

Usefulness of an Application-Based Child Sexual Abuse Prevention Program during Routine Activities and Use of Social Networking Services in Elementary Students in Japan

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Background: Child sexual abuse (CSA) is a public health problem of epidemic proportions worldwide. Among children, the consequences of sexual violence on individual health are particularly numerous and often pervasive. Exposure to CSA appears to occur during early adolescence, with a peak incidence rate at age 12 years. In Japan, from 2012 to 2022, the increase in the number of children using smartphones resulted in an increase in the number of children victimized by crimes linked to social networking services (SNS), including child prostitution, child pornography, sexual assault, and rape, from 1,076 to 1,732.

Objective: The present study aimed at applying self-care theories to develop a child sexual abuse prevention program with an application (CSAP-A) and to evaluate its effects on self-protective attitudes during routine activities and use of social networking services (SNS) in elementary school students in Japan.

Methods: The study was performed to fifth-grade children at four elementary schools in Japan and used a pretest/posttest design. In the control group, an education by lecture with learning materials was introduced to four elementary schools in June 2022, and the presentation was given in July 2022. The control group was selected after obtaining assent from the children and consent from their guardians and school principals; the control group comprised 102 (43.4%) of the 235 fifth-grade children at the four elementary schools. In the intervention group, CSAP-A was introduced to four elementary schools in May and June 2023, and the intervention was performed in July 2023. The intervention group was selected after obtaining assent from the children and consent from their guardians and school principals; the intervention group comprised 96 (53.9%) of the 178 fifth-grade children at the four elementary schools. Participants completed a questionnaire before and after presentation of the information.

Results: A significant interaction was found between the pretest/ posttest and the CSAP-A group / the control group with respect to the total scores for self-protective attitudes during routine activities ($F(1,391) = 4.68, p = 0.03$). CSAP-A showed a tendency to improve the total scores for self-protective attitudes while using SNS ($F(1,383) = 3.31, p = 0.06$). In addition, the satisfaction with the way in which the information was presented was significantly higher in the intervention group than in the control group.

Conclusions: The results suggest that CSAP-A may be useful in helping elementary school children develop self-protective attitudes during routine activities and increase the satisfaction of learning about such attitudes.

Keywords: elementary student, sexual abuse, prevention, application, social networking services

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I Introduction

1. International definition of sexual violence

Sexual violence, defined as ‘any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic or otherwise directed against a person’s sexuality using coercion, by any person regardless of their relationship to the victim, in any setting, including but not limited to home and work’¹⁾. Their alarming prevalence must mobilize all our attention: approximately 8–10 % of men and 20–25 % of women worldwide have been victims of sexual abuse before they reached the age of 18 years old in 2012, child sexual abuse (CSA) is a public health problem of epidemic proportions worldwide²⁾. Among children, these consequences of sexual violence on individual health are particularly numerous, often pervasive³⁾. In 2023, Chopin et al. showed that developmental Adverse Childhood Experiences (ACEs) trajectories were associated with sexual violence history among individuals involved in sexual offending; the exposure to sexual violence appears during early adolescence with a peak in frequency at age 12 years⁴⁾. This suggests that sexual violence prevention education should take place before the age of 12.

2. Actual condition of CSA and prevention in Japan

In Japan, the number of arrests for child abuse increased from 521 in 2012 to 2,171 in 2022, and during the same period, the number of arrests for CSA increased from 112 to 359⁵⁾. In terms of the number of recognized crimes in which boys were the victims in 2022, 704 of the total 2,087 boy victims of sexual assault and 216 of the total 689 boy victims of rape were 12 years old or younger⁶⁾. From 2012 to 2022, the increase in the number of children using smartphones resulted in an increase in the number of children victimized by crimes linked to social networking services (SNS), including child prostitution, child pornography, sexual assault, and rape, from 1,076 to 1,732⁶⁾. However, in Japan only a small number of perpetrators of such crimes are arrested because it is difficult to prove that victims were in fact coerced; to improve this situation.

The widespread school closures in 131 countries due to the COVID-19 pandemic posed additional challenges for implementing and evaluating school-based CSA prevention programs⁷⁾. Sexual violence also increased in Japan because of school closures, so from 2020

onwards, the Ministry of Education, Culture, Sports, Science, and Technology, Cabinet Office, Ministry of Health, Labor, and Welfare, and National Police Agency started promoting the “policy of strengthening measures against sex crimes and sexual violence⁸⁾.” In addition, these bodies began implementing a child sexual assault prevention plan through life safety education, which provides education in elementary, junior high, and high schools nationwide to help students avoid becoming perpetrators, victims, or bystanders of sexual crimes and sexual violence and aims to enhance education by taking into account the developmental stages of children⁸⁾.

To date, few empirical studies have evaluated sexual violence prevention education in Japan. The principal researcher of one regional study recommended strengthening information and communication technology-based learning as a method for educating junior high school students in the prevention of and response to sexual violence from close associates, persons in the local community, or online⁹⁾. The education program used web-based learning and was shown to help prevent sexual violence among junior high school, high school, and college students in Japan¹⁰⁾.

