants of safe sexual behavior in this study

Determinants	Specific determinants
Attitude	Feeling shame when suggesting safe sexual behavior (L, F)
	Feeling uncomfortable communicating with your partner about condoms (L, F)
	Feeling embarrassed buying condoms (L, F)
	Safe sexual behavior is not considered important (F)
Subjective norm	Tolerating and complying with pressure from a partner to engage in risky sexual behaviors (L, F)
	Weighing the values of partners, peers, parents, and society more heavily when deciding on safe sexual behavior (L, F)
Self-efficacy	Difficulties communicating with their partner about safe sexual behavior (L)
	Difficulties negotiating with their partner about safe sexual behavior (F)

*Note.* L = Literature review; F = Focus group interviews.

#### 4. Constructing matrices of change objectives

In the fourth task of IM Step 2, the objective was to develop a matrix of change objectives for each ecological level to be incorporated into the intervention (Bartholomew et al., 2016). Expanding on the behavioral outcomes identified in the needs assessment during Step 1, change objectives were crafted by integrating four performance objectives with three determinants. The matrix of change objectives for the SRHL intervention aimed at promoting safe sexual behavior among racial and ethnic female adolescents is presented in Table 12.

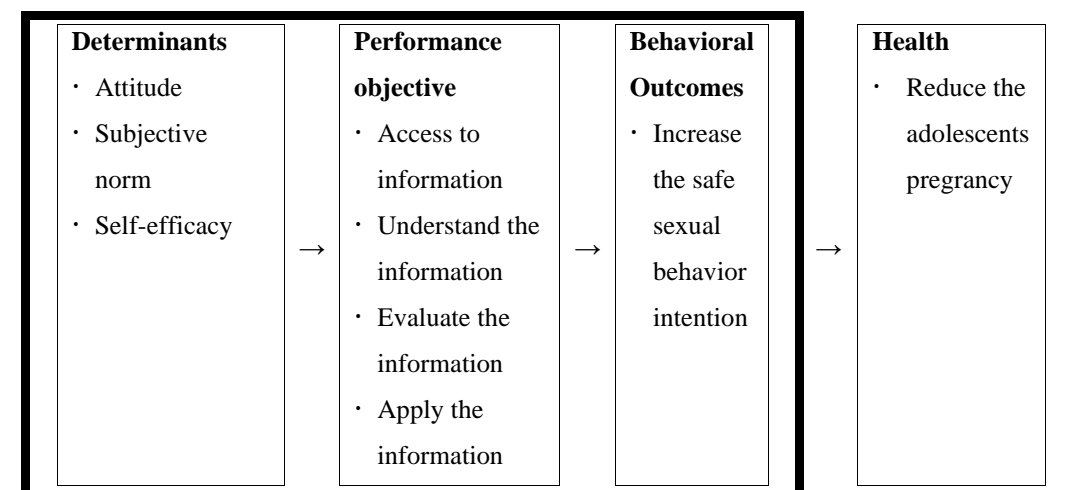
**Table 12.** Matrix of change objectives in this study

Performance objectives	Personal Determinants		
	Attitude	Self-efficacy	Subjective Norm
PO1. Access the information related to safe sexual behavior	A1. Express positive feelings toward accessing information related to safe sexual behavior.	SE1. Express confidence in accessing information about safe sexual behavior.	
PO2. Understand the information related to safe sexual behavior	A2. Express positive feelings about practicing safe sexual behavior.	SE2-1. Express confidence in explaining why it is important to practice safe sexual behavior. SE2-2. Express confidence in understanding how to practice safe sexual behavior.	
PO3. Appraise correctly the information related to safe sexual behavior.	A3. Recognize the advantages of evaluating information related to safe sexual behavior.	SE3. Express confidence in evaluating whether sexual behavior information is accurate.	
PO4-1. Apply informed and safe sexual behavior - Prepare safe sexual behavior.		SE4-1. Express confidence in preparing safe sexual behavior.	SN4-1. Explain that significant others say that safe sexual behavior is easy and natural.
PO4-2. Apply informed and safe sexual behavior - Negotiate safe sexual behavior.		SE4-2a. Express confidence in being able to negotiate safe sexual behavior with a partner.	SN4-2. Explain that significant others talk to partners about negotiating safe sexual behavior.
PO4-3. Apply informed and safe sexual behavior - Communicate about safe sexual behavior.	A4-3. Feel positive about communicating about safe sexual behavior.		

**Note.** PO = Performance Objectives; A = Attitude; SE = Self-Efficacy; SN = Subjective Norm.

## 5. Logic model of the change

In the concluding task of IM Step 2, the objective was to formulate a logical model of change for the health promotion program (Bartholomew et al., 2016). The logic model of change for the SRHL intervention for racial and ethnic female adolescents was constructed based on the health outcomes identified in Step 1, the matrix of change objectives in Step 2, and the integrated model of health literacy and the theory of planned behavior (Figure 3).



*Note.* The square box with the darker line is the part of this study.

**Figure 3.** Logic model of the change in this study



## **C. Intervention mapping Step 3: Program design**

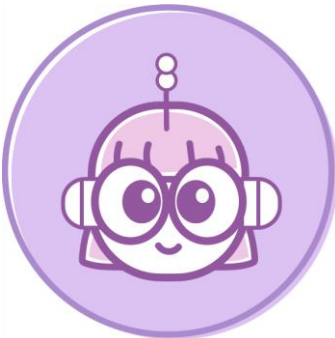
### **1. Program themes, components, scope, and sequence**

During the initial stage of Intervention Mapping (IM) Step 3, the emphasis was on generating ideas for program themes, components, scope, and sequence through collaborative efforts with the planning group (Bartholomew et al., 2016). By applying the 'providing cultural evidence' strategy, appropriate materials were created to appeal to racial and ethnic female adolescents. A needs assessment confirmed the preference of the participants for friend-like chatbots. Accordingly, a chatbot persona was developed, as shown in Table 13, implementing existing studies and chatbot design codebooks (Nißen et al., 2022; Kim et al., 2021). The chatbot was named 'BORA', which means 'bot for sexual and reproductive health literacy among adolescents', and the persona is of a 'class leader with a racial and ethnic background who provides information on safe sexual behavior'. In addition, 'BORA' in Korean means 'to do', which reflects the act of engaging in the process of SRHL.

In addition, the strategy of 'having flexibility' was applied to designing the BORA intervention so that it could be delivered effectively to racial and ethnic female adolescents. The duration of the intervention was set at eight modules over two weeks, with the duration of each module set at 5–10 minutes, based on evidence from previous studies suggesting that longer learning periods could lead to a loss of engagement (Maenhout et al., 2021; Gabrielli et al., 2020). Finally, the digital technology preferred by adolescents for

messaging and delivery was confirmed. This choice allows them to access the intervention personally and anonymously at their convenience (Nadarzynski et al., 2021).

**Table 13.** Chatbot's theme and persona

	Categories	Contents
	Name	Bot for sexual and reproductive health literacy among adolescents (BORA)
	Meaning	Do search, assess, read, interpret, apply, find, look different, look exactly, try
	User	Racial and ethnic female adolescents
	Brand	Accurate, correct, protective of rights, advocating, active, assertive
	Purpose	Providing accurate sexual health information
	Sex	Female
	Age	Middle school student
	Position	A leader who speaks righteously but has a warm heart
	Tone of voice	Informal language
	Color	Purple (a neutral color)

## 2. Theory-and evidence-based change methods

The second task involved selecting theory- and evidence-based change methods to address the defined program objectives (Bartholomew et al., 2016). Theory- and evidence-based change methods are techniques for changing behavior determinants based on health behavior and change theory. In this study, the theory and evidence-based change methods were selected after first reorganizing the change objectives into a list based on determinants

(Table 14). The methods employed to change the attitude determinant encompassed “scenario-based risk information, individualization, entertainment education, consciousness-raising, conscious regulation of impulsive stereotyping and prejudice, belief selection, and implementation intentions.” For enhancing self-efficacy, the methods utilized included “mobilizing social support, individualization, entertainment education, scenario-based risk information, anticipated regret, planning coping responses, environmental re-evaluation, resistance to social pressure.” Lastly, the methods applied to the subjective norms were “individualization, entertainment education, and shifting focus.”

### **3. Practical applications**

In the third step of IM, the third task was to choose or develop practical applications (Bartholomew et al., 2016). In this task, 'providing cultural evidence' was used to select practical applications based on the statements of racial and ethnic female adolescents. The practical application of the BORA intervention comprised providing 1) information on safe sexual behavior within the chatbot and 2) an educational module to promote SRHL. For example, the practical application of the change objective ‘A3—recognize the benefits of evaluating information related to safe sexual behavior’ is based on the theoretical- and evidence-based method of ‘conscious regulation of impulsive stereotypes and prejudices. Then, the educational module included the content that racial and ethnic female adolescents rely on gender role stereotypes of their parents from different cultural backgrounds when evaluating information related to safe sexual behavior (Table 14).

**Table 14.** Theoretical methods and practical application of sexual and reproductive health literacy intervention

Determinants and Change Objectives	Theory and evidence-based change methods	Parameter for effectiveness	Practical application
<i>Attitude</i>			
A1. Express positive feelings toward accessing information related to safe sexual behavior.	Scenario-based risk information (Precaution-Adoption Process Model: Mevissen, Meertens, Ruiter, Feenstra, & Schaalam, 2009)	Plausible scenario with a cause and an outcome; imagery. Most effective when people generate their own scenario or when multiple scenarios are provided.	Educational module <ul style="list-style-type: none"> <li>- Offer a real-life example of a teenager searching the internet for information on fertility</li> <li>- Explain the dangers of accessing misleading sexual health information.</li> </ul>
A2. Express positive feelings about practicing safe sexual behavior.	Individualization (Trans-Theoretical Model: Bartholomew et al., 2000a, 2000b; Prochaska, Redding, & Evers, 2015)  Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007) Consciousness raising (Health Belief Model; Precaution-Adoption Process Model; Trans-Theoretical Model: Skinner, Tiro, & Champion, 2015; Prochaska et al., 2015; Weinstein et al., 2008)	Personal communication that responds to a learner's needs.  Consideration of source and channel; balance of media professional's and health promoter's needs. Can use feedback and confrontation; however, raising awareness must be quickly followed by increase in problem-solving ability and (collective) self-efficacy	Questions and answers <ul style="list-style-type: none"> <li>- Freely ask questions about the consequences of risky sexual behavior and provide information accordingly</li> </ul> Educational module <ul style="list-style-type: none"> <li>- Example: consequences of risky sexual behavior in a soap opera</li> </ul>
A3. Recognize the advantages of evaluating information related to safe sexual behavior.	Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007)	Consideration of source and channel; balance of media professional's and health promoter's needs.	Educational module <ul style="list-style-type: none"> <li>- Remind participants of the consequences that misinformation in the media can have on the public</li> </ul>

**Note.** A = attitude; SE = self-efficacy; SN = subjective norm.

**Table 14.** Theoretical methods and practical application of sexual and reproductive health literacy intervention (Cont'd)

Determinants and Change Objectives	Theory and evidence-based change methods	Parameter for effectiveness	Practical application
A3. Recognize the advantages of evaluating information related to safe sexual behavior. (Cont'd)	Consciousness raising (Health Belief Model; Precaution-Adoption Process Model; Trans-Theoretical Model: Skinner, Tiro, & Champion, 2015; Prochaska et al., 2015; Weinstein et al., 2008) Conscious regulation of impulsive stereotyping and prejudice (Theories of Stigma and Discrimination: Bos et al., 2008)	Can use feedback and confrontation; however, raising awareness must be quickly followed by increase in problem-solving ability and (collective) self-efficacy More suppression almost always leads to counterproductive effects and is not advisable. Conscious self-regulation of automatic stereotyping can be used effectively.	Educational module - Present gender role stereotypes, culture, and beliefs that negatively impact safe sexual behavior - Explain how to improve gender-equitable thinking, family culture, and peer culture
A4-3. Feel positive about communicating about safe sexual behavior.	Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007) Belief selection (Theory of Planned Behavior; Reasoned Action Approach: Fishbein & Ajzen, 2010) Implementation intentions (Theories of Goal Directed Behavior; Theories of Automatic, Impulsive and Habitual Behavior: Gollwitzer & Sheeran, 2006; Verplanken & Aarts, 1999)	Consideration of source and channel; balance of media professional's and health promoter's needs. Requires investigation of the current attitudinal, normative, and efficacy beliefs of the individual before choosing the beliefs on which to intervene. Existing positive intention	Educational module - Show entertainment programs on planning safe sexual behaviors Educational module - Encourage preparation for safe sexual behavior as a means of preventing teen pregnancy Educational module - Explain how to plan safe sexual behavior with a partner: when, where, and how contraceptive methods work

*Note.* A = attitude; SE = self-efficacy; SN = subjective norm.

**Table 14.** Theoretical methods and practical application of sexual and reproductive health literacy intervention (Cont'd)

Determinants and Change Objectives	Theory and evidence-based change methods	Parameter for effectiveness	Practical application
<i>Self-efficacy</i>			
SE1. Express confidence in accessing information about safe sexual behavior.	Mobilizing social support (Diffusion of Innovations Theory; Theories of Social Networks and Social Support: Holt-Lundstad & Uchino, 2015; Valente, 2015)	Combines aring, trust, openness, and acceptance with support for behavioral change; positive support is available in the enviornment.	Educational module <ul style="list-style-type: none"> <li>- Types of pathways and resources to get accurate information related to safe sexual behavior</li> </ul>
SE2-1. Express confidence in explaining why it is important to practice safe sexual behavior.	Individualization (Trans-Theoretical Model: Bartholomew et al., 2000a, 2000b; Prochaska, Redding, & Evers, 2015)	Personal communication that responds to a learner's needs.	Questions and answers <ul style="list-style-type: none"> <li>- Freely ask questions about how to practice safe sex and provide information accordingly</li> </ul>
	Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007)	Consideration of source and channel; balance of media professional's and health promoter's needs.	Educational module <ul style="list-style-type: none"> <li>- Example: consequences of risky sexual behavior in a soap opera</li> <li>- Ask them to imagine the consequences of risky sexual behavior</li> </ul>
	Anticipated Regret (Theory of Planned Behaviorl Reasoned Action Approach: Richard, Pligt, & de Vries, 1995)	Stimulation of imagery; assumes a positive intention to avoid the risky behavior.	
	Scenario-based risk information (Precaution-Adoption Process Model: Mevisssen, Meertens, Ruiter, Feenstra, & Schaalam, 2009)	Plausible scenario with a cause and an outcome; imagery. Most effective when people generate their own scenario or when multiple scenarios are provided.	Questions and answers <ul style="list-style-type: none"> <li>- Present a situation in which a teen pregnancy results in a choice between childbirth or abortion</li> </ul>

**Note.** A = attitude; SE = self-efficacy; SN = subjective norm.

**Table 14.** Theoretical methods and practical application of sexual and reproductive health literacy intervention (Cont'd)

Determinants and Change Objectives	Theory and evidence-based change methods	Parameter for effectiveness	Practical application
SE2-2. Express confidence in understanding how to practice safe sexual behavior.	Individualization (Trans-Theoretical Model: Bartholomew et al., 2000a, 2000b; Prochaska, Redding, & Evers, 2015) Guided practice (Social Cognitive Theory; Theories of Self-Regulation: Kelder et al., 2015)	Personal communication that responds to a learner's needs.  Subskill demonstration, instruction, and enactment with individual feedback; requires supervision by an experienced person; some environmental changes cannot be rehearsed.	Questions and answers - Freely ask questions about how to practice safe sex and provide information accordingly.  Educational module - Demonstrate how to read the instructions on contraceptive products
SE3. Express confidence in evaluating whether sexual behavior information is accurate.	Planning coping responses (Attribution Theory and Relapse Prevention Theory; Theories of Self-Regulation: Marlatt & Donova, 2005)	Identification of high-risk situations and practice of coping response	Educational module - Present methods for appraising information related to safe sexual behavior on the internet
SE4-1. Express confidence in preparing safe sexual behavior.	Individualization (Trans-Theoretical Model: Bartholomew et al., 2000a, 2000b; Prochaska, Redding, & Evers, 2015) Environmental reevaluation (Trans-Theoretical Model: Prochaska et al., 2015)	Personal communication that responds to a learner's needs.  Stimulation of both cognitive and affective appraisal to improve appraisal and empathy skills	Questions and answers - Freely ask questions about how to practice safe sex and provide information accordingly  Educational module - View a documentary on the acquisition of contraceptives by teenagers
SE4-2a. Express confidence in being able to negotiate safe sexual behavior with a partner.	Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007)	Consideration of source and channel; balance of media professional's and health promoter's needs.	Educational module - a webtoon depicting a situation where a woman negotiates safer sex practices with her male partner, only to encounter rejection

**Note.** A = attitude; SE = self-efficacy; SN = subjective norm.

**Table 14.** Theoretical methods and practical application of sexual and reproductive health literacy intervention (Cont'd)

Determinants and Change Objectives	Theory and evidence-based change methods	Parameter for effectiveness	Practical application
SE4-2a. Express confidence in being able to negotiate safe sexual behavior with a partner. (Cont'd)	Planning coping responses (Attribution Theory and Relapse Prevention Theory; Theories of Self-Regulation: Marlatt & Donova, 2005) Resistance to social pressure (Theory of Planned Behavior: Reasoned Action Approach: Evans, Getz, & Raines, 1992)	Identification of high-risk situations and practice of coping response  Commitment to earlier intention; relating intended behavior to values; psychological inoculation against pressure.	Educational module - Present the misconception that a woman's rejection (negotiation) is not accepted by her male partner - Present effective techniques for negotiation or refusal to use when your partner is unwilling to engage in safe sexual behavior
<i>Subjective Norm</i>			
SN4-1. Explain that significant others say that safe sexual behavior is easy and natural.	Individualization (Trans-Theoretical Model: Bartholomew et al., 2000a, 2000b; Prochaska, Redding, & Evers, 2015) Entertainment education (Diffusion of Innovations Theory; Social norm theories; Moyer-Guse, 2008; Petraglia, 2007; Shen & Han, 2014; Wilkin et al., 2007) Shifting focus (Theory of Planned Behavior; Reasoned Action Approach: Fishbein & Ajzen, 2010)	Personal communication that responds to a learner's needs.  Consideration of source and channel; balance of media professional's and health promoter's needs.  Preferably shift focus to a new reason for performing the behavior.	Questions and answers - Freely ask questions about how to practice safe sex and provide information accordingly Educational module - View a documentary on the acquisition of contraceptives by teenagers  Educational module - Advocate that purchasing contraception is an action that promotes one's health
SN4-2. Explain that significant others talk to partners about negotiating safe sexual behavior.	Shifting focus (Theory of Planned Behavior; Reasoned Action Approach: Fishbein & Ajzen, 2010)	Preferably shift focus to a new reason for performing the behavior.	Educational module - Encourage reflection on whether a relationship with a male partner who is uncooperative with safe sexual behavior is a respectful relationship

*Note.* A = attitude; SE = self-efficacy; SN = subjective norm.



## **D. Intervention mapping step 4: Program production**

### **1. Refine program structure and organization**

The first task in Step 4 of IM was to refine the program structure and organization generated in Step 3 (Bartholomew et al., 2016). The scope, sequence, and delivery medium of the BORA intervention were identified to ensure that the intended intervention reached the participants. The BORA intervention was delivered through a chatbot, and the information and educational modules on safe sexual behavior could be accessed at the convenience of the participants. In addition, the chatbot was designed to respond to questions, allowing the intervention to be delivered in a personalized approach.

### **2. Prepare plan for program materials**

The second task in Step 4 of the IM was to prepare the production plans (design documents) (Bartholomew et al., 2016). The design documents for providing information on safe sexual behavior included a list of safe sexual behavior information, chatbot scenarios, utterances, entities, and illustration workbooks. The design documents for the educational module consisted of a module learning guide, module chatbot scenarios, and illustration workbooks.

### **3. Draft messages, materials, and protocols**

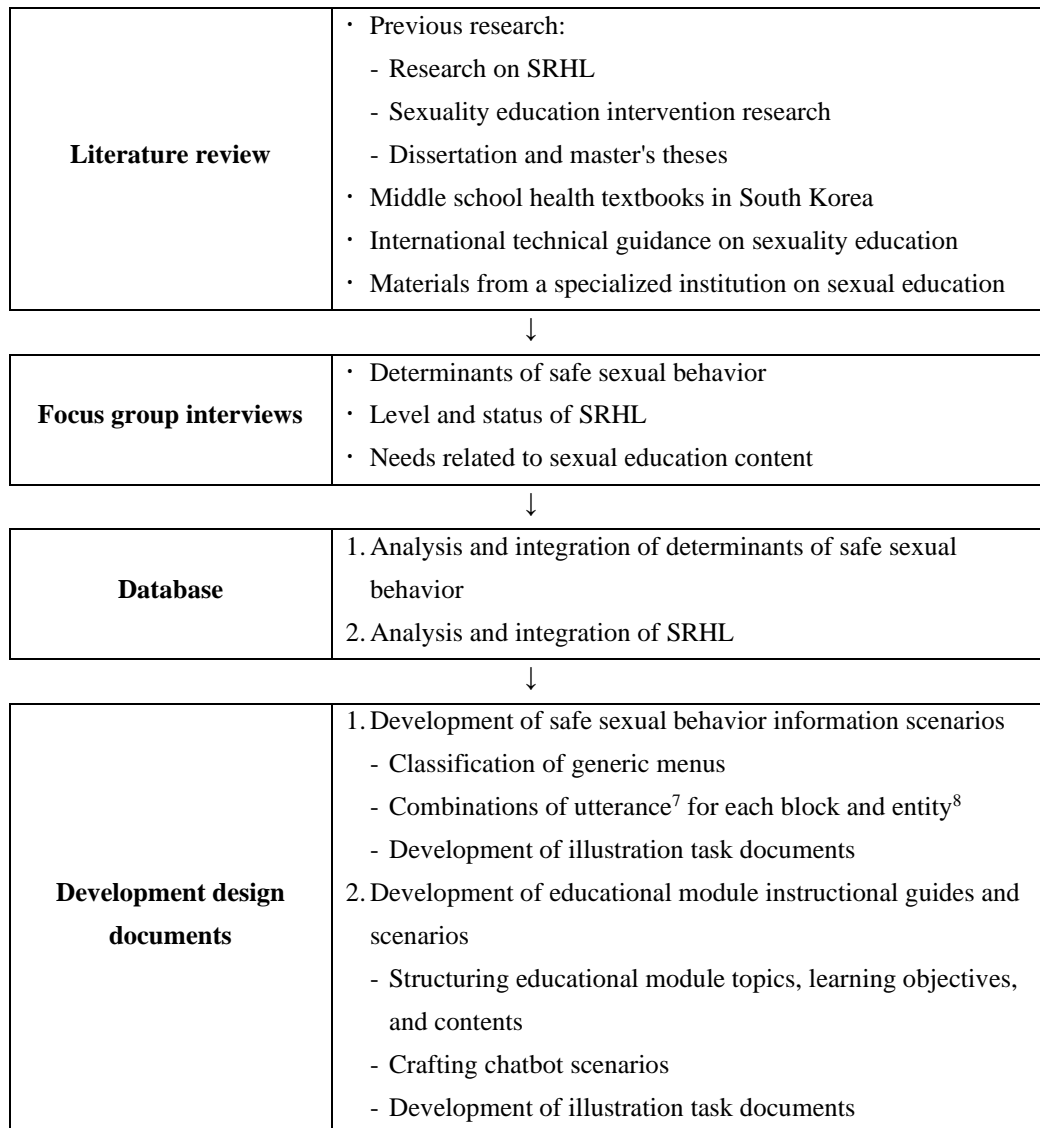
The third task in Step 4 of the IM was to draft messages and produce preliminary or prototype materials and protocols for the health promotion program (Bartholomew et al.,

2016). For this task, the 'providing cultural evidence' strategy was applied to develop a design document that appealed to the cultural values and beliefs of racial and ethnic female adolescents. Literature and focus group interviews were first analyzed to develop the design document. The literature included existing studies, national secondary school health textbooks, international guidance on the education of sexuality (United Nations Educational, Scientific and Cultural Organization, 2018), sexuality educational materials from relevant institutions<sup>5</sup>, and contraceptive information from Drug Safety<sup>6</sup>. Based on this analysis, the next step was to create a database on safe sex behavior information and SRHL, and finally, develop a design document (Figure 4).

