Development of an Internet-based Smoking Prevention Program for Young Male Adolescents in Thailand

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Abstract : This developmental study produced the Internet-based Tobacco Smoking Prevention Program for young male adolescents. It was informed by the Health Belief Model, the Theory of Reasoned Action, the Social Cognitive Theory, and the Information Processing Model; used modified processes of computer-based instruction development; and tested the feasibility of the Program.

Participants (n=64) were purposively recruited into four subsamples: eight teachers, 16 male students for focus group discussion, 10 students for pretesting, and 30 students for feasibility testing. Data were collected using six questionnaires: *Knowledge Regarding Smoking, Attitudes Toward Smoking, Decision Making in Smoking Refusal, Smoking Refusal Skill, Self-efficacy in Smoking Refusal, and Satisfaction Regarding the Use of the Computer Program.* Data were analyzed using descriptive statistics and one-way repeated measures ANOVA.

Results revealed that the critical elements of the theory-based program were content, simulations/video clips, interactive exercises, and web board for discussion. There was high agreement from the students that the website was convenient, preferable, interesting, useful, acceptable, practical, and sufficient but only moderately fast in speed. There were significant increases in the mean scores of knowledge regarding smoking, attitude toward smoking, and self-efficacy in smoking refusal at immediate post-test and on day 7, excluding the skills of smoking refusal, but significant differences in the mean scores of decision-making in smoking refusal at baseline and at immediate post-test.

Findings suggest that school and community nurses can use the Program as an interactive strategy to improve the adolescents' knowledge regarding smoking, attitude toward smoking, and self-efficacy for smoking prevention.

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Introduction

Tobacco smoking among young male adolescents is a critical public health priority and a leading cause of morbidity and mortality.[1] The World Health Organization (WHO) reported that the onset of smoking occurs primarily in adolescence.[2] The global prevalence of young male adolescents who are currently smoking cigarettes or using other tobacco products as reported by the Global Youth Tobacco Survey (GYTS) varied among countries of

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each region and among regions ranging from 0-41.8% and 0.4-52.1%, respectively.[3] Currently, the highest prevalence of those who are currently smoking cigarettes was found in the Western Pacific region and the highest prevalence of use of other tobacco products was found in the Eastern Mediterranean region.[3] Alarmingly, there is a high prevalence rate of smoking among young male adolescents in Thailand[3], 20.1% who currently smoke cigarettes, and 15.3% for those who currently used other tobacco products, indicating an apparent rate increase since 2004.[4] Notably, 14.2% of the young male adolescents who were never smokers were susceptible to initiating cigarette smoking in the following year.[3] When considering the age of the onset of smoking, nowadays males start at a younger age than previously reported.[5] The impact of smoking is substantially harmful to health[6,7] and an economic burden.[8] WHO estimated that the harmful effects of smoking could kill one billion smokers during the 21st Century.[2] Since young Thai male adolescents are susceptible to smoking, intervening in their initial smoking experience may prevent the onset of new smokers. Hence, preventing smoking uptake among adolescents is important because it curbs new addiction and decreases morbidity and mortality from smoking-related diseases.

Decades of smoking prevention efforts directed at young adolescents have been undertaken following the measures to reduce tobacco demand were contained in the WHO Framework Convention on Tobacco Control (WHO FCTC) especially the measures related to education, communication, training, and public awareness.[9] The majority of school intervention studies drew on social influences, with half of the best quality studies presenting short-term effects.[10] In Western countries, studies have been conducted on Internet-based or web-based programs for health behavior changes including smoking prevention and cessation, and the results showed potential.[11-17] However, innovative and effective strategies are still needed to prevent smoking uptake among susceptible young male adolescents in many countries.

In Thailand, the National Tobacco Control Policy also emphasizes using an innovative approach with computer information technology to prevent young adolescents from becoming initial smokers.[5] An Internet-based intervention program could link to such policy since it is disseminated through the Internet and thus attractive and accessible to young people. However, in Thailand, no prior theory-based study has been done on the development of such a program for young male adolescents. Thus, in this study the interactive and preliminary Internet-based Tobacco Smoking Prevention Program (ITSPP or 'the Program') was developed through the integration of the Health Belief Model (HBM),[18] the Theory of Reasoned Action (TRA),[19] Social Cognitive Theory (SCT)[20] and the Information Processing Model (IPM).[21] The feasibility of the ITSPP was also tested.

Review of Literature

Tobacco smoking uptake among young adolescents involves complex behavior. According to a number of studies, multiple factors influencing smoking uptake among young adolescents can be divided into three groups: intrapersonal, interpersonal, and environmental factors. Intrapersonal factors include attitudes toward smoking,[3,22-25] self-efficacy in smoking refusal,[24-27] and academic success[24,25]; interpersonal factors include peer persuasion[24,25,27] and parental influence;[24,25,28,29] while environmental factors include mass media and advertisement.[3,30] Thus, these influencing factors were considered in developing intervention strategies of the ITSPP.

