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Development and Evaluation of a Smoking Prevention Program for Vietnamese Adolescents in Rural Areas

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Abstract

Purpose: The objective of this research was to develop and evaluate a peer-led smoking prevention program for Vietnamese adolescents living in rural areas. **Research design, data, and methodology:** The study was carried out in three stages: program development, intervention implementation, and evaluation. Program development involved five phases: needs assessment, program design, evaluation of the program content and cultural suitability, evaluation of program applicability, and final program design. The developed program was delivered by trained peer educators to second-year middle school students in Region T, Vietnam, in a single 40-minute session. The program was evaluated using a quasi-experimental, non-equivalent control group pre-posttest design, and a posttest survey was conducted four months after the intervention. **Results:** The results showed no significant difference between the experimental and control groups. These findings suggest that repeated and continuous educational programs are needed to achieve long-term educational effects among adolescents.

Keywords Smoking prevention program; Adolescent; Vietnam

JEL Classification Code : I12, I18, I21, O15

1. Introduction

About 7,000 different chemicals are inhaled into the respiratory system during smoking. These chemicals induce cancer in several organs such as the lungs, laryngopharynx, and esophagus, and various chronic diseases such as diabetes, stroke, and rheumatoid arthritis (U.S. Department of Health and Human Services [HHS], 2014). While the global rate of smoking among adults decreased from 24% in 2005 to 20% in 2015, over 7 million people still die from smoking every year (World Health Organization [WHO], 2018). The WHO adopted the Framework Convention on

Tobacco Control in 2005 to reduce cigarette consumption, as well as the health, socioeconomic, and environmental problems caused by cigarette smoke exposure (WHO, 2018). Vietnam enacted the Tobacco Control Law in 2013, banning smoking in educational and medical institutions and offices (Tran et al., 2020). According to the Global Adult Tobacco Survey (GATS) conducted among Vietnamese adults in 2015, approximately 23% of all adults in Vietnam were smokers (WHO, 2017). This rate of smoking was higher than the global rate of smoking in 2015 of 20% and the average rate of smoking in Southeast Asia of 17% (WHO, 2017, 2018), indicating the need for consistent efforts to

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reduce the rate of smoking in Vietnam. Secondhand smoking refers to the inhalation of cigarette smoke exhaled by a smoker or emitted from a burning tobacco product, and the health of secondhand smokers can be harmed through inhalation of various toxic substances in cigarette smoke (American Cancer Society, 2020). Secondhand smoking can cause lung cancer, stroke, and coronary heart disease in adults, and middle ear disease, lung function impairment, and sudden infant death syndrome (SIDS) in children (HHS, 2014). Secondhand smoking should be recognized as harmful as direct smoking. Over 600,000 people die from secondhand smoking every year, 170,000 of whom are children (WHO, n.d.). Home is the most common site of secondhand smoking (50%), followed by workplace (37%), public transportation (19%), and school (16%) (WHO, 2017). According to the Global Youth Tobacco Survey (GYTS) conducted among Vietnamese adolescents aged 13–15 years in 2014, 4% of Vietnamese adolescents were smokers, and approximately 50% and 67% of Vietnamese adolescents were exposed to secondhand smoke at home and in public places, respectively (WHO, 2020). Accordingly, Vietnamese children are exposed to secondhand smoke not only at their homes but also in public places.

Previous studies reported that smoking among adolescents is associated with age, academic performance, alcohol consumption, and peer and parental smoking (Hong et al., 2013; Péntzes et al., 2012). Additionally, psychological factors such as stress and depression and false perception of smoking as glamorous increased the rate of smoking (Bobo et al., 2018; Hong et al., 2013). Conversely, knowledge about the harms of smoking decreased the rate of smoking (Bobo et al., 2018; Hoang et al., 2019). Male adolescents or adolescents whose family members were smokers or who had no rules about smoking at home were found to be highly exposed to secondhand smoke (Ghazali et al., 2019; Ngo et al., 2020). A Vietnamese study conducted among parents of young children reported that even though most parents were aware of the harmful effects of secondhand smoke, 50% of their children were still being exposed to secondhand smoke (Ngo et al., 2020). Thus, various factors must be considered to reduce smoking behaviors and secondhand smoking among adolescents.

Previous smoking prevention interventions for adolescents include one that considers environmental factors (personal beliefs, smokers around the student, percentage of non-smokers, etc.) to provide students with appropriate feedback or teach them how to refuse cigarettes (Conner, 2010; de Jong et al., 2014). Another intervention took a multilayer approach such as educating students one-on-one, posting smoking-related posters within a school, and distributing brochures to homes that contain information about secondhand smoking among households (Blanch et al., 2013). These interventions effectively reduced smoking

behavior and attempts, and exposure to secondhand smoke among students (Blanch et al., 2013; Conner, 2010; de Jong et al., 2014). Methods of interventions included one-on-one education at school, web-based education, and interactions with parents using emails (Blanch et al., 2013; de Jong et al., 2014; Hiemstra et al., 2013). Peer education is considered an excellent method of intervention since students tend to enjoy and focus on a lesson better if the lesson is provided by someone around their age rather than by a teacher (Dobbie et al., 2019; Rhee et al., 2012). Peer education improved the level of health-related knowledge, attitude, and quality of life among students (Diao et al., 2020; Hatami et al., 2015; Young et al., 2017), as well as the level of knowledge, confidence, self-esteem, and leadership skills of the peer educators educating the students (Dobbie et al., 2019; Rhee et al., 2012). A Stop Smoking in Schools Trial (ASSIST), a school-based smoking prevention program that uses a peer-led approach, was able to spread health promotion messages beyond the school environment, reaching out to homes and communities (Dobbie et al., 2019). Thus, this study aims to develop a peer-led education program to effectively deliver information about smoking prevention to students and assess its effects among Vietnamese adolescents in a rural area.