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<sup>5</sup> Aha Sexuality Education & Counseling Center for Youth (<https://ahacenter.kr/fac/>), Bucheon Sexuality Culture Center for Youth (<http://www.bchello.co.kr/5#tab-1qnxD8>), Yongin Sexuality Culture Center for Youth ([http://www.ysay.or.kr/Inb04.asp?content\\_id=content\\_04\\_01](http://www.ysay.or.kr/Inb04.asp?content_id=content_04_01)), Incheon Sexuality Culture Center for Youth ([http://www.isc.or.kr/board/board\\_faq/board\\_list.asp](http://www.isc.or.kr/board/board_faq/board_list.asp))

<sup>6</sup> Drug Safety Korea. Contraceptive Medication Guidance Manual (for Pharmacists): <https://nedrug.mfds.go.kr/pbp/CCBFC03/getItem?tchmtrId=SU201911240034#SU20191124003413>



**Figure 4.** The development process for the design documents

<sup>7</sup> The text or words that a user types to talk to a chatbot.

<sup>8</sup> A data dictionary that organizes terms that bots can understand (e.g., entity: contraceptive, synonym - condom, oral contraceptive pill, emergency contraceptive pill).

### 3.1 Safe sexual behavior information

Safe sexual behavior information was specifically categorized into definitions, needs, consequences of risky sexual behavior, and methods. Definitions of safe sexual behavior included "making informed sexual behavior decisions and using appropriate contraception." The need for safe sexual behavior encompassed preventing unintended pregnancy and childbirth. Consequences of risky sexual behavior included unintended pregnancy and childbirth, illegal abortion, teen parenthood, and the associated personal and social challenges. In the case of pregnancy, details on the signs and diagnosis, recommended actions, and the likelihood of pregnancy were included. Finally, to provide methods for safe sexual behavior, the principles, effects and side effects, types of contraceptives, and where to buy them.

Based on this database, scenarios were created for delivery via the chatbot (Appendix 2). Since KakaoTalk is used by 94.4% of Koreans, we utilized KakaoTalk Chatbot Open Builder for chatbot development. KakaoTalk's chatbot employs two methods: "keyword extraction" using a decision tree and "choice extraction" using a roll base (menu options). To increase the response rates to participants' questions and chatbot utilization, a decision tree was constructed based on the 'direct connection button' function<sup>9</sup> provided by Open Builder. In addition, an entity database was created to categorize utterances, representing expected participant questions or conversational texts, and to provide consistent answers

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<sup>9</sup> Ability to obtain answers without writing an utterance.

for each utterance. Finally, an illustrated request form was designed to enhance comprehension when presenting information.

### **3.2 Educational module instructional guides**

First, the "Accessing safe sexual behavior information" module provided guidance on how and where to access information on safe sexual behavior. In the "Understanding safe sexual behavior information" module, emphasis was placed on the necessity of safe sexual behavior through the consequences of risky sexual behaviors as well as the principles and methods of contraception. This module considered understanding about the instructions on contraceptive products. The "Appraising safe sexual behavior information" module was designed to establish criteria for evaluating information accessed through commonly used media sources and to provide examples of gender role stereotypes, peer culture, and family culture that influence the evaluation process. The "Applying safe sexual behavior information" module covered the preparation of contraceptives in advance, practical ways to consent, negotiate safe sexual behavior, and refuse risky sexual behavior, and proactive communication with partners about safe sexual behavior. Scenarios for the chatbot were developed based on these databases to facilitate the educational modules. The chatbot alarm was configured using friendly language and emoticons to remind users to complete the educational module. And the educational modules have been linked to the direct connection button so that participants can be completed at a convenient time. Finally, an illustrated request form was developed to improve understanding of the educational module.

## **4. Pretesting and refining the materials**

The fourth task in step 4 of the IM is to pretest and pilot-test the program materials and to make revisions prior to overseeing materials' production (Bartholomew et al., 2016). The task applied "engaging stakeholders" to ensure that the educational module respected all aspects of the specific culture of the participants, drawing on the experience of the school nurses.

### **4.1 Content validity index**

Prior to finalizing the educational modules, the content validity was determined by six school nurses experienced in delivering sexuality education to racial and ethnic female adolescents. Content validity is rated on a 4-point Likert scale (1='not relevant', 2='relevant but needs a lot of modification', 3='relevant but needs some modification', 4='very relevant and valid'). Following Lynn's (1986) method, the item-level CVIs were calculated by dividing the number of people who marked 3 or 4 by the total number of people (Lynn, 1986). Items with an I-CVI of less than 0.78 were reviewed and revised.

The content validity determined by the six experts on the structure of the developed educational module instructional guides (Appendix 3) ranged from 0.83 to 1.00 (Appendix 4). Their main suggestions included changing learning objectives to behavioral verbs, correcting chatbot errors, and adding videos to explain how to use contraceptives in addition to the descriptions provided in Module 3. For Module 4, it was suggested that criteria such as "distinguishing between fact and opinion, checking for bias and economic

benefit (e.g., sales), and ensuring the information is up-to-date" be included when evaluating media information. Their feedback for Module 5 included the addition of an example on gender equality, and that for Module 6 included adding the terminology engaging in health advocacy activities to applying safe sexual behavior.

## **4.2 Final version of educational module instructional guides**

The final version of educational modules that incorporated modifications and enhancements based on expert suggestions are presented in Table 15. Subsequently, a chatbot and illustration developer were employed to create a chatbot capable of exploring sexual and reproductive health information and delivering the educational modules based on the finalized designed materials. In collaboration with the developer, drafts of the materials were iteratively reviewed to ensure compliance with the requirements outlined in the design document. The completed chatbot as well as the information and the educational modules it provides are detailed in Appendices 5, 6 and 7.

### ***Module 1. "Finding safe sexual behavior information"***

To promote the participants' ability to access safe sexual behavior information, the first educational module was designed to generate interest by presenting real-life examples of how young people seek sexual behavior information in the introduction. It subsequently presented the types of pathways and resources (information, material, and human resources) to obtain safe sexual behavior information correctly.

### ***Module 2. "Why practice safe sexual behavior?"***

The second educational module was designed to increase the participants' ability to understand the information on safe sexual behavior that they had access to. The drama of experiencing the negative consequences of risky sexual behavior was presented to motivate learning. In addition, the concept of safe sexual behavior and the consequences of risky sexual behavior were illustrated with epidemiological data.

***Module 3. "Do you really understand what you found?"***

The third educational module also aimed to improve the participants' ability to understand the safe sexual behavior information they had access to. It provided a detailed explanation of how to properly read the instructions on contraceptive products.

***Module 4: " Unnoticed infiltration of sexual health information in the media".***

The fourth educational module was designed to enhance participants' ability to evaluate the safe sexual behavior information they access. Misleading sexual health information provided by physical media was presented to the participants to make them aware of the issue. The need to evaluate sexual health information in the digital space was emphasized by providing criteria for appraising it correctly.

***Module 5: "Gender role stereotypes and culture that unknowingly affected me"***

The fifth educational module was also designed to increase participants' ability to evaluate the accessed safe sexual behavior information. Experiences of contraceptive-related bias were provided in the introduction, and examples of gender role stereotypes (negative societal views of women's sexual behavior), peer culture (sexual teasing), and family



culture (lack of sexual communication, existing parental sexual culture) that contribute to these biases were presented as illustrative materials. The module concluded with a discussion of ways to modify these gender role stereotypes, peer culture, and family culture.

***Module 6: "I'm too embarrassed to buy it"***

The sixth educational module promoted the participants' ability to apply safe sexual behavior information by first recognizing the barriers to purchasing contraceptives and thinking about health advocacy methods that can change social perceptions.

***Module 7: "Love requires consent"***

The seventh educational module, which promoted the participants' ability to apply safe sexual behavior information, was about negotiating safe sexual behavior. A visual illustration of the passivity and negative gender roles identified in racial and ethnic female adolescents in negotiating safe sexual behavior was presented. Effective negotiation and refusal methods to address these issues were presented in plain language, and the participants were asked to evaluate their self-efficacy levels. This module also emphasized that healthy relationships are about respecting each other's opinions.

***Module 8: "Sexual behavior, plan ahead"***

The eighth educational module, which promoted the participants' ability to apply safe sexual behavior information, focused on safe sexual behavior communication. A sexual behavior plan from an entertainment program was presented to raise awareness of the importance of communicating with partners in advance. The module then guided the

participants to create a safe sexual behavior plan to support them in thinking ahead about their relationships with the opposite sex and the consequences of sexual behavior in advance.

**Table 15.** Final version of educational module

No.	Performance objectives	Change objectives	Title	Learning objectives
1	PO1. Access the information related to safe sexual behavior	A1. Express positive feelings toward accessing information related to safe sexual behavior. SE1. Express confidence in accessing information about safe sexual behavior.	Find safe sexual behavior information	Racial and ethnic female adolescents - can comprehend and articulate the significance of assessing information regarding safe sexual behavior. - can identify and apply methods to assess information on safe sexual behavior.
2	PO2. Understand the information related to safe sexual behavior	A2. Express positive feelings about practicing safe sexual behavior. SE2-1. Express confidence in explaining why it is important to practice safe sexual behavior.	Why practice safe sexual behavior?	- can explain what safe sexual behavior entails. - can articulate the reasons for practicing safe sexual behavior.
3	PO2. Understand the information related to safe sexual behavior	SE2-2. Express confidence in understanding how to practice safe sexual behavior.	Do you really understand what you found?	- can describe the methods outlined in contraceptive instructions for achieving safe sexual behavior.
4	PO3. Appraise correctly the information related to safe sexual behavior.	A3. Recognize the advantages of evaluating information related to safe sexual behavior. SE3. Express confidence in evaluating whether sexual behavior information is accurate.	Unnoticed infiltration of sexual health information in the media	- can explain the reasons for evaluating information on safe sexual behavior. - can enumerate methods for evaluating information on safe sexual behavior.

**Note.** PO=Performance Objective; A=Attitude, SE=Self-Efficacy, SN=Subjective Norm

**Table 15.** Final version of educational module (Cont'd)

No.	Performance objectives	Change objectives	Title	Learning objectives
5	PO3. Appraise correctly the information related to safe sexual behavior.	A3. Recognize the advantages of evaluating information related to safe sexual behavior. SE3. Express confidence in evaluating whether sexual behavior information is accurate.	Gender role stereotypes and culture that unknowingly affected me	- can explain the factors influencing the evaluation of information on safe sexual behavior.
6	PO4-1. Apply informed and safe sexual behavior - Prepare safe sexual behavior.	SE4-1. Express confidence in preparing safe sexual behavior. SN4-1. Explain that significant others say that safe sexual behavior is easy and natural.	I am too embarrassed to buy it	- can explain the factors influencing the purchase of contraceptives in the practice of safe sexual behavior.
7	PO4-2. Apply informed and safe sexual behavior - Negotiate safe sexual behavior.	SE4-2a. Express confidence in being able to negotiate safe sexual behavior with a partner. SN4-2. Explain that significant others talk to partners about negotiating safe sexual behavior.	Love requires consent	- can explain negative societal perceptions related to negotiating safe sexual behavior. - can list appropriate negotiation strategies for practicing safe sexual behavior.
8	PO4-3. Apply informed and safe sexual behavior - Communicate about safe sexual behavior	A4-3. Feel positive about communicating about safe sexual behavior.	Sexual behavior, plan ahead	- can explain the importance of communication with their partners in advance to practice safe sexual behavior

*Note.* PO=Performance Objective; A=Attitude, SE=Self-Efficacy, SN=Subjective Norm

## **E. Intervention mapping Step 5: Program implementation plan**

### **1. Identify potential program users**

In the fifth step of IM, the initial task involves determining who will perform specific roles at each stage of program utilization (Bartholomew et al., 2016). In the case of the BORA intervention for racial and ethnic female adolescents, school nurses and related professionals were identified as the primary users of sexual and reproductive health education for this age group.

### **2. Designing implementation interventions**

In the fifth step of IM, the ultimate task is to create materials for an implementation intervention aimed at influencing the utilization of the program (Bartholomew et al., 2016). The educational module instruction guideline was developed to ensure that the intervention could be used by teachers and allied professionals who deliver sexuality education (Appendix 5). The eight modules of the BORA intervention were organized by their titles, learning objectives, core competencies, SRHL abilities, and learning content. The learning content was organized into introduction, development, and summarization, and teaching and learning activities and materials were presented according to each learning content and activity.

## **F. Intervention mapping step 6: Process and effect evaluation**

### **1. Effect questions from program logic model**

In the sixth step of IM, the initial task is to formulate process and effectiveness questions. These questions stem from a review of the program logic models, goals, objectives, and the intervention mapping matrices (Bartholomew et al., 2016). The following questions for the process evaluation of the BORA intervention were formulated: 1) Was the intervention acceptable to participants? 2) Was the content of the intervention delivered appropriately? 3) What were the levels of recruitment, consent, and retention? 4) Did the participants adhere to the intervention with fidelity? (Table 16). Based on these questions, Proctor et al.'s (2011) implementation outcome indicators of acceptability, appropriateness, feasibility, and fidelity were selected. The next questions to evaluate the effectiveness of the BORA intervention was whether there were positive changes in the experimental group compared with the control group before and after the intervention. Based on this, the primary outcome of the potential effect was safe sexual behavior intention, and the secondary outcomes were safe sexual behavior attitude, safe sexual behavior subjective norms, safe sexual behavior self-efficacy, and SRHL.

### **2. Selecting and developing measures**

In the sixth step of IM, the second task is to formulate indicators and measures for evaluating the chosen effect and process evaluation questions (Bartholomew et al., 2016). Indicators and measures were selected based on the questionnaire selected in the first task (Table 16). In the process evaluation, the User Engagement Scale Short Form was selected to measure acceptability (O'Brien et al., 2018). Quantitative and qualitative surveys were employed to measure the perceived appropriateness of the educational modules. To measure feasibility, the recruitment rate, consent rate, retention rate, and usability were selected as indicators, and administration data, a pre-post test, and the Chatbot Usability Questionnaire were employed (Holmes et al., 2019). Finally, the adherence rate of educational modules and participant's usage pattern of chatbot were selected as indicators, and the chatbot dialog was employed to measure fidelity.

To evaluate potential effects, self-report questionnaires were employed as measures for all outcome variables. To measure SRHL, the Questionnaire on Sexual and Reproductive Health Literacy was used as an indicator (Vongxay et al., 2022), and for safe sexual behavior attitude, the Condom Attitude Scale was used as an indicator (Kang & Jang, 2004). Contraception subjective norm was set as an indicator for safe sexual behavior subjective norm (Primack et al., 2007; Hwang & Jeong, 2014), and the Condom Self-Efficacy Scale was set as an indicator for safe sexual behavior self-efficacy (Hanna, 1999; Cha et al., 2008). Finally, safe sexual behavior intention was set as an indicator that was assessed with the following item: "When you engage in sexual behavior, how often do you intend to engage in safe sexual behavior?".

**Table 16.** Plan for evaluation of process and effect evaluation

Outcomes	Questions	Indicators
<i>Process</i>		
Acceptability	Is the intervention acceptable to the participants?	User Engagement Scale Short Form (O'Brien et al., 2018)
Appropriateness	Is the intervention relevant and appropriate for the participants?	Perceived relevance
Feasibility	Will the intervention be used successfully?	Recruitment rate, Consent rate, Retention rate
Fidelity	Is the intervention suitable for ongoing daily use?	Chatbot Usability Questionnaire (Holmes et al., 2019)
	To what extent will the intervention reach participants? What is the quality of the intervention delivery?	Adherence rate Participant involvement
<i>Potential effect</i>		
Sexual and reproductive health literacy	Will the experimental group increase their sexual and reproductive health literacy compared with the control group?	Questionnaire on Sexual and Reproductive Health Literacy (Vongxay et al., 2022)
Safe sexual behavior attitude	Will the experimental group show improved safe sexual behavior attitudes compared with the control group?	Condom Attitude Scale (Kang & Jang, 2004)
Safe sexual behavior subjective norm	Will the experimental group experience a positive change in safe sexual behavior subjective norms compared with the control group?	Contraception Subjective Norm (Primack et al., 2007; Hwang & Jeong, 2014)
Safe sexual behavior self-efficacy	Will the experimental group increase safe sexual behavior self-efficacy compared with the control group?	Condom Self-Efficacy Scale (Hanna, 1999; Cha et al., 2008)
Safe sexual behavior intention	Will the experimental group increase their intention to engage in safe sexual behaviors compared with the control group?	One question "If engaging in sexual behavior, how often do you intend to do safe sexual behavior?"



### **3. Planning designs for process and effect evaluation**

In the Step 6 of IM, the third task involves specifying designs for conducting process and effect evaluations (Bartholomew et al., 2016). The data collection period for process evaluation occurs from the time of participant recruitment until after the intervention is completed. In the case of research design, implementation research is a method that attempts to understand implementation within the participant's actual conditions (Miller et al., 2020); therefore, a quasi-experimental design was selected rather than random allocation to control the subjects' conditions.

In addition, to evaluate the effectiveness of the BORA intervention, measurement points were set for before and after the intervention. Then, a design including a control group was constructed to compare the effect of the intervention. As a quasi-experiment was designed for process evaluation, the effect evaluation also had to be performed using a quasi-experimental design. Therefore, to increase the internal validity of this study (Miller et al., 2020), the following detailed, accessible population was settled as follows: middle school-aged adolescents who were born in South Korea and were children of Vietnamese married immigrants. In other words, a non-equivalent control group pre-post design was employed to evaluate the process and potential effects of the BORA intervention.

## 4. Completing the evaluation plan

The ultimate step in IM Step 6 involves detailing and finalizing the evaluation plan (Bartholomew et al., 2016). The research design for the process and effect evaluation in the BORA intervention derived through steps 1 to 6 of IM is as follows.

### 4.1 Research design

This is a quasi-experimental pilot study using a nonequivalent control group design to evaluate the process and potential effect of the BORA intervention developed for racial and ethnic female adolescents (Table 17).

**Table 17.** Research design

Group	Pre-test	Intervention (2 weeks)								Post-test
Experimental Group	O1	X	X	X	X	X	X	X	X	O2
Control Group	O1									O2

*Note.* O=Observation; X=BORA intervention

### 4.2 Participants

The target population is female adolescents with diverse racial and ethnic backgrounds living in South Korea; the accessible population is female middle school students born in South Korea whose mothers are Vietnamese migrants. In 2021, married immigrant families accounted for 82.8% of foreign-born families, with Vietnamese nationals accounting for 24.5% of married immigrant families in 2021, which is increased from 7.3% in 2012

(Ministry of Education, 2022; Ministry of Gender and Family, 2021). With 94.5% of racial and ethnic adolescents being Korean-born (Ministry of the Interior and Safety, 2022), domestic-born female middle school students of Vietnamese-married immigrant mothers may be representative of racial and ethnic female adolescents. Participants were those who voluntarily agreed to participate in the study, and the specific selection criteria were as follows:

### **1) Inclusion criteria**

- Female students in grades 1–3 enrolled in middle school;
- Children of Vietnamese migrant women;
- Children born in South Korea;
- Those who were able to communicate in Korean; and
- Those who had and could use a mobile device with an internet connection.

### **2) Exclusion criteria**

- Those who did not attend middle school;
- Those whose father or mother was not a marriage immigrant from Vietnam;
- Those who entered the country midway even if their father or mother was a marriage immigrant from Vietnam; and
- Those who did not attend middle school.

### **3) Sample size**

The sample size was determined to evaluate the process and potential effect of this research design rather than to provide adequate power for hypothesis testing. Since the sample size for a pilot study is based on a minimum of 12 participants per group (Julious, 2005), a total of 26 participants was set as the final sample size, considering a dropout rate of 5% during the intervention duration for racial and ethnic female adolescents, and 13 participants per group were assigned to the experimental and control groups.

## **4.3 Measurements**

### **4.3.1 Process evaluation**

#### **1) Acceptability**

Acceptability refers to the perception of whether an intervention is agreeable and satisfactory (Proctor et al., 2011). To measure the acceptability of the BORA intervention, the User Engagement Scale Short Form developed by O'Brien et al. (2018) was translated into Korean using the WHO's tool translation procedures (O'Brien et al., 2018; WHO, 2009). After obtaining approval from the original developer, two experts in developing and evaluating digital interventions who were proficient in both English and Korean performed the translation and back-translation. The initial version was then finalized through expert meetings, and the Korean language review was conducted by a Korean teacher with experience in teaching Korean to racial and ethnic adolescents. User engagement refers to the quality of participants' cognitive, temporal, emotional, and behavioral experiences

when interacting with a digital system. The User Engagement Scale Short Form consists of a total of 12 items divided into 4 subscales (aesthetic appeal, focused attention, perceived usability, and reward). The tool consists of participatory experiences, such as 'I felt interested in this experience'. The scores are measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). To calculate the score, the three items in the perceived usability subscale (items 4, 5, 6) are reverse-coded, all the items are added together, and the sum is divided by twelve. The range is 12–60 points, with higher scores indicating higher user engagement. The omega reliability ( $\omega$ ) of the original instrument ranged from .81 to .86, while the omega reliability for this study ranged from .503 to .938.

## **2) Appropriateness**

Appropriateness refers to the participants' perceived fit and relevance of the intervention (Proctor et al., 2011). To measure the appropriateness of the BORA intervention, the participants were individually assessed to determine perceived relevance after completing each educational module. Each item is rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) to the question: "Was each education appropriate for promoting safe sexual behavior?". The appropriateness scores for each module were added together and divided by the number of participants to calculate the score. The range is 1–5 points, and a higher score indicates a higher perceived appropriateness of the educational module by the participants. In addition, the participants were asked to answer the open-ended question, "Why did you give this score? Please write the reason".

### 3) Feasibility

Feasibility refers to whether a new intervention can be successfully implemented or is suitable for everyday use (Proctor et al., 2011). To assess the feasibility of the BORA intervention, the recruitment rate, consent rate, retention rate, and level of usability of the chatbot were measured. The number of participants recruited within one month was calculated to measure the recruitment rate. Consent was measured by comparing the number of actual research participants to those recruited. To assess the retention rate, it was determined whether participants who completed the pre-test also completed the post-test. To assess the usability of the chatbot, it was used the Chatbot Usability Questionnaire developed by Holmes et al. (2019) and translated into Korean by Lee et al. (2022)<sup>10</sup>. The questionnaire consists of eight positive and eight negative questions covering aspects such as chatbot personality, user experience, and error handling. Each item is rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). To calculate usability, the odd questions were summed and subtracted by eight, and the sum of the even questions was subtracted from 40. These sums were combined, divided by 64, and multiplied by 100 to yield the usability score. A score of 70 or higher indicates good usability of the chatbot. Finally, participants were asked to answer open-ended questions, such as "Please write down what was useful (advantages) and inconvenient (disadvantages) when using the chatbot."

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<sup>10</sup> Chatbot Usability Questionnaire Korean version (CUQ-K).  
[http://mhr.co.kr/sub\\_media/gallery.php?mode=view&number=99&page=1&b\\_name=gallery](http://mhr.co.kr/sub_media/gallery.php?mode=view&number=99&page=1&b_name=gallery)

#### **4) Fidelity**

Fidelity, which indicates the degree of implementation of an intervention (Proctor et al., 2011), was assessed in the BORA intervention through module adherence rates and the participants' usage patterns of the chatbot. Adherence rates were determined by counting the number of modules completed per participant and the number of participants who completed each of the eight modules. To identify participation usage patterns, the ratio of those who completed the educational modules within 24 hours to those who completed them after 24 hours was calculated. Moreover, the number of questions asked, the number of information searches, and the number of conversations held by participants were also calculated as total scores and ratios.

#### **4.3.2 Potential effect evaluation**

##### **1) Safe sexual behavior attitude**

Safe sexual behavior attitude was measured using the Condom Attitude Scale developed by Kang & Jang (2004) for college students (Kang & Jang, 2004). This instrument assesses an individual's positive or negative evaluation of practicing safe sexual behavior. It consists of three subscales with a total of 16 items: 7 items on barriers to sexual behavior, 5 items on protective factors, and 4 items on image factors. Each item is rated on a 5-point Likert scale (1 = 'strongly disagree' 5 = 'strongly agree'), resulting in a total score ranging from 16 to 80. To calculate the score, items 1–10 and 12 are reverse-coded, and all the items should be added together. A higher total score indicates a more positive attitude

toward safe sexual behavior. Cronbach's alpha of Kang & Jang (2004) was .88, and that for this study was .915 (pre) and .850 (post).

## **2) Safe sexual behavior subjective norms**

Safe sexual behavior subjective norms were measured using Hwang & Jeong's (2014) instrument, which was modified from Primack et al.'s (2007) subjective norms for smoking cessation to fit the context of contraception. In this study, the important people to racial and ethnic female adolescents were adapted to include their parents, friends, teachers, and sexual partners. This instrument consists of four items, such as 'My sexual partner emphasizes that I should practice safe sexual behavior,' measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores are calculated by summing the total points, which range from 4 to 20. Higher scores indicate a perception of pressure from significant others for safe sexual behavior. In the study by Primack et al. (2007), Cronbach's was .82, and in the study by Hwang & Jung (2014), Cronbach's alpha was .75. Cronbach's alpha for this study was .904 (pre) and .918 (post).