After decades of efforts to combat smoking, most of previous smoking prevention programs drew

on social influences and there was little evidence that information alone was effective.[10] To date, the Internet is a useful tool as e-health promotion for anti-smoking advocacy.[31] Internet-based or web-based programs are novel, interactive strategy for risk behavior modification. A content analysis of 67 prior anti-smoking websites was revealed that intervention strategies most frequently emerged from the theories of behavior change and the HBM was used.[31]

Hence, developing an innovative and effective theory- and Internet-based intervention has great potential to prevent smoking uptake among young male adolescents in Thailand. It is an effective method of instruction that is sensitive to the learning preferences of youth.[32] An Internet-based program is defined here as a primarily self-guided intervention online program that operated through a website and used by users seeking health information related assistance. The ITSPP attempted to create positive change and improve knowledge, awareness, and understanding via the provision of sound health-related material and use of interactive web-based components. The key components of such intervention include program content, use of multimedia, interactive online activities, and guidance or supportive feedback.[33] In this study feasibility is defined as possibility of the developed program for being used to prevent smoking among young Thai male adolescents and measured in terms of the program effectiveness and the user's evaluation. Program effectiveness is an improvement of the user's smoking risk awareness, attitudes towards smoking, and decision making and skills in smoking refusal. The user's evaluation referred to opinions of the young male adolescent using the Program regarding convenience, preference, interest, speed, usefulness, acceptability, practicality, and sufficiency of the program.

Research questions: 1. What are the critical elements of an Internet-based smoking prevention program that will be appropriate for young male adolescents in Thailand?; and 2. Is such a program feasible for use with young male adolescents in Thailand?

Theoretical framework

The integration of the HBM,[18] the TRA,[19] the SCT[20] and the IPM[21] was used as a framework for designing the ITSPP. The HBM's concepts of perceived susceptibility and perceived severity[18] were used to guide construction of a module about knowledge on poisonous constituents of cigarette and harmful health effects of cigarette smoking. The TRA's concepts of attitude and subjective norm[19] or perceived parents' expectations on non-smoking behavior were applied for constructing modules and video clips. The SCT's concept of four sources of self-efficacy including enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states[20] were applied to guide designing contents and video clips for the modules of decision-making and smoking refusal skills training, and dealing with smoking desire. In addition, the IPM[21] was used to explain the movement of information from inputs, including information provided through the constructed modules to outputs that included increased risk awareness, unfavorable attitude toward smoking, increased perceived subjective norm, and increased self-efficacy. A series of processing stages consisting of encoding, comparison, response selection, and response executions was applied to explain the learning process of young male adolescent via the Program.

Method

Design: This study was a developmental research, a systematic study of designing, developing, and evaluating instructional program, processes, and products.[34] There were two distinct study phases

(see **Figure 1**). Phase 1: focus group discussion (FGD) and program development which consisted of writing learning objectives and content modules, writing flowcharts, creating a storyboard and reviewing this for content validity, program construction, program delivery, evaluation and program revision; and Phase 2: feasibility testing of the preliminary ITSPP.