In Japan, no effective programs exist for sexual violence prevention in elementary school students. In 2019 to 2021, school closures caused by the COVID-19 pandemic accelerated the distribution of tablets or personal computers for home study to elementary school students nationwide, and the percentage of children in Japan using the internet increased¹¹⁾. In 2022, the Cabinet Office reported that 68% of elementary school students used smartphones¹¹⁾. Therefore, there is an urgent need for education targeting elementary school students in Japan that aims to prevent sexual violence, including sexual violence associated with SNS.

3. International prevention of CSA

In the USA, CSA prevention efforts have largely consisted of school-based programs, and almost 90% of elementary school districts offer such prevention training¹²⁾. Despite the prevalence of these programs, little rigorous research has evaluated their efficacy¹²⁾. One study in the USA found that second- and third-grade elementary students benefited from knowledge of inappropriate touch provided by a school-based, one-time CSA prevention program¹³⁾. However, to date the studies have not evaluated prevention education on SNS-associated sexual violence. In their 2021 article Unpacking School-Based Child Sexual Abuse Prevention

Programs until 2020: A Realist Review, Lu et al. did not mention any program that used an application to reinforce self-protective attitudes when using SNS¹⁴). In 2021, Thompson et al. reported on the *Play it Safe!* program for increasing the knowledge and skills of third- to fifth-grade elementary students in the USA in preventing physical and sexual abuse¹⁵). This study included knowledge about and prevention skills regarding sexual violence occurring in association with the use of SNS.

In Asia, findings from a study that examined a mobile application designed for preventing CSA among primary school students in South Korea indicated that program materials presented by using animations and interactive quiz sessions were better received by participants than print-based materials¹⁶). In addition, another study in South Korea reported that a child sexual abuse prevention education program that used a hybrid application based on the self-care theory was effective in elementary fifth-grade students, especially regarding self-protective behaviors¹⁷). Although this study did not include sexual violence occurring in association with the use of SNS, it was a breakthrough study because it demonstrated the effectiveness of an education program with a self-care theory-based hybrid application.

Orem's self-care theory was used as a theoretical framework for this study. We set the core concepts as (a) self-care, (b) self-care demands, (c) self-care ability, and (d) nursing agency¹⁸). Orem's self-care theory shows why humans care for themselves and how they keep their lives healthy by meeting self-care requirements¹⁸). Self-care theory shows why humans care for themselves and how they keep their lives healthy by meeting self-care requisites¹⁸). This consists of activities performed by oneself in order to maintain life and promote individual development and well-being continuously¹⁹).

The child sexual abuse prevention program with an application (CSAP-A) was developed on the basis of self-care theory. Self-care is an individual activity performed for oneself independently. In this study, self-care means the fifth-grade children's acquisition of self-protective attitudes against CSA. We regarded fifth-grade children as individuals having self-care demand against CSA. Self-care ability is an individual's ability to engage in self-care activities. In this study, self-care ability means the students' ability to self-protective attitudes to prevent CSA. Nursing agency helps people to fulfill self-care needs required to maintain and promote well-being. In this study, nursing agency refers to the application of the CSA prevention education using an application. The main focus of this study framework is to achieve health

education that promotes and ensures the children's safety through self-care. In addition to, this study aims to help fifth-graders proactively learn the risks of sexual violence occurring during routine activities or while using SNS and how to obtain support and build a self-protective attitude. To achieve this, CSAP-A is required.

CSAP-A was developed for sexual violence prevention by referring to studies on web-based learning with video materials⁹⁾¹⁰), program materials presented via animations and interactive quiz sessions¹⁵), a program that used a hybrid application and video footage of a puppet show¹⁷), examples of teaching materials for upper elementary school students of the "life safety education²⁰)" by the Ministry of Education, Culture, Sports, Science and Technology. To help students learn knowledge, techniques, and attitudes, CSAP-A also used the Attention, Relevance, Confidence, Satisfaction (ARCS) model (attention, "It sounds interesting"; relevance, "It seems relevant"; confidence, "I think I can do it"; and satisfaction, "I'm glad I did")²¹). The ARCS model was designed to enable students to proactively learn about self-protective attitudes while answering quizzes after watching an animation in which a fifth-grade boy and girl respond to a female narrator. This study used an application, i.e., an operating system that enabled simultaneous cross-platform access between web-based and smartphone-based applications²²). An application can also improve accessibility and be more convenient and is better suited for providing information and education²²).

The present study aimed at applying self-care theories to develop and evaluate a CSAP-A for elementary students in Japan to prevent sexual abuse during their routine activities and while using SNS.