## **3) Safe sexual behavior self-efficacy**

Safe sexual behavior self-efficacy was measured using the Korean version of the Condom Self-Efficacy Scale (CSE-K) by Cha et al. (2008), who translated Hanna's (1999) condom self-efficacy tool into Korean and validated its reliability and validity. There are 14 total items divided into 3 subscales (consistent use: 3 items; correct use: 6 items; and communication self-efficacy: 5 items). The CSE-K consists of questions about how much one can do in these situations (e.g., 'I could talk my partner into using a condom when we



have sex'). Each item is rated on a 5-point Likert scale, ranging from 1 (very unsure) to 5 (very sure). The scores were summed and ranged from 14 to 70, with higher scores indicating higher self-efficacy for safe sexual behavior. Cronbach's  $\alpha$  was .85 in Hanna's (1999) study and .91 in Cha et al.'s (2008) study. Cronbach's  $\alpha$  for this study was .945 (pre) and .880 (post).

#### **4) Safe sexual behavior intention**

To measure safe sexual behavior intention with one item, participants were asked, "If engaging in sexual behavior, how often do you intend to do safe sexual behavior?". It was measured on a 5-point Likert scale ranging from 1 ("I will never perform safe sexual behavior") to 5 ("I will always perform safe sexual behavior"), with higher scores indicating higher levels of safe sexual behavior.

#### **5) Sexual and reproductive health literacy**

To measure SRHL, the Questionnaire on Sexual and Reproductive Health Literacy developed by Vongxay et al. (2022) was translated into Korean following the WHO tool translation procedure (Vongxay et al., 2022; WHO, 2009). First, after approval from the original authors, it was translated and back-translated by experts specializing in racial and ethnic adolescent health research who were fluent in Korean and English. The first version was then reviewed by panels of experts, and the final version was reviewed in Korean by a language teacher experienced in teaching Korean to racial and ethnic adolescents. The tool consists of 39 questions related to teenage pregnancy, contraception, and abortion, such as 'find information about possible side effects of contraceptives.' The subscales include 9

items on access, 10 items on understanding, 9 items on appraisal, and 13 items on application scored on a 4-point Likert scale (1=very difficult, 4=very easy). The formula for calculation is  $(\text{mean}-1)*50/3$ , with a range of 0-50. Cronbach's  $\alpha$  of the Vongxay et al's (2022) study (2022) was 0.91, and Cronbach's  $\alpha$  of this study was 0.970 (pre) and 0.982 (post).

## **6) General characteristics**

Personal factors were measured by age, living area, and socioeconomic status. Socioeconomic status was measured using the MacArthur Scale - Adolescent's version, which is a ladder with 10 rungs ranging from 1 to 10 (Goodman et al., 2001). The following question was presented with the picture: "Imagine that the ladder is a way of drawing a school. At the top of the ladder are the students who are most respected or who everyone wants to hang out with. At the bottom of the ladder are the students who are least respected who no one wants to hang out with and who have the lowest status. Where do you think you are on this ladder." Participants were then asked to choose from 1 (lowest position) to 10 (highest position). One indicates that the perceived socioeconomic status of the participant is very low, and ten indicates that the perceived socioeconomic status of the participant is very high. Living with parents as a situational factor was measured on a dichotomous scale of yes or no with one item, "Do you live with your father/mother?"

## **4.4 Intervention**

For two weeks in September 2023, the BORA intervention was delivered via a chatbot. First, the researcher shared a link to the chatbot that could be accessed via a mobile device

(mobile phone, tablet, etc.) with the experimental group. The BORA intervention consisted of information on safe sexual behavior and educational modules on SRHL. Participants were free to ask the chatbot questions at any time, receive real-time responses, and receive information via a direct connection button. The educational module lasted two weeks, with eight 10-minute sessions four times a week. A pop-up alert was delivered via chatbot text message to encourage users to complete the module. The educational module included four processes: accessing, understanding, appraising, and applying information about safe sexual behavior.

The educational modules were structured into an introduction, development phase, and a conclusion. The introduction included videos, dramas, cartoons, etc., to raise their awareness of barriers to accessing, understanding, appraising, and applying information on safe sexual behavior, and they had opportunities to comment or respond. The development phase involved the application of methods to remove barriers to accessing, understanding, appraising, and applying safe sexual behavior information and to promote SRHL. The conclusion consisted of a debriefing session to summarize the content of the module. Participants in the control group received no treatment during the BORA intervention.

#### **4.5 Data collection**

Convenience and snowball sampling were employed to recruit participants for the experimental and control groups. Participants were recruited through the multicultural family support center, the middle school, and related centers. Since racial and ethnic female adolescents needed parental consent to participate in the BORA intervention, relevant workers from each institution, acting as gatekeepers, recruited the research participants

through their own institutions and networks. Racial and ethnic female adolescents interested in participating voluntarily accessed the recruitment link, read the study description, and completed the consent form. The researcher then explained the study to the legal representatives of the racial and ethnic female adolescents who met the inclusion criteria and obtained consent forms. For process evaluation of the BORA intervention, the experimental group completed selected questionnaires after completing each educational module and when conducting the post-test. To evaluate the effectiveness, pre- and post-tests were conducted in both the experimental and control groups before and after the BORA intervention. Participants in the experimental and control groups who completed the data collection were remunerated.

## **4.6 Data analysis**

Data from the process and effects evaluations of this study were analyzed using the SPSS/WIN 25.0 program (IBM Corp., 2019) and STATA (StataCorp., 2019), with the specific analytical methods described below.

### **4.6.1 Process evaluation analysis**

- Acceptability: Descriptive statistics (means) were used for each item, subscale, and participant.
- Appropriateness: Descriptive statistics (means, ranges) were used for each module. In addition, qualitative findings were subjected to a content analysis.
- Feasibility: Recruitment, consent, and retention rates were analyzed as ratios. The usability of the chatbot was analyzed using the tool formula. Qualitative data on

the usefulness and inconvenience of using the chatbot were analyzed using content analysis.

- Fidelity: The adherence to each educational module was analyzed using descriptive statistics (frequencies, percentages, means). The time in which each module was implemented was assessed by frequencies and percentages. Patterns of chatbot use by each participant were examined using frequencies and percentages.

#### **4.6.2 Program evaluation analysis**

- General Characteristics: Descriptive statistics (frequencies, percentages, means, standard deviations) were employed to analyze the general characteristics of the experimental and control groups.
- Homogeneity Testing: Independent t-tests and Mann-Whitney U tests were conducted to test the homogeneity of the general characteristics and main variables between the experimental and control groups.
- Interaction Testing: A mixed-effects model was utilized to test the interaction of group and time between the experimental and control groups

#### **4.7 Ethical consideration**

This study received approval from the Institutional Review Board of Yonsei University. Participants were fully informed about the study's purpose, procedures, and the voluntary nature of their participation. They were assured of the option to withdraw at any time without consequences. Participants were informed that the collected data would be

used solely for academic purposes and that their anonymity would be preserved. Moreover, the study was registered (KCT0008572) with the Clinical Research Information Service (CRIS) at the National Institutes of Health of the Centers for Disease Control and Prevention. CRIS registration enhances the protection of human subjects, ensures research transparency, and upholds the objectivity of results.

## V. RESULTS

The study implemented the BORA (Bot of sexual and reproductive health literacy for adolescents) intervention for safe sexual behavior among racial and ethnic female adolescents over two weeks. To evaluate the implementation process of the pilot study, acceptability, appropriateness, feasibility, and fidelity were assessed for the experimental group using administrative data, quantitative questionnaires, and open-ended questions during and immediately after the intervention. To gauge the potential effect of BORA intervention, sexual and reproductive health literacy (SRHL), safe sexual behavior attitude, safe sexual behavior subjective norm, safe sexual behavior self-efficacy, and safe sexual behavior intention were assessed. The results were as follows:

### A. Process evaluation

#### 1. Acceptability

The mean score of the acceptability, assessing fulfillment of participants' needs, was 3.65 out of 5, with a range of 2.17-4.25 (Table 18). Among the four subscales (focused attention, perceived usefulness, aesthetic appeal, and reward), the highest-scoring subscale was reward, while the lowest-scoring was focused attention. The top-scoring items were “Item 8: This "BORA" was aesthetically appealing” and “Item 12: I felt interested in this experience”. The lowest-scoring item was “Item 1: I lost myself in this experience”.

**Table 18.** Acceptability of the BORA intervention

(*N* = 12)

Item	Total
1. I lost myself in this experience.	1.75
2. The time I spent using “BORA” just slipped away.	3.75
3. I was absorbed in this experience.	2.75
4. I felt frustrated while using this “BORA.”*	3.58
5. I found this “BORA” confusing to use.*	3.58
6. Using this “BORA” was taxing.*	3.33
7. This “BORA” was attractive.	3.92
8. This “BORA” was aesthetically appealing.	4.33
9. This “BORA” appealed to my senses.	4.00
10. Using “BORA” was worthwhile.	4.17
11. My experience was rewarding.	4.25
12. I felt interested in this experience.	4.33
Focused attention (Item 1,2,3)	2.75
Perceived usability (item 4,5,6)	3.50
Aesthetic appeal (item 7,8,9)	4.08
Reward (item 10,11,12)	4.25
<b>Total</b>	<b>3.65</b>

\* Reverse item



## 2. Appropriateness

The mean score of the appropriateness, evaluating perceived fit and relevance of eight educational module, was 4.50 out of 5, with a range from 4.33 (module 5) to 4.60 (module 3). The modules that showed the highest appropriateness were Module 3 (“Do you really understand what you found?”) and Module 7 (“Love requires consent.”) The module that showed the lowest appropriateness was module 5 (“Gender role stereotypes and culture that unknowingly affected me.”) (Table 19).

**Table 19.** Appropriateness of educational modules

	Components	Title	Mean
1	Access	Finding safe sexual behavior information	4.56
2	Understand	Why practice safe sexual behavior?	4.56
3	Understand	Do you really understand what you found?	4.60
4	Appraise	Unnoticed infiltration of sexual health information in the media	4.50
5	Appraise	Gender role stereotypes and culture that unknowingly affected me	4.33
6	Apply	I am too embarrassed to buy it	4.43
7	Apply	Love requires consent	4.60
8	Apply	Sexual behavior, plan ahead	4.43
<b>Total</b>			<b>4.50</b>

In addition, comments about the appropriateness of the educational modules were provided (Table 20). The overall opinion was that the educational modules based on the four processes of SRHL was appropriate.

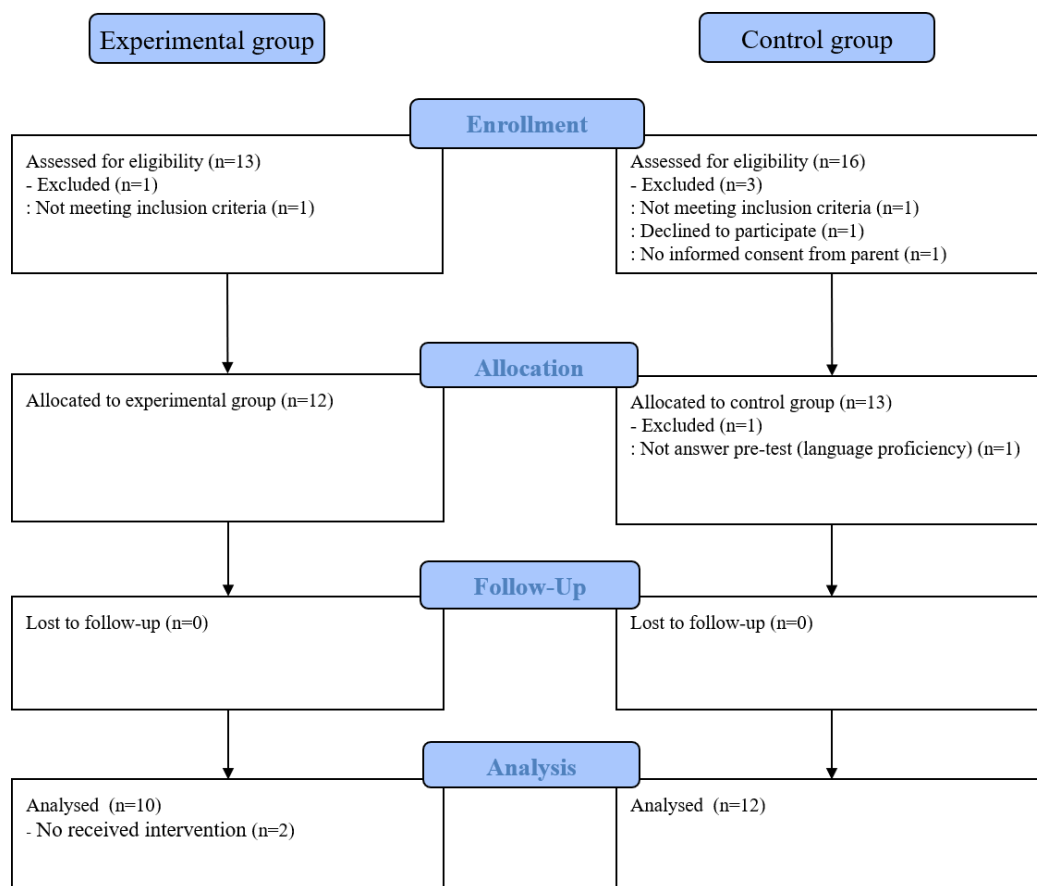
**Table 20.** Quotation related to appropriateness of educational modules

Component	Quotation
1. access	“Since there were so many options for sexual health information, I could learn a lot.” - EG 4
2. understand	“I appreciated how it utilized material that adolescents would be interested in (drama) to spark conversation!” - EG 8
3. understand	“I learned that when using contraceptives, you need to be familiar with the instructions and precautions for use.” – EG 7
4. appraisal	“It is good for prevention, as one may come up with the idea of wearing two condoms to lower the chance of pregnancy.” – EG 4
5. appraisal	“Today's training made me realize that I need to let go of my prejudices and respect other cultures.” - EG 5
6. apply	“I realized that buying contraception was an active act of self-protection.” – EG 12
7. apply	“It taught me how to recognize when someone is making threatening demands to fulfill his or her desires, and how to judge how much they care about me.” – EG 4
8. apply	“I know that safe sexual behavior requires a plan and mutual trust and respect.” -EG 12

*Note.* EG=Experimental Group

### 3. Feasibility

Feasibility, which assesses successful implementation of the BORA intervention, was confirmed by recruitment rate, consent rate, retention rate, and chatbot usability (Figure 5). The recruitment rate was 29 participants within one month. The consent rate was 86.21% (experimental group, 92.31%; control group, 81.25%). In the experimental group, 13 people expressed their interest in participating; however, one person did not satisfy the inclusion criteria due to being born outside the country and was excluded. In the control group, 16 people consented to participate; however, three were excluded due to birth abroad (n=1), withdrawal after consent (n=1), and parental refusal (n=1). A total of 25 participants joined the intervention: 12 in the experimental group and 13 in the control group. The retention rate was 88.00% (experimental group, 100.0%; control group, 92.30%). One participant in the control group withdrew during the pre-test due to difficulty understanding the survey. Hence, a total of 24 participants (12 in the experimental group and 12 in the control group) was included for analysis.



**Figure 5.** CONSORT flow diagram of this study

The chatbot usability mean score was 81.12 (range: 51.6-95.3), indicating good usability (Table 21). Upon reviewing the items, “Item 15: The chatbot was very easy to use” had the highest score of 4.83. The lowest-scoring item was the reverse question, “Item 10: The chatbot failed to recognize a lot of my input”, which received a score of 2.50 (converted: 3.50).

**Table 21.** Feasibility of the BORA intervention

(N = 12)

Item	Total
The chatbot's personality was realistic and engaging	4.50
The chatbot seemed too robotic*	2.58
The chatbot was welcoming during initial setup	4.67
The chatbot seemed very unfriendly*	1.33
The chatbot explained its scope and purpose well	4.67
The chatbot gave no indication as to its purpose*	2.25
The chatbot was easy to navigate	4.42
It would be easy to get confused when using the chatbot*	1.58
The chatbot understood me well	4.25
The chatbot failed to recognise a lot of my inputs*	2.50
Chatbot responses were useful, appropriate, and informative	4.58
Chatbot responses were irrelevant*	2.00
The chatbot coped well with any errors or mistakes	3.83
The chatbot seemed unable to handle any errors*	2.25
The chatbot was very easy to use	4.83
The chatbot was very complex*	1.33
<b>Total</b>	<b>81.12</b>

\* Reverse item

Lastly, after two weeks of using the chatbot, qualitative comments about the advantages and disadvantages were noted (Table 22). As an advantage, participants mentioned that the chatbot, which greeted them in a friendly tone daily, felt like a friend. They also found the function categorizing and presenting questions about safe sexual behavior was convenient. The most cited benefit was the provision of detailed, accurate, and reliable information. However, the inconvenience of lacking information was noted, and participants pointed out that the chatbot sometimes provided incorrect answers when they asked questions.

**Table 22.** Advantages and challenges of chatbot

Categories		Quotations
Advantages	Friendly approach	<p><i>“The chatbot spoke in a friendly manner, not robotic, which made it more approachable.” – EG 4</i></p> <p><i>“The chatbot's tone of voice is friendly, and the fact that it greets you every day makes it feel like a friend.” – EG 9</i></p> <p><i>“It's a little awkward because it's dealing with sexuality, but its friendly approach induces honest conversations.” – EG 8</i></p>
	Convenient functions	<i>“The chatbot menu option made it easy to find the gender-related information I was curious about” – ET2</i>
	Trustworthiness of information	<p><i>“It was more reliable and gave me a lot more information, which was more detailed and accurate.” – EG 9</i></p> <p><i>“The chatbot had more information about contraception that I could not get on the internet; it was useful because it pointed me to specialized medical sites that only a few people would know about; and it was more realistic with various and unique examples.” – EG 4</i></p>
Challenges	Insufficient information	<p><i>“Sometimes I couldn't ask the questions I wanted to ask.” – EG 6</i></p>
	Response errors	<p><i>“Sometimes it gives the wrong answer.” – EG 2</i></p> <p><i>“When I asked a question by sending a message to the chatbot, sometimes I didn't get an answer.” – EG 9</i></p>
<p><i>Note.</i> EG=Experimental Group</p>		

## 4. Fidelity

Fidelity, which assesses the extent to which the BORA intervention was delivered to participants, was confirmed via patient adherence to the educational modules, time to completion, and participants usage patterns of chatbot. First, the adherence rate of the educational modules was 67.6%, with a mean number of adherences at 5.42 out of 8. Four participants (33.3%) participated in all eight educational modules, while two participants (16.67%) did not participate at all (Table 23). Additionally, 55 modules (83.08%) were performed primarily within 24 hours, and 10 modules (15.38%) were performed after 24 hours. Moreover, participants completed fewer educational modules over time, reducing from 10 to 5.

**Table 23.** Adherence rate of educational modules

Experimental group	Module								Adherence rate
	1	2	3	4	5	6	7	8	
1	O	O	O	O	O	O	O	O	8 (100.0)
2									0 (0.0)
3	O	O	O	O	O	O		O	7 (87.5)
4	O	O	O	O	O	O	O	O	8 (100.0)
5	O	O	O	O	O	O	O	O	8 (100.0)
6	O	O	O			O		O	5 (62.5)
7	O	O	O	O	O	O	O		7 (87.5)
8	O	O	O	O	O	O			6 (75.0)
9									0 (0.0)
10	O	O	O	O					4 (50.0)
11	O	O	O					O	4 (50.0)
12	O	O	O	O	O	O	O	O	8 (100.0)
<b>Amount of program delivered</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>5</b>	<b>7</b>	<b>5.42 (67.7)</b>



As shown in Table 24, each participant's chatbot usage patterns were categorized as asking questions, searching information, or having a conversation. The mean number of asking questions was 0.41 (range: 0-3), with questions such as: “What is menstruation?”, “How do I say no to risky sexual behavior?”, “What is sexual behavior?”, “What is fondling?”, and “What is foreplay?”. The mean number of times wherein participants searched for information regarding safe sexual behavior presented through the chatbot menu was 9.00 (range: 0-39). Lastly, the mean number of times wherein participants interacted with the chatbot was 9.0 (range: 0-39). For the responses to the chatbot, participants answered with “Yes,” “Okay,” and “Thank you,” and typed small talk such as “What should I do if I get into a fight with my friend?” and “I have the day off from school today.”

**Table 24.** Participants’ chatbot use patterns

Categories	n (%)	Mean±SD	Range
Asking questions	5 (4.0)	0.41±0.99	0-3
Searching information	108 (83.0)	9.00±12.18	0-39
Having conversations	17 (13.0)	1.41±3.52	0-12
<b>Total</b>	<b>130 (100.0)</b>		

*Note.* SD=Standard Deviation

## **B. Potential effect evaluation**

### **1. Homogeneity test for general characteristics of participants**

No statistically significant difference in age was found between the experimental and control groups ( $z=-0.876$ ,  $p=.443$ ). Additionally, no statistically significant difference was identified in area of residence ( $z=-0.608$ ,  $p=.590$ ). There was also no statistically significant difference in socioeconomic level ( $t=-0.246$ ,  $p=.808$ ). Finally, no statistically significant difference was found regarding cohabitation with the father ( $z=-0.604$ ,  $p=.775$ ). In short, the homogeneity of the general characteristics between the two groups was confirmed (Table 25).

**Table 25.** General characteristics of racial and ethnic female adolescents

Variables		Exp.(n=12)	Cont.(n=12)	<i>t/z</i>	<i>p</i>
		Mean±SD or n(%)			
Age		14.83±.93	15.17±.93	-.876	.443
	14	6 (50.0)	4 (33.3)		
	15	2 (16.7)	2 (16.7)		
	16	4 (33.3)	6 (50.0)		
Living area	Seoul	5 (41.7)	8 (66.7)	-.608	.590
	Busan	6 (50.0)	1 (8.3)		
	Others	1 (8.3)	3 (25.3)		
Socioeconomic status		5.75±2.34	6.00±2.62	-.246	.808
Living with father	Yes	11 (91.7)	10 (83.3)	-.604	.755
	No	1 (8.3)	2 (16.7)		
Living with mother	Yes	12 (100.0)	12 (100.0)	.000	1.000

*Note.* Exp=Experimental Group; Cont=Control Group; SD=Standard Deviation

† Independent t-test, Mann-Whitney test

## 2. Homogeneity test of key variables between two groups

No statistically significant difference was found in SRHL between the experimental and control groups ( $t=1.055$ ,  $p=0.303$ ). Similarly, no statistically significant difference in the safe sexual behavior attitude was found between these groups ( $t=0.960$ ,  $p=.347$ ). Furthermore, no statistically significant difference in the safe sexual behavior subjective norm was observed between these groups ( $t=-1.456$ ,  $p=.159$ ). Moreover, no statistically significant difference in the safe sexual behavior self-efficacy was identified between these groups ( $t=-0.384$ ,  $p=.705$ ). Lastly, no statistically significant difference in the safe sexual behavior intention was found between these groups ( $z=-0.231$ ,  $p=.775$ ). In short, the homogeneity of the key variables between these groups was confirmed (Table 26).

**Table 26.** Homogeneity test of variables

Variables	Exp.(n=12)	Cont.(n=12)	<i>t/z</i>	<i>p</i>
	Mean±SD			
Sexual and reproductive health literacy	31.62±10.31	27.81±7.08	1.055	.303
Safe sexual behavior attitude	64.83±10.12	60.83±10.28	.960	.347
Safe sexual behavior subjective norm	13.00±4.49	15.50±3.89	-1.456	.159
Safe sexual behavior self-efficacy	48.58±14.68	50.50±9.12	-.384	.705
Safe sexual behavior intention	3.92±1.50	4.08±1.31	-.231	.775

*Note.* Exp=Experimental Group; Cont=Control Group; SD=Standard Deviation

† Independent t-test, Mann-Whitney test

Specifically, when categorizing according to the four criteria of SRHL (Table 27), the experimental group levels were classified as inadequate (33.3%), problematic (25.0%), sufficient (16.7%), and excellent (25.0%). The control group levels were also divided into inadequate (33.3%), problematic (50.0%), sufficient (16.7%), and excellent (0.0%). However, no statistically significant difference in categorized SRHL between the experimental and control groups ( $\chi^2=3.740$ ,  $p=.335$ ).