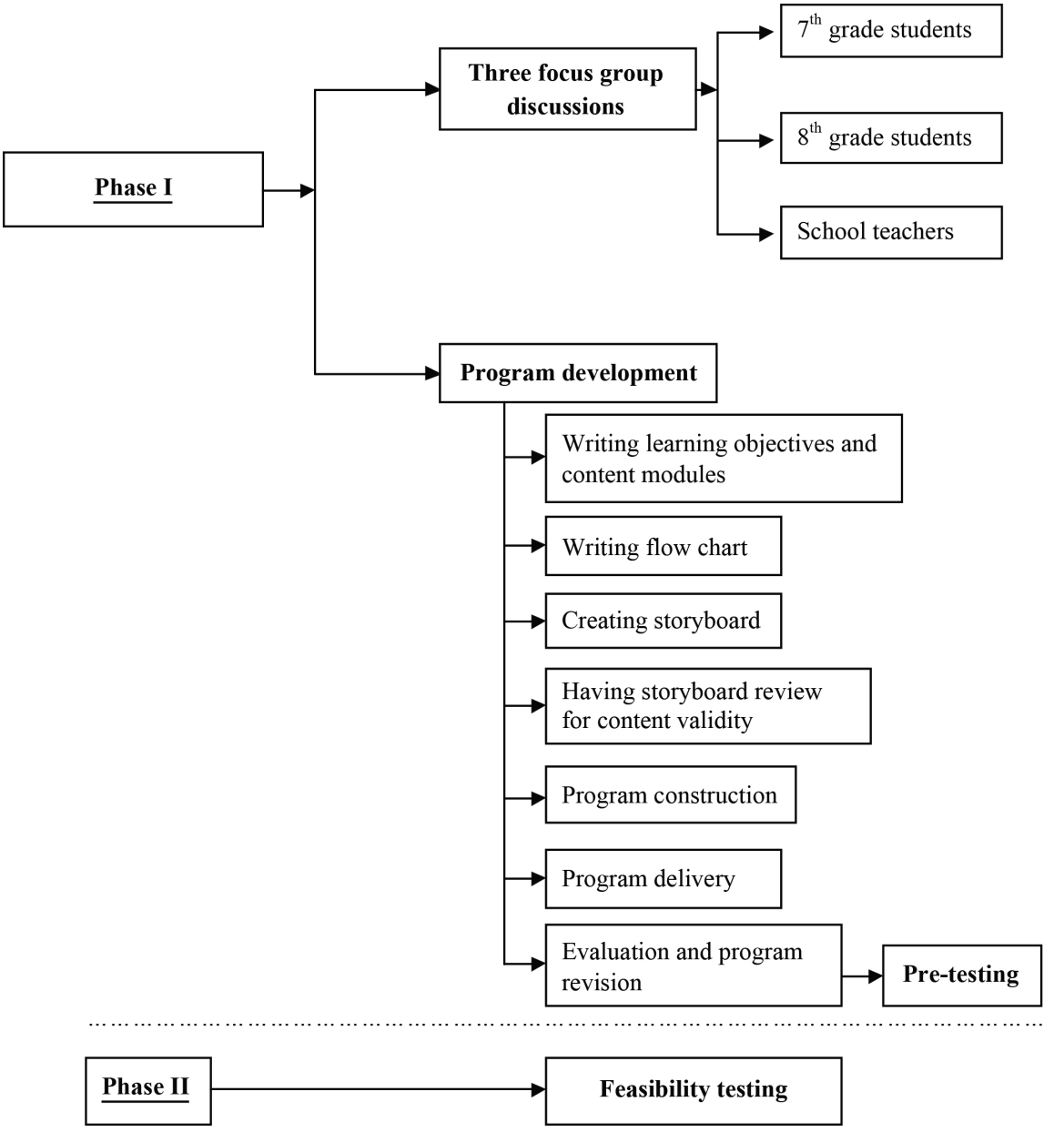

Figure 1 The process of developing of the ITSPP

Setting: The settings for this study were two public secondary schools in two provinces in Eastern Thailand, the region that showed high prevalence of smoking among young male adolescents. The two schools were selected because of availability and accessibility of the Internet. The first school was chosen for FGD and feasibility testing of the developed program. The second school was used for pretesting the Program.

Sample: Samples consisted of eight school teachers and 56 young male adolescents.

They were purposively recruited and divided into four subsamples. The first subsample comprised eight school teachers teaching the 7th and 8th grade students in the first school, and who were also recruited for a FGD. The second subsample comprised 16 male students for FGD, and who were purposively selected from the first school according to the following inclusion criteria: 1) Being extrovert, outgoing and assertive adolescent studying in 7th and 8th grades as suggested by school teachers that they could share their opinions to the group; 2) Willing to participate in this study and having written consent of parents and student's own assent; and 3) Being classified in the early smoking stage as screened by the Current Smoking Stage Questionnaire (CSSQ) developed by Homsin.[24] It is a self-reported questionnaire, consisting of four items: "Have you ever smoked a cigarette, even a few cigarettes?"; "Do you think you would like to try smoking in the next year?"; "If one of your closest friends offers you a cigarette, would you smoke it?"; and "How often do you smoke?". The early smoking stage can be classified into 5 stages: 1) Non-susceptible pre-contemplation stage in which an individual has never smoked, and has a strong commitment to not smoke; 2) Susceptible pre-contemplation stage in which an individual has never smoked, but does not have a strong commitment to not smoke; 3) preparation/contemplation stage where an individual who has never smoked, but thinks they will start smoking in the following year; 4) Initiation stage, where an individual smokes no more than 4 cigarettes in their life; and 5) Experimentation stage in which an individual repeats smoking irregularly or has smoked 5-100 cigarettes in their life, but does not smoke anymore.

The third subsample comprised 10 students selected from the second school for pretesting. They met the inclusion criteria of being in the susceptible pre-contemplation stage, were willing to participate in the ITSPP, and there were written consent of parents and student's own assent. The fourth subsample consisted of 30 students who were 7th grade students from the first school and met the same inclusion criteria as the third subgroup. They were asked to access the ITSPP and complete all questionnaires for feasibility testing.