2. Methodology

This study was conducted in three stages: program development, intervention administration, and program evaluation [Figure 1]. Stage 1 (Program development) consisted of five steps: conducting needs assessment, designing the program, evaluating the content and cultural appropriateness of the program, evaluating program applicability, and determining the final program design. Stage 2 (Intervention implementation) included training of peer educator trainers, peer educator trainin, and peer-led education. Stage 3 (Program evaluation) was conducted using a quasi-experimental non-equivalent control group pretest-posttest design, which comprised pre-evaluation, post-evaluation, and program evaluation by the peer educators.

2.1. Program Development

2.1.1. Conduct Needs Assessment

The target regions of this study were areas included in the "Vietnam Quang Tri Province Happiness Program" supported by the Korea International Cooperation Agency (KOICA). To develop the educational program, a needs assessment was conducted through baseline data analysis and interviews with institutional heads. In May 2015, the research team conducted a baseline survey among first-year

middle school students residing in H and T regions, which are rural areas in Vietnam. The survey results indicated that while almost no students smoked in either region, a high proportion—69% on average—reported that people around them had smoked for one or more days in the past 7 days (Southeast Asia Team 1, & Chungbuk National University, 2023).

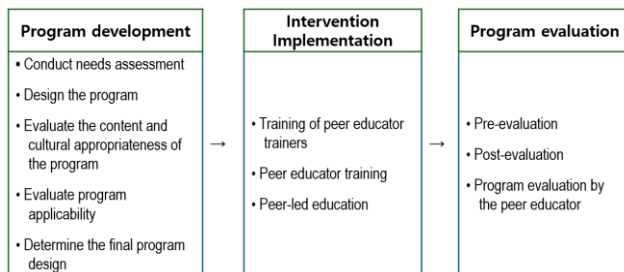


Figure 1: Study Procedure

2.1.2. Design the Program

Based on literature on adolescent smoking provided by authorized organizations such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), the research team organized the educational content from December 2015 to January 2016. Specifically, the content consisted of three modules: Module 1. Risks of Smoking and Secondhand Smoking, Module 2. Refusal skills, and Module 3. Avoidance behavior toward secondhand smoking.

As the main content for each module, Module 1 consisted of toxic substances and addictiveness of cigarettes, health effects of smoking, and the effects and exposure to secondhand smoking, allowing participants to indirectly experience that smoking causes shortness of breath through a simple activity using straws. Module 2 aimed to improve refusal skills by presenting examples of refusal techniques. Module 3 presented ways to avoid secondhand smoking and encouraged students to seek ways on their own to turn places where they are exposed to secondhand smoke into smoke-free zones.

2.1.3. Evaluate the Content and Cultural Appropriateness of the Program

Two nursing professors and one researcher from Korea reviewed the contents of the education materials together. The education materials were then translated into Vietnamese, and two public health professors from Vietnam reviewed the cultural appropriateness of the translated materials. Expressions deemed by the experts as being too difficult for middle school students to understand were revised to facilitate understanding. To help students understand the contents of tobacco pictures, chemical names were added to the pictures. For the exercise in which

students indirectly experienced the health problems caused by smoking using a straw, participation restrictions (cardiovascular diseases, asthma, etc.) were more clearly specified.

2.1.4. Evaluate Program Applicability

Two local middle school teachers evaluated the developed smoking prevention program and determined that it was appropriate for middle school students. The head of the local public health center also evaluated the content of the smoking prevention program as suitable for educating middle school students.

2.1.5. Determine the Final Program Design

The final program was constructed after revisions and supplements were made to reflect expert evaluations regarding the cultural appropriateness and applicability of the developed smoking prevention program. The final program consisted of three modules on “Risks of Smoking and Secondhand Smoking”, “Refusal Skills”, and “Avoidance behavior toward secondhand smoking”, and the specific details of the peer education are as follows [Table 1].

2.2. Intervention Implementation

2.2.1. Training of peer educator trainers

Three middle school teachers and one nurse in Vietnam were selected as peer educator trainers. The researchers educated four peer educator trainers on the contents of the smoking prevention program and effective methods of peer educator training with the help of a translator. The education was provided inside a multimedia room at H commune Middle School for 5 hours in a single day using a PowerPoint presentation on the contents of the three modules and education materials (peer educator training manual and peer educator handbook). The researchers instructed the teachers and the nurse to read the peer educator handbook and education manual for smoking prevention to be competent in training peer educators.

2.2.2. Peer Educator Training

15 students at H commune Middle School (5 per class) were selected as peer educators based on teachers’ recommendations. The four peer educator trainers previously trained in the smoking prevention program trained the 15 peer educators. Training took place for 3 hours per day for 3 days (9 hours in total), each day covering a single module. The peer educators were trained using a PowerPoint presentation and education materials for the smoking prevention program, comprising three modules.