**Table 27.** Differences level of sexual and reproductive health literacy between groups.

Level	Exp. (n=12)	Cont. (n=12)	$\chi^2$	<i>p</i>
	n(%)			
Inadequate	4(33.3)	4(33.3)	3.740	.303
Problematic	3(25.0)	6(50.0)		
Sufficient	2(16.7)	2(16.7)		
Excellent	3(25.0)	0(00.0)		

Note. Exp=Experimental Group; Cont=Control Group;

† Level: Inadequate (0~25), Problematic (26~33), Sufficient (34~42), Excellent (43~50)

### 3. Hypothesis test among racial and ethnic female adolescents

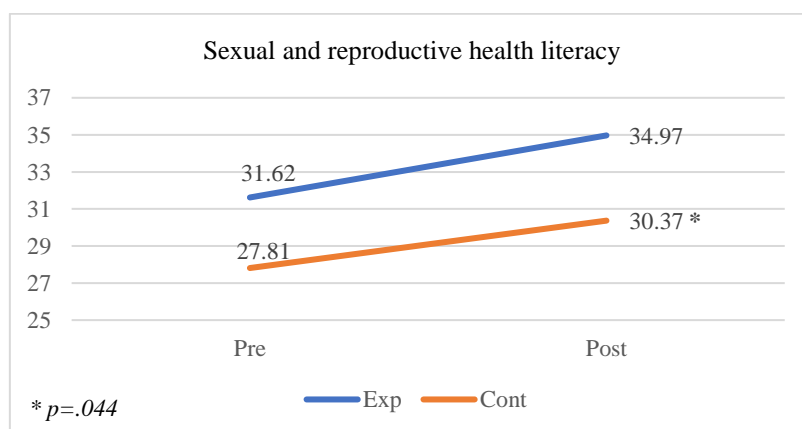
#### 3.1 Comparison of changes in sexual and reproductive health literacy

The change in SRHL of the experimental group over time did not statistically increase compared to that of the control group ( $z=-0.28, p=.780$ ) (Table 28). Compared to baseline in both groups, the control group exhibited a significant increase in SRHL after the intervention ( $t=-2.275, p=.044$ ), whereas the experimental group had no significant changes in SRHL following the intervention ( $t=-1.235, p=.243$ ) (Figure 6).

**Table 28.** Comparison of changes in sexual and reproductive health literacy between groups  
( $N = 12$ )

Parameter	Coefficient	SE	$z$	$p$	95% CI
Intercept	31.623	2.598	12.17	.000	(26.531, 36.716)
Group	-3.810	3.674	-1.04	.300	(-11.012, 3.391)
Time	3.347	1.987	1.68	.092	(-.547, 7.242)
Group*Time	-.783	2.810	-0.28	.780	(-6.291, 4.724)

Note. SE=Standard Error; CI= Confidence Interval



**Figure 6.** Change in mean score of sexual and reproductive health literacy between groups

Additionally, the effects of the intervention, categorized according to the four criteria of SRHL, are as follows (Table 29). A significant change was observed ( $\chi^2=9.433$ ,  $p=.018$ ) in the control group regarding the change in SRHL from pre-test to post-test based on the four criteria. However, it was not statistically significant in the experimental group ( $\chi^2=11.584$ ,  $p=.088$ ).

**Table 29.** Comparison of changes in sexual and reproductive health literacy (based on criteria) between groups

Level	Exp. (n=12)		$x^2$	$p$	Cont. (n=12)		$x^2$	$p$
	Pre	Post			Pre	Post		
	n(%)				n(%)			
Inadequate	4(33.3)	3(25.0)	11.584	.088	4(33.3)	2(16.7)	9.433	.048*
Problematic	3(25.0)	3(25.0)			6(50.0)	6(50.0)		
Sufficient	2(16.7)	2(16.7)			2(16.7)	3(25.0)		
Excellent	3(25.0)	4(33.3)			0(00.0)	1(8.3)		

Note. Exp=Experimental Group; Cont=Control Group;

† Level: Inadequate (0~25), Problematic (26~33), Sufficient (34~42), Excellent (43~50)

\* Fisher's exact test

### 3.2 Comparison of change in safe sexual behavior attitude

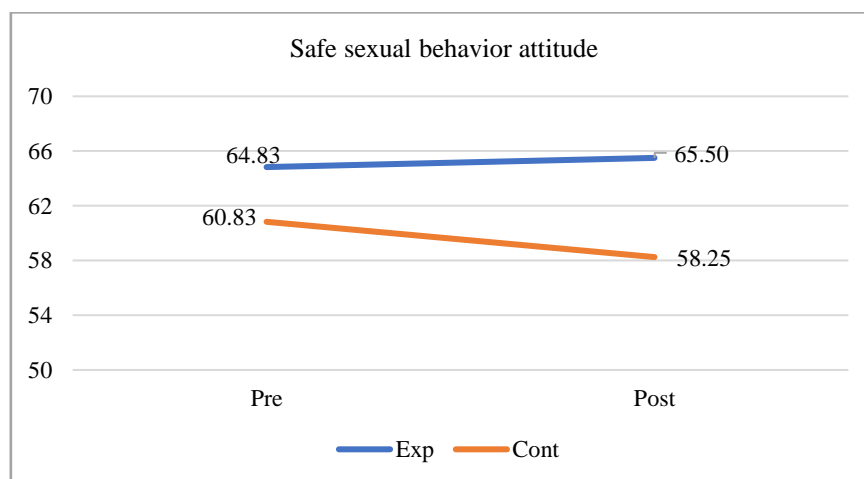
The change in safe sexual behavior attitude of the experimental group over time did not statistically increase compared to that of the control group ( $z=-1.03, p=.303$ ) (Table 30). Compared to baseline in both groups, there is no significant changes in safe sexual behavior attitude after intervention ( $t=-0.254, p=.805$  vs.  $t=1.300, p=.220$ ) (Figure 7).

**Table 30.** Comparison of changes in safe sexual behavior attitude between groups

( $N = 12$ )

Parameter	Coefficient	SE	$z$	$p$	95% CI
Intercept	64.833	2.479	26.14	.000	(59.972, 69.694)
Group	-4	3.507	-1.14	.254	(-10.874, 2.874)
Time	.666	2.231	0.30	.765	(-3.706, 5.039)
Group*Time	-3.25	3.155	-1.03	.303	(-9.434, 2.934)

Note. SE=Standard Error; CI= Confidence Interval



**Figure 7.** Changes in mean score of safe sexual behavior attitude between groups



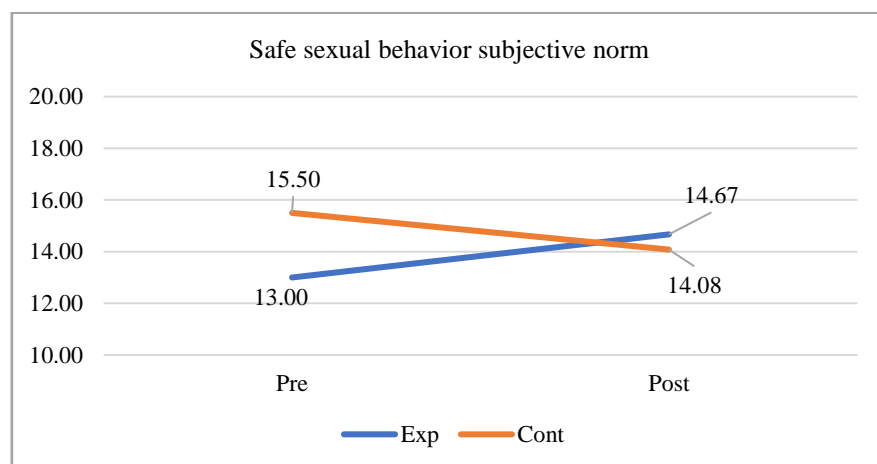
### 3.3 Comparison of change in safe sexual behavior subjective norm

The change in safe sexual behavior subjective norm of the experimental group over time statistically increased compared to that of the control group ( $z=-2.62, p=.009$ ) (Table 31). Compared to baseline in both groups, there is no significant changes in safe sexual behavior subjective norm after intervention ( $t=-1.785, p=.107$  vs.  $t=1.809, p=.098$ ) (Figure 8).

**Table 31.** Comparison of changes in safe sexual behavior subjective norm between groups  
( $N = 12$ )

Parameter	Coefficient	SE	$z$	$p$	95% CI
Intercept	13	1.235	10.53	.000	(10.579, 15.420)
Group	2.5	1.746	1.43	.152	(-.923, 5.923)
Time	1.666	.832	2.00	.045	(.035, 3.298)
Group*Time	-.308	1.177	-2.62	<b>.009</b>	(-5.390, -.775)

Note. SE=Standard Error; CI= Confidence Interval



**Figure 8.** Changes in mean score of safe sexual behavior subjective norm between groups

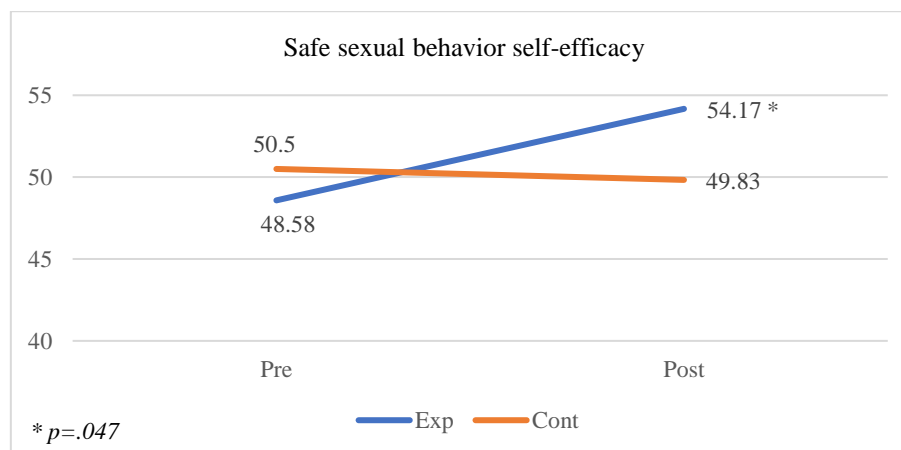
### 3.4 Comparison of change in safe sexual behavior self-efficacy

The change in safe sexual behavior self-efficacy of the experimental group over time statistically increased compared to that of the control group ( $z=-2.28$ ,  $p=.023$ ) (Table 32). Compared to baseline in both groups, the experimental group exhibited a significant increase in safe sexual behavior self-efficacy after the intervention ( $t=-2.236$ ,  $p=.047$ ), whereas the control group had no significant changes in safe sexual behavior self-efficacy following the intervention ( $t=.473$ ,  $p=.646$ ) (Figure 9).

**Table 32.** Comparison of changes in safe sexual behavior self-efficacy between groups ( $N = 12$ )

Parameter	Coefficient	SE	$z$	$p$	95% CI
Intercept	48.583	3.111	15.62	.000	(42.485, 54.681)
Group	1.916	4.399	0.44	.663	(-6.706, 10.540)
Time	5.583	1.941	2.88	.004	(1.778, 9.388)
Group*Time	-6.25	2.745	-2.28	<b>.023</b>	(-11.631, -.868)

Note. SE=Standard Error; CI= Confidence Interval



**Figure 9.** Changes in mean score of safe sexual behavior self-efficacy between groups

### 3.5 Comparison of change in safe sexual behavior intention

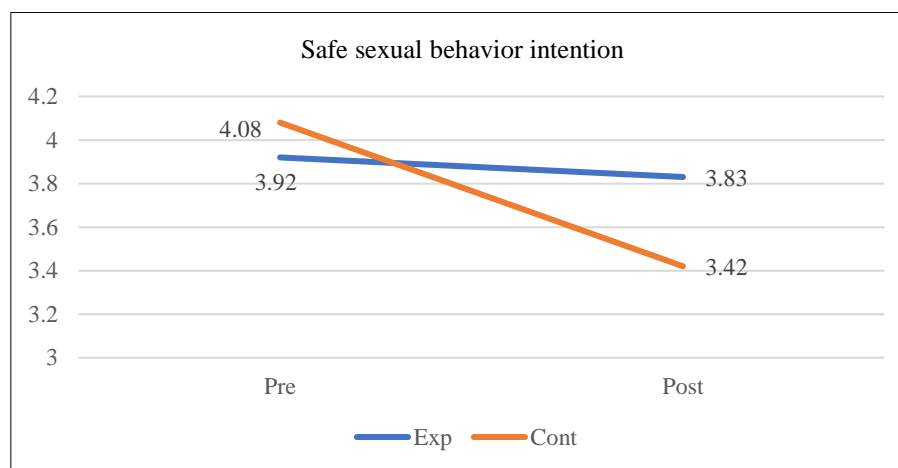
The change in safe sexual behavior intention of the experimental group over time did not statistically increase compared to that of the control group ( $z=-1.73, p=.084$ ) (Table 33). Compared to baseline in both groups, there is no significant changes in safe sexual behavior intention after intervention ( $t=-.447, p=.655$  vs.  $t=-1.511, p=.131$ ) (Figure 10).

**Table 33.** Comparison of changes in safe sexual behavior intention between groups

( $N = 12$ )

Parameter	Coefficient	SE	<i>z</i>	<i>p</i>	95% CI
<b>Intercept</b>	3.916	.409	9.57	.000	(3.114, 4.718)
<b>Group</b>	.116	.578	-.29	.773	(-.967, 1.300)
<b>Time</b>	-.833	.309	-.27	.788	(-689, .523)
<b>Group*Time</b>	-.583	.437	-1.33	.183	(-1.441, .274)

Note. SE=Standard Error; CI= Confidence Interval



**Figure 10.** Changes in the mean score of safe sexual behavior intention between groups

## V. DISCUSSION

As sexual and reproductive health disparities are identified among female adolescents from diverse cultural backgrounds, the importance of sexual and reproductive health literacy (SRHL)—the ability to correctly access, understand, appraise, and apply sexual and reproductive health information—is increasing. This study is the first to employ a chatbot-based SRHL intervention to improve safe sexual behavior among racial and ethnic female adolescents in South Korea and to evaluate its process and potential effectiveness. The key findings of this study, including the development of the intervention and evaluation of its potential effects, are interpreted from a nursing perspective. The limitations of this study are acknowledged, and suggestions for enhancing the nursing knowledge base are provided.

### A. Intervention development

The BORA (BOt of sexual and Reproductive health literacy for Adolescents) Intervention was developed following the six steps of intervention mapping (IM), a systematic methodology for interventions to promote safe sexual behavior among racial and ethnic female adolescents. IM is a theory- and evidence-based methodology grounded in an ecological approach to assess and improve health outcomes while engaging community members (Bartholomew et al., 2016). As demonstrated in previous studies, IM is a valuable tool in this study for health behavior changes, serving as a guiding and systematic procedure for designing interventions (Mevissen et al., 2018).

The evaluation of how an intervention is implemented is overlooked in many studies, but IM emphasizes process evaluation of intervention. The monitoring of the implementation process and the results to improve the intervention ensures the ongoing quality of the intervention. Nevertheless, there are insufficient guidelines concerning indicator types, how to measure them, and when to measure them to evaluate the process. Proctor et al. (2011) provides a detailed guide for evaluating the implementation process of an intervention, including the necessity of measuring the eight implementation outcomes, definitions, levels of analysis (e.g., provider, participant, organization), timing (e.g., early, mid, late), and methods (e.g., survey, observation, administrative data) (Proctor et al., 2011).

Utilizing this guide, outcomes that can be measured at the participant level (acceptability, appropriateness, feasibility, and fidelity), data collection points, and measurement methods were constructed to assess the implementation process of the BORA intervention. However, the instruments used to assess implementation process disregard the absence of validation in their psychometrics (Khadjesari et al., 2020; Lewis et al., 2015). Therefore, to improve the quality of intervention, it is imperative to evaluate the implementation process. Specifically, future studies should consider developing reliable and validated instruments to measure implementation outcomes accurately.

SRHL, the core concept in the BORA intervention, is the ability to access, understand, appraise, and apply information on sexual and reproductive health to make informed and appropriate decisions (WHO, 2016). This ability encourages safe sexual behavior by increasing knowledge, motivation, and skills. The present study highlights the concentrated efforts in intervention research to promote safe sexual behavior among adolescents by enhancing SRHL. Moreover, it is noteworthy that this research attempted an intervention

design for SRHL enhancement with minimal evidence of its effect on safe sexual behavior. The strength of this study lies in establishing performance objectives that incorporate all literacy processes into the intervention design, forming a comprehensive intervention strategy and goals. Furthermore, this study only included Vietnamese female adolescents who were children of Vietnamese-born migrant women. As such, future studies should investigate SRHL and safe sexual behavior determinants among female adolescents from different cultural backgrounds in South Korea and those native to South Korea. This avenue of research would expand the understanding of cultural differences that influence sexual and reproductive health disparities among racial and ethnic female adolescents.

Moreover, the needs assessment phase of this study underscored the impact of parental SRHL on racial and ethnic female adolescents. Previous research indicates that parent-child sexual communication positively impacts safe sexual behavior among racial and ethnic female adolescents (Widman et al., 2016). Specifically, interventions aimed at parents yield positive changes in adolescents' sexual health knowledge, sexual self-efficacy, safe sexual behavior intentions, and condom use (Widman et al., 2019). In this study, the participants' parents lacked accurate information about safe sexual behavior and exhibited poor judgment regarding information authenticity. Additionally, parental gender role stereotypes acquired from their cultural backgrounds were transmitted to their children. Notably, health literacy levels among married migrant women in South Korea were low (Ahn et al., 2018).

However, the current study could not implement the intervention directly with parents due to its individualized nature facilitated through a chatbot. This approach was chosen to enhance accessibility, ensure anonymity, and maintain neutrality when discussing the

sensitive subject of safe sexual behavior. IM underscores the significance of taking into account the environmental factors contributing to health problems (Bartholomew et al. 2016). In other words, health problems can be addressed more effectively if the intervention also considers the influential environmental factors. Future research that prioritizes interventions aimed at improving the low SRHL of parents is anticipated to foster positive shifts in parent-child sexual communication. Subsequently, this result is expected to encourage safe sexual behaviors among racial and ethnic female adolescents.

The current intervention development also emphasizes culturally tailored strategies, which refer to approaches or interventions specifically designed and adapted to fit a particular group or community's cultural characteristics, values, beliefs, and preferences (Im & Chee, 2020). The developed BORA intervention incorporated culturally tailored strategies for racial and ethnic female adolescents that were analyzed and modified from existing literature (Evans et al., 2020a; Evans et al., 2020b; Kreuter et al., 2003; Im & Chee, 2020). As such, five culturally tailored strategies were derived: 1) considering cultural context; 2) providing culturally congruent evidence; 3) having flexibility in intervention development; 4) cultural translation; and 5) engaging stakeholders. As an illustration, the 'stakeholder engagement' strategy, which involved integrating community service providers who had established trust with mothers of racial and ethnic female adolescents as members of the research team, resulted in a notable enhancement in participant recruitment and consent rates. These strategies enhance the process and effectiveness of the BORA intervention, achieving acceptability, appropriateness, feasibility, and fidelity of the intervention's content and delivery methods. The observed findings support the

applicability of specific culturally tailored strategies to promote safe sexual behavior among adolescents from different cultural backgrounds in South Korea.

A chatbot was developed to deliver the intervention to racial and ethnic female adolescents effectively. Chatbots can augment interaction through human-like conversational features to increase participation and promote health behavior changes (Aggarwal et al., 2023). KakaoTalk, which has the largest number of users in South Korea, was chosen as the platform for developing a chatbot. Since this application is free to use, it was convenient and cost-effective for participants accessing the chatbot. However, according to the platform's policy, participants' dialogue records with the chatbot are stored for three years. Thus, additional procedures are required to extract these records, which may hinder recruitment and retention. In addition, some missing dialogues were identified when reviewing the chatbot dialogue records, reducing data reliability.

A standalone AI chatbot and a separate program for data collection were developed in a study by Wang et al. (2022) to facilitate data extraction and ensure reliability. As AI-based chatbots require numerous users and data to generate accurate and appropriate responses, previous studies utilized open platforms such as Facebook for user recruitment. Even so, this has resulted in low participation rates among women. In light of these findings, future intervention development should consider strategies to balance data collection for researchers with privacy for participants.



## **B. Intervention effects**

### **1. Process evaluation**

Achieving the expected health outcomes from nursing interventions depends on how well they are implemented. Therefore, evaluating the intervention implementation process to identify barriers accurately is paramount (Fernandez et al., 2019). Implementation science explores the effective integration of interventions and technologies into real-world settings (Eccles & Mittman, 2006). Aligned with the eight implementation outcomes suggested by Proctor et al. (2011), this study evaluated the implementation process of the BORA intervention by gauging acceptability, appropriateness, feasibility, and fidelity.

Firstly, the BORA intervention is deemed acceptable and satisfactory by the participants. Consistent with previous studies, chatbots with friend-like interactions were preferred and achieved high acceptability. Given that acceptability is influenced by social and cultural norms, user-centered and participatory design principles are recommended to understand participants' norms, values, and goals and develop acceptable interventions (Perski & Short, 2021). When assessing target population needs during the first step of IM, which reflects the results, incorporating “engaging stakeholders” strategies enhances acceptability. Thus, incorporating racial and ethnic female adolescent preferences with chatbots, a youth-friendly digital intervention tool, can increase the acceptability of nursing interventions for racial and ethnic adolescents.

Second, the eight educational modules in the BORA intervention are found to be highly appropriate; appropriateness refers to the perceived suitability of an innovation in addressing a specific issue or problem for a particular target audience (Proctor et al., 2011). In other words, the innovative core concept of SRHL offered in the BORA intervention is interpreted as being consistent with the needs of racial and ethnic female adolescents to promote safe sexual behavior. Even in existing sexual and reproductive health interventions that reflect adolescent needs, this approach was notably perceived as appropriate among adolescents (Van Lieshout et al., 2017). As disparities in SRHL have been identified across different sociocultural backgrounds, particularly cultural backgrounds (Lirios et al., 2023), research aimed at promoting high appropriateness should be preceded by a full exploration of the population's needs.

Feasibility was the third implementation outcome assessed and measured recruitment rate, consent rate, retention rate, and chatbot usability. A recruitment, consent, retention rate, and chatbot usability were considered adequate. Using a 'stakeholder engagement' strategy, which has also been shown to be effective in increasing acceptability, the use of Multicultural Family Centre staff with trusted relationships with parents as part of the research team facilitated the recruitment of many participants through parents. Moreover, previous research suggests that usability depends on the platform's user interface and cultural sensitivity in the chatbot's design (Aggarwal et al., 2023). The BORA intervention based on the KakaoTalk platform, an interface that can run for free on any smartphone regardless of the phone's operating system, removed potential accessibility barriers for racial and ethnic female adolescents. In addition, the design with input from participants

resulted in a more 'friend-like' experience, improving chatbot usability. Therefore, low entry barriers, friendly platforms, and culturally relevant designs are strategies to increase the usability of chatbots for racial and ethnic groups with high digital barriers.

The last implementation outcome of this process evaluation is fidelity, which analyzes the adherence rate to the educational modules and patterns of participant use. The adherence rate of the educational modules was 67.6%, which was considered relatively low. In particular, when analyzing the participation patterns of those who did not complete any of the educational modules, the participants did not receive appropriate answers due to the chatbot's response errors. This phenomenon is analogous to a previous study in which participants stopped asking questions after the chatbot gave an incorrect answer (Maenhout et al., 2021). Despite the development of a chatbot based on the KakaoTalk platform that operates through machine learning, this study was unable to meet the needs of the subjects because the information on safe sexual behavior collected during the development of the intervention was limited in amount and scope. As big data collection provided accurate and reliable information (Wang et al., 2022), future research should consider research designs that are premised on collecting enough data to meet the needs of the participants.

Finally, contrasting previous studies, participants tended to browse through listed information trees rather than asking direct questions. Privacy concerns have been cited as a reason for the lack of active questioning (Nadarzynski et al., 2021). For instance, women may be less comfortable discussing their sexual and reproductive health in public (Wang et al., 2022). While most participants were comfortable with considering the chatbot as a friend, some were aware of others, as evidenced by comments such as, "This is from my

teacher, right?" The chatbot developed in this study could only be accessed by logging in with personal information, so it is difficult to say that the intervention was completely anonymous despite the individual approach. Future research should prioritize anonymity when designing digital sexual and reproductive health interventions to cultivate trust regarding privacy protection for racial and ethnic female adolescents.

## 2. Potential effect evaluation

To promote safe sexual behavior among racial and ethnic female adolescents, the study established a theoretical framework rooted in the theory of planned behavior and the integrated model of health literacy. SRHL, the core concept of the intervention, was measured based on the theoretical framework. Moreover, this study measured changes in safe sexual behavior intention as the primary outcome and changes in safe sexual behavior attitude, safe sexual behavior subjective norm, and safe sexual behavior self-efficacy as secondary outcomes.