II Methods

1. Participants

Four schools in Japan were selected: two public elementary schools in Prefecture Fukuoka, which has a population of five million or more, and two public elementary schools in Prefecture Saga, which has a population of less than one million by recruitment. In 2022, a control group was selected after obtaining assent from the children and consent from their guardians and school principals; the control group comprised 102 (43.4%) of the 235 fifth-grade children at the four elementary schools. The intervention group was selected in 2023 after obtaining assent from the children and consent from their guardians and school principals; the

intervention group comprised 96 (53.9%) of the 178 fifth-grade children at the four elementary schools. At each of the four schools, we used an experimental pretest/posttest design to evaluate the control presentation and CSAP-A intervention in the children. Before performing the study, we spoke with two fifth-grade children at other public elementary schools, confirmed that they were not aware of sexual victimization related to SNS in Japan. To calculate the sample size, G*Power Version 3.1.7 was used. It required 26 participants in each group to achieve a large effect size of 0.80, power of 0.95, and a significance level of 0.05 for calculation of the Student's *t*-test.

2. Procedure

First, learning materials with illustrations were prepared, and using those learning materials, the investigators provided the control group with lecture-based training in 2022. In the second step, all learning materials were converted into animations, and a quiz-style application was developed. Thus, we created a system suitable for web learning. We had an opportunity to have the intervention group take part in CSAP-A in 2023. **Figure 1** shows the method of this research. The intervention was performed one year after the control presentation because it took us one year to develop the application on the basis of the findings in the control group. In the control group, a session with learning materials was introduced to four elementary schools in June 2022, and the presentation was given in July 2022. In the intervention group, CSAP-A was introduced to four elementary schools in May and June 2023, and the intervention was performed in July 2023. **Table 1** shows the learning objectives and contents of CSAP-A. The address of the application is as follows: <https://www.jrckicn.ac.jp/e-learning2023/> (**Figure 2**).

In the four elementary schools, study guidance flyers for students and information sheets and consent forms for guardians were distributed with the help of special education instructors and fifth-grade teachers. Students who wanted to participate and whose guardian gave consent were asked to come to school during extracurricular activity sessions before summer break or at the start of summer break; the program was performed in children who agreed to participate in the program and the pre- and post-learning survey.

We explained the following aspects to the children: “(1) To ensure that a person who answers a question remains anonymous, please do not fill in your name. (2) The

filled-in sheet of paper will not be disclosed to anyone, including family members and teachers. (3) Even if you do not take part in the learning program, and regardless of whatever information you provide, your school grades will not be affected. (4) Results will be summarized and presented in a numerical manner, for example, “Children who answered as XX after learning compared to pre-learning increased.” (5) A filled-in sheet of paper will be stored in a lockable cabinet in International College of Nursing laboratory and will be destroyed a decade later. In addition, for learning participation as well as how to ask a question and how to answer a question before and after learning, we explained the following: (1) Whether you take part in the learning program or whether you answer a question before and after the program is entirely up to you. (2) Please answer if you take part in the learning program and/or if you take part in answering a question. After you decide to take part in the learning program or answer a question, you are free to terminate your participation. (3) Questions will be asked before and after the learning program. Please answer once each before and after the learning program. (4) If you do not want to answer or if you do not understand a question, you do not need to answer at all. Please enter O if you are not comfortable to answer. (5) Once a sheet of paper is submitted, it cannot be returned to you. If you are OK with submitting the filled-in sheet of paper, put a sheet of paper for each before and after the learning program in a small envelope and seal it. Then, it should be put into a large white envelope. If you do not want to submit a sheet of paper, please simply put a sheet of paper into a large blue envelope. It will be destroyed without opening. After these explanations were provided, the study was conducted with the children who gave consent to participation in the program and to answering questions before and after.

Both the control and intervention groups were given 15 minutes to respond to the pre-learning paper survey and then received a 60-minute presentation, either from a speaker (control group) or through CSAP-A (intervention group). Students in both groups who responded to the subsequent post-learning paper survey received participation gifts.

Participation was voluntary, and students were free to withdraw their consent during the study. Extra care was taken with the management of data. The study was conducted with approval of the research institution after review by Japanese Red Cross Kyushu International College of Nursing Research Ethics Review Committee (approval number 21-022).