Ethical Considerations: Approval to conduct the study was obtained from the Research Ethics Review Committee Faculty of Nursing, Chiang Mai University, and the directors of the two public secondary schools of the study setting. All students, teachers and their parents were informed about the purpose of the study, procedures, confidentiality and anonymity preserved, as well as potential risks and benefits. They were also informed of their rights to take part or withdraw from the study without repercussion. Then written consents were obtained from the parents and teachers and assent was obtained from the students. Their rights were protected throughout the study.

Instruments: Data were obtained using six instruments, all described below:

The *Satisfaction Regarding the Use of the Computer Program Questionnaire* (SUCPQ) developed by Ponpaipan,[5] is a 7-level semantic differential scale. It was used to measure the opinions of the students about convenience, preference, interest, speed, usefulness, acceptability, practicality, and sufficiency of ITSPP. The students were asked to respond "How

do you feel or think about an Internet-based smoking prevention program?" Scores of response ranged from 1 to 7, with 1 indicating the most negative response and 7 the most positive. Responses were classified into seven equal levels, namely, very highly negative (1-1.49), highly negative (1.5-2.49), fairly negative (2.5-3.49), midway of negative and positive (3.5-4.49), fairly positive (4.5-5.49), highly positive (5.5-6.49), and very highly positive (6.5-7). Additionally, an open-ended question was used to ask further about the subjects' problems and suggestions for improvement. The SUCPQ was previously confirmed by a panel of experts as content valid and had evidence of reliability.[35] In this study, the Cronbach's alpha coefficient of the SUCPQ was 0.97.

The *Knowledge Regarding Smoking Questionnaire* (KRSQ) developed by Juntachum[36] was used to assess knowledge about smoking. One example of the 12 items is: "Smoking is not harmful to health if the smoker is healthy." Possible responses to each item are true or false (1 or 0). A total score, which could range from 0 to 12, is obtained by summing the response values of all items. The instrument was reviewed by experts as content valid and had evidence of discrimination power and reliability. The reliability of original instrument was 0.88.[36] In this study, the reliability of this instrument was 0.73.

The 20-item, *Attitudes toward Smoking Questionnaire* (ASQ) developed by Homsin[24] as both negative and positive items (10 each). Examples are: "Smoking makes me look like an addict" and "Smoking makes me feel grown up". Responses in the original ASQ were scaled on a 4-point Likert scale ranging from 1 (absolutely disagree) to 4 (absolutely agree) for positive items and 4 to 1 for negative items. In this study, the scores were reversed as 4 (absolutely disagree) and 1 (absolutely agree) for positive items because less positive or less favorable attitude toward smoking was expected for smoking prevention. The negative items were reverse scored in analysis so that the range of possible total score is 20-80. The higher the total score, the less favorable the attitudes are. The content validity index and the Cronbach's alpha coefficient of the original study were 0.98 and 0.91, respectively.[24] In this study, Cronbach's alpha coefficient of this instrument was 0.93.

The *Decision Making in Smoking Refusal Questionnaire* (DMSRQ) developed by Juntachum[36] was used for measuring decision-making to refuse smoking. It consists of ten questions with two alternative choices, an example being: "At a New Year party, your closest friend persuades you to try smoking cigarettes. What would you do in this situation?". There are two response choices: "Smoking, because it makes me look free and cheerful" and "Not smoking, because cigarettes are one of the most addictive substances and if one tries them, they will become addicted". A score of 1 was assigned to the proper decision and 0 was assigned to the improper decision. The range of the possible total score is 0-10. The DMSRQ was confirmed by experts as content valid and tested for discrimination power and reliability. The reliability of the original instrument was 0.89.[36] In this study, its reliability was 0.94.

The *Smoking Refusal Skill Questionnaire* (SRSQ) developed by Juntachum[36] was used for assessing subjects' responses when they were persuaded to smoke and consists of ten items showing conversation scripts between two adolescents with two alternative choices. One scenario reads: "You feel anxious and nervous about the upcoming examination, and your closest friend offers you to try a cigarette: "Hey! Try this, it will reduce your anxiety and make you happy." This is followed by two choices of possible answers: "Oh, really! I want to try it. Please give me a cigarette" and "Thank you my friend! I don't like its smell." A score of 1 was assigned to proper response and 0 was assigned to improper response.

The range of possible total score is 0-10. The measure was confirmed by experts as content valid and tested for discrimination power and reliability. The reliability of the original study was 0.87.[36] In this study, the reliability of this instrument was 0.98.

The *Self-efficacy in Smoking Refusal Questionnaire* (SSRQ) developed by Juntachum[36] was used to measure subjects' confidence to refuse smoking in various situations. One example is: "When your friend persuades you to try smoking cigarettes, you can refuse smoking immediately." The Questionnaire consists of ten items with three alternative choices: can do=1, unsure=0, and cannot do=0. The measure was confirmed by experts as content valid and tested for discrimination power and reliability. The Cronbach's alpha coefficient of original study was 0.84.[36] In this study, the coefficient of this instrument was 0.94.