The experimental group who participated in the BORA intervention did not exhibit significantly increased SRHL over time compared to the control group. This study was designed as a quasi-experimental study to evaluate the process of the intervention in a real-world setting. In addition, specific inclusion criteria were set to ensure participant homogeneity. A comparison of pretests revealed that the experimental and control groups were homogeneous concerning SRHL, and the mean scores of both groups were at a problematic level defined by Sørensen et al. (2012). However, when SRHL was categorized according to the four criteria (Vongxay et al., 2022), the experimental group indicated sufficient and excellent SRHL levels (41.7%) compared to the control group (16.7%). Therefore, clarifying the inclusion criteria of participants is essential for accurately determining the intervention's effect. Additionally, the number of participants in this study is insufficient to derive the intervention's effect as a pilot study. In future studies, assessing the SRHL level in advance is necessary to ensure the inclusion of enough participants with limited health literacy (inadequate and problematic).

Moreover, achieving positive outcomes across all four SRHL processes through short-term interventions can pose a challenge. Health literacy is a skill that matures over time through repeated engagement (Edwards et al., 2012). In other words, compared to existing SRHL interventions, the duration and amount of intervention delivered in this study were much smaller, which may explain why the change in SRHL was not significant. Furthermore, as the BORA intervention developed as a pilot study was a textual chatbot, future studies are recommended to develop the intervention with more engaging elements, such as games and avatars, which would be more appealing to the adolescent population.

The experimental group that received the BORA intervention exhibited significantly increased subjective norms of safe sexual behavior over time compared to the control group. The theory of planned behavior suggests that individuals should be aware of the reference group's influence to achieve positive changes in subjective norms and avoid negative conformity (Ajzen, 1991, 2020). First, an IM step was initiated to identify the reference group and its influence on the safe sexual behavior of racial and ethnic female adolescents. As a result, partners, friends, parents, and teachers were identified as influential figures upon whom racial and ethnic female adolescents base their normative beliefs. This study explored the negative influence of low gender roles inherited from mothers of different cultural backgrounds, which effectuated high compliance with a partner's opinion about safe sexual behavior among racial and ethnic female adolescents. Therefore, identifying specific reference groups that exemplify the health behaviors of the target population is imperative to change their subjective norms.

Notably, there was a rise in participants' perceptions of peer pressure regarding safe sexual behaviors following BORA intervention. This implies that participants viewed the

chatbot as a friend. Fortuna et al. (2019) support this observation by proposing that chatbots can provide ‘artificial peer support.’ As digital technology advances, chatbots can adopt distinct personas and generate human-like text responses (Skjuve et al., 2021). Human-chatbot friendships have positively impacted health outcomes, as participants stated that the chatbot felt like a friend. Subsequently, health chatbots with a friend-like persona are expected to improve health behaviors in adolescent age groups.

The experimental group that received BORA intervention exhibited significantly increased safe sexual behavior self-efficacy over time compared to the control group. Consistent with previous studies, the intervention positively influenced self-efficacy by providing information on practical refusal and consent. The BORA intervention encompasses eight educational modules designed to foster abilities in accessing, understanding, appraising, and applying information according to the SRHL process. In addition, the first step of IM identified the skills needed by racial and ethnic female adolescents, such as contraceptive communication, negotiation, refusal, consent, and their low self-efficacy in these areas. Although the theory of planned behavior suggests that positive attitudes and supportive subjective norms provide motivation, the intention to engage in said behavior necessitates sufficient levels of self-efficacy (Ajzen, 2020). Increased self-efficacy can induce a significant positive change in safe sexual behavior among racial and ethnic female adolescents, and utilizing IM to develop the SRHL-focused educational modules was effective. Future studies should reflect the target population’s actual SRHL level and formulate specific interventions to improve their ability in each process.

However, compared to the control group, the experimental group that received the BORA intervention did not show a significant increase in safe sexual behavior attitude over time. The key concepts in IM are "planning as a continuous process," "matrices as a base for intervention planning," "logic models," and "program evaluation" (Bartholomew et al., 2016). In reviewing the IM process, the focus group interviews elicited safe sexual behaviors the most, but did not modify or adjust previous steps in response to new information; therefore, this did not lead to sufficient development of the change objective during the matrix development phase. Therefore, future research should consider the core concepts of IM to develop interventions that promote safe sexual behavior among racial and ethnic female adolescents. Moreover, Interventions involving condom purchase and negotiation with a partner in a virtual reality environment have been reported to have a positive impact on adolescents' attitudes towards safe sexual behavior (Hadley et al., 2019). In other words, digital technologies in real-world settings are expected to reinforce the perceived benefits and barriers of real-life safe sexual behavior-related situations and lead to safe sexual behavior attitudes.

Lastly, the experimental group that received the BORA intervention did not exhibit a significant increase in safe sexual behavior intention over time compared to the control group. Based on a systematic review, the nonsignificant increase in safe sexual behavior intention among racial and ethnic adolescents may be due to already established intentions to practice safe sexual behavior (Evans et al., 2020a). 50% of the experimental and control groups in this study indicated high intention to engage in safe sexual behavior by stating, 'I intend to engage in safe sexual behavior every time.' The theory of planned behavior proposes that behavioral intentions may be overestimated as they tend to be biased toward



socially desirable behaviors (Ajzen, 2020). One participant stated, "People think that I don't practice safe sexual behavior because her mother is foreign, so we should never practice risky sexual behavior." Therefore, there are limitations in interpreting the high intention to engage in safe sexual behavior among racial and ethnic female adolescents. An alternative strategy is an indirect approach in which the question is answered from the perspective of another person or group, such as "How often do your friends intend to practice safe sexual behavior?" (King, 2022). Future research must refine measures to assess safe sexual behavior intentions accurately among racial and ethnic female adolescents.

### **C. Limitations**

This study acknowledges several limitations. First, a systematic needs assessment was conducted to identify safe sexual behavior determinants among racial and ethnic female adolescents in South Korea. However, the retrieved domestic studies solely relied upon secondary analyses using nationally representative data. Therefore, the focus group interview questionnaire was based on safe sexual behavior determinants from racial and ethnic female adolescents abroad. As such, these findings are insufficient for re-identifying the determinants of safe sexual behavior among racial and ethnic female adolescents in South Korea. Second, Vietnamese adolescents were selected as an accessible population for the culturally tailored interventions and represented the racial and ethnic female adolescent population. Therefore, there are limitations in generalizing the findings of this study to the safe sex behavior status of the entire racial and ethnic female adolescent population. Third, since this was a pilot study to evaluate the implementation of the

intervention, the number of participants was calculated based on the pilot study design. Although pilot study effects are interpreted as potential effects, the reverse is limited, particularly given the low fidelity of this intervention. Lastly, the safe sexual behavior attitudes, subjective norms, and self-efficacy instruments used in this study were all developed for college-aged late adolescents. Thus, this data may have limitations when applied to adolescents from racial and ethnic backgrounds with low literacy levels.

## **D. Significance of this study**

### **1. Nursing theory**

This study developed a theoretical framework based on the integrated model of health literacy and the theory of planned behavior to promote safe sexual behavior among racial and ethnic female adolescents. The intervention focused on SRHL and demonstrated a relationship between SRHL and two key concepts, safe sexual behavior subjective norm and safe sexual behavior self-efficacy from the theory of planned behavior. This implies a potential mediating effect of SRHL for the change in intention. It also supports the notion that health literacy is closely related to racial and ethnic disparities and health promotion. On the other hand, contrary to the hypothesis, the relationship between SRHL and safe sexual behavior attitudes was not confirmed, and ultimately, no evidence of change in safe sexual behavior intention could be derived.

As the results of this study are at the pilot study level, further research is needed to confirm the mediating role of SRHL in the theory of behaviour change for racial and ethnic

female adolescents Furthermore, this study evidences the positive impact of SRHL on safe sexual behavior subjective norms and safe sexual behavior self-efficacy, confirming the conceptual framework's efficiency.

## **2. Nursing research**

This study is the first to develop and implement an intervention tailored for female adolescents from racial and ethnic backgrounds with low levels of safe sexual behavior. Given the declining age of sexual debut and increasing rates of adolescent pregnancy, this study highlights the urgency for research concerning the early adolescent population of middle school students. Additionally, the culturally tailored strategies implemented in this study were proven to improve safe sexual behavior among racial and ethnic adolescents in South Korea. Next, utilizing both qualitative and quantitative methods to systematically analyze SRHL levels, the core concept, yielded empirical evidence verifying its effectiveness. Furthermore, the development and application of digital technology via a chatbot is a valuable intervention tool for promoting safe sexual behavior among racial and ethnic female adolescents in South Korea. In particular, this study provides evidence supporting the usefulness of adopting a user-friendly interface and friend personas that reflect the target population's needs to increase intervention acceptability and feasibility. Finally, this intervention is a pilot study that offers a comprehensive analysis and empirical discussion on the strengths and barriers concerning intervention implementation and underscores the need for strategies to improve its quality.

### **3. Nursing practice**

The findings in this study emphasize the importance of culturally sensitive nursing practice and support using the developed chatbot as an educational tool for school- and community-based nursing to promote safe sexual behavior among racial and ethnic female adolescents. The learning guidelines developed through IM are expected to serve as a basis for educational methods to promote SRHL. Finally, the empirical findings of this study establish a foundation for policymaking aimed at promoting SRHL as a means to foster health equity among racial and ethnic populations.

## VII. CONCLUSION

This study developed a chatbot based on sexual and reproductive health literacy (SRHL) intervention, named Bora intervention, based on Sorenson et al.'s (2012) integrated model of health literacy and Ajzen's (1991) theory of planned behavior to promote safe sexual behavior among racial and ethnic female adolescents. Intervention mapping, a systematic approach to developing interventions, was employed to design an intervention incorporating SRHL as the core concept and culturally tailored strategies. In addition, a pilot study conducted to systematically evaluate the implementation process and potential effectiveness of the BORA intervention. The implementation process of the BORA intervention was evaluated and found to be acceptable, appropriate, and feasible for consideration. Furthermore, safe sexual behavior subjective norms and safe sexual behavior self-efficacy were found to have potential effects on safe sexual behaviour intentions.

This study is the first to implement a SRHL intervention among racial and ethnic female adolescents in South Korea. Given the escalating sexual and reproductive health disparities among racial and ethnic female adolescents, the intervention development strategies and findings in this study may provide evidence for improving health disparities. Promoting safe sex attitudes and safe sex self-efficacy through the BORA intervention is expected to positively impact the healthy development of racial and ethnic female adolescents.

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## APPENDICES

## Appendix 1. The institutional review board approval



### 연세의료원 세브란스병원 연구심의위원회

Yonsei University Health System, Severance Hospital, Institutional Review Board

서울특별시 서대문구 연세로 50-1 (우) 03722

Tel. 02 2228 0430~4, 0450~4 Fax. 02 2227 7888~9 Email, irb@yuhs.ac

심 의 일 자 2023년 8 월 25 일  
접 수 번 호 2023-0761-004  
과 제 승 인 번 호 4-2023-0432

세브란스병원 연구심의위원회의 심의 결과를 다음과 같이 알려 드립니다.

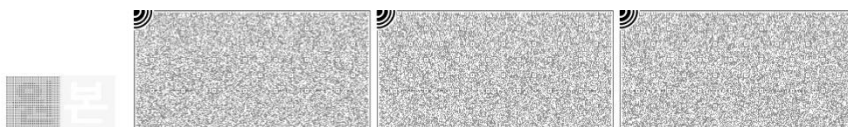
#### Protocol No.

연 구 제 목 베트남계 여성 청소년 대상 챗봇 기반 성생식 헬스 리터러시 중재 개발 및 예비연구  
연 구 책 임 자 이현경 / 세브란스병원 간호학과  
의 회 자 세브란스병원  
연 구 예 정 기 간 2023.06.07 ~ 2024.06.06  
지 속 심 의 빈 도 12개월마다  
과 제 승 인 일 2023.06.07  
위 험 수 준 Level 1 | 최소위험  
심 의 방 법 신속  
심 의 유 형 계획변경  
심 의 내 용  
- [변경전] 유효성 평가 항목: 1) Primary endpoint(과정 평가): 중재의 과정 평가의 항목과 기준은 Pilot study checklist와 Intervention mapping의 6단계인 평가계획에 따라 구성한다(Thabane & Lancaster, 2019; Thabane et al., 2010).  
- Eligibility criteria: 선정기준을 작성한 참여자 수, 실제 연구등록자의 수  
- Recruitment rates: 베트남계 여성 청소년 동의서의 수, 법정대리인 동의서의 수, 실제 연구등록자의 수  
- Adherence and Attrition rate: 중재의 각 세션을 완료한 참여자의 수  
- Feasibility: 챗봇 사용성 평가 및 챗봇 대화  
\* 챗봇 사용성 평가는 Holmes et al(2019)가 개발한 The Chatbot Usability Questionnaire을 이현경 et al(2022)이 한국어로 번역한 도구를 활용하여 측정한다(Holmes et al., 2019). 챗봇 성격, 사용자 경험 및 오류 처리와 같은 항목을 포함하여 긍정적인 측면 8문항과 부정적인 8문항으로 총 16문항으로 구성되며, 1점 (strongly disagree)에서 5점 (strongly agree)의 5점 리커트 척도로 측정한다. 도구의 formula에 따라 계산하며 총점은 100점이다. 70점 이상일 때 챗봇의 사용성이 적절하다고 평가한다.  
- Acceptability: 사용자 참여 평가 및 챗봇 대화  
\* 챗봇 사용자 참여 평가는 O'Brien et al(2018)이 개발한 user engagement scale short form을 번역하여 활용한다(O'Brien et al., 2018). 사용자 참여는 디지털 시스템과 상호작용할 때 참여자의 인

Ver 5.0 / 누적 출력 횟수

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Severance Hospital [2020-05-24] 1/6



지적, 시간적, 정서적 및 행동적 경험의 품질을 의미한다. 총 4개의 하위 요소(집중, 지각된 사용성, 심미적 매력, 보상)로 구성된 12항목이며 5점 리커트 척도로 1= 강하게 동의하지 않는다에서 5=강하게 동의한다고 측정한다. 각 하위 척도의 점수는 3개의 항목의 값을 더하고 3으로 나누어 계산할 수 있으며 지각된 사용성(PU)는 역코딩한다. 전체 참여점수는 모든 항목을 함께 더하고 12로 나누어 계산한다.

2) Secondary endpoint(잠재적 효과 평가): 잠재적 효과 평가를 위해 안전한 성행동 태도, 안전한 성행동 주관적 규범, 안전한 성행동 자기효능감, 안전한 성행동 의도 및 성생식 헬스 리터러시를 활용한다. 또한 일반적 특성으로 안전한 성행동 결정요인을 확인한다.

- 안전한 성행동 태도: 피임태도는 Wang 등(2003)이 청소년을 대상으로 개발한 21문항의 CAS (Contraceptive Attitude Scale)를 김유진(2015)이 전문가 집단의 논의를 거쳐 2문항을 제외하고 총 19문항을 한국어로 번역하고 수정·보완한 도구를 사용하였다. 응답은 4점 Likert 척도를 사용하여 '매우 그렇다' 4점, '그렇다' 3점, '그렇지 않다' 2점, '전혀 그렇지 않다' 1점으로 측정하며, 점수의 범위는 최저 19 - 16 - 점에서 최대 76점으로 총점이 높을수록 피임에 대한 태도가 긍정적임을 나타낸다. 고등학생을 대상으로 한 Wang 등(2003)의 연구에서의 신뢰도는 Cronbach's  $\alpha$  = .83, 김유진(2015)의 연구에서 Cronbach's  $\alpha$  = .83이었다.

- 안전한 성행동 주관적 규범: 안전한 성행동 주관적 규범은 Primack et al(2007)의 금연에 대한 주관적 규범 측정도구를 피임의 상황에 맞게 황신우 & 정재원(2014)이 수정 및 보완한 도구를 활용하여 측정한다(황신우 & 정재원, 2014)). 준거자로 부모님, 친구, 동료, 성관계 파트너가 포함되어 있으므로 본 연구에서는 부모님, 친구, 교사 및 성관계 파트너의 준거자로 변경한다. 총 4문항으로 1점(전혀 아니다)에서 5점(매우 그렇다)의 5점 likert 척도로 측정하며 총점은 4~20점으로 점수가 높을수록 주관적 규범의 정도가 높은 것으로 해석한다. Primack et al(2007)의 연구의 Cronbach's  $\alpha$ 는 .82였고 황신우 & 정재원(2014)의 연구의 Cronbach's  $\alpha$ 는 .75였다.

- 안전한 성행동 자기효능감: 본 연구에서는 Hanna, K.M(1999)의 Condom self-efficacy를 한국어로 번안한 후 신뢰도와 타당도를 검증한 Cha(2008)의 한국어판 condom self-efficacy scale (CSE-K)을 활용하여 피임의 상황에 맞게 수정, 보완하여 사용한다(Cha et al., 2008; Hanna, 1999). 총 문항은 14문항이며 3개의 하부요인(consistent use: 3문항, correct use: 6문항, communication self-efficacy: 5문항)로 나뉜다. 응답은 5점 Likert 척도로 측정하여 1 point (very unsure) to 5 points (very sure)이다. 최소 14점에서 최대 70점으로 점수가 높을수록 피임 자기효능감이 높은 것을 의미한다. 도구의 신뢰도는 Hanna의 연구에서는 Cronbach's  $\alpha$  = .85였으며 한국어판은 Cronbach's  $\alpha$  = .91이었다.

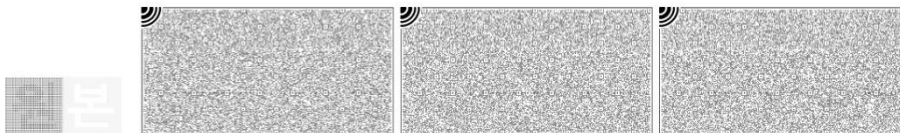
- 안전한 성행동 의도: 피임의도를 측정하기 위해 얼마나 자주 피임을 할 의도가 있는지에 대한 응답은 5점 Likert 척도를 사용하여 '매번할 것이다' 5점, '자주' 4점, '반 정도' 3점, '가끔' 2점, '전혀 할 생각이 없다' 1점으로 측정하며, 점수가 높을수록 피임의도가 높은 것을 의미한다.

- 성생식 헬스 리터러시: 성생식 헬스 리터러시는 Vongxay et al(2022)가 개발한 Questionnaire on sexual and reproductive health literacy를 한국어로 번역하여 활용한다(Vongxay et al., 2019). WHO의 도구번역 절차에 따라 원 저자의 승인을 득한 후 번역 및 역번역을 거쳐 전문가 패널 검토를 거쳐 한국어판을 완성한다. 본 도구는 총 39개 문항으로 10대 임신, 피임 및 인공임신중절로 구성되어 있다. 하부요인은 accessing 9문항, understanding 10문항, appraising/thinking 9문항, applying/decision making 13문항이다. 4점 리커트 척도(1=very difficult, 4=very easy)로 총 점수는 39점에서 156점이다. 본 도구의 cronbach's  $\alpha$ 는 .91이었다.

- 안전한 성행동 결정요인: 개인적 결정요인은 연령, 성별, 사회경제적 상태, 성경험 유무 및 성경험 시기이며, 상황적 결정요인은 가족과의 동거여부, 사회문화적 결정요인은 부모님의 국적이다.

[변경후]유효성 평가 항목: 1) Primary endpoint(과정 평가): 중재의 과정 평가의 항목과 기준은 Pilot study checklist와 Intervention mapping의 6단계인 평가계획에 따라 구성한다(Thabane & Lancaster, 2019; Thabane et al., 2010).

- Eligibility criteria: 선정기준을 작성한 참여자 수, 실제 연구등록자의 수





- Recruitment rates: 베트남계 여성 청소년 동의서의 수, 법정대리인 동의서의 수, 실제 연구등록자의 수
- Adherence and Attrition rate: 중재의 각 세션을 완료한 참여자의 수
- Feasibility: 챗봇 사용성 평가 및 챗봇 대화
  - \* 챗봇 사용성 평가는 Holmes et al(2019)가 개발한 The Chatbot Usability Questionnaire을 이현경 et al(2022)이 한국어로 번역한 도구를 활용하여 측정한다(Holmes et al., 2019). 챗봇 성격, 사용자 경험 및 오류 처리와 같은 항목을 포함하여 긍정적인 측면 8문항과 부정적인 8문항으로 총 16문항으로 구성되며, 1점 (strongly disagree)에서 5점 (strongly agree)의 5점 리커트 척도로 측정한다. 도구의 formula에 따라 계산하며 총점은 100점이다. 70점 이상일 때 챗봇의 사용성이 적절하다고 평가한다.
  - Acceptability: 사용자 참여 평가 및 챗봇 대화
    - \* 챗봇 사용자 참여 평가는 O'Brien et al(2018)이 개발한 user engagement scale short form을 번역하여 활용한다(O'Brien et al., 2018). 사용자 참여는 디지털 시스템과 상호작용할 때 참여자의 인지적, 시간적, 정서적 및 행동적 경험의 품질을 의미한다. 총 4개의 하위 요소 (집중, 지각된 사용성, 심미적 매력, 보상)로 구성된 12항목이며 5점 리커트 척도로 1= 강하게 동의하지 않는다에서 5=강하게 동의한다고 측정한다. 각 하위 척도의 점수는 3개의 항목의 값을 더하고 3으로 나누어 계산할 수 있으며 지각된 사용성 (PU)는 역코딩한다. 전체 참여점수는 모든 항목을 함께 더하고 12로 나누어 계산한다.
    - Appropriateness: 각 교육 모듈에 대해 "해당 교육 모듈은 다문화 여성들의 안전한 성행동을 개선하기 위한 내용으로 관련성이 있나요"라는 1문항(총 8문항)을 4점 척도로 측정한다. 1점 "관련없다" 2점 "어느정도 관련있다" 3점 "꽤 관련있다", 4점 "매우 관련있다"로 점수를 산정한다. 그리고 점수에 대한 의견을 수집한다.

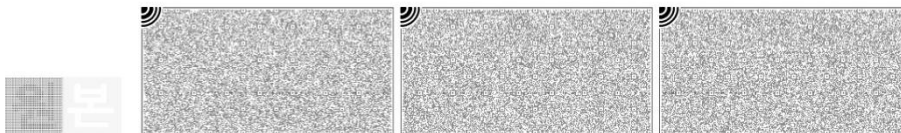
2) Secondary endpoint(잠재적 효과 평가): 잠재적 효과 평가를 위해 안전한 성행동 태도, 안전한 성행동 주관적 규범, 안전한 성행동 자기효능감, 안전한 성행동 의도 및 성생식 헬스 리터러시를 활용한다. 또한 일반적 특성으로 안전한 성행동 결정요인을 확인한다.

- 안전한 성행동 주관적 규범: 안전한 성행동 주관적 규범은 Primack et al(2007)의 금연에 대한 주관적 규범 측정도구를 피임의 상황에 맞게 황신우 & 정재원(2014)이 수정 및 보완한 도구를 활용하여 측정한다(황신우 & 정재원, 2014). 준거자로 부모님, 친구, 동료, 성관계 파트너가 포함되어 있으므로 본 연구에서는 부모님, 친구, 교사 및 성관계 파트너의 준거자로 변경한다. 총 4문항으로 1점(전혀 아니다)에서 5점(매우 그렇다)의 5점 likert 척도로 측정하며 총점은 4~20점으로 점수가 높을수록 주관적 규범의 정도가 높은 것으로 해석한다. Primack et al(2007)의 연구의 Cronbach's a는 .82였고 황신우 & 정재원(2014)의 연구의 Cronbach's는 .75였다.

- 안전한 성행동 자기효능감: 본 연구에서는 Hanna, K.M(1999)의 Condom self-efficacy를 한국어로 번안한 후 신뢰도와 타당도를 검증한 Cha(2008)의 한국어판 condom self-efficacy scale (CSE-K)을 활용하며 피임의 상황에 맞게 수정, 보완하여 사용한다(Cha et al., 2008; Hanna, 1999). 총 문항은 14문항이며 3개의 하부요인 (consistent use: 3문항, correct use: 6문항, communication self-efficacy: 5문항)로 나뉜다. 응답은 5점 Likert 척도로 측정하여 1 point (very unsure) to 5 points (very sure)이다. 최소 14점에서 최대 70점으로 점수가 높을수록 피임 자기효능감이 높은 것을 의미한다. 도구의 신뢰도는 Hanna의 연구에서는 Cronbach's  $\alpha$  = .85였으며 한국어판은 Cronbach's  $\alpha$  = .91이었다.