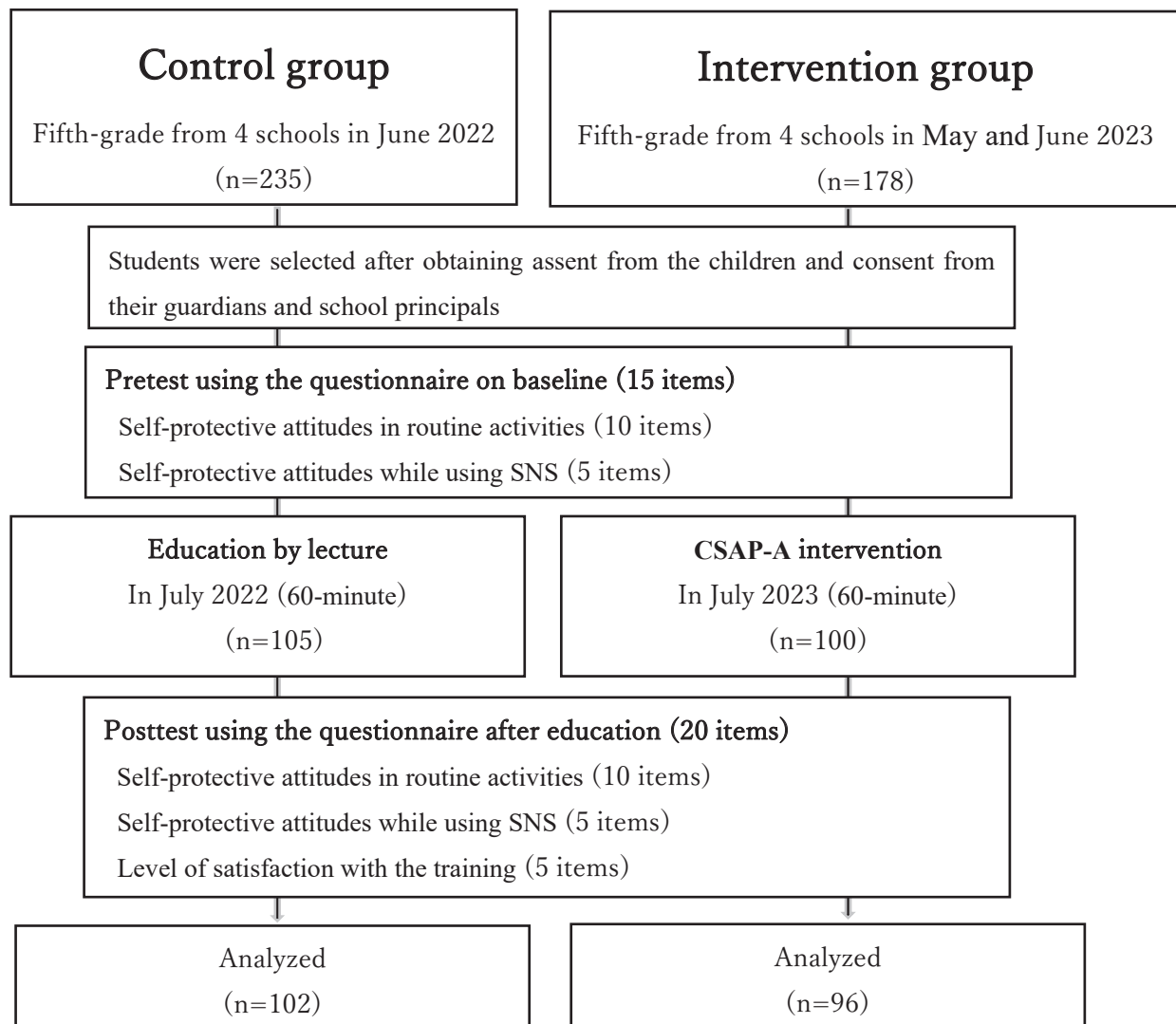


Figure 1 Method of this study.

We assessed the validity of the content. Five experts consisting of two nursing professors, two elementary school nurses, and an expert in Domestic Violence Countermeasures Prevention Center validated each question. The validity test verified that the items used in the study were valid (item-level content validity index; I-CVI = 0.8). In addition, the pretest was given to a boy and a girl in fifth-grade, and the questions were revised based on their opinions.

3. Instrumentation

(1) Self-protective attitudes in routine activities

We created a questionnaire based on self-protective behaviors against CSA¹⁷⁾ and information from the textbook published by the commentary on the health and physical education part of the elementary school curriculum guidelines issued by the Ministry of

Education, Culture, Sports, Science and Technology in Japan²³⁾. Self-protective attitudes in routine activities were measured by using a simulated abuse situation and scored according to the child's response to the situation. Each student's self-protective attitudes in routine activities were queried with multiple-choice questions, with possible scores ranging from 0 to 10. A higher score indicated higher competence in self-protective behavior against CSA. This scale was also not yet validated, but we used it this study due to the lack of available scales. We confirmed that this scale had acceptable reliability among fifth-grade students by pretest (Cronbach's $\alpha = 0.70$). Table 2 shows the questions of self-protective attitudes in routine activities.