On Day 1, the purpose and contents of the smoking prevention program and the importance of peer-led

education were explained to the peer educators. Additionally, a short lecture was provided on the harmful substances in tobacco products and the effects of smoking

and secondhand smoking, followed by a group exercise. The main topic of Day 2 was smoking refusal skills. After being presented with a scenario in which a friend suggested

Table 1: Contents of Smoking prevention Program

Module 1. Risks of Smoking and Secondhand Smoking	
❖ Topic 1. What's in a cigarette?	• Subject: Toxic substances • Objective: To understand the harms of smoking • Education material: Picture (Cigarette), Sticker • Time: 7 min
	• Activities - Instruct peers to select and paste stickers of substances that they believe are contained in a cigarette - Educate peers on the number of chemicals in a cigarette and the dangers of smoking.
❖ Topic 2. What is true about smoking	• Subject: Health effects of smoking • Objective: To clarify misunderstandings about risks of smoking • Education material: "True" and "False" sign • Time: 5 min
	• Activities - Instruct peers to listen to each sentence and raise a "True" or "False" sign. - Provide the correct answer for each sentence and discuss the results together.
❖ Topic 3. Can you breathe?	• Subject: Health effects of smoking • Objective: To experience the lack of oxygen in the lungs caused by smoking • Education material: Straw • Time: 7 min • Activities
	- Ask peers if they had any health issues before the program participation. - Give a straw to a peer and instruct him to run in place for 1 minute. Instruct him to grab his nose with his hand and breathe through a straw in the mouth only. - Instruct the peer to breathe without a straw. - Discuss how breathing felt and explain how smoking can cause shortness of breath.
❖ Topic 4. What will you do next?	• Subject: Effects of secondhand smoking • Objective: To understand the health effects of secondhand smoking • Education material: Pictures • Time: 5 min
	• Activities - Show a peer Picture A of someone smoking. Ask him what he would do if someone smoked around him. - Show Picture B of how harmful secondhand smoking is. Explain to a peer the health problems caused by secondhand smoking.
❖ Topic 5. What is true about secondhand smoking	• Subject: Health effects of secondhand smoking • Objective: To clarify misunderstandings of risks of secondhand smoking • Education material: "True" and "False" sign • Time: 7 min
	• Activities - Instruct peers to listen to each sentence and raise a "True" or "False" sign. - Provide the correct answer for each sentence and discuss the results together.
Module 2. Refusal Skills	
❖ Topic 1. What would you say?	• Subject: Health effects of secondhand smoking • Objective: To understand how to refuse wisely under pressure • Education material: Scenario • Time: 7 min
	• Activities - Discuss a situation in which a friend suggests smoking. - Teach a peer how to refuse smoking in such a situation. - Imagine other scenarios and practice together.
Module 3. Avoidance behavior toward secondhand smoking	
❖ Topic 1. What is true about secondhand smoking	• Subject: Exposure to secondhand smoke • Objective: To clarify misunderstandings about exposure to secondhand smoke • Education material: "True" and "False" sign • Time: 7 min
	• Activities - Instruct peers to listen to each sentence and raise a "True" or "False" sign. - Provide the correct answer for each sentence and discuss the results together.
❖ Topic 2. Make a "Smoke-Free Zone"	

- Subject: Prevention of secondhand smoking
- Objective: To create a smoke free zone for prevention of secondhand smoking
- Education material: Smoke-free sticker
- Time: 5 min
- Activities
- Teach a peer how to avoid secondhand smoking.

- Imagine a situation in which one could be exposed to secondhand smoke and ask the peer what he would do in that situation.
- If the peer struggles to answer, teach him the correct response according to the manual and practice together.
- Give the peer no-smoking stickers and tell him to place them wherever he wishes for a no-smoking zone at his house or school.

smoking or drinking, students shared their opinions on the situation and performed a skit as a group. On Day 3, a short lecture and a quiz on secondhand smoking were given, and students discussed how to avoid secondhand smoking and how to turn their surrounding environments into a no-smoking zone. Lastly, the students practiced how to share what they learned from Modules 1–3 with their peers. The researchers distributed peer educator handbooks and education materials to the peer educators and instructed them to use these resources to train their peers.

2.2.3. Peer-led education

63 students in the second grade of H commune Middle School were educated by peer educators (4–5 students per peer educator in a one-on-one manner). Education was provided after school for 4 days.

2.3. Program evaluation

2.3.1. Study Design

The evaluation of the developed smoking prevention program following its implementation was conducted using a quasi-experimental design of a non-equivalent control group pre-posttest design.

2.3.2. Participants

The participants of this study included all second-year middle school students from rural regions H and T in Vietnam. The experimental group consisted of 78 middle school students from region H, and the control group consisted of 97 students from region T, but 96 students ultimately participated in this study as one parent declined to participate.

2.3.3. Instruments

2.3.3.1. Secondhand-smoking-related factors

This instrument consisted of 2 items on family members' smoking status and family relationships, 1 item on the frequency of conversations with parents about smoking, 1 item on the frequency of experiencing secondhand smoke, 2 items on thoughts about secondhand smoke, and 1 item on coping with secondhand smoke. The items on family members' smoking status and family relationships, frequency of conversations with parents about smoking,

frequency of experiencing secondhand smoke, support for limiting exposure to secondhand smoke, and belief in the harm of secondhand smoke were measured by modifying and supplementing the CDC (Centers for Disease Control and Prevention) YTS (Youth Tobacco Survey) 2006 Questionnaire (2015).

2.3.3.2. Self-efficacy to avoid secondhand smoking

Self-efficacy to avoid secondhand smoking was measured using the Self-efficacy to Resist Environmental Tobacco Smoke (ETS) Exposure Scale developed by Martinelli et al. (2002) and modified by Li and Wang (2006). The original tool developed by Martinelli et al. (2002) contained seven items. The version by Li and Wang (2006) had a total of 13 items, with additional items on self-efficacy in avoiding secondhand smoking in public places, at home, or around peers. In this study, three of the six additional items added by Li and Wang (2006) were included, and two new items on secondhand smoke avoidance behaviors at home and on the street were additionally added. Each item was rated on a five-point scale (1 point = Not at all confident, 5 points = Extremely confident), where a higher score indicates higher self-efficacy to avoid secondhand smoking. The scale had a Cronbach's α of 0.83 in a study by Li and Wang (2006) and 0.68 in this study.