- 안전한 성행동 의도: 피임의도를 측정하기 위해 얼마나 자주 피임을 할 의도가 있는지에 대한 응답은 5점 Likert 척도를 사용하여 '매번할 것이다' 5점, '자주' 4점, '반 정도' 3점, '가끔' 2점, '전혀 할 생각이 없다' 1점으로 측정하며, 점수가 높을수록 피임의도가 높은 것을 의미한다.

- 성생식 헬스 리터러시: 성생식 헬스 리터러시는 Vongxay et al(2022)가 개발한 Questionnaire on sexual and reproductive health literacy를 한국어로 번역하여 활용한다(Vongxay et al., 2019). WHO의 도구번역 절차에 따라 원 저자의 승인을 득한 후 번역 및 역번역을 거쳐 전문가 패널 검토를 거쳐 한국어판을 완성한다. 본 도구는 총 39개 문항으로 10대 임신, 피임 및 인공임신중절로 구성





되어 있다. 하부요인은 accessing 9문항, understanding 10문항, appraising/thinking 9문항, applying/decision making 13문항이다. 4점 리커트 척도(1=very difficult, 4=very easy)로 총 점수는 39점에서 156점이다. 본 도구의 cronbach's  $\alpha$ 는 .91이었다.

- 안전한 성행동 결정요인: 개인적 결정요인은 연령, 성별, 사회경제적 상태, 성경험 유무 및 성경험 시기이며, 상황적 결정요인은 가족과의 동거여부, 사회문화적 결정요인은 부모님의 국적이다.

- 안전한 성행동 태도: 강희선 & 장순복(2004)이 대학생들을 대상으로 개발한 16문항의 "콘돔사용에 대한 태도"를 사용한다. 응답은 5점 Likert 척도를 사용하여 1점 '전혀 그렇지 않다'에서 5점 '매우 그렇다'로 측정하며, 점수의 범위는 최저 16점에서 최대 80점으로 총점이 높을수록 피임에 대한 태도가 부정적임을 나타낸다. 강희선 & 장순복(2004)의 연구에서의 신뢰도는 Cronbach's  $\alpha$  = .88이었다

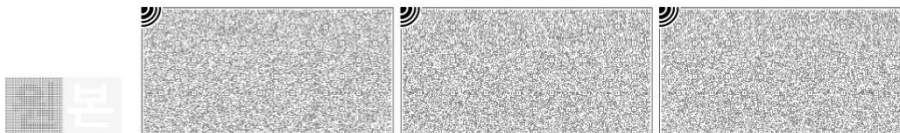
- [변경전]통계 분석 방법: 통계 분석 방법: (1) 과정 평가 분석: 과정 평가 분석을 위해 Eligibility criteria, recruitment rates, adherence and attrition rates, feasibility, acceptability를 분석한다.
  - Eligibility: 연구대상자의 선정기준의 적절성을 확인하기 위해 선정기준을 작성한 수와 실제 연구대상자 등록수의 비율을 확인한다.
  - recruitment rates: 연구대상자의 동의과정의 적절성을 확인하기 위해 대상자의 동의서 작성, 법정 대리인의 동의서 작성 및 실제 연구대상자 등록 비율을 확인한다.
  - Adherence and attrition rates: 연구대상자의 이행을 및 탈락률을 확인하기 위해 챗봇 대화를 통해 중재의 각 세션을 완료한 참여자의 비율을 확인한다.
  - Feasibility: 챗봇 활용에 있어 사용성을 확인하기 위해 총 점수의 평균, 표준편차, 최고 및 최저 점수, 각 문항의 평균 및 표준편차를 확인한다. 또한 챗봇 대화 기록 분석을 통해 챗봇을 통해 어떠한 대화가 이루어졌는지 내용 분석한다.
  - Acceptability: 연구대상자의 참여도를 확인하기 위해 사용자 참여도 척도의 총 점수의 평균을 확인하고 챗봇 대화 기록을 내용 분석한다.

(2) 잠재적 효과 평가 분석: 잠재적 효과평가 결과의 자료 분석을 위해 SPSS/WIN 25.0 프로그램을 활용하여 실험 도중 탈락한 연구대상자까지 포함하여 통계를 처리하는 방법인 치료의할분석을 적용하여 산출한다. 구체적인 분석방법은 다음과 같다.

- 실험군과 대조군의 일반적 특성은 기술통계(빈도, 백분율, 평균, 표준편차)로 분석한다.
- 실험군과 대조군의 동질성 검증을 위해 독립 t-검정(independent t-test)을 행한다.
- 그룹 간 유의한 차이가 없다면 사후 실험군과 대조군 간의 차이를 paired t-검정을 통해 검증한다.
- 그룹 간 사전에 차이가 있다면 사후 결과에 대한 공분산분석(ANCOVA: Analysis of covariance) 또는 사전-사후에 대해 독립 t-검정을 수행한다.

[변경후]통계 분석 방법: 통계 분석 방법: (1) 과정 평가 분석: 과정 평가 분석을 위해 Eligibility criteria, recruitment rates, adherence and attrition rates, feasibility, acceptability를 분석한다.

- Eligibility: 연구대상자의 선정기준의 적절성을 확인하기 위해 선정기준을 작성한 수와 실제 연구대상자 등록수의 비율을 확인한다.
- recruitment rates: 연구대상자의 동의과정의 적절성을 확인하기 위해 대상자의 동의서 작성, 법정 대리인의 동의서 작성 및 실제 연구대상자 등록 비율을 확인한다.
- Adherence and attrition rates: 연구대상자의 이행을 및 탈락률을 확인하기 위해 챗봇 대화를 통해 중재의 각 세션을 완료한 참여자의 비율을 확인한다.
- Feasibility: 챗봇 활용에 있어 사용성을 확인하기 위해 총 점수의 평균, 표준편차, 최고 및 최저 점수, 각 문항의 평균 및 표준편차를 확인한다. 또한 챗봇 대화 기록 분석을 통해 챗봇을 통해 어떠한 대화가 이루어졌는지 내용 분석한다.
- Acceptability: 연구대상자의 참여도를 확인하기 위해 사용자 참여도 척도의 총 점수의 평균을 확인하고 챗봇 대화 기록을 내용 분석한다.
- Appropriateness: CVI 계산 산정처럼 각 문항에 대해 3점 또는 4점을 준 참여자의 수만큼 나누며 문항의 CVI(item-level CVI, I-CVI) 값은 0.78(전문가 6명 이상일 때)이어야 문항의 내용타당도가 만족된 것으로 판단한다. 해당 점수에 대한 의견을 내용분석한다.



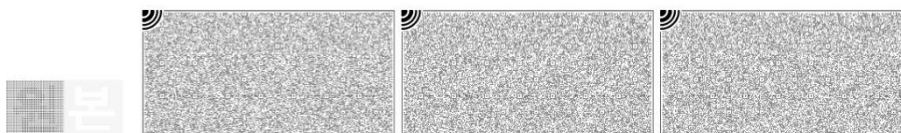
- (2) 잠재적 효과 평가 분석: 잠재적 효과평가 결과의 자료 분석을 위해 SPSS/WIN 25.0 프로그램을 활용하여 실험 도중 탈락한 연구대상자까지 포함하여 통계를 처리하는 방법인 치료의향분석을 적용하여 산출한다. 구체적인 분석방법은 다음과 같다.
- 실험군과 대조군의 일반적 특성은 기술통계 (빈도, 백분율, 평균, 표준편차) 로 분석한다.
  - 실험군과 대조군의 동질성 검증을 위해 독립 t-검정 (independent t-test)를 행한다.
  - 그룹 간 유의한 차이가 없다면 사후 실험군과 대조군 간의 차이를 paired t-검정을 통해 검정한다.
  - 그룹 간 사전에 차이가 있다면 사후 결과에 대한 공분산분석 (ANCOVA: Analysis of covariance) 또는 사전-사후에 대해 독립 t-검정을 수행한다.
  - [변경후]임상 연구계획서(국문) : 삭제
  - [변경후]기타 : 예비조사설문지\_실험군\_0811 삭제
  - [변경후]기타 : 예비조사설문지\_대조군\_0811 삭제
  - [변경후]임상 연구계획서(국문) : 추가
  - [변경후]기타 : 실험군설문지 추가
  - [변경후]기타 : 대조군설문지 추가

심 의 위 원 회	제4위원회
참 석 위 원	제4위원회 신숙심의자
심 의 결 과	승인, 대상자 동의서 면제
심 의 의 견	-

※ 본 통보서에 기재된 사항은 세브란스병원 연구심의위원회의 기록된 내용과 일치함을 증명합니다.  
 ※ 세브란스병원 연구심의위원회는 국제 임상시험 통일안 (ICH-GCP), 임상시험 관리기준 (KGCP), 생명윤리 및 안전에 관한 법률을 준수합니다.  
 ※ 연구책임자 및 연구담당자가 IRB위원인 경우, 해당 위원은 위 연구의 심의과정에 참여하지 않았습니다.

연세의료원 세브란스병원

연구심의위원회 위원장



## Appendix 2. Quotations of FGIs

Categoriis	Quaotations
<b>Determinants</b>	
Attitude	<p>“콘돔 같은 거 편의점에 파는 게 있잖아요. 그런 걸 그냥 사기가 좀 그래요. 중학생인데 이걸? 약간 이렇게 하는 것 때문에” – 청소년 FGI 3</p> <p>“여자는 콘돔을 먼저 말하면 안된다, 요구하면 안된다, 그런 인식이 있어요” – 부모 FGI2</p> <p>“다문화 여성 청소년들은 굳이 피임을 하지 않아도 된다고 생각하는 경향이 있어요” – 전문가 FGI 2</p>
Subjective norm	<p>“(남자친구에게) 피임하라고 말하면 (남자친구는) 안 한다고 약간 뭐라고 하고, 그래서 (성행동을) 안 한다고 못 하는 애들이 있을 것 같아요” – 청소년 FGI 3</p>
Self-efficacy	<p>“(성행동을 하자는 남자친구 제안을) 약간 거절을 못 할 것 같아요” – 청소년 FGI 1</p> <p>“표현이 어렵다 보니 상대방이 거절을 동의로 받아들이는 오류도 자주 발생하고 있습니다” – 전문가 FGI 1</p>
<b>Sexual and reproductive health literacy</b>	
Access	<p>저는 정자와 난자가 어떻게 만나지 라는 생각을 계속 품고 있었는데 중학교 2 학년 올라갈 때쯤에 애들이 막 섹스에 대한 얘기를 막 이렇게 하고 다니고, 남자 성기 있잖아. 자지 막 이려고 진짜 그러고 다니거든요. 그러면 그때쯤 (자연스럽게) 알게 되고. – 청소년 FGI 1</p> <p>“경제적인 어려움 등으로 가정 내 부모님의 부재가 있는 경우가 많으며 가정내의 성교육은 거의 이루어지지 않고 있습니다.” – 전문가 FGI1</p>
Understand	<p>언어적이 어려움이 있어 학교수업에서는 정확한 정보전달이 안되다보니 – 전문가 FGI 1</p> <p>베트남계 여성 청소년들의 인식 속에서 피임을 굳이 하지 않아도 된다고 인식하고 있는 경향이 있어요. – 전문가 FGI2</p>
Appraise	<p>또래 사이에서 어떠한 (성) 경험을 했는지에 대한 자기 과시들이 함께 접목되어 있어요 – 전문가 FGI 2</p> <p>그냥 진짜로 해보자. 영상에서 봤던 걸 실제로 해보고 싶어서 하는 거고 그런 것 같아요. – 청소년 FGI 1</p>

“베트남은 한국과 달리 여성을 남성보다 낮은 위치로 생각하고 남성에게  
복종적인 상대로 생각하는 가치관을 가지고 있어요” – 전문가 FGI 1

Apply “저희가 돈이 없어서 집에서 놀자고 그랬는데 근데 개가 그거를 잘못된 의미로  
받아들이고” – 청소년 FGI2

“정확한 언어와 몸짓을 이용한 거절하는 의사소통 기술이 필요하다고  
생각됩니다. “ – 전문가 FGI 1

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**Content for intervention**

Contraception “콘돔이 어디에서 파는 거 지도 막 이런 걸로 가르쳐주면 좋겠어요” – 청소년 FGI 1

“직접 경험해 볼 수 있도록 피임도구도 직접 실습해보고 VR, 인공지능 기술 등을  
접목하여 가상의 상황에서 피임하는 방법 등을 알아보는 것이 필요합니다” –  
전문가 FGI 1

“콘돔 꼭 꺼라, 콘돔 꼭! 이렇게 굉장히 메시지를 막 날려야 해요. 진짜 필요하다.  
세뇌시켜야 해요” – 청소년 FGI 1

“임신을 하게 됐을 때 어떤 일이 일어나는지, 그리고 육아비도 좀 많이 들기도  
하고 얼마드는지” - 청소년 FGI 3

Healthy “어떤 육체로 하는 사랑이 그게 다는 아니다. 그런 관계가 진정한 사랑인 건지  
relationship 그런 얘기도 약간 나오면 좋겠어요” – 청소년 FGI 2

**Need and preference for chatbot-based program**

Preference “또래 친구가 이야기해주는 듯한 어투로, 친근함에 기반한 또래 공감 형성을  
통해서” – 전문가 FGI 2

“만약에 답변을 하면 영상을 좋은 자료가 있으면 그런 링크랑 같이 영상을 같이  
너무 글만 있으면 그런 것도 좋은 것 같아요. 영상을 같이 첨부한다던가” – 청소년  
FGI 2

Functions “청소년들이 쉽게 접근할 수 있는 플랫폼, 어플과 메신저 기반의 플랫폼에서  
개발하면 좋을 것” – 전문가 FGI 2

“고민과 대화를 들어줄 수 있는 기능을 개발해야 할 것으로 생각된다” - 전문가  
FGI 2

“인공지능 챗봇 운영이 다문화 청소년의 성상담실로 운영된다면 좋을 수 있다고  
생각해요” – 전문가 FGI 1

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### Appendix 3. Chatbot senario of safe sexual behavior information

제네릭 메뉴	1차 블록	2차 블록	3차 블록	4차 블록
1. 처음으로	<div>소개</div> <div>⇒</div> <div>2. 피임이 뭔지 알아?</div> <div>3. 안전한 피임을 하려면?</div> <div>4. 피임을 못했어! 그렇다면?</div>	<div>⇒</div> <div>챗봇 목적</div> <div>⇒</div> <div>챗봇 기능</div>		
2. 피임이 뭔지 알아?	<div>⇒</div> <div>2-1. 피임의 종류에는?</div> <div>2-2. 피임의 효과는?</div> <div>2-3. 피임을 안하면?</div>	<div>⇒</div> <div>2-1-1 청소년 임신</div> <div>⇒</div> <div>2-1-1-1 출산과 청소년 부모</div> <div>⇒</div> <div>2-1-1-2 인공임신중절</div>	<div>⇒</div> <div>3. 안전한 피임을 하려면?</div>	
3. 안전한 피임을 하려면?	<div>⇒</div> <div>3-1. 콘돔</div> <div>3-2. 경구피임약</div>	<div>⇒</div> <div>3-1-1 콘돔을 어떻게 사용해?</div> <div>3-1-2 콘돔의 장단점</div> <div>3-1-3 어디서 팔아?</div> <div>3-2-1 먹는 피임약을 어떻게 먹어?</div> <div>3-2-2 먹는 피임약의 장단점</div> <div>3-2-3 어디서 팔아?</div>		
4. 피임을 못했어! 그렇다면?	<div>⇒</div> <div>4-1. 그게 뭐야?</div> <div>4-2. 어디서 사?</div> <div>4-3. 언제 먹어?</div> <div>4-4. 부작용</div>			
5. 이런 피임법은 피해줘...	<div>⇒</div> <div>5-1. 질외 사정법</div> <div>5-2. 월경주기법</div>			
6. 자주 묻는 질문				

## Appendix 4. Content validity of educational module instructional guides

**「 다문화 여성 청소년의 안전한 성행동을 위한  
챗봇 기반 sexual and reproductive health literacy 중재 개발 및 예비연구 」**  
- 교육 모듈의 내용 타당화를 위한 전문가 검토 -

안녕하십니까?

연세대학교 간호대학 박사과정생 이해연입니다.

“다문화 여성 청소년의 안전한 성행동을 위한 챗봇 기반 sexual and reproductive health literacy 중재 개발 및 예비연구”라는 주제로 박사학위 논문을 진행하고 있습니다.

다문화 여성 청소년은 비다문화 여성 청소년에 비해 부정적인 성생식건강 수준을 나타내고 있습니다(이른 성경험, 높은 성경험률, 낮은 피임실천율 및 높은 임신경험률). 피임에 대한 부정적인 태도와 낮은 자기효능감, 파트너 및 가족에 대한 높은 주관적 규범이 다문화 여성 청소년의 성생식건강 수준에 부정적인 영향을 미칩니다.

본 연구는 WHO(2016)에서 청소년의 성생식건강 증진에 긍정적인 영향을 미치는 sexual and reproductive health literacy(sexual and reproductive health literacy, SRHL)를 주 개념으로 하여 다문화 집단의 대표민족인 베트남계 여성 청소년의 안전한 성행동을 증진하는 목적 하에 개발되었습니다.

챗봇 기반의 해당 중재는 베트남계 여성 중학생을 대상으로 2 주동안 sexual and reproductive health literacy 증진을 위한 8 개의 교육을 제공할 예정입니다.

각 교육 모듈의 내용이 타당한지에 대한 전문가분들의 평가와 조언을 듣고자 합니다. 평가해주신 타당도 결과를 프로그램 보완에 반영하여 다문화 여성 중학생들의 안전한 성행동을 증진하는 중재가 되도록 준비하겠습니다.

감사합니다.

2023 년 8 월

연세대학교 간호대학 박사과정생 이해연

연세대학교 간호대학 지도교수 이현경

## 1. 교육모듈의 전반적인 개요

1. 대상자: 14-16 세 연령이며 국내 출생인 베트남계 여성 중학생

2. 프로그램 개발: Intervention Mapping (Bartholomew et al., 2016) 의 1~4 단계에 따라 개발됨

- 1) 1 단계 : 다문화 여성 청소년의 안전한 성행동에 영향을 미치는 요인에 대한 문헌고찰과 포커스 그룹 인터뷰(15 명의 베트남계 여성 청소년, 10 명의 베트남 결혼이주여성, 10 명 전문가)를 수행함
- 2) 2 단계: 행동결과(안전한 성행동 의도가 증가한다), 실행목표(sexual and reproductive health literacy, SRHL) 및 determinants(The theory of planned behavior)를 설정하고 변화목표 매트릭스를 작성함
- 3) 3 단계: 교육 모듈의 주제, 구성요소, 범위 및 순서를 구상하고 청소년 연령과 문화에 적합한 전달기법인 챗봇을 선택함
- 4) 4 단계: 8 개의 교육 모듈을 구체화하고, 챗봇(초안)에 반영함([http://pf.kakao.com/\\_xevTRG](http://pf.kakao.com/_xevTRG)).

No.	SRHL	Change objectives	Contents
모듈 1	접근	A1. 안전한 성행동 정보를 찾는 것이 중요함을 진술한다. SE1. 안전한 성행동 정보를 찾을 수 있는 자신감을 표현한다.	실제 청소년들이 성건강정보를 찾는 경로 올바른 성건강정보를 얻을 수 있는 경로 및 자원의 종류
모듈 2	이해	A2. 안전한 성행동을 해야 하는 이유를 나열한다. SE2-1. 안전한 성행동을 해야 하는 이유를 설명함에 자신감을 표현한다.	피임없는 성행동의 결과 책임있는 성행동의 의미
모듈 3	이해	SE2-2. 안전한 성행동(피임실천)방법을 이해함에 자신감을 표현한다.	피임제품 내 사용설명서의 확인 사용설명서 읽는 방법
모듈 4	평가	A3. 성행동 정보를 평가해야 하는 이유를 나열한다. SE3. 성행동 정보가 옳은지 평가할 수 있는 자신감을 표현한다.	디지털 공간 내 잘못된 성건강정보 디지털 공간 내 성건강정보를 평가할 수 있는 기준
모듈 5	평가	A3. 성행동 정보를 평가해야 하는 이유를 나열한다. SE3. 성행동 정보가 옳은지 평가할 수 있는 자신감을 표현한다.	피임에 대한 편견에 영향을 미치는 성역할 고정관념 양성평등의 정의와 필요한 이유
모듈 6	적용	SE4-1. 안전한 성행동을 위한 콘돔을 준비에 자신감을 표현한다. N4-1. 중요한 사람들은 콘돔 준비는 쉬운 것이며 당연한 것이라고 이야기한다.	청소년의 피임제 구매를 방해하는 요인 청소년의 피임제 구매에 대한 사회적 인식 변화 방법
모듈 7	적용	SE4-2a. 파트너와의 안전한 성행동 협상에 대한 자신감을 표현한다. SE4-2b. 파트너와 안전한 성행동 협상이 되지 않았을 때, 거절할 수 있는 자신감을 표현한다. N4-2. 중요한 사람들은 콘돔 협상에 대해 파트너와 이야기한다고 설명한다.	여성이 위험한 성행동을 거절하지 못하는 이유 안전한 성행동을 위해 파트너와 협상 및 거절하는 방법
모듈 8	적용	A4-3. 피임 의사소통을 해야 하는 이유를 나열한다.	안전한 성행동 계획표 성행동 전 이성과의 관계 및 성행동의 결과에 대한 고려

## 2. 교육 모듈 구성의 내용타당도 평가

모듈별 학습지도안을 확인 후, 우측의 칸에 모듈의 내용타당도를 평가하여 V표 해주십시오.

(1= 관련없음, 2=관련있으나 많은 수정이 필요함, 3=관련있으나 약간 수정이 필요함, 4=매우 관련 있음)

추가적인 조언은 맨 우측의 '제언하실 내용'에 적어주시길 바랍니다.

