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The effect of nurse-led body protection education on the sexual abuse knowledge levels of students with visual impairments: a randomized controlled trial

Esma Akgul[1*] and Ayse Ergun[2]

Abstract

Background Sexual abuse is a significant public health issue, particularly during childhood, with profound negative effects on children, families, and society. Children with visual impairment face a heightened risk of abuse due to their reliance on tactile perception to navigate their environment and their limited ability to discern appropriate from inappropriate touch. This study aimed to evaluate the impact of nurse-led body protection education on the sexual abuse knowledge levels of students with visual impairments.

Methods A randomized controlled trial with pre-test, post-test, and follow-up test was conducted. Fifty-three students with visual impairments were randomly allocated to the intervention group ($n=27$) or the control group ($n=26$). Data were collected using the Children's Knowledge of Abuse Questionnaire – Revised, at three points: two weeks before the education, two weeks after the education, and two months post-education. The intervention group received nurse-led body protection education in small groups (3–4 students) during 40-minute sessions. The education utilized verbal explanations, a doll, and a distress whistle. Two weeks after the post-test, a reminder brochure prepared in Braille was distributed to the intervention group.

Results The intervention group demonstrated significantly higher post-test and follow-up scores in the "good touch" and "bad touch" subdimensions compared to the control group ($p<.05$). Additionally, their post-test and follow-up scores were significantly higher than their pre-test scores ($p<.05$).

Conclusions Nurse-led body protection education effectively improved the sexual abuse knowledge levels of students with visual impairments. This intervention can be feasibly implemented among students with visual impairments to enhance their awareness and protective skills.

Trial registration It was retrospectively registered at ClinicalTrials.gov (https://clinicaltrials.gov/study/NCT06497803) on July 12, 2024 (NCT06497803).

Keywords Children, Child sexual abuse, Experimental, Health education, Nursing, Prevention, Visual impairments

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Background

Sexual abuse is a significant public health concern that predominantly affects children, leading to profound negative consequences for individuals, families, and society as a whole [1–3]. Global estimates indicate that approximately 12% of the child population has experienced sexual abuse, with the highest prevalence reported in Africa and the lowest in Europe [3, 4]. Although comprehensive statistical data on child abuse in Türkiye are lacking, a report by End Child Prostitution, Child Pornography, and Trafficking of Children for Sexual Purposes (ECPAT) ranks Türkiye 18th out of 60 countries, with a score of 56.7 in terms of child abuse and exploitation [5].

Children with visual impairments face unique vulnerabilities that may further increase their risk of experiencing abuse. The loss of sight in these children often leads to a greater reliance on tactile perception to navigate their environment [6]. While this sensory adaptation facilitates environmental interaction, it also poses a risk—making it harder for children to distinguish between appropriate and inappropriate physical contact [7, 8].

Numerous studies have highlighted the increased susceptibility of children with disabilities to abuse, reporting that they are four times more likely to be victimized compared to their non-disabled peers [9–13]. Specifically, children with visual impairments are often more dependent on self-care, less capable of evaluating their situations [4], and less responsive in crisis. They also face greater difficulty in identifying perpetrators of abuse [14]. According to a scoping review, disability not only increases the risk of sexual abuse but also correlates with longer duration and greater severity of abuse [15]. Therefore, children with disabilities—especially those with visual impairments—require heightened protection from sexual abuse [16].

Preventive education, particularly in the area of body safety, plays a vital role in reducing this risk among children with visual impairments, who are recognized as a high-risk group [17, 18]. Experts recommend that such education be integrated throughout all grade levels—from kindergarten through 12th grade—with particular emphasis on primary and secondary education as optimal periods [19–21]. However, research on sexual abuse prevention in Türkiye remains limited. Existing programs are often based on Body Safety Training (BST), a prevention model originally developed by Wurtele in 1986 and revised in 2007 [22]. Akgül et al. (2021) implemented the Nurse-Led "I Am the Hero of My Body" program, based on BST principles, for fourth-grade students and found it effective in raising awareness [23]. Similarly, Çıtak-Tunç et al. (2018) utilized the BST Educators Workbook with preschool students, successfully enhancing their knowledge and skills in body safety [2].

Nurses hold a critical role in the protection of children from potential risks. They are instrumental in promoting health, delivering education, and implementing protective interventions [10, 24–26]. With their ability to identify and access high-risk groups, nurses are key stakeholders in the prevention of sexual abuse, serving as educators, advocates, and protectors [25, 27].