2.3.3.3. Knowledge of tobacco hazards

Knowledge of tobacco hazards was measured using the Knowledge of Tobacco Hazards Scale developed by Huang et al. (2012). The tool contains 10 items with "True", "False", and "I do not know" as possible responses, and 1 point is assigned for a correct answer and 0 points for an incorrect answer or "I do not know". Total scores range from 0 to 10 points, where a higher score indicates a higher level of knowledge about tobacco hazards. The scale had a Cronbach's α of 0.76 in a study by Huang et al. (2012) and 0.51 in this study.

2.3.3.4. Attitude toward smoking

Attitude toward smoking was measured using the Attitude toward Smoking Scale developed by Huang et al. (2012). The scale consists of 12 items, each rated on a four-point scale (1 point = *Strongly disagree*, 4 points = *Strongly agree*). Total scores range from 12 to 48 points, with higher scores indicating a more favorable attitude toward smoking.

The scale had a Cronbach's α of 0.73 in a study by Huang et al. (2012) and 0.61 in this study.

2.3.3.5. Refusal skills

Refusal skills were assessed using the Drug Refusal Skills Technique Scale developed by Epstein et al. (1997). The scale consists of five items, each rated on a five-point scale (1 = *Definitely would*, 5 points = *Definitely would not*). Total scores range from 5 to 25 points, with lower scores indicating greater possession of refusal skills. The scale had a Cronbach's α of 0.89 in a study by Epstein et al. (1997) and 0.50 in this study.

2.3.3.6. Social emotional competence

Social-emotional competence was measured using the Social Emotional Competence Questionnaire (SECQ) developed by Zhou and Ee (2012). This tool consists of a total of 25 items on a 6-point scale, with 5 items for each of the 5 domains (self-awareness, self-management, social awareness, relationship management, and responsible decision-making); a higher score indicates higher social-emotional competence. In the study by Zhou and Ee (2012), Cronbach's α for the sub-domains of social-emotional competence ranged from 0.71 to 0.79, while in this study, it ranged from 0.65 to 0.77.

2.3.3.7. Sense of community

Sense of community was measured using the Sense of Community (SOCOM) Scale developed by Peterson et al. (2008) and modified by Nelson et al. (2015). The scale consists of eight items, each rated on a five-point scale (1 point = Strongly disagree, 5 points = Strongly agree). Total scores range from 8 to 40 points, with higher scores indicating a higher sense of community with a peer network. The scale had Cronbach's α of 0.92 in a study by Peterson et al. (2008), 0.87 in a study by Nelson et al. (2015), and 0.67 in this study.

2.3.4. Data Collection and Analysis

This study was approved by the Institutional Review Board of K University (KBUIRB-201512-SB-031-02). Consent was obtained from the director and teachers of H commune Middle School after informing them of the study needs and purpose, and an information sheet was distributed to the participants. A questionnaire survey was conducted after obtaining consent from students and their parents. The consent form included information about the study purpose, data confidentiality, benefits of study participation, and freedom to withdraw participation at any time during the study and was signed with a handwritten signature.

The questionnaire was translated into Vietnamese by a Vietnamese health expert and was used in the study after the translation quality was reviewed by a Vietnamese middle

school teacher.

Data was analyzed using SPSS 23.0. General characteristics were analyzed using descriptive statistics. Secondhand smoking-related characteristics were analyzed using a chi-square(χ^2) test and independent *t*-test. To analyze the pretest-posttest differences in the number of days of exposure to secondhand smoke, categorical data were converted to ratio data; for example, 1 or 2 days was converted to 1.5 days. Differences in dependent variables between the pre-test and post-test were analyzed using a paired *t*-test.

2.4. Program evaluation by the peer educator

A self-report survey was conducted among 15 peer educators to evaluate the educational program after completing the peer education. The survey consisted of five items designed to allow respondents to describe their thoughts: "number of students educated, difficulties encountered during education, positive aspects during education, feelings about the education, and other suggestions."

3. Result

3.1. Homogeneity Test on General Characteristics and Dependent Variables

Regarding the pre-test sociodemographic characteristics and exposure to secondhand smoke between the experimental and control groups, there were no significant differences in any items, except for perception of smoking in public places ($p = .019$). The pre-test homogeneity test results for the dependent variables revealed no significant differences in self-efficacy for secondhand smoke avoidance behavior ($t = 1.12$, $p = .265$), knowledge about the harms of smoking ($t = 0.28$, $p = .777$), attitude toward smoking ($t = -0.36$, $p = .716$), refusal skills ($t = 0.58$, $p = .565$), social-emotional competence—including self-awareness ($t = 0.42$, $p = .674$), social awareness ($t = -1.25$, $p = .212$), self-management ($t = -1.72$, $p = .088$), relationship management ($t = -1.10$, $p = .271$), and responsible decision-making ($t = -0.63$, $p = .528$) and sense of community connectedness ($t = 0.09$, $p = .926$). Therefore, there were no significant differences between the two groups across all variables, indicating that the experimental and control groups were homogeneous [Table 2].