Module 1 학습지도안						내용 타당도				제언하실 내용
						1	2	3	4	
제목	안전하고 올바른 성정보를 찾자									
학습 목표	A1. 안전한 성행동 정보를 찾는 것이 중요함을 진술한다.									
	SE1. 안전한 성행동 정보를 찾을 수 있는 자신감을 표현한다.									
핵심 역량	<input type="checkbox"/> 건강관리 능력		<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력		<input checked="" type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력					
	<input type="checkbox"/> 건강 의사소통 능력		<input checked="" type="checkbox"/> 건강 의사결정 능력		<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식					
성생식 헬스리터러시 역량			<input checked="" type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input type="checkbox"/> 적용							
학습내용 및 활동	교수 <input type="checkbox"/> 학습 활동				자료	1	2	3	4	제언하실 내용
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시  ● 청소년들이 인터넷을 통해 성건강 정보를 찾는 내용(임신가능성 문의)을 제시하고, 해당 내용에 대해 이야기해본다.				네이버 질문 캡처				
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기  ● 청소년들이 성건강 정보를 찾는 경로에 대해 살펴보고, 올바른 성정보를 찾아야 하는 중 요성을 알고 경로를 배운다.  <input type="checkbox"/> 학습 목표를 제시한다.								
전개	학습활동	<input type="checkbox"/> 청소년들의 성건강정보를 찾는 경로를 확인한다.  ● 2021년 아하! 청소년성문화센터에서 진행한 청소년 성문화 실태조사에서 성건강정보를 찾는 경로 결과를 보고 그 이유에 대해 생각해본다.				2021 청소년성문화 실태조사				



## Appendix 5. Content validity index of educational modules

No.	Components	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	I-CVI
1	Title	4	4	4	4	3	4	1.00
	Learning objective	3	4	4	4	3	3	1.00
	Core competency	4	4	4	4	4	4	1.00
	Introduction	4	4	3	3	4	4	1.00
	Development	4	3	4	4	3	4	1.00
	Conclusion	4	4	4	4	3	3	1.00
2	Title	3	4	4	4	3	4	1.00
	Learning objective	3	4	4	3	3	4	1.00
	Core competency	4	4	4	4	4	4	1.00
	Introduction	3	4	4	4	3	4	1.00
	Development	3	4	3	4	3	3	1.00
	Conclusion	4	4	4	4	3	4	1.00
3	Title	4	2	4	4	4	4	0.83
	Learning objective	3	4	4	4	3	4	1.00
	Core competency	4	4	4	4	4	4	1.00
	Introduction	4	3	4	4	4	4	1.00
	Development	4	4	4	4	4	4	1.00
	Conclusion	3	4	4	4	3	4	1.00
4	Title	4	4	4	4	3	4	1.00
	Learning objective	3	4	3	3	2	4	0.83
	Core competency	4	4	4	4	4	4	1.00
	Introduction	3	4	4	4	3	4	1.00
	Development	4	3	4	4	4	4	1.00
	Conclusion	4	4	4	4	4	4	1.00
5	Title	3	4	4	4	4	4	1.00
	Learning objective	3	4	4	3	4	4	1.00
	Core competency	4	4	4	4	3	4	1.00
	Introduction	4	4	4	4	4	3	1.00
	Development	4	4	4	4	3	4	1.00
	Conclusion	4	4	4	3	3	4	1.00
6	Title	4	4	4	4	4	4	1.00
	Learning objective	3	4	4	4	3	4	1.00
	Core competency	4	4	3	4	4	4	1.00
	Introduction	4	4	4	4	3	3	1.00
	Development	3	4	2	4	4	3	0.83
	Conclusion	4	4	4	4	4	4	1.00
7	Title	4	4	4	4	4	4	1.00
	Learning objective	3	4	4	4	3	4	1.00
	Core competency	4	4	4	3	4	4	1.00
	Introduction	4	4	4	4	4	4	1.00
	Development	4	4	4	4	4	4	1.00
	Conclusion	4	4	4	4	4	4	1.00
8	Title	4	4	4	4	4	4	1.00
	Learning objective	3	4	4	4	3	4	1.00
	Core competency	4	4	4	3	4	4	1.00
	Introduction	3	4	4	4	4	4	1.00
	Development	4	4	4	4	4	4	1.00
	Conclusion	4	4	4	4	4	4	1.00

## Appendix 6. Final version of educational module instructional guides

Module 1 학습지도안			
제목	안전하고 올바른 성행동 정보를 찾자		
학습 목표	안전한 성행동 정보를 찾는 것의 중요함을 알고 설명할 수 있다 안전한 성행동 정보를 찾는 방법을 알고 적용할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	■ 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	■ 건강 의사결정 능력	<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량		■ 접근 <input type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습동기유발	<input type="checkbox"/> 동기유발 자료 제시 ● 청소년들이 인터넷을 통해 잘못된 성행동건강 정보를 접하여 이를 적용하는 잘못된 사례를 제시하고, 해당 내용에 대해 이야기해본다.	네이버 질문 캡처
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 ● 청소년들이 성건강 정보를 찾는 경로에 대해 살펴보고, 올바른 성정보를 찾아야 하는 중요성을 알고 경로를 배운다. <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 청소년들의 성건강정보를 찾는 경로 및 현황을 확인한다. ● 2021년 아하! 청소년성문화센터에서 진행한 청소년 성문화 실태조사에서 성건강정보를 찾는 경로 결과를 보고 그 이유에 대해 생각해본다. ■ 학교 - 남 60.7%, 여 68.6% ■ 디지털 공간(포털사이트, 유튜브, 웹툰, 온라인게임, 커뮤니티사이트, SNS 등 디지털 플랫폼) - 남 58.2%, 여 64.1%	2021 청소년성문화 실태조사
		<input type="checkbox"/> 올바른 성건강정보를 얻을 수 있는 경로 및 자원의 종류를 확인한다. ● 올바른 성건강정보를 찾기 위해 어떤 자원을 탐색할 것인지 선택한다. ■ 정보 자원: 건강 관련 정보를 얻을 수 있는 모든 매체 ■ 물적 자원: 건강에 도움을 줄 수 있는 시설, 기관, 도구 등 ■ 인적 자원: 건강에 도움을 줄 수 있는 모든 사람	천재교과서 p182. 건강자원과 문화 활용한 시각자료 재구성
정리	학습활동정리	<input type="checkbox"/> 학습활동 정리하기 ● 학습내용을 정리하여 마무리한다. <input type="checkbox"/> 자기평가지 작성하기 ● 올바른 성건강정보를 찾을 수 있는 자기효능감 수준을 스스로 측정한다. <input type="checkbox"/> 다음 교육예고 ● 차시예고를 통한 호기심을 유발한다.	

Module 2 학습지도안			
제목	왜 안전한 성행동을 해야할까?		
학습 목표	안전한 성행동이 무엇인지 설명할 수 있다. 안전한 성행동을 해야하는 이유를 설명할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	<input checked="" type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	<input checked="" type="checkbox"/> 건강 의사결정 능력	<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량		<input type="checkbox"/> 접근 <input checked="" type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시 ● 한 드라마에서 여고생이 임신을 하게 되는 내용을 보며, 앞으로 어떤 결정을 해야 할지 함께 고민해본다.	드라마(우리들의 블루스 캡처본)
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 ● 안전한 성행동이 무엇인지 확인하고, 위험한 성행동(피임없는 성행동)이 어떠한 결과를 일으키는지 확인하여 피임의 중요성에 대해 인식하고, 청소년기의 안전한 성행동이 무엇인지 판단한다. <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 안전한 성행동이 무엇인지 확인하고, 피임없는 성행동의 결과를 알아본다. ● 안전한 성행동은 원하지 않은 임신을 예방하기 위해 피임제를 사용하는 행동임을 안다. ● 피임없는 성행동이 미치는 결과가 무엇인지 탐색한다	피임없는 성행동 결과 시각자료
		<input type="checkbox"/> 책임있는 성행동을 위한 생각을 표현한다. ● 100% 완벽한 피임방법은 없다는 사실을 통해 청소년기의 성행동에 대해 다시 생각해본다.	드라마(우리들의 블루스 캡처본)
정리	학습활동정리	<input type="checkbox"/> 학습활동 정리하기 ● 학습내용을 정리하여 마무리한다. <input type="checkbox"/> 자기평가지 작성하기 ● 성건강정보를 올바르게 이해할 수 있는 자기효능감 수준을 스스로 측정한다. <input type="checkbox"/> 다음 교육예고 ● 차시예고를 통한 호기심을 유발한다.	

Module 3 학습지도안			
제목	너가 지금 보고 있는 그 정보, 제대로 이해한 게 맞을까?		
학습 목표	안전한 성행동을 위한 사용설명서를 활용하는 방법을 설명할 수 있다. 안전한 성행동을 위해 사용설명서에 제시된 피임실천 방법을 설명할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	■ 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	■ 건강 의사결정 능력	<input type="checkbox"/> 건강 사회·문화 공동체 의식
성생식 헬스리터러시 역량		<input type="checkbox"/> 접근 ■ 이해 <input type="checkbox"/> 평가 <input type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습동기유발	<input type="checkbox"/> 동기유발 자료 제시 <ul style="list-style-type: none"> <li>● 피임제품(콘돔) 안에 있는 사용설명서 예시를 보고 어떤 생각이 드는지 나누어본다.</li> </ul>	콘돔 사용설명서 예시
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 <ul style="list-style-type: none"> <li>● 피임제의 사용설명서 존재를 알고, 읽는 법을 올바르게 이해한다.</li> </ul> <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 피임제품 내 사용설명서의 존재를 확인한다. <ul style="list-style-type: none"> <li>● 콘돔의 사용설명서를 확인한다.</li> <li>● 경구피임약의 사용설명서를 확인한다.</li> </ul>	피임제품의 사용설명서 사진
		<input type="checkbox"/> 피임제품 내 사용설명서의 존재를 확인하고, 사용설명서의 구성과 읽는 법을 안다. <ul style="list-style-type: none"> <li>● 사용설명서 구성: 사용기한, 효능/효과, 용법/용량, 주의사항 등</li> <li>● 의약품에 관한 정보 사이트"건강IN 웹사이트, 식품의약품안전처 의약품통합정보시스템"를 안내한다.</li> </ul>	사용설명서 구성 및 읽는 법 시각자료
정리	학습활동정리	<input type="checkbox"/> 학습활동 정리하기 <ul style="list-style-type: none"> <li>● 학습내용을 정리하여 마무리한다.</li> </ul> <input type="checkbox"/> 자기평가지 작성하기 <ul style="list-style-type: none"> <li>● 성건강정보를 올바르게 이해할 수 있는 자기효능감 수준을 스스로 측정한다.</li> </ul> <input type="checkbox"/> 다음 교육예고 <ul style="list-style-type: none"> <li>● 올바른 정보를 이해한 다음에 필요한 능력에 대해 궁금할 수 있도록 안내한다.</li> </ul>	

Module 4 학습지도안			
제목	너도나도 모르게 스며드는 미디어에서의 성건강정보		
학습 목표	안전한 성행동 정보를 평가해야하는 이유를 설명할 수 있다. 안전한 성행동 정보가 옳은지 평가할 수 있는 방법을 나열한다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	<input checked="" type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	<input checked="" type="checkbox"/> 건강 의사결정 능력	<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량		<input type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input checked="" type="checkbox"/> 평가 <input type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시 <ul style="list-style-type: none"> <li>한 미디어컨텐츠의 내용(더 안전하게 하려고 주인공이 콘돔을 2개를 낀)을 보며 미디어에서 전달하는 내용의 적절성에 대해 판단해본다.</li> </ul>	이번생은 처음이라 드라마 캡처본
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 <ul style="list-style-type: none"> <li>인터넷, 미디어컨텐츠 등 디지털 공간의 성건강정보에서 잘못된 내용들을 확인하고, 해당 내용이 미치는 결과가 무엇인지 탐색하여, 바르게 평가할 수 있는 기준을 세운다.</li> <li><input type="checkbox"/> 학습 목표를 제시한다.</li> </ul>	
전개	학습활동	<input type="checkbox"/> 디지털 공간에서의 잘못된 성건강정보 현황을 확인한다. <ul style="list-style-type: none"> <li>미디어에서 표현된 잘못된 성건강 정보를 제시한다.</li> </ul>	YMCA 웹툰 및 미디어 양성평등 분석보고서
		<input type="checkbox"/> 올바른 성건강정보를 평가할 수 있는 기준을 제시한다. <ul style="list-style-type: none"> <li>출처를 확인한다: 검증된 기관인지</li> <li>누가 썼는지 확인한다: 전문가가 썼는지</li> <li>근거가 있는지 확인한다: 전문적인 근거가 있는지</li> </ul>	(주) 지구문화 중학교 중학교 보건 p177 / (주) 들샘미디어 중학교 보건 p149
정리	학습활동 정리	<input type="checkbox"/> 학습활동 정리하기 <ul style="list-style-type: none"> <li>학습내용을 정리하여 마무리한다.</li> </ul> <input type="checkbox"/> 자기평가지 작성하기 <ul style="list-style-type: none"> <li>성건강정보를 올바르게 평가할 수 있는 자기효능감 수준을 스스로 측정한다.</li> </ul> <input type="checkbox"/> 다음 교육예고 <ul style="list-style-type: none"> <li>성건강정보를 올바르게 평가하기 위해 기억해야 할 또 다른 능력에 대해 궁금할 수 있도록 안내한다.</li> </ul>	

Module 5 학습지도안			
제목	알게 모르게 나에게 미친 성역할 고정관념과 문화		
학습목표	안전한 성행동 정보를 평가에 영향을 미치는 요인들을 설명할 수 있다.		
핵심역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	<input checked="" type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	<input type="checkbox"/> 건강 의사결정 능력	<input checked="" type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량	<input type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input checked="" type="checkbox"/> 평가 <input type="checkbox"/> 적용		
학습내용 및 활동		교수학습 활동	자료
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시 <ul style="list-style-type: none"> <li>● 안전한 성행동 관련 편견에 대해 주변에서 들어본 적이 있는지 확인한다.</li> </ul>	
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 <ul style="list-style-type: none"> <li>● 성역할 고정관념/가족문화/또래문화에 의해 성행동 정보를 다르게 평가할 수 있음을 알고, 올바르게 판단할 수 있는 양성평등적 사고로 수정한다.</li> </ul> <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 우리가 가지고 있는 안전한 성행동에 대한 편견이나 오류들에 영향을 미치는 성역할 고정관념/또래문화/가족문화를 확인한다. <ul style="list-style-type: none"> <li>● 성역할 고정관념:</li> <li>● 또래문화: 너 이것도 안해봤냐? 성적 농담, 여성비하발언, 성희롱발언</li> <li>● 가족문화: 성에 대해 금기시하는 문화, 부모님이 가지고 있는 기존의 성에 대한 인식</li> </ul>	성역할 고정관념에 대한 시각자료
		<input type="checkbox"/> 우리가 가지고 있는 성역할 고정관념 및 문화를 개선하기 위한 방안을 고민한다.	
정리	학습활동 정리	<input type="checkbox"/> 학습활동 정리하기 <ul style="list-style-type: none"> <li>● 학습내용을 정리하여 마무리한다.</li> </ul> <input type="checkbox"/> 자기평가지 작성하기 <ul style="list-style-type: none"> <li>● 성건강정보를 올바르게 평가할 수 있는 자기효능감 수준을 스스로 측정한다.</li> </ul> <input type="checkbox"/> 다음 교육예고 <ul style="list-style-type: none"> <li>● 성건강정보를 올바르게 적용하는 능력에 대한 교육을 안내한다.</li> </ul>	

Module 6 학습지도안			
제목	부끄러워서 못 사겠어요.		
학습 목표	안전한 성행동 실천에 있어 피임제 구매에 영향을 미치는 요인들을 설명할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력 <input type="checkbox"/> 건강 의사소통 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력 <input checked="" type="checkbox"/> 건강 의사결정 능력	<input checked="" type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력 <input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량		<input type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input checked="" type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습 동기 유발	<input type="checkbox"/> 동기유발 자료 제시 ● 청소년이 피임구매가 가능한지 사회실험테스트유투브를 보면서 청소년의 피임구매 현실을 인지한다	<a href="https://www.youtube.com/watch?v=XnNJTUI-OIk">https://www.youtube.com/watch?v=XnNJTUI-OIk</a>
	학습 활동 안내	<input type="checkbox"/> 학습활동 안내하기 ● 사회적 편견에도 불구하고 피임은 자신의 몸을 보호하는 적극적인 행동임을 이해하고 대처방법을 찾아보도록 한다. <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습 활동	<input type="checkbox"/> 청소년의 피임제 구매의 어려움을 탐색한다. ● 사회적 시선으로 인한 어려움 ● 본인이 콘돔을 사는 것에 대한 부끄러움 ● 부모들의 반발	피임구매를 방해하는 요인 시각자료
		<input type="checkbox"/> 청소년의 피임구매에 대한 사회적 인식을 바꿀 수 있는 다른 건강옹호방법을 생각해본다 ● 연합뉴스 기사: 콘돔 판매거부에 대응하는 반박글 게시	연합뉴스 기사 <a href="https://www.yna.co.kr/view/AKR20200812152500505">https://www.yna.co.kr/view/AKR20200812152500505</a>
정리	학습 활동 정리	<input type="checkbox"/> 학습활동 정리하기 ● 학습내용을 정리하여 마무리한다. <input type="checkbox"/> 자기평가지 작성하기 ● 성건강정보를 올바르게 적용하는 것, 피임제 구매를 할 수 있는 자기 효능감 수준을 스스로 측정한다. <input type="checkbox"/> 다음 교육예고 ● 안전한 성행동 적용을 할 때의 또 다른 어려움에 대해 궁금할 수 있도록 안내한다.	

Module 7 학습지도안			
제목	남자친구가 피임하기 싫대요 / 사랑에도 동의가 필요해		
학습 목표	안전한 성행동 협상에 있어 부정적인 사회적 통념에 대해 설명할 수 있다. 안전한 성행동을 위한 적절한 협상 전략을 나열할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	<input type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	<input checked="" type="checkbox"/> 건강 의사결정 능력	<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량		<input type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input checked="" type="checkbox"/> 적용	
학습내용 및 활동		교수학습 활동	자료
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시 ● 안전한 성행동 협상이 잘 되지 않은 커플의 이야기를 제시하고 그 이유를 탐색해본다.	
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 ● 여성의 거절에 대한 사회적 통념을 확인하고, 안전한 성행동 협상 및 거절방법이 필요함을 안다. <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 여성이 위험한 성행동을 거절하지 못하는 이유와 여성의 거절이 받아들여지지 않는지에 대한 사회적 통념을 확인한다. ● 거절하지 못한 이유(여성): 관계를 유지하고 싶어서(분위기를 망치고 싶지 않아서, 헤어질까봐) ● 사회적 통념(남성): 바로 허락하면 밝히는 여자로 보일까봐 한번 거절하는 척하는 것이다, 관계를 밀당하려고 거절하는 것이다.	
		<input type="checkbox"/> 안전한 성행동을 위해 파트너와의 협상 및 거절의 방법을 제시한다. ● 예, 아니오라고 명확히, 자신과 상대방 모두 동의해야 함 ● 전에 동의했던 행동도 지금은 마음이 바뀌어 거부할 수 있음 ● 위협적인 행동, 심리적인 압박, 술에 취한 상태에서 동의는 참된 의미의 동의라고 할 수 없음 <input type="checkbox"/> 이성관계는 상대방의 의견을 존중하는 것임을 강조한다.	천재교과서 p92. 상대방을 배려하는 확실한 동의
정리	학습활동 정리	<input type="checkbox"/> 학습활동 정리하기 ● 학습내용을 정리하여 마무리한다. <input type="checkbox"/> 자기평가지 작성하기 ● 안전한 성행동을 실천하기 위한 협상 및 거절을 할 수 있는지 자기효능감 수준을 스스로 측정한다. <input type="checkbox"/> 다음 교육예고 ● 안전한 성행동을 실천하기 위한 마지막 방법인 피임 의사소통에 대한 교육을 안내한다.	



Module 8 학습지도안			
제목	성행동, 미리 계획하자		
학습 목표	안전한 성행동을 위해 사전에 상대방과 의사소통이 필요한 이유를 설명할 수 있다.		
핵심 역량	<input type="checkbox"/> 건강관리 능력	<input type="checkbox"/> 건강 <input type="checkbox"/> 안전 위험인식 능력	<input type="checkbox"/> 건강정보 <input type="checkbox"/> 자원 활용 능력
	<input type="checkbox"/> 건강 의사소통 능력	<input checked="" type="checkbox"/> 건강 의사결정 능력	<input type="checkbox"/> 건강 사회 <input type="checkbox"/> 문화 공동체 의식
성생식 헬스리터러시 역량	<input type="checkbox"/> 접근 <input type="checkbox"/> 이해 <input type="checkbox"/> 평가 <input checked="" type="checkbox"/> 적용		
학습내용 및 활동	교수학습 활동		자료
도입	학습동기 유발	<input type="checkbox"/> 동기유발 자료 제시 <ul style="list-style-type: none"> <li>한 예능프로그램에서 진행된 안전한 성행동 계획표에 대해 제시하고, 이에 대해 생각해본다.</li> </ul>	2019 년 비디오스타 프로그램 자료 캡처본
	학습활동 안내	<input type="checkbox"/> 학습활동 안내하기 <ul style="list-style-type: none"> <li>안전한 성행동은 성행동 직전에 이야기하는 것이 아니라 파트너와 사전에 논의되어야 하는 것임을 안다.</li> </ul> <input type="checkbox"/> 학습 목표를 제시한다.	
전개	학습활동	<input type="checkbox"/> 안전한 성행동 계획표를 작성한다. <ul style="list-style-type: none"> <li>성행동을 한다면, 시기, 장소, 무엇을 준비해야할지 생각해본다.</li> </ul>	움츠러들지 않고 용기있게 딸 성교육하는 법 p166(다산 에듀)
		<input type="checkbox"/> 이성과의 관계 및 성행동의 결과에 대해 사전에 생각한다. <ul style="list-style-type: none"> <li>1) 우리는 친밀한 사이인가?</li> <li>2) 성행동을 했을 때 걱정되는 것은 무엇인가?</li> <li>3) 성행동 결과로 어떤 상황이 나타날 수 있는가?</li> <li>4) 성행동 결과에 서로 책임질 수 있는가?</li> </ul>	천재교과서 p73. 이성교제 시 바람직한 성적 자기결정권 행사의 기준
정리	학습활동 정리	<input type="checkbox"/> 학습활동 정리하기 <ul style="list-style-type: none"> <li>학습내용을 정리하여 마무리한다.</li> </ul> <input type="checkbox"/> 자기평가지 작성하기 <ul style="list-style-type: none"> <li>성건강정보를 올바르게 적용하는 것, 파트너와 미리 의사소통할 수 있는 자기효능감 수준을 스스로 측정한다.</li> </ul>	

## Appendix 7. Chatbot based Intervention


챗봇 처음 연결 시 인사	챗봇 제네릭 메뉴	교육모듈 안내
 <p>성교육챗봇_보라</p> <p>안녕? 내 이름은 보라야!</p> <p>나랑 2주동안 같이 안전한 성행동을 증진시킬 수 있는 성생식 헬스 리터러시에 대해 배워볼거야.</p> <p>성생식 헬스 리터러시는 올바른 성건강강령 보름</p> <ol style="list-style-type: none"> <li>1. 찾고,</li> <li>2. 이해하고,</li> <li>3. 평가하고</li> <li>4. 적용하는 능력이야.</li> </ol> <p>그래서 교육메시지는 2주동안 8번을 전달할거야.</p> <p>너가 원하는 시간에 아래의 "오늘의 교육"을 눌러서 배우면 돼. 교육 마치면 쿠폰도 지급되니 꼭꼭 해봐!</p> <p>그리고 매일매일 퀴즈도 있으니 풀어봐!</p> <p>먼저, 아래 상담직원을 연결해서 너의 이름을 알려줄래? 😊</p> <p>그리고 다시 챗봇 전환을 눌러줘!</p>	 <p>오늘의 퀴즈 🧐</p> <p>오늘의 교육! 📖</p> <p>피임이 뭔지 알아? 🤔</p> <p>안전한 피임을 하려면? 🛡️</p> <p>피임을 못했어! 그렇다면? 🤔</p> <p>이런 피임법은 피해줘! ❌</p> <p>자주 묻는 질문? ❓</p> <p>처음으로 🏠</p> <p>+ 챗봇에게 메시지 보내기</p>	 <p>성교육챗봇_보라</p> <p>첫번째!</p> <p>안녕! 나랑 친구해줘서 고마워 🥰</p> <p>14일 동안 함께 "안전한 성행동"을 위한 성생식 헬스 리터러시를 알아가자!</p> <p>오늘부터 내가 알짜배기 내용을 전해줄게.</p> <p>아래 "오늘의 교육"을 눌러봐 📖!</p>
“피임이 뭔지 알아” 연결	설문조사 안내	
 <p>성교육챗봇_보라</p> <p>피임은 "안전한 성행동"이야!</p> <p>피임은 정자와 난자가 만나 수정되는 것을 막거나 자궁벽에 붙어서 착상되는 것을 방해해서 원하지 않는 임신을 하지 않도록 하는 거야.</p> <p>게다가, 성병을 예방할 수도 있어!!</p> <p>피임의 종류에는? 피임의 효과는? 피임을 안하면</p> <p>오늘의 퀴즈 🧐</p> <p>오늘의 교육! 📖</p> <p>+ 챗봇에게 메시지 보내기</p>	 <p>성교육챗봇_보라</p> <p>안녕!</p> <p>2주동안 나와 함께 공부해줘서 고마워 :) 정말정말 재미있었어!</p> <p>마지막 설문지 링크를 보내줄게!</p> <p>설문지까지 다 하고 나면 알려줘. 챗봇 참여에 대한 모바일 쿠폰을 전달해줄게!</p> <p>설문조사하기</p>	

## Appendix 8. Information and illustrations related to safe sexual behavior

주제 및 메시지 내용	일러스트	주제 및 메시지 내용	일러스트
피임의 종류 피임방법은 굉장히 다양해!		청소년 임신 2021 년 기준, 성경험이 있는 여성 청소년들 가운데 임신 경험이 있는 비율은 5.23% 야. 청소년은 성장하는 과정 중에 있기 때문에 임신이 매우 위험해. 자, 만약 네가 임신했다면 이제 다음은 어떻게 해야 할까? 출산 그리고 인공임신중절, 너 무엇을 선택할거야? 🤔	
피임의 효과 100% 완벽한 피임법은 없어. 효과적인 피임법 덜 효과적인 피임법으로 나눌 뿐이야.		청소년 임신 2019 년 기준 여성 청소년의 출산은 1,109 명으로 매년 약 1 천명이 출산을 해. 그리고 그 중 약 24.2%만이 부모가 되기로 결정하고, 나머지는 입양 또는 양육시설에 아이를 보내기로 결정을 한대(2019).	

## Appendix 9. Permission to use survey instruments

### Sexual and reproductive health literacy


 **Poom Viengkhone** <viengkhone\_poom@yahoo.com> 4월 28일 (금) 오전 7:55 ☆ 😊 ↩ ⋮  
나에게 ▼

Dear Hyecheon,

I am glad to share with you the questionnaire. I would recommend to adjust or adapt it accordingly to your context of research. Please find attached.

I also would like to share with you to read the related article for this tool validation. Please follow this link: [Validation of the Questionnaire on Sexual and Reproductive Health Literacy for Adolescents Age 15 to 19 Years in Lao People's Democratic Republic](#)

### Safe sexual behavior attitude

 **강희선** <goodcare@cau.ac.kr> 8월 7일 (월) 오후 8:31  
나에게 ▼

이혜연 선생님

안녕하세요.