Procedure: Three focus group discussions with 7th and 8th grade students and school teachers were separately held three times. Each of the first two groups consisted of eight students: two were in non-susceptible pre-contemplation stage, two in susceptible pre-contemplation stage, two in initiation/tried stage, and two in experimentation stage. All of them were screened and classified by the CSSQ. The third group included eight school teachers. Each FGD conducted by the principal investigator (PI) took approximately 40 minutes and was tape-recorded, while discussion notes were taken by a master degree prepared nurse instructor.

Information obtained from three FGD was content analyzed and categorized to guide the critical elements of developing an Internet-based smoking prevention program for young male adolescents. Participants believed this should:

a) comprise contents of smoking-related diseases or harmful effects of cigarette smoking on health, society and country; value inoculation; attitudes about the harmful effects of cigarette smoking; decision-making and smoking-refusal skills; tobacco control laws; quitting smoking methods; pictorial warning of smoking-related diseases; and how to deal with smoking desire.

b) be interesting, interactive e-learning with colorful graphic design with pop up media and cartoon animation more appealing to adolescents;

c) have short movies/video clips or simulations with soundtrack; and

d) games and web board for discussion should be included.

Program development: The procedure to develop the ITSPP involved six steps, modified from computer-based instruction development of Alessi and Trollip,[37] as follows:

1) Writing learning objectives and content modules.

2) Writing flowchart, and creating storyboard.

3) Having storyboard review for content validity by the panel of five experts including one physician with expertise in adolescent smoking prevention, one adolescent psychologist, two nurse educators, and one educational technology specialist. Each expert was asked to rate the content of the storyboard for level of relevance using a 4-point rating scale: very relevant, fair relevant, a little relevant, and not relevant. These ratings were used to decide which content should be further refined before testing. The panel had agreement with a content validity ratio (CVR) = 1, indicating that the storyboards were judged as valid. However, there were some suggestions and comments for improvement including that Module 1: Cigarette Monster had too much detail about tobacco control law; the Program should have content about individual expenditure of smoking; and the questionnaire for skills about smoking refusal was too easy and the right answer could be guessed. Revisions were undertaken based on the feedback.

4) Program construction: The PI developed the ITSPP with a computer program specialist.

5) Program delivery: The PI uploaded the ITSPP for dissemination via a website www.smoke-freeteen.com

6) Evaluation and program revision: The PI submitted the ITSPP to experts to review again, thereafter, the program was pretested with 7th grade students who met the inclusion criteria. The average age of students was 12.4 years. They took approximately one hour to navigate from the first webpage to the last. The results of pretesting showed that they rated high to very high the scores for usefulness, preference, sufficiency, and practicality, except convenience, interest, speed, acceptability, for which they gave moderate scores. During pretesting, one problem was identified. The Internet connectivity in school was not stable so the uploaded video clips via YouTube stopped periodically. The students gave suggestions that the Program should have more video clips and its background, and the font color should be brighter. Then the ITSPP was revised according to their suggestions.

Feasibility testing: 30 students from the fourth subsample group evaluated the feasibility of the preliminary ITSPP using SUCPQ. They were classified into susceptible pre-contemplation stage and were firstly pre-tested for baseline data by using the questionnaire of: the KRSQ, the ASQ, the DMSRQ, the SRSQ, and the SSRQ. Then, they accessed the program by using a password to log in and worked individually on the web site www.smoke-freeteen.com, completed all content modules, and all questionnaires for immediate post-test data. The estimated time for using the program was 40 minutes, ten minutes per each module. They were able to skip the module and there was no need to complete in order each of the learning units. However, they needed to focus on completing every learning unit including interactive exercises to meet objectives of the program. After that, they accessed the program again at Day 4 and completed all questionnaires at Day 7 for the second or follow-up post-test data.

Data Analysis: Descriptive statistics were used to analyze the demographic data of the samples and the utility of the program. The one-way repeated measures ANOVA was used to evaluate differences of mean scores of knowledge regarding smoking, attitudes toward smoking, decision making in smoking refusal, skills of smoking refusal, and self-efficacy in smoking refusal at baseline, immediate post-test, and at Day 7 follow up.