(2) Self-protective attitudes while using SNS

From the 14 questions regarding self-protective attitudes (Cronbach's $\alpha = 0.77$) in sexual violence

Table 1 Learning objectives and contents

Session	Learning objectives	Learning topic
1 20min	Learn about diverse sexuality	Sexuality of body, sexuality of mind, sexual orientation, LGBT Everyone should be respected as a human being, regardless of their sexuality
	Learn about changes in the body and mind	Development of a child born as a member of a family Changes in male and female bodies
	Learn about private parts	Private parts include the mouth, breasts, genitals, and buttocks that is connected inside the body. They are vital parts of the body Promises for protect private part
	Learn to value own body and mind in routine activities	According to statistics, elementary school students may become victims Value oneself in relationships with friends of opposite/same sex Value oneself in relationships with family in routine activities
	Review the information	Summary of the knowledge section
	Learn about actions to take in dangerous situations in routine activities	Say no to what you don't want Scream loudly or make a loud noise to get help and run away Let a trusted adult know
2 40min	Learn ways to protect yourself in dangerous situations	While alone at home While taking an elevator alone While taking a train or riding a bus While walking on a street While playing in a park
	Learn how to call for help	Where to call for help Whom to call for help
	Learn about the dangers of using social networking services	Dangers of distributing pictures/videos taken with your friends and how to deal Dangers of being connected with people you met online and how to deal Dangers of engaging with strangers in online gaming and how to deal Dangers of people you have been connected to through social media for over one year and how to deal with the dangers Do not send pictures or videos to other people and do not meet them Say no if you don't like what someone asks for Let a trusted adult know
	Review the lecture	Summary of the attitude section

prevention created by Thompson et al.²⁴⁾, we selected and used those on self-protective attitudes when using SNS that were appropriate for Japanese culture; in addition, we created five questions to fit the situations of elementary school students in Japan. The questions asked about behaviors in dangerous situations when using social media, among other things. Students were asked to select one out of four choices, and the possible

score ranged from 0 to 5. A higher score indicated higher capacity for self-protective attitudes towards sexual violence related to SNS use. We confirmed that this scale had acceptable reliability among fifth-grade students by pretest (Cronbach's $\alpha = 0.68$). **Table 2** shows the questions of self-protective attitudes while using SNS.

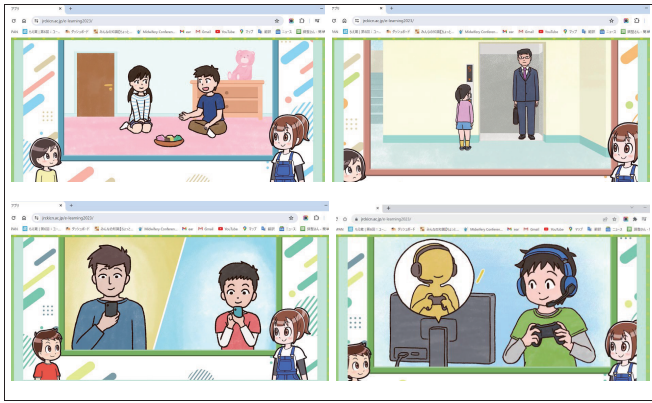


Figure 2 Screenshots of applications

The top two screenshots are learning contents for self-protective attitudes in routine activities.

The bottom two screenshots are learning contents for self-protective attitudes when using social networking services.

(3) Level of satisfaction with the training

At the end of the control presentation and CSAP-A intervention, we assessed participants' level of satisfaction with the training and gathered feedback. The scale for assessing satisfaction consisted of five items each of which was scored on a four-point Likert-type scale (1, not at all; 2, a little; 3, moderately; 4, very)¹⁷⁾. Participant satisfaction with five items was evaluated: Are you interested in this training? Was the duration of training appropriate? Could you understand the content of the training? In case you experience a harassment situation, are you now confident to take safety actions? If you are at risk, do you consult a trustworthy adult? This scale was also not yet validated. We confirmed that this scale had acceptable reliability among fifth-grade students by pretest (Cronbach's $\alpha = 0.77$).

4. Data analysis

Analyses were performed with SPSS for Windows Version 28.0. (IBM Japan, Tokyo, Japan) Two-way ANOVA was employed to assess whether there was a significant interaction between measures of the effect of intervention between the pretest and posttest stratified by each question item of self-protective attitudes of the control and intervention groups during routine activities and while using SNS. Two-way ANOVA was employed to assess whether there was a significant interaction between measures of the effect of intervention between the pretest and posttest stratified by the total score of self-protective attitudes of the control and intervention groups during routine activities and while using SNS. A Student's *t*-test was used to compare the difference

in each question item for level of satisfaction with the training. The level of significance was set at $p < 0.05$.

III Results

Table 2 shows the significant interaction between pretest/ posttest and CSAP-A group /the control group with respect to three question items among ten questions items for self-protective attitudes during routine activities; What should you do if a delivery person asks you to open the front door when you're alone at home? ($F(1,392) = 3.94, p = 0.05$), What should you do if you're about to enter an elevator and there's a stranger alone inside the elevator? ($F(1,392) = 4.15, p = 0.04$), Which of the following is wrong when you're trying to avoid danger? ($F(1,389) = 4.42, p = 0.04$).

In addition, a significant interaction was found between the pretest/ posttest and the CSAP-A group / the control group with respect to a question item among five questions items for self-protective attitudes while using SNS; Which of the following is not true about social media? ($F(1,382) = 4.13, p = 0.04$).