3.2. Evaluation of smoking prevention programs

3.2.1. Self-efficacy to Avoid Secondhand Smoking

The self-efficacy to avoid secondhand smoking scores in the experimental group were 19.05 ± 3.72 points before intervention and 17.93 ± 4.65 points after intervention, showing no statistically significant difference ($t=1.85$, $p=.070$). In the control group, the scores were 18.64 ± 4.12 points before intervention and 19.45 ± 3.71 points after intervention, showing no statistically significant difference ($t=-1.46$, $p=.148$). In the analysis of the difference in self-efficacy to avoid secondhand smoking before and after intervention between the experimental and control groups, there was no statistically significant difference between the two groups ($F=2.89$, $p=.092$) [Table 3].

3.2.2. Knowledge of Tobacco Hazards

Knowledge of Tobacco Hazards scores in the experimental group were 8.13 ± 1.67 points before intervention and 8.28 ± 2.53 points after intervention, showing no statistically significant difference ($t = -0.48$, $p = .631$). In the control group, the scores were 7.99 ± 1.86 points before intervention and 8.70 ± 1.86 points after intervention, showing a statistically significant difference ($t = -2.71$, $p = .008$). In the analysis of the difference in Knowledge of Tobacco Hazards before and after intervention between the experimental and control groups, there was no statistically significant difference between the two groups ($F = 0.99$, $p = .321$) [Table 3].

3.2.3. Attitude Toward Smoking

Regarding attitudes toward smoking, there was no statistically significant difference in the experimental group, with scores of 19.05 ± 5.09 before intervention and 18.67 ± 5.16 after intervention ($t=0.49$, $p=.628$). In the control group, there was no statistically significant difference, with scores of 19.27 ± 4.38 before intervention and 19.77 ± 4.84 after intervention ($t=-0.78$, $p=.440$). In the test for differences in attitudes toward smoking before and after intervention between the experimental and control groups, there was no statistically significant difference between the two groups ($F=0.51$, $p=.475$) [Table 3].

3.2.4. Refusal Skills

The refusal skills score in the experimental group was 12.62 ± 4.65 points before intervention and 9.92 ± 4.35 points after intervention, showing a statistically significant difference ($t=3.65$, $p=.001$). In the control group, the score was 12.64 ± 5.19 points before intervention and 10.64 ± 3.86 points after intervention, showing a statistically significant difference ($t=2.77$, $p=.007$). In the test for the difference in refusal skills before and after intervention between the experimental and control groups, there was no statistically significant difference between the two groups ($F=0.05$, $p=.824$) [Table 3].

3.2.5. Social Emotional Competence

Among the sub-domains of Social Emotional Competence, there were no statistically significant differences between the experimental and control groups in the analysis of differences before and after intervention for Self-awareness ($F = 0.00$, $p = .989$), Social awareness ($F = 0.65$, $p = .423$), Self-management ($F = 0.38$, $p = .540$), and Relationship management ($F = 2.98$, $p = .087$). Regarding Responsible decision-making, there was a statistically significant difference between the two groups in the analysis of the pre- and post-intervention difference ($F = 4.30$, $p = .040$) [Table 3].

3.2.6. Sense of Community

Sense of community scores in the experimental group were 25.73 ± 6.22 points before intervention and 27.94 ± 7.62 points after intervention, showing no statistically significant difference ($t = -1.90$, $p = .062$). In the control group, the scores were 25.47 ± 6.85 points before intervention and 27.30 ± 7.55 points after intervention, showing no statistically significant difference ($t = -1.45$, $p = .154$). In the analysis of the difference in Sense of Community before and after intervention between the experimental and control groups, there was no statistically significant difference between the two groups ($F = 0.63$, $p = .431$) [Table 3].

3.3. Program evaluation by the peer educator

The evaluation results of the educational program by 15 peer educators are as follows [Table 4]. The evaluation results showed that the average number of students educated per peer leader was approximately 4, and 12 students (80%) reported no difficulties during the education, indicating that most students proceeded with the education smoothly. Regarding the positive aspects of the education, "friends cooperated happily" was the highest with 7 students (46.7%), followed by "it was fun" with 3 students (20%), "teaching friends" with 3 students (20%), and "acquiring more knowledge" with 2 students (13.3%). Regarding what they felt about education, "none" was the highest with 6 people (40%), followed by "it was enjoyable" with 4 people (26.7%), "teaching friends" with 3 people (20%), and "more experience" with 2 people (13.3%). As for other suggestions, 1 person responded that they "want to learn more useful things."

4. Discussion

This study developed a smoking prevention program for adolescents in rural Vietnam and evaluated the program. In

this study, regarding factors related to secondhand smoke, the frequency of discussions with parents was found to be above average for both the experimental and control groups. According to a study by Small, Kushner, and Neufeld (2012), there were three types of communication patterns between children and parents regarding smoking. Most parents intentionally discussed smoking with their children, while some parents engaged in conversation only when their children showed interest due to external factors. A small number of parents were found to acknowledge the harmful effects of smoking and engage in conversation only when

their children brought up the topic first. An integrated literature review on the relationship between parent-child bonding and communication and adolescent risky behaviors (drinking, smoking, and drug use) indicated that conversations between parents and children regarding drinking, smoking, and drug use reduced risky behaviors in adolescents. However, too frequent conversations of low quality increased risky behaviors (Carver et al., 2017). Therefore, since children may perceive frequent, unilateral mentions of smoking by parents as discipline, it is believed that reciprocal communication between parents and children