Results

The Critical Elements of the ITSPP for Young Male Adolescents in Thailand

The ITSPP and www.smoke-freeteen.com (see **Figure 2**) were developed based on the theoretical framework of HBM, TRA, SCT and IPM and opinions of the students and school teachers. The home page is illustrated with colorful graphic screen designs. The results revealed that the ITSPP consisted of four critical elements, as follows: 1) content, 2) simulations/video clips, 3) interactive exercises, and 4) web board for discussion. The Program includes four modules described below and depicted in **Table 1**:

Figure 2 Sample of the ITSPP webpage for young male adolescents

Table 1 Description of the ITSPP, and Components

Module	Objective	Components
Module 1 Cigarette Monster	To raise their awareness or perception regarding risk or seriousness of smoking consequences and to change their attitudes toward smoking	- Hazardous to health ingredients of cigarette smoking, life cycle of adolescent smokers, impact of smoking, expenditure on smoking, and tobacco control law.
Module 2 Decision-making in Smoking refusal	To demonstrate Thai male early adolescents about processes of decision-making in smoking refusal	- Processes of decision-making on smoking refusal. - The simulation of decision-making on smoking refusal was acting by Thai male early adolescents
Module 3 Self-efficacy in Smoking Refusal	To enhance self-efficacy in smoking refusal among Thai male early adolescents	- Principles of effective smoking refusal. - The simulation of smoking refusal is acted by young Thai male adolescents.
Module 4 Dealing with Smoking Desire	To guide adolescents away from smoking	- Instruction on strategies to deal with smoking desire

Module 1: Cigarette Monster: Content is based on the HBM's concepts of perceived susceptibility and severity[18], and the TRA's concept of attitude[19]. Information on life cycle of adolescent smokers was included to increase their perception of susceptibility to smoking. Information on hazardous ingredients of cigarette smoking, impact of smoking on health and expenditure of smoking aimed to raise the adolescents' awareness of the severity of smoking-related diseases and other negative burdens. The information conveyed also aimed to change their favorable belief or attitude toward smoking to an unfavorable belief or attitude so that they would give up smoking or not consider it.

Module 2: Decision Making in Smoking Refusal includes text information describing the process of decision-making about smoking refusal and a video clip presenting simulation of adolescents' decision-making in smoking refusal. A scene of a parent's warning and expectation about their smoking is shown on the video clip. This simulation was based on the TRA's concept of subjective norm that influences behavioral intention.[19]

Module 3: Self-efficacy in Smoking Refusal includes text describing the process of smoking refusal and a video clip simulating an adolescent's smoking refusal. The latter displays a male adolescent acting as a model who successfully refused smoking when he encountered persuasion or was offered a cigarette by his peers. This video clip was designed based on the SCT's concept of self-efficacy.[20]

Module 4: Dealing with Smoking Desire: this includes text information describing the means to deal with smoking desire, presented via website and illustrated with colorful graphic screen designs.

Feasibility of the ITSPP for Young Male Adolescents in Thailand

Further results revealed that the average age of the students who tested the feasibility of the developed program was 12.56 years. After using the website on two occasions, they highly agreed that the website was convenient, preferred, interesting, useful, acceptable, practical, and sufficient (mean scores = 5.90 – 6.30, SD = 0.72 – 0.92); however, the speed was rated as only moderately fast (mean score = 5.03, SD = 1.27).

There were significant increases in mean scores of knowledge regarding smoking, attitude toward smoking, decision making in smoking refusal, and self-efficacy in smoking refusal between pre and post tests at $p<.05$ Further analysis showed that there were significant increases in the mean scores of knowledge regarding smoking, attitude toward smoking, and self-efficacy in smoking refusal at baseline, immediate post- test, and at Day 7 follow up at $p<.05$ but not in the skills of smoking refusal. There was significant difference in the mean scores of decision making in smoking refusal at baseline and immediate post-test at $p<.05$. However, there was no statistically significant difference among scores of decision making in smoking refusal at immediate post-test and at Day 7 follow up as shown in **Table 2.**

Table 2 Comparison of the knowledge regarding smoking, attitude toward smoking, Decision-making in smoking refusal, skills of smoking refusal, and self-efficacy in smoking refusal among young male adolescents at baseline (Day 1), at immediate post-test (Day 1), and at Day 7 follow up (n=30)

Variables	The Mean Scores						Repeated Measures ANOVA F	Post hoc
	Baseline (n=30)		Immediate post-test (n=30)		Day 7 follow up (n=30)			
	Mean	SD	Mean	SD	Mean	SD		
Knowledge regarding smoking	7.50	2.16	10.47	0.90	10.63	1.15	37.15*	2>1* 3>1*
Attitude toward smoking	55.83	11.45	73.40	6.79	73.73	5.10	69.32*	2>1* 3>1*
Decision making in smoking refusal	8.60	2.73	9.97	0.18	9.90	0.30	6.83*	2>1*
Skills of smoking refusal	9.07	2.71	10.00	0.00	9.93	0.25	3.25	-
Self-efficacy in smoking refusal	5.87	3.93	9.87	0.43	9.73	0.25	32.18*	2>1* 3>1*