도구는 사용하시면 되는데  
제가 정리해둔 파일이 없으니  
본 도구 관련 선행연구를 찾아보시고  
찾을 수 있으시면 사용하시고,  
없으시면 다른 도구 사용을 고려하시기 바랍니다.

큰 도움이 되지 못해서 죄송합니다.


강희선 드림

### Safe sexual behavior subjective norm

 **황신우/간호학과** <sepochung@dhc.ac.kr> 4월 26일 (수) 오후 4:29  
나에게 ▼

안녕하세요. 황신우입니다.  
예 얼마든지 사용하시면 됩니다.  
훌륭한 논문 쓰시길 바라겠습니다.

황신우 드림

 **Primack, Brian** <brian.primack@oregonstate.edu> 8월 2일 (수) 오후 8:19  
나에게 ▼

You are welcome to!

Sent from a mobile device. Please excuse brevity and typos.

## Safe sexual behavior self-efficacy



**EunSeok Cha** <echa5@cnu.ac.kr>

나에게 ▼

4월 26일 (수) 오후 4:31

선생님,

1. 먼저 좋은 학위논문 쓰시기 바랍니다.
2. 저는 번역자일 뿐이므로, 사용에 대한 허가 및 수정에 대한 허가는 원저자에게 받으셔야 합니다.
3. 한국어 도구 보냅니다. 말씀 드렸지만, 원저자 허가를 반드시 득하신 후 도구를 사용하시기 바랍니다.

은석드림

Automatic reply: Request for permission of using "An adolescents and young adult condom self-efficacy scale"(1999) ➤ 0. 연구/1) 학위논문/2) 도구 ✕

**Hanna, Kathy M** <kathy.hanna@unmc.edu>

나에게 ▼

8월 2일 (수) 오후 6:54 ☆

I am now retired and not monitoring this email account on a regular basis. Kathy

The information in this e-mail may be privileged and confidential, intended only for the use of the addressee(s) above. Any unauthorized use or disclosure of information is prohibited. If you have received this e-mail by mistake, please delete it and immediately contact the sender.



**UW Nursing** <uwnurs@uwoy.edu>

나에게 ▼

8월 26일 (토) 오전 2:28

Hello Hyeyeon,

We unfortunately do not have any contact information for professor Hanna, as she retired at a time before we had outside contact information for them. Apologies for this.

## User Engagement Scale (UES) short form



**O'Brien, Heather** <h.obrien@ubc.ca>  
나에게 ▼

4월 27일 (목) 오전 1:15 ☆ ☺ ↶ ⋮

Dear Hyeyeon,

I am happy to provide students with permission to use the User Engagement Scale (UES) for academic (non-commercial) purposes to support their work. In using the UES, I request that you acknowledge the original work in your own theses and publications. I recommend including the questions for the UES as you have modified them for your chatbox tool in your appendix.

UES publications for citing in your work:

O'Brien, H.L. (2008). Defining and measuring engagement in user experiences with technology. Doctoral Dissertation, Dalhousie University, Halifax, NS.

O'Brien, H. L., & Toms, E. G. (2010). The development and evaluation of a survey to measure user engagement. *Journal of the American Society for Information Science and Technology*, 61(1), 50-69

O'Brien, H. L., Cairns, P., & Hall, M. (2018). A practical approach to measuring user engagement with the refined user engagement scale (UES) and new UES short form. *International Journal of Human-Computer Studies*, 112, 28-39.

<https://www.sciencedirect.com/science/article/pii/S1071581918300041>

There are no additional files for the questionnaire and scoring -- everything is published in the appendix to the journal article you cite below.

All the best,  
Heather

## Chatbot Usability Questionnaire



**Samuel Holmes** <sholmes@serc.ac.uk>  
나에게 ▼

5월 2일 (화) 오후 4:46

Hi Hyeyeon,

You can of course have permission to use this tool.

I wish you the best of luck with your research.

Sam

**Dr Samuel Holmes**

## Appendix 10. Questionnaire

# 설문지

안녕하세요.

저는 청소년의 성생식건강 증진에 관심을 갖고 연구하고 있는 연세대학교 간호대학 박사과정 이해연입니다.

본 설문지는 다문화 여성 청소년의 성생식건강 증진을 위한 sexual and reproductive health literacy 중재의 과정과 잠재적 효과를 평가하기 위해 작성되었습니다. 본 연구의 결과는 다문화 여성 청소년의 성생식건강 증진에 있어 중요한 근거자료로 제공될 것입니다.

설문지에 작성되는 시간은 약 25~30 분입니다.

귀하는 언제든지 연구 참여에 대해 동의를 철회할 수 있으며, 이 경우 연구 참여는 종료되고 연구자는 귀하에게 연구와 관련된 추가적인 정보를 수집하지 않을 것입니다. 또한, 본 설문지는 연구목적 외에는 다른 목적으로 사용되지 않을 것입니다. 이에 설문 내용에 대하여 솔직하고 정확하게 응답해주시다면, 귀하께서 응답해주신 내용들은 귀중한 연구 자료로 활용될 것입니다.

연구에 관련하여 문의사항이 있으신 경우, 연구자에게 언제든지 연락주시기 바랍니다. 연구에 참여해주셔서 진심으로 감사드립니다.

- 연구 책임자: 연세대학교 간호대학 이현경 지도교수
- 연구 담당자: 연세대학교 간호대학 박사과정 이해연  
✉ leeleah86@gmail.com

안전한 성행동 태도						
성경험과 무관하게 콘돔 사용과 관련하여 평소 각 문항에 대해 어떻게 생각하시는지 해당란에 표시하여 주십시오.						
문항		전혀 그렇지 않다	그렇지 않다	보통이다	그렇다	매우 그렇다
1	콘돔은 자연스러운 성행동을 방해한다.	1	2	3	4	5
2	콘돔은 성감을 둔화시킨다.	1	2	3	4	5
3	콘돔사용은 전희, 애무 과정에 맥을 끊는다.	1	2	3	4	5
4	콘돔사용은 정서적 친밀감을 방해한다.	1	2	3	4	5
5	콘돔을 사용하면 신체적으로 불편하다.	1	2	3	4	5
6	내(파트너)가 콘돔을 사용하면 속스러울 것이다.	1	2	3	4	5
7	콘돔을 준비하는 것에 대해 거부감이 있다.	1	2	3	4	5
8	둘 사이에 콘돔을 사용하는 것 자체가 싫다.	1	2	3	4	5
9	콘돔을 사용하는 것은 번거로운 일이다.	1	2	3	4	5
10	콘돔을 지니고 다니면 난잡하게 여겨진다.	1	2	3	4	5
11	성행동 시 콘돔을 사용할 필요가 있다.	1	2	3	4	5
12	콘돔을 사용하거나 사용하라고 권하면 상대방이 나를 난잡하게 볼 것 같다.	1	2	3	4	5
13	콘돔 사용은 상대방을 배려하는 행위이다.	1	2	3	4	5
14	콘돔 사용은 자신을 보호하는 행위이다.	1	2	3	4	5
15	콘돔은 경구 피임약과 같은 부작용이 없어서 좋다	1	2	3	4	5
16	콘돔은 사용하기가 쉽다.	1	2	3	4	5

안전한 성행동 주관적 규범						
다음은 귀하가 성관계를 가질 때 아래의 사람들이 안전한 성행동(피임)의 중요성을 “얼마나 강조하는지”를 묻는 내용입니다. 해당하는 곳에 V 표시를 해주십시오.						
내용		전혀 아니다	아니다	보통이다	그렇다	매우 그렇다
1	나의 <u>부모님</u> 은 내가 성관계를 가질 때 피임을 해야 한다고 강조한다.	1	2	3	4	5



2	나의 친구는 내가 성관계를 가질 때 피임을 해야 한다고 강조한다.	1	2	3	4	5
3	나의 교사는 내가 성관계를 가질 때 피임을 해야 한다고 강조한다.	1	2	3	4	5
4	나의 성관계 파트너는 내가 성관계를 가질 때 피임을 해야 한다고 강조한다.	1	2	3	4	5

안전한 성행동 자기효능감						
<p>당신이 아래의 상황들에 있을 때 얼마나 그 일들을 할 수 있을지에 대해서 해당하는 번호를 선택하여 주십시오. 만약, 당신이 아래 상황에 대해 전혀 그렇지 못할 것 같다고 생각할 때는, 0 번을 적으시고, 그렇지 못할 것 같다고 생각할 때는 1 번을, 약간을 그럴 것 같다고 생각할 때는 2 번을, 그럴 것 같다고 생각할 때는 3 번을, 매우 그럴 것 같다고 생각할 때는 4 번을 적어주시기 바랍니다.</p> <p>다음 문항들에 대한 정답이나 오답은 없습니다.</p>						
문항		전혀 그렇지 못할 것 같다	그렇지 못할 것 같다	약간을 그럴 것 같다	그럴 것 같다	매우 그럴 것 같다
1	나는 콘돔이 필요할 때 가지고 다닐 수 있을 것 같다.	0	1	2	3	4
2	파트너와 성행동을 할 때마다 나는 매번 콘돔을 사용할 수 있을 것 같다.	0	1	2	3	4
3	내 파트너와 성행동을 할 때마다 나는 매번 새로운 콘돔을 사용할 수 있을 것 같다.	0	1	2	3	4
4	나 또는 내 파트너가 콘돔을 착용하도록 하기 위해 나는 멈출 수 있을 것 같다.	0	1	2	3	4
5	나(또는 내 파트너)는 콘돔을 성기 끝까지 완전히 씌울 수 있을 것 같다.	0	1	2	3	4
6	나(또는 내 파트너)는 콘돔이 미끄러져 벗겨지지 않게 사용할 수 있을 것 같다.	0	1	2	3	4
7	나(또는 내 파트너)는 사용한 콘돔을 쓰레기통에 버릴 수 있을 것 같다.	0	1	2	3	4

8	나(또는 내 파트너)는 성행동이 끝난 후 성기를 빼는 동안 콘돔이 성기 끝에 원래대로 씌워져 있게 할 수 있을 것 같다.	0	1	2	3	4
9	나(또는 내 파트너)는 음주(맥주, 포도주 혹은 그 이외의 술)를 했을 때라도 콘돔을 사용할 수 있을 것 같다.	0	1	2	3	4
10	나는 어떤 파트너와도 콘돔 사용에 대해 이야기할 수 있을 것 같다.	0	1	2	3	4
11	나의 파트너가 콘돔 사용에 대해 어떤 감정을 가지고 있는지 확실하지 않을 때라도, 나는 콘돔 사용에 대해 이야기할 수 있을 것 같다.	0	1	2	3	4
12	포옹이나 키스를 하지 않은 단계라도, 나는 앞으로 성행동을 할 수도 있는 상대와 콘돔 사용에 대해 이야기할 수 있을 것 같다.	0	1	2	3	4
13	성행동을 할 때, 나는 파트너에게 콘돔을 사용하도록 이야기할 수 있을 것 같다.	0	1	2	3	4
14	만약 상대가 콘돔 사용을 거부할 경우, 나는 성행동을 하지 않겠다고 이야기할 수 있을 것 같다.	0	1	2	3	4

안전한 성행동	
<p>다음은 귀하의 미래(결혼 후 임신을 계획하는 상황이 아닌 경우를 가정) 안전한 성행동(피임) 의도를 알아보기 위한 문항입니다. 성 경험이나 피임유무와 무관하게 질문을 읽고 본인의 생각에 가장 가까운 곳에 V 표시를 하면 됩니다.</p>	
<p>만일 성관계를 하게 된다면, 얼마나 자주 피임을 할 의도가 있는가?</p> <p>① 전혀 할 생각이 없다</p> <p>② 가끔 할 생각이다</p> <p>③ 반 정도</p> <p>④ 자주 할 생각이다</p> <p>⑤ 매번 할 생각이다</p>	

청소년 성생식 건강문해력					
다음 각 문항에 대해 당신은 어떻게 생각하는지 표시해주세요.		매우 어렵다	어렵다	쉽다	매우 쉽다
<b>접근</b>					
1	사용 가능한 피임법에 대한 정보 찾기				
2	발생 가능한 피임의 부작용에 대한 정보 찾기				
3	임신의 초기 증상과 임신 테스트에 대한 정보 찾기				
4	임신 중 건강하게 생활하기 위한 정보 찾기				
5	당신 또는 당신의 여자친구가 임신한 경우 전문적인 도움을 받을 수 있는 곳에 대한 정보 찾기				
6	임신한 청소년에게 발생할 수 있는 문제에 대한 정보 찾기				
7	안전한 인공임신중절에 대한 정보 찾기				
8	자연유산 또는 인공임신중절을 할 경우 발생할 수 있는 문제에 대한 정보 찾기				
9	지역사회나 학교에서 참여할 수 있는 피임, 청소년 임신, 인공임신중절 관련 활동에 대한 정보 찾기				
<b>이해</b>					
10	피임도구/피임약 사용방법에 대한 의사나 약사의 지시를 이해하기				
11	피임도구/피임약 박스에 적혀있는 정보 이해하기				
12	임신, 피임, 인공임신중절에 대한 미디어 정보 이해하기(페이스북, 구글, 티비, 잡지, 포스터 등)				
13	피임(콘돔 사용 등)을 하지 않고 성관계를 할 경우 어떻게 임신이 되는지 이해하기				
14	당신 또는 당신의 여자친구가 임신을 했는지 검사하는 방법과 임신 초기에 나타나는 증상을 알기				
15	임신한 청소년이 임신기간 동안 건강하게 생활하고 정기적으로 의사의 검진을 받아야하는 이유를 알기				
16	당신 또는 당신의 여자친구에게 임신과 관련된 위험한 문제가 생겼을 때 무엇을 해야 하는지 알기				
17	당신 또는 당신의 여자친구에게 자연유산 또는 인공임신중절과 관련된 위험한 문제가 생겼을 때 무엇을 해야 하는지 알기				

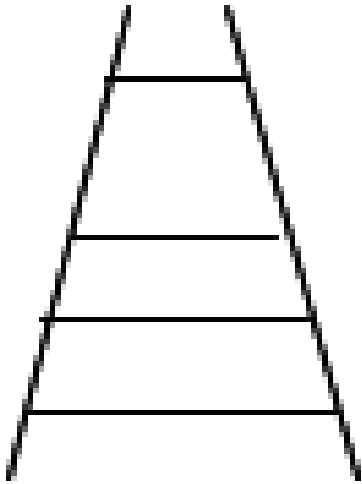
18	당신 또는 당신의 여자친구가 임신할 경우 생길 수 있는 문제를 알기				
19	당신 또는 당신의 여자친구가 인공임신중절을 할 경우 생길 수 있는 문제를 알기				
<b>평가</b>					
20	피임의 장점과 단점이 무엇인지 판단하기				
21	원하지 않는 임신을 했을 경우, 임신을 계속 유지하는 경우와 인공임신중절하는 경우의 장점과 단점 판단하기				
22	임신, 피임, 인공임신중절에 대해 궁금한 점이 있을 때, 의사의 진료가 필요한지 판단하기				
23	임신, 피임, 인공임신중절에 대해 미디어에서 제공하는 정보의 질을 판단하기				
24	임신, 피임, 인공임신중절에 대해 가족이나 친구가 제공하는 정보의 질을 판단하기				
25	임신, 피임, 인공임신중절에 대해 의사 또는 약사가 제공하는 정보의 질을 판단하기				
26	임신, 피임, 인공임신중절에 대해 선생님 또는 학교 밖에서 제공하는 정보의 질을 판단하기				
<b>적용</b>					
27	성관계 전 피임하기				
28	임신, 피임, 인공임신중절에 대한 의사 또는 약사의 지시사항을 따르기				
29	피임도구/피임약 박스에 적혀있는 지시사항을 따르기				
30	당신 또는 당신의 여자친구가 임신한 것을 알았을 때 무엇을 할지 결정하기(임신유지, 인공임신중절, 또는 유산)				
31	당신 또는 당신의 여자친구에게 임신과 관련된 문제가 생겼을 때 무엇을 할지 결정하기				
32	당신 또는 당신의 여자친구에게 피임과 관련된 문제가 생겼을 때 무엇을 할지 결정하기				
33	당신 또는 당신의 여자친구에게 유산과 관련된 문제(심한 출혈, 통증, 감염 등)가 생겼을 때 무엇을 할지 결정하기				
34	성관계 전 파트너와 피임법에 대해 말하거나 협상하기				

35	친구들과 청소년 임신, 피임법, 인공임신중절에 대해 말하기				
36	가족과 청소년 임신, 피임법, 인공임신중절에 대해 말하기				
37	의료인(의사나 간호사)과 청소년 임신, 피임법, 인공임신중절에 대해 상담하기				
38	선생님과 청소년 임신, 피임법, 인공임신중절에 대해 상담하기				
39	성교육 활동, 피임 활동, 청소년 지지 활동에 참여하기				

챗봇 사용성 평가						
다음은 챗봇에 대한 질문입니다. 챗봇 사용 경험을 바탕으로 가장 가까운 응답을 선택해주세요. 해당 문항에 정해진 답은 없으니 느끼신대로 응답해주세요.						
문항		매우 동의하지 않는다	동의하지 않는다	보통이다	동의한다	매우 동의한다
1	챗봇은 진짜 사람 같았고 매력적이었다.	1	2	3	4	5
2	챗봇은 너무 로봇 같았다.	1	2	3	4	5
3	챗봇은 초기 설정에서 나를 반겨주었다.	1	2	3	4	5
4	챗봇은 별로 친근하게 느껴지지 않았다.	1	2	3	4	5
5	챗봇은 범위와 목적을 잘 설명하였다.	1	2	3	4	5
6	챗봇은 목적을 밝히지 않았다.	1	2	3	4	5
7	챗봇은 탐색하기 쉬웠다.	1	2	3	4	5
8	챗봇은 사용할 때 헛갈리기 쉬웠다.	1	2	3	4	5
9	챗봇은 나를 잘 이해하고 있었다.	1	2	3	4	5
10	챗봇은 나의 입력 값을 대부분 인식하지 못하였다.	1	2	3	4	5
11	챗봇의 응답은 유용하고 적절하며 유익했다.	1	2	3	4	5
12	챗봇의 응답은 관련이 없었다.	1	2	3	4	5

13	챗봇은 어떤 오류나 실수에도 잘 반응하였다.	1	2	3	4	5
14	챗봇은 오류를 잘 다루지 못하는 것 같았다.	1	2	3	4	5
15	챗봇은 매우 사용하기 쉬웠다.	1	2	3	4	5
16	챗봇은 매우 복잡했다.	1	2	3	4	5

사용자 참여도 평가						
다음 문장은 “성교육챗봇” 참여 경험에 대한 질문입니다. 각 문장에 대해 점수 척도를 사용하여 당신의 경험에 가장 가까운 것에 표시해 주십시오.		전혀 그렇지 않다.	그렇지 않다	보통이다	그렇다	매우 그렇다
1	나는 “성교육챗봇”에 빠져서 정신이 나갔다.					
2	나는 “성교육챗봇”을 사용하는 동안 시간이 흘러가는 줄 몰랐다.					
3	나는 “성교육챗봇”에 푹 빠졌다.					
4	나는 “성교육챗봇”을 사용하는 것이 어렵고 힘들었다.					
5	나는 “성교육챗봇”을 사용하는 방법이 헛갈렸다.					
6	“성교육챗봇”을 사용하는 것이 부담스러웠다.					
7	“성교육챗봇”은 매력적이었다.					
8	“성교육챗봇”은 보기에 마음에 들었다.					
9	“성교육챗봇”은 내 마음에 들었다.					
10	“성교육챗봇”은 사용해 볼만 했다.					
11	“성교육챗봇” 사용은 나에게 도움이 됐다.					
12	“성교육챗봇”은 흥미로웠다.					

다음은 여러분과 가족의 특성에 대한 질문입니다.	
1	<div>학생이 태어난 연도는 언제입니까?</div> <div>20□□년</div>
2	<div>학생이 태어난 월은 몇 월입니까?</div> <div>□□월</div>
3	<div>학생은 몇 학년입니까?</div> <div>           ① 중학교 1 학년            ② 중학교 2 학년            ③ 중학교 3 학년         </div>
4	<div>학생이 사는 지역은 무슨 동(읍,면)입니까?</div>
5	<div> <p>“사다리가 학교를 그리는 방법이라고 가정하십시오. 사다리의 맨 위에는 가장 존경받거나 모두가 어울리고 싶어 하는 학생이 있습니다. 그 사다리의 맨 아래에는 존경하는 사람도, 어울리고 싶어하는 사람도 없고, 신분이 가장 낮은 학생이 있습니다. 본인은 이 사다리의 어느 위치에 있다고 생각합니까?”</p>  <div> <div>(가장 낮음)</div> <div>(가장 높음)</div> </div> <div>           1      2      3      4      5      6      7      8      9      10         </div> </div>
6	<div>당신은 아버지와 함께 살고 있습니까?</div> <div>           ① 예            ② 아니오         </div>
7	<div>당신은 어머니와 함께 살고 있습니까?</div> <div>           ① 예            ② 아니오         </div>

## ABSTRACT IN KOREAN

### 다문화 여성 청소년 대상 안전한 성행동을 위한 챗봇 기반 성생식 헬스 리터러시 중재 개발 및 예비연구

이 혜연

연세대학교 일반대학원 간호학과

본 연구는 다문화 여성 청소년의 안전한 성행동을 위한 챗봇 기반 성생식 헬스 리터러시 중재를 개발하고 과정과 잠재적 효과를 평가하기 위해 시도되었다. 본 연구를 통해 개발된 중재는 Sorenson의 헬스 리터러시 통합모델과 Ajzen의 계획된 행동이론을 이론적 기틀에 기반하였다. 중재개발을 위해 중재매핑에 따라 총 6 단계에 걸쳐 진행하였고, 성생식 헬스 리터러시를 핵심개념으로 설정하고, 문화적으로 맞춤형 전략을 활용하며, 중재전달 도구로서 챗봇을 개발하였다. 그리고 개발한 중재수행 수준과 잠재적 효과측정으로 위해 예비연구를 설계하였다.

중재는 비동등성 대조군 사전사후설계의 유사실험연구였으며, 대상자는 국내 출생이며 중학생 연령인 다문화 여성 청소년으로, 전국에서 모집되었다. 실험군과 대조군 각각 12 명이 최종 모집되었고, 실험군에게 총 2 주동안 중재(8 번의 교육모듈과 자유로운 정보탐색)를 제공하였다. 중재수행 수준은 수용성, 적절성, 실현가능성 및 충실도를 측정했으며, 잠재적 효과를 검증하기 위해 성생식 헬스 리터러시, 안전한 성행동 태도, 안전한 성행동 주관적 규범, 안전한 성행동



자기효능감, 안전한 성행동 의도를 측정하였다. 수집된 자료는 IBM SPSS Statistics version 26.0 과 Stata 16 version 을 이용하여 Fisher's exact test, independent test 및 mixed effect model 로 분석되었다.

중재에 참여한 실험군의 수용성은 3.65 점으로 적절한 수준이었으며 교육모듈의 적절성 또한 4.5 점으로 충족하였다. 한달의 기간동안 완료된 모집, 86.2%의 동의률, 88.0%의 유지율 및 81.1 점의 챗봇 사용성 점수를 통해 실현가능성 역시 높은 수준임을 확인되었다. 하지만, 67.6%의 교육모듈 이행률과 수동적인 사용패턴을 통해 충실도는 낮은 수준이 확인되었다. 잠재적 효과의 경우, 중재에 참여한 실험군의 안전한 성행동 규범( $z=-2.62$ ,  $p=.009$ ), 안전한 성행동 자기효능감 ( $z=-2.28$ ,  $p=.023$ )은 대조군에 비해 시간이 지남에 따라 통계적으로 유의하게 증가하였다. 하지만, 성생식 헬스 리터러시( $z=-.28$ ,  $p=.780$ ), 안전한 성행동 태도( $z=-1.03$ ,  $p=.303$ ) 및 안전한 성행동 의도( $z=-1.73$ ,  $p=.084$ )는 대조군에 비해 유의하게 증가하지 않았다.

본 연구는 국내 다문화 여성 청소년의 성생식 건강 수준을 개선하고자 수행된 최초의 성생식건강 중재라는 점에서 의의가 있다. 추후 연구에서는 다문화 여성 청소년의 안전한 성행동 증진을 위해 낮은 성생식 헬스 리터러시 수준을 가진 부모 대상 중재가 되어야 한다. 또한 정확한 응답을 제공하는 챗봇 개발을 위해 인공지능을 기반으로 충분한 데이터 수집이 사전에 고려되어야 한다.

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**핵심되는 말:** 다문화 여성 청소년, 안전한 성행동, 성생식 헬스 리터러시, 챗봇, 수행결과, 예비연구