Table 2: Homogeneity Between Experimental Group and Control Group

Characteristics	Categories	Exp. (n=78) n(%) / M±SD	Cont.(n=96) n(%) / M±SD	χ^2 value / t	p
Gender	Male	41(52.6)	44(45.8)	0.534	.465
	Female	37(47.4)	52(54.2)		
Age(years)	13	74(98.7)	87(94.6)	0.997	.318
	14	1 (1.3)	5 (5.4)		
Living with whom smoke Cigarettes	Yes	38(50.7)	37(49.3)	0.043	.837
	No	45(47.9)	49(52.1)		
Relationship with whom smoke Cigarettes	Grandfather	4 (5.1)	12(12.6)	2.049	.152
	Grandmother	3 (3.8)	5 (5.3)	0.195*	.731
	Father	34(43.6)	32(33.7)	1.386	.239
	Sibling	3 (3.8)	2 (2.1)	0.463*	.659
	Others	8(10.3)	12(12.6)	0.061	.805
Discussion with parents about the danger of smoking	Never	13(17.6)	15(16.5)	7.632	.106
	Rarely	15(20.3)	8 (8.8)		
	Sometimes	24(32.4)	25(27.5)		
	Often	14(18.9)	30(33.0)		
	Very often	8(10.8)	13(14.3)		
Days of secondhand smoking	0 days	30(38.5)	24(25.8)	5.828	.212
	1 or 2 days	22(28.2)	41(44.1)		
	3 or 4 days	11(14.1)	13(14.0)		
	5 or 6 days	6 (7.7)	8 (8.6)		
	All 7 days	9(11.5)	7 (7.5)		
Opinion about smoking in indoor public	Never be allowed	73(94.8)	76(81.7)	5.507	.019
	Be allowed only at some times or in some places	4 (5.2)	17(18.3)		
Agreement with harms of Secondhand smoking	Strongly agree	68(87.2)	71(75.5)	4.760	.190
	Agree	8(10.3)	20(21.3)		
	Disagree	0 (0.0)	1 (1.1)		
	Strongly disagree	2 (2.6)	2 (2.1)		
Stage of change related to avoidance of secondhand smoking	Pre-contemplation	26(34.7)	43(47.3)	3.369	.498
	Contemplation	15(20.0)	18(19.8)		
	Preparation	14(18.7)	11(12.1)		
	Action	9(12.0)	8 (8.8)		
	Maintenance	11(14.7)	11(12.1)		
Self efficacy on resist Environmental Tobacco Smoking(ETS)exposure		19.05±3.72	18.64±4.12	1.12	.265
Knowledge of tobacco hazards		8.13±1.67	7.99±1.86	0.28	.777
Attitude toward smoking		19.05±5.09	19.27±4.38	-0.36	.716

Refusal Skills techniques		13.06±5.10	12.56±5.19	0.58	.565
Social Emotional Competence	Self-awareness	4.70±1.05	4.62±1.28	0.42	.674
	Social awareness	3.71±1.31	3.99±1.46	-1.25	.212
	Self-management	4.15±1.31	4.52±1.22	-1.72	.088
	Relationship management	4.57±1.07	4.78±1.16	-1.10	.271
	Responsible decision-making	4.51±1.10	4.63±1.16	-0.63	.528
Sense of Community		25.57±6.52	25.47±6.77	0.09	.926

Table 3: Comparison of Dependent Variables for the Two Groups

Characteristics		Pretest	Posttest	t(p)	Differen	F(p)
		M±SD	M±SD		ce	
					M±SD	
Self efficacy on resist ETS exposure	Exp.	19.05±3.72	17.93±4.65	1.85(.070)	-1.02±4.66	2.89(.092)
	Cont.	18.64±4.12	19.45±3.71	-1.46(.148)	0.68±4.76	
Knowledge of tobacco hazards	Exp.	8.13±1.67	8.28±2.53	0.48(.631)	0.18±2.50	0.99(.321)
	Cont.	7.99±1.86	8.70±1.86	-2.71(.008)	0.68±2.32	
Attitude toward smoking	Exp.	19.05±5.09	18.67±5.16	0.49(.628)	-0.25±5.90	0.51(.475)
	Cont.	19.27±4.38	19.77±4.84	-0.78(.440)	0.43±5.16	
Refusal skills techniques	Exp.	12.62±4.65	9.92±4.35	3.65(.001)	-2.71±5.78	0.05(.824)
	Cont.	12.64±5.19	10.64±3.86	2.77(.007)	-2.18±5.72	
Social Emotional Competence						
Self-awareness	Exp.	4.67±1.05	4.45±1.31	1.14(.260)	-0.22±1.49	0.00(.989)
	Cont.	4.72±1.25	4.51±1.39	1.06(.292)	-0.23±1.63	
Social awareness	Exp.	3.67±1.30	3.41±1.36	1.35(.183)	-0.24±1.55	0.65(.423)
	Cont.	3.97±1.44	3.14±1.60	3.50(.001)	-0.83±1.87	
Self -management	Exp.	4.20±1.22	3.88±1.29	1.49(.143)	-0.33±1.62	0.38(.540)
	Cont.	4.55±1.22	4.14±1.49	1.84(.071)	-0.35±1.76	
Relationship management	Exp.	4.50±1.07	4.54±1.09	-0.23(.823)	0.06±1.45	2.98(.087)
	Cont.	4.81±1.16	4.60±1.24	1.30(.197)	-0.22±1.35	
Responsible decision -making	Exp.	4.52±1.14	4.43±1.18	0.41(.686)	-0.06±1.65	4.30(.040)
	Cont.	4.66±1.15	4.47±1.23	1.07(.287)	-0.19±1.35	
Sense of community	Exp.	25.73±6.22	27.94±7.62	-1.90(.062)	2.27±9.26	0.63(.431)
	Cont.	25.47±6.85	27.30±7.55	-1.45(.154)	1.82±9.62	