** $p < .05$*

Note : 1 refers to at baseline
2 refers to immediate post-test
3 refers to Day 7 follow up

Discussion

This theory-based program was developed for smoking prevention among young male adolescents in Thailand based on the theoretical concepts from the HBM, the TRA, and the SCT. These three theories have been commonly used in prior studies but most studies used no more than one theory, and interestingly, few studies on anti-smoking websites focus on developing theory-based intervention strategies.[31] Most of such websites provide general information about smoking that seems to be guided by the concept of perceived threat from the HBM, while the intervention strategies guided by the concepts of self-efficacy and subjective norm are rarely found. The Program developed in this study comprised of both general information on harmful consequences of smoking and strategies to enhance self-efficacy and subjective norm that were recommended being more effective.[31] In addition to those strategies that are classified as cognitive, the Program also included information and guidelines about dealing with smoking desire that can be counted as an affective or emotional-focus strategy rarely employed in previous websites.[31] Finally, the theories were confirmed to be very helpful for guiding the creation of all critical elements of the Program.

With regard to the critical elements of the ITSPP, the content was presented using text in conjunction with bright colorful pictures useful in reaching young male adolescents with varied learning styles.[38] The video clips presenting simulations were included in the Program because they represented models of real phenomena that allowed the young male adolescents to experience vicariously with less risk and cost. Interactive exercises that are prevalent in most web-based smoking prevention sites for adolescents were used, because these interactive exercises are so attractive[38,39] that they encourage active learning, and fit within the preferences of adolescents.[32] Inclusion of the web board for discussion was consistent with previous health-related web-based programs.[14,15,40] It can be beneficial to the adolescents since it offers opportunities to share their ideas and experiences, ask questions, and consult experts.

The findings from feasibility testing revealed that the young male adolescents had significantly improved their knowledge regarding smoking, attitude toward smoking, and self-efficacy in smoking refusal, but not skills of smoking refusal, immediately after learning the program and at day 7 follow up. These improvements were expected. However, the improvement of decision-making in smoking refusal was found only at immediate post-test. Moreover, skill of smoking refusal was not significantly improved. These non-significant findings may be due to three reasons. First, their pre-test scores of the decision making in smoking refusal and skill of smoking refusal were high compared to the maximum possible scores, indicating that they had good decision-making skills already. Thus, it would be very difficult to have more improvement if the program or intervention was not strong. Second, the two occasions of access to the program with simulations may be not adequate enough to improve long-term decision-making skills because skill enhancement needs continuous practice in various real life situations. Third, the measurement issue may contribute to these findings. For example, the instruments used to measure decision-making and skills of smoking refusal are dichotomous response scales that may not be sensitive enough to detect changes. The multi-choice type instrument is suggested.

Limitations

Several limitations of the study should be considered in the interpretation of its findings. First, the ITSPP was developed for young male adolescents in Thailand in the susceptible pre-contemplation stage of smoking uptake using a small group of sample. This study

was developmental research, therefore, generalization of the findings in the young male adolescents in other stages of smoking uptake and in other groups should be cautiously considered. Second, the Program effectiveness was evaluated in terms of improvement of knowledge regarding smoking, attitude toward smoking, self-efficacy and decision making in smoking refusal, and skills of smoking refusal that were viewed as influencing factors of smoking refusal behavior. The ultimate behavioral outcome was not measured. Moreover, the effectiveness was examined shortly after the sample finished using the program twice. Therefore, the behavioral outcome should be examined to verify the effects, both in short-term and long-term, of the fully developed program. Third, all outcome variables were measured on the basis of self-report. This measurement method is subject to measurement error due to social desirability. Additionally, some questionnaires used dichotomous response choices that may not be sensitive enough to capture change in outcome variables. Therefore, use of the multiple methods of measurement and/or multiple choice formats with more socially desirable options is recommended.

Conclusion and Recommendations

This study developed the preliminary ITSPP for young male adolescents based on the HBM, the TRA, the SCT, and the IPM by using modified processes and testing its feasibility. The study involved two phases of focus group discussions and program development and phase of feasibility testing of the developed program using pre-and post-test approach.

The critical elements of the theory-, Internet-based program were content, video clips, interactive exercises, and web board for discussion. The feasibility of the Program was proven in that the students highly agreed that the website was convenient, preferred, interesting, useful, acceptable, practical, and sufficient; however, speed was rated as only moderately fast. The findings indicate that the developed program is useful for improving adolescents' knowledge, attitude, self-efficacy and skill required for smoking prevention.