Table 3 shows a significant interaction between pretest/ posttest and CSAP-A group /the control group with respect to the total scores for self-protective attitudes during routine activities ($F(1,391) = 4.68, p = 0.03$). CSAP-A showed a tendency to improve the total scores for self-protective attitudes while using SNS ($F(1,383) = 3.31, p = 0.06$).

Table 4 shows the post-learning scores for the levels of satisfaction with learning in the control and intervention groups. Overall, we found a significant difference in the total score of the five items. Among the individual items, only the confidence to cope was significantly different between the two groups.

IV Discussion

During the COVID-19 epidemic, many elementary schools in Japan provided tablets to students so that they could study at home, so the number of children using tablets or smartphones increased¹¹⁾. We examined the development and efficacy of an application that reinforces self-protective attitudes when using SNS and also evaluated self-protective attitudes in the routine activities included in CSA prevention education to date.

1. Self-protective attitudes in routine activities

In this study, the students who participated in the

Table 2 Two-way ANOVA for the differences of the variables according to the interaction between pretest/posttest or intervention/control and each item of self-protective attitudes

Self-protective attitudes in routine activities	Intervention (n = 96)	Control (n = 102)	Intervention -Control×	
	Pretest Posttest <i>M (SD)</i>	Pretest Posttest <i>M (SD)</i>	Pretest- Posttest <i>F</i>	<i>p</i>
1.What should you do if a delivery person asks you to open the front door when you're alone at home? - Open the front door and ask the delivery person to leave the package outside. ° Call your parents without opening the front door. - Open the front door and ask the delivery person to come back when an adult is at home. - Open the front door, give the delivery person your parents' phone number, and ask the person to call your parents.	0.58 (0.49)	0.55 (0.50)	3.94	0.05
2.Which of the following is the wrong way to behave when trying to avoid danger? - Lock all the windows and the front door when you're alone at home. - Never open the front door when you're alone at home, even if the doorbell rings. ° When visiting a friend's house, if the friend isn't there, you should go inside and wait. - Tell a trusted adult if anyone, even someone you know, touches your private parts.	0.76 (0.42)	0.83 (0.37)	1.09	0.30
3.What should you do if you're about to enter an elevator and there's a stranger alone inside the elevator? ° Don't get on the elevator and move away from it. - Enter the elevator and introduce yourself. - Enter the elevator and immediately press the emergency bell inside the elevator. - Tell the stranger: "I'm getting on, so please get off."	0.80 (0.39)	0.89 (0.32)	4.15	0.04
4.Which of the following is wrong when riding a train? - You should ride the train with your family or your friends. ° You can sit on a stranger's lap on the train if he or she lets you. - Yell loudly if another person on the train gets very close to you. - Have a safety buzzer with you when you ride the train.	0.84 (0.37)	0.81 (0.39)	0.23	0.63
5.What should you do if you're walking down the street alone and a stranger starts talking to you? - If a stranger says, "I'll give you some money," and you need money, you should take it. - If a stranger stops a car and asks for directions, you should walk up to the stranger's car and give him or her directions. ° If a stranger in a car says, "I'll give you some food," you should say no. - If a stranger says, "Your father has been taken to the hospital, so I'll drive you to the hospital," you should get in the car.	0.86 (0.35)	0.88 (0.32)	0.18	0.68
6.What should you do if a stranger comes up to you and says, "I'm your mother's friend. I'll buy you some candy, so let's go to the store together"? - Be happy and follow the stranger. - Check whether the candy is something you like, and then follow the stranger. ° Tell the stranger, "I'm not going with you." - Follow the stranger while talking about your mother.	0.95 (0.22)	0.98 (0.13)	0.09	0.76
7.What should you do if something dangerous happens to you on your way home from school? - You should stand there and cry. ° You should run to a place where there are a lot of people. - If you have a bag or other things in your hands, you should hold on to them tightly.- You should hit the person with something.	0.85 (0.36)	0.85 (0.35)	0.09	0.77