Table 4: Results of Program Evaluation by Peer Educators

Items	Categories	N	%	Mean±SD
The number of students whom you educated	3 students	1	6.7	4.20±0.56
	4 students	10	66.7	
	5 students	4	26.7	
Difficulties during the education	None	12	80	
	Paid no attention to me	3	20	
Things liked during the education	Friends cooperated happily	7	46.7	
	Acquiring more knowledge	2	13.3	
	Happy	3	20.0	
	Teaching my friends	3	20.0	
Impression of the education	None	6	40.0	
	Happy	4	26.7	
	Teaching my friends	3	20.0	
	More experience	2	13.3	
Other comments	No ne	14	93.3	

regarding smoking is more effective. Continuous familial engagement is essential to help adolescents internalize the health risks of smoking through interactive parent-child discourse. This approach can effectively deter smoking initiation among non-smokers and foster cessation intentions among current smokers.

The smoking prevention program developed in this study was designed to educate children by applying various methods, such as quizzes and identifying harmful substances using magnetic boards, to raise awareness of the dangers of smoking and secondhand smoke. The effectiveness of classroom games and quiz-based education for adolescents has been proven in several previous studies (Coppo et al., 2014).

Adolescents attempted smoking primarily due to exposure to smoking by parents, siblings, and close friends, as well as through mass media (Wellman et al., 2016). Conversely, since refusal skills act as a factor in reducing risky behaviors such as drinking and smoking among adolescents, there is a need to improve their refusal skills (Schwinn et al., 2016). In this study, refusal skills were structured as the second module to reduce situations where one might be exposed to smoking, and to facilitate discussions and role-playing regarding these situations. Previous studies on smoking prevention programs have reported that using animations to present refusal responses (de Jong et al., 2014) or activities in which participants think about and write down various refusal responses they might offer when offered a cigarette are effective (Conner & Higgins, 2010). According to Hiemstra, Otten, and Engels (2012), higher refusal of self-efficacy in adolescents was associated with a reduced likelihood of smoking initiation one year later. Hence, refusal skills represent a crucial factor in preventing adolescent smoking attempts.

In this study, only 30%–40% of the participants reported having no exposure to secondhand smoke, while 60%–70% of the students were found to be exposed. Tran et al. (2020) compared secondhand smoke indicators (PM2.5 concentrations) in public places (restaurants, coffee shops, etc.) one month before (2013) and five years after (2018) the implementation of Vietnam's Tobacco Control Law. The study results showed that while PM2.5 concentrations decreased by approximately 50% five years after the implementation of the law, exposure to secondhand smoke in public places in Vietnam persists. Avoidance behaviors are considered part of efforts to reduce exposure to secondhand smoke. These avoidance behaviors range from passive responses, such as leaving smoking areas, to more active responses, including asking smokers to stop smoking. In this study, students were informed of methods to avoid secondhand smoke and were given the opportunity to think

for themselves and discuss how they would respond in situations where they were exposed to it. Furthermore, no-smoking stickers were given to students, enabling them to designate their surroundings, such as their homes and schools, as no-smoking zones on their own. In a study by Park et al. (2014), interventions were provided to improve coping skills for avoiding secondhand smoke through role-playing, in which groups considered how to respond to secondhand smoke situations; the study reported that these interventions were effective for both verbal and behavioral coping skills regarding secondhand smoke.

As adolescence is a period heavily influenced by peers, this study provided intervention through peer educators. Previous studies have reported on the effectiveness of smoking prevention through peer educators. Campbell et al. (2008) reported in a large-scale randomized controlled trial targeting adolescents aged 12–13 years that positive effects persisted even in a survey conducted two years later when smoking prevention education was conducted by influential students in the classroom (Campbell et al. 2008), and the effectiveness of peer education has also been demonstrated in Korea targeting high school students (Shin et al., 2014). In this study, peer educators were selected based on teacher recommendations, and most of them stated that they conducted the education smoothly and that their peers cooperated happily. The fact that education proceeded smoothly indicates that the level of the educational content was appropriate for adolescents, and the fact that peers cooperated happily confirms that the smoking prevention program was composed of content and activities that were interesting and not boring for adolescents. Young et al. (2017) conducted peer education on antibiotics, microorganisms, and hygiene, and the results showed that the confidence and communication skills of the peer educators improved. In this study as well, peer educators responded that they enjoyed teaching their friends and gained more experience and knowledge, suggesting that peer education helped improve the confidence of peer educators. Rhee et al. (2012) confirmed the effectiveness of peer education by comparing a group of adolescents educated by peer educators on asthma self-management with a group educated by medical professionals. The results showed that students who received peer education evaluated the educational program more positively compared to the group educated by adults. Furthermore, the students who received peer education rated the peer educators' level of knowledge regarding asthma highly and evaluated their communication skills and attitudes positively. Therefore, peer education can be considered an effective method for adolescents to acquire health-related educational content. However, there is a limitation in that the educational

competence of peer educators was not evaluated prior to providing the training. In this study, peer educators were selected based on recommendations from school teachers, and they subsequently evaluated the program. MacArthur et al. (2016), who analyzed 17 studies on peer-led interventions for adolescents, stated that peer educators should evaluate their own experiences and views after providing the intervention. They reported that while peer-led interventions are effective, the selection and training processes for peer educators were not clearly presented. Accordingly, future research needs to evaluate the competence of the intervention providers in advance to ensure that the intervention is delivered as intended by the researchers.