With regard to the limitations of this study, three recommendations for further research are presented. First, a randomized controlled trial should be designed to test the effectiveness of the developed program. The duration of program implementation should be longer than one week to provide adequate intervention. Second, a methodological study to refine some existing instruments or to develop new highly sensitive instruments measuring behavioral outcomes and the mediating factors is recommended. Third, another developmental study that aims to develop a specific stage-matched program or a tailored smoking prevention program is also recommended. Such a program will be beneficial for young male adolescents at different stages of smoking uptake.

Implications for Nursing Practice

This theory-based program provided a nursing intervention in the form of an e-health initiative for smoking prevention among young male adolescents. School nurses can apply program by integrating it within a health education course or encouraging students to learn from the Program once it has been tested and refined. Moreover, community health nurses who provide services to young male adolescents could also use it as a primary health education teaching tool when a project of smoking prevention is conducted.

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การพัฒนาโปรแกรมการป้องกันการสูบบุหรี่ทางอินเทอร์เน็ตสำหรับวัยรุ่นชายไทยตอนต้น

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บทคัดย่อ: การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาโปรแกรมการป้องกันการสูบบุหรี่ทางอินเทอร์เน็ตสำหรับวัยรุ่นชายไทยตอนต้นโดยใช้แบบแผนความเชื่อด้านสุขภาพ ทฤษฎีการกระทำด้วยเหตุผล ทฤษฎีการเรียนรู้ทางปัญญาสังคมและแบบแผนการประมวลสารสนเทศ โดยใช้ขั้นตอนที่ดัดแปลงจากกระบวนการสร้างบทเรียนคอมพิวเตอร์ และทดสอบความเป็นไปได้ในการใช้

กลุ่มตัวอย่างได้รับการคัดเลือกแบบเจาะจง แบ่งเป็น 4 กลุ่มย่อย คือ ครู จำนวน 8 คน นักเรียนชาย จำนวน 16 คน สำหรับการอภิปรายกลุ่ม นักเรียนชาย จำนวน 10 คนสำหรับทดลองใช้โปรแกรม และนักเรียนชาย จำนวน 30 คน สำหรับทดสอบความเป็นไปได้ในการใช้โปรแกรม รวบรวมข้อมูลโดยใช้แบบสอบถาม จำนวน 6 ฉบับ ได้แก่ แบบสอบถามความรู้เกี่ยวกับการสูบบุหรี่ แบบสอบถามทัศนคติต่อการสูบบุหรี่ แบบสอบถามการตัดสินใจปฏิเสธบุหรี่ แบบสอบถามทักษะการปฏิเสธบุหรี่ แบบสอบถามสมรรถนะแห่งตนในการปฏิเสธบุหรี่ และความพึงพอใจในการใช้โปรแกรม วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนาและการวิเคราะห์ความแปรปรวนเมื่อมีการวัดซ้ำ

ผลการวิจัยพบว่าโปรแกรมการป้องกันการสูบบุหรี่สำหรับวัยรุ่นชายไทยตอนต้นที่มีทฤษฎีเป็นฐานมี 4 องค์ประกอบสำคัญ คือ เนื้อหาหรือบทเรียน สถานการณ์จำลองหรือวีดิทัศน์ แบบฝึกหัดแบบปฏิสัมพันธ์และกระดานสนทนา สำหรับความเป็นไปได้ในการใช้งานของโปรแกรมนั้นนักเรียนเห็นด้วยในระดับสูงว่าโปรแกรมสะดวก รู้สึกชอบ น่าสนใจ มีประโยชน์ เป็นที่ยอมรับได้และสาระเพียงพอเหมาะสมแต่ความเร็วในการใช้อยู่ในระดับปานกลาง สำหรับคะแนนเฉลี่ยของความรู้เกี่ยวกับการสูบบุหรี่ ทัศนคติต่อการสูบบุหรี่และสมรรถนะแห่งตนในการปฏิเสธบุหรี่ของนักเรียนภายหลังการใช้โปรแกรมทันทีและวันที่ 7 เพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ แต่คะแนนเฉลี่ยของทักษะการปฏิเสธการสูบบุหรี่ไม่มีความแตกต่างกันและพบความแตกต่างอย่างมีนัยสำคัญทางสถิติของคะแนนเฉลี่ยการตัดสินใจในการปฏิเสธบุหรี่ก่อนการใช้โปรแกรมและภายหลังการใช้โปรแกรมทันที

ผลการศึกษานี้เป็นประโยชน์ต่อพยาบาลที่ทำงานในโรงเรียนและชุมชนสามารถนำโปรแกรมซึ่งเป็นกลยุทธ์ที่มีปฏิสัมพันธ์ไปใช้ในการส่งเสริมความรู้ ทัศนคติและสมรรถนะแห่งตนสำหรับการป้องกันการสูบบุหรี่สำหรับวัยรุ่นชายไทยตอนต้น

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