8.What should you do if a stranger tries to touch you in a park? - You should stand still on the spot.- You should throw things at the stranger. ◦ You should run away immediately. - You shouldn't tell anyone.	0.93 (0.26) 0.97 (0.17)	0.94 (0.23) 0.98 (0.14)	0.01	0.96
9.What phone number should you call if something dangerous is about to happen? - 112 without an area code.- 131 without an area code. ◦ 110 without an area code.- 134 without an area code.	0.95 (0.22) 0.98 (0.14)	0.96 (0.19) 0.98 (0.14)	0.10	0.75
10.Which of the following is wrong when you're trying to avoid danger? ◦ If someone asks you to keep a secret, you should. - You should know which people can help you. - You should find out about safe places to go on the way from your home to school. - You should tell your parents or a trusted adult when you leave home.	0.56 (0.49) 0.94 (0.24)	0.62 (0.48) 0.86 (0.35)	4.42	0.04
Self-protective attitudes when using social networking services				
1.Which of the following is the right approach when taking a photo with a friend? - It's okay to take any kind of photo if it's with a friend. - It's okay for a friend to have a photo with your face in it. ◦ You should ask your friend not to take a photo with your face or body in it. - If it's a good photo, it's okay to post it on social media.	0.72 (0.45) 0.96 (0.20)	0.71 (0.45) 0.90 (0.30)	0.39	0.54
2.Which of the following is not true about social media? - People may know your name. - People may know your address. - People may know where you go to school. ◦ Information can be deleted once it's been posted.	0.67 (0.47) 0.93 (0.26)	0.79 (0.40) 0.91 (0.29)	4.13	0.04
3.Which of the following is the right way to interact with a person you first met on social media? - Send a message. ◦ Talk to an adult if you think something is odd. - Send them a photo. - Meet them in person.	0.93 (0.25) 0.97 (0.17)	0.95 (0.21) 0.96 (0.19)	0.43	0.51
4.A friend you met through an online game says, "We go to the same elementary school and are the same age" and "I want to hang out with you, so tell me where you live." Which of the following is true about this friend? - It's okay to play together at home because we live near each other. - We go to the same elementary school, so it's safe. - We're the same age, so we get along. ◦ The friend could be lying	0.94 (0.23) 0.99 (0.10)	0.97 (0.17) 0.99 (0.10)	0.68	0.41
5.Which of the following is the right way to interact with someone you've been emailing for over a year? - It's okay to meet someone you've been emailing for over a year because they're like a friend. - It's okay to send the other person a photo of you naked. ◦ It's not okay to receive a naked photo of the other person. - It's okay to send a photo of your body as long as it doesn't show your face.	0.82 (0.38) 0.99 (0.10)	0.78 (0.41) 0.95 (0.22)	0.01	0.94

F=the interaction between the pretest/ posttest and two intervention surveys was analyzed by two-way ANOVA

CSAP-A presentation of the information had significantly higher post-learning scores for self-protective attitudes in routine activities than the students who received the information as a conventional lecture (control group). Similarly, in studies with mobile applications¹⁶⁾ and hybrid applications¹⁷⁾ performed in South Korea, the scores for self-protective attitudes in routine activities were significantly higher in the group that received

information via an application than they were in those who received a conventional lecture. For children who are used to studying with a tablet or smartphone these days, studying at an individual pace by using applications is considered to be an effective approach. Lu et al. also wrote that 18 included studies identified interactive delivery approaches as being important factors that influence whether the intended outcomes were

Table 3 Two-way ANOVA for the differences of the variables according to the interaction between pretest/posttest or intervention/control and the total scores of self-protective attitudes

	Intervention (n = 96)		Control (n = 102)		Intervention- Control× Baseline-After	
	Pretest	Posttest	Pretest	Posttest	<i>F</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>		
The total of self-protective attitudes in routine activities	8.06 (1.60)	9.40 (1.08)	8.32 (1.54)	9.05 (1.31)	4.68	0.03
The total of self-protective attitudes when using social networking services	4.09 (0.96)	4.84 (0.37)	4.21 (0.91)	4.67 (0.68)	3.31	0.06

F=the interaction between the baseline/after and two intervention surveys was analyzed by two-way ANOVA

Table 4 Students' level of satisfaction with the child sexual abuse prevention learning program with an application and the control lecture

	Intervention (n = 96)	Control (n = 102)	<i>t</i>	<i>p</i>
	<i>M (SD)</i>	<i>M (SD)</i>		
Inducement of interest	3.57 (0.73)	3.46 (0.64)	1.08	0.28
Helpfulness	3.57 (0.66)	3.40 (0.63)	1.85	0.07
Well-understood	3.68 (0.55)	3.52 (0.62)	1.92	0.06
Confidence to cope	3.31 (0.66)	2.96 (0.71)	3.54	<0.01
Applicability	3.65 (0.56)	3.65 (0.57)	0.03	0.98
Total	17.77 (2.20)	16.95 (2.05)	2.73	0.01

t=*t* value of mean difference

achieved¹⁴⁾. In this study, the number of Japanese children who successfully demonstrated self-protective behaviors increased, particularly in everyday situations where they were alone at home, about to enter an elevator, and in other actions to avoid danger. This is because, although they were unaware of dangers in everyday life before the learning program, learning through the two-way approach application allowed them to visualize dangers and improve their attitudes.