After applying the smoking prevention education program developed in this study, no significant effect was verified in the experimental group compared to the control group. Looking into these results, first, it is considered that the intensity and duration of the intervention were insufficient to lead to changes in the subjects. This study provided a single 40-minute intervention.

In the study by Park et al. (2014), which demonstrated the effectiveness of secondhand smoke prevention education, the researcher implemented a secondhand smoke prevention program for 45 minutes per week for a total of four weeks. A meta-analysis by Song and Park (2021) on the effectiveness of adolescent smoking prevention programs reported that interventions were effective when delivered in sessions of 40–65 minutes for seven or more iterations. In addition, Campbell et al. (2008), who reported effective smoking prevention through informal message delivery via peers, also provided an intervention over a period of 10 weeks or more. These findings suggest that more repetitive and sustained interventions are required to achieve significant smoking prevention effects among adolescents.

Second, the appropriateness of the post-intervention evaluation timing should be examined. In this study, the intervention effect was evaluated 4 months post-intervention. Campbell et al. (2008) evaluated immediate and long-term effects immediately after the intervention, at 1 year, and at 2 years; while a favorable direction was maintained in all three evaluations, only the 1-year post-intervention evaluation was statistically significant. Among the 23 studies analyzed by Song and Park (2021), the evaluation timing varied from immediately post-intervention to 3 months, and from 6 months to 2–4 years. When classified into short-term effects (less than 1 year) and long-term effects (1 year or more), both were reported to be effective. In a meta-analysis of 32 smoking cessation studies by Choi et al. (2021), it was reported that the effect was largest 1 month post-intervention and was maintained after 6 months. This suggests that intervention effects vary depending on the timing of post-intervention evaluation.

Rather than considering a single time point as the appropriate evaluation timing, it is necessary to design research to evaluate both short-term effects immediately after intervention and long-term effects to confirm whether the effect persists.

Third, the measurement instruments used in this study demonstrated low internal reliability. Although Hair et al. (2010) state that a Cronbach's alpha (α) of .60 or higher is generally acceptable as a lower threshold in exploratory or social science research, the subscales for knowledge of tobacco hazards ($\alpha = 0.51$) and refusal skills ($\alpha = 0.50$) fell below this standard. Taber (2018) stated that both researchers presenting Cronbach's alpha as evidence of instrument quality and readers evaluating such research should report and interpret it more carefully. Tavakol and Dennick (2011) explained that Cronbach's alpha is affected by test length, item inter-relatedness, and dimensionality. Taber (2018) also noted that participant characteristics influence reliability. Specifically, the refusal skills subscale contained only five items, representing a short test length, and the potential influence of the unique characteristics of Vietnamese adolescents cannot be overlooked.

Furthermore, unlike scales measuring a single construct such as attitudes or self-efficacy, knowledge assessment instruments measure diverse sub-topics or distinct concepts within a single domain; thus, lower inter-item correlations are a natural phenomenon (Taber, 2018). Addressing this issue, Bretz and McClary (2014) cautioned against mechanically applying the conventional threshold of 0.70 to knowledge-based assessments. Similarly, Berger and Hänze (2015) noted that Cronbach's alpha (α) values between 0.45 and 0.60 can be acceptable when evaluating knowledge, whereas excessively high values should be interpreted with caution as they may indicate item redundancy. Therefore, because the low reliability of the instruments used in this study may have masked the potential effects of the intervention, caution should be exercised when interpreting the non-significant differences observed between the experimental and control groups.

Therefore, when designing adolescent smoking prevention programs, it is necessary to enrich the program content, deliver education over an extended period, and plan outcome evaluations more systematically.

However, this study holds significance in that it provided a short-term intervention to Vietnamese adolescents in a resource-constrained environment. Both the control group and the experimental group are regions where the 'Vietnam Quang Tri Province Happiness Program' supported by the Korea International Cooperation Agency is being conducted. Since there is a 7-month gap between the pre- and post-intervention surveys, the impact of various awareness improvement projects conducted throughout the region on the control group during this period cannot be

overlooked. Therefore, when conducting future studies on the effectiveness of interventions, it is necessary to conduct research in an environment where such community influences can be controlled.

5. Conclusion

This study developed a smoking prevention program for adolescents in rural Vietnam and evaluated the program after its application. The program development process involves needs assessment, designing the program, evaluating the content and cultural appropriateness of the program, evaluating program applicability, and determining the final program design. Interventions were provided by peer educators, and four months later, the results were evaluated using a quasi-experimental design with a non-equivalent control group pre- and post-intervention structure. The study results showed no significant effect in the experimental group compared to the control group after the application of the smoking prevention program.

Based on these findings, the following suggestions are made for future research. First, regarding the provision of intervention programs for cognitive and behavioral change in adolescents, it is necessary to increase the intensity of intervention by providing repetitive and continuous interventions rather than one-time education. Second, when evaluating the effectiveness of the intervention, it is necessary to assess both short-term and long-term effects (immediately after education, and after a few weeks or months). Third, the reliability of the "knowledge of the harmful effects of smoking" and "refusal skills" tools used to evaluate the effectiveness of the smoking prevention program in this study was low. Therefore, caution is required when interpreting the results of this study regarding knowledge of the harmful effects of smoking and refusal skills, and it is suggested that future research verify the effectiveness of smoking prevention programs using tools with higher reliability. Fourth, when conducting research in developing countries, a research design is required that can control the indirect effects of programs in other areas conducted in the study region.

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