In the present study, the students who received the information via CSAP-A also had significantly higher post-learning satisfaction scores than the control group both overall and for the item *confidence to cope*. We suggest that watching the animation and learning about possible dangers in everyday life, together with the use of an animated video in which a fifth-grade boy and girl who were learning about the dangers together gave responses

to the narrator, helped the students empathize with the animation characters. Our findings suggest that the use of an application is effective in increasing the interest of elementary school children. Kang et al. reported that an education program that used video footage of a puppet show for sexual violence prevention had more effect on self-protective attitudes in routine activities than text-only materials¹⁷⁾. It is difficult for children to imagine the danger of sexual violence occurring around them, but the use of sexual violence-related material that easily holds children's attention, such as puppet shows, illustrations, and animations, is assumed to make it easier for children to understand sexual violence and think of ways to protect themselves. Applications with animations and quizzes were also shown to help children acquire knowledge for self-protection¹⁷⁾. In our study, the use of an application designed for students to proactively learn

from the application and subsequent quizzes also had a beneficial effect on their attitudes towards protecting themselves.

In 2020, the health and physical education part of the elementary school curriculum guidelines was revised in Japan, but sexual violence prevention was not included in study contents for any of related subjects, including moral education²⁵). Upper elementary school children aged 9 or older are able to objectify and perceive things to some extent, to analyze things by considering the subject from a distance, and to pursue things by more differentiated methods in intellectual activities²⁶). Therefore, we believe that after watching the animation in CSAP-A, the students could easily imagine the dangers that may occur in everyday life and build a self-protective attitude while answering quizzes even on things they had not yet learned about. The National Police Agency, Cabinet Office, Ministry of Education, Culture, Sports, Science and Technology, and other relevant ministries and agencies promote prevention education for infants to college students with the cooperation of local people so that children will not become perpetrators, victims, or bystanders. Studies have evaluated the use of applications that can be used for children aged younger than 9 years¹⁶), so programs for lower-grade students can now be developed on the basis of the findings. There is also a need to establish awareness activities and consulting systems for special education instructors, class teachers, parents, and local residents to whom children may talk immediately after experiencing sexual violence by someone close to them.

2. Self-protective attitudes while using SNS

In this study, the students who received the information via the CSAP-A tended to improve self-protective attitudes when using SNS more than those who received a conventional lecture. Another study examined the role of technology in the perpetration of in-person childhood sexual abuse and found that only 8.5% of the sample reported that they met the perpetrator online through SNS, chatrooms, and other online applications²⁶). When looking at the role of technology in the perpetration of the abuse, 35% of participants reported texting with the perpetrator, 27% reported engaging in online chats, and 33% spoke to the perpetrator on the phone²⁶). In Japan, the number of children victimized by the posting of sexual videos is also increasing⁶).

As mentioned in the Methods section, after speaking with two students before the study we assumed that

most of the students in our study were not aware of sexual victimization related to SNS before the lecture, and our findings suggest that by using the application, they proactively learned how to prevent sexual violence and improved their self-protective attitudes when using SNS. In this study, the number of Japanese children who successfully demonstrated self-protective behaviors increased, particularly can be not deleted once it's been posted when using SNS. Our results indicate that the students were able to imagine the dangers of SNS through the application-based learning and that the quizzes increased their interest in the topic. The animation that depicted cases occurring during the use of SNS helped the students to learn the dangers of SNS and let them build their self-protective attitudes. We believe that the information in the application helped those who were not aware of the dangers of SNS, such as sending pictures and videos, to imagine these dangers and improve their self-protective attitudes when using SNS. At the same time, we assume that by using the application, the information was easy for those who had never used SNS to imagine what SNS is while they watched the animation for an hour during the study intervention and later at their own pace. Cronbach's α of Self-protective attitudes by SNS scale was somehow low. Hence, it is slightly difficult to claim that significant intervention effects were observed. In the future, a careful review of Self-protective attitudes using the SNS scale will be necessary for the evaluation methods for the intervention.

The Cabinet Office reported that the percentage of children who use the internet has increased, and 68% of elementary school students use smartphones¹¹). Considering that nearly 100% of junior high students and high school students own smartphones and elementary school students are highly likely to use SNS soon, we need to improve children's self-protective attitudes when using SNS. Therefore, the number of upper elementary school students who use of sexual violence prevention learning applications must be increased. There is also a need to develop sexual violence prevention programs for younger children and to conduct studies to expand the target population.

V Limitations

This study has several limitations. First, we included only fifth graders in two regions in Japan. Future studies need to include more participants from various regions. Second, the study did not include a control group of students who had never received sexual

violence prevention education or who received web-based education with different contents. Because the elementary schools agreed to cooperate with only one assessment survey before presentation of the information and one immediately afterwards, we could not measure the students' behavior at a later date. Cronbach's α of Self-protective attitudes by SNS scale was shown to be slightly low. Since no alternate SNS scale was suitable for elementary school children, this scale was adopted anyway. For a future study, we will revisit Self-protective attitudes by SNS scale before use. Self-protective attitudes while using SNS Future studies need to evaluate applications with games that help elementary school students from lower grades learn about prevention of childhood sexual abuse.

VI Conclusions

The results suggest that CSAP-A may be useful to help elementary school children develop self-protective attitudes during routine activities and that learning satisfaction is higher with an application-based program than with a conventional lecture.

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IX Competing interests

The authors declare that they have no competing interests.

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