Research aim

This study aimed to evaluate the effectiveness of the Nurse-Led Body Protection Education Program (NLBPE), which was developed in accordance with Body Safety Training (BST), Safe Touches, and educational tools recommended in the literature, on the sexual abuse knowledge levels of students with visual impairments.

Research hypothesis

H1

The sexual abuse knowledge scores of the intervention group are hypothesized to be significantly higher than those of the control group after receiving nurse-led body protection education.

Methods

Research type

The study was designed as a randomized controlled trial with pre-test, post-test, and follow-up assessments. This study was reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines to ensure transparency and completeness in the presentation of its methodology and findings [28].

Study registration and protocol

This study was registered in ClinicalTrials.gov (NCT06497803). A detailed study protocol outlining the objectives, methodology, and ethical considerations was prepared prior to data collection and approved by the ethics and institute board.

Research population and sample

The sample consisted of 105 students attending a school for the visually impaired. A power analysis was conducted to determine the appropriate sample size based on the Good Touch and Bad Touch subdimensions. The analysis indicated that a minimum sample size of 48 students (24 in the intervention group and 24 in the control group) was required to achieve statistical significance ($\alpha = 0.01$, $\beta = 0.2$). The power analysis for this study was conducted based on the following parameters: For the Good Touch subdimension, the expected mean score was 6.50 ± 0.50 for the intervention group and 7.00 for the control group, with a statistical power of 0.80. For the Bad Touch subdimension, the expected mean was 10.05 ± 1.00 for the

intervention group and 11.00 for the control group, also with a power of 0.80.

The inclusion criteria were: (1) being a student with a visual impairment, (2) providing informed consent to participate in the study, and (3) the ability to communicate in Turkish. The exclusion criterion was having both a visual impairment and an additional mental disability.

The parents of all 105 students attending the school were informed about the study and provided with consent forms. Fifty parents did not approve their children's participation, one student declined to participate, and one student who could not speak Turkish was excluded from the study.

Randomization and blinding

Due to limited class sizes and the unequal distribution of gender among students, as well as differences in the number of participants with parental consent in each classroom, randomization was performed at the individual level rather than the classroom level.

Following the administration of the pre-test to 53 students who met the inclusion criteria and had parental approval, the data were entered into the SPSS statistical software. The second researcher used the "Select Cases – Random Sample of Cases" function to randomly assign students into two equal groups (50%). The groups were coded as A ($n=27$) and B ($n=26$). Subsequently, the groups were compared to ensure similarity in terms of socio-demographic characteristics and baseline scale scores.

While the first researcher administered the educational sessions and assessments (pre-test, post-test, and follow-up), steps were taken to minimize bias. Specifically, all data were anonymized using group codes (Group A and Group B) prior to statistical analysis. The statistician conducting the analysis was blinded to the group assignments to reduce potential bias (Fig. 1. CONSORT flow diagram).

Research location and date

The study was conducted at a school for students with visual impairments in Istanbul, Türkiye, between October 2021 and January 2022.

Data collection tools

Study data were collected using the Sociodemographic Characteristics Form and the Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R). In this study, the focus was specifically on measuring the knowledge component rather than practices or skills. This decision was made due to the developmental characteristics of the target population and the short duration of the intervention. Knowledge acquisition is considered the foundational step in behavior change, particularly in younger students, and serves as a necessary precursor to skill development. Moreover, the educational intervention was designed to raise awareness and improve understanding of body safety concepts, which is essential before any attempt to assess behavioral practices or skills.

Sociodemographic characteristics form

The form consists of six questions regarding the students' age, gender, household members, parental education levels, and any prior education on body protection.

Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R).

The scale was initially developed by Tutty in 1992 and revised in 1995 [29]. The Turkish adaptation of the scale was conducted by Yilmaz and Cenkseven-Onder in 2020. The Turkish version consists of 30 items divided into two subdimensions: "Good Touch (GTS)" and "Bad Touch (BTS)." Eight items (1, 3, 8, 17, 20, 25, 27, and 30) belong to the Good Touch subdimension, while 22 items are categorized under the Bad Touch subdimension. The responses to each item are recorded as Correct, Incorrect, or Don't Know. Ten items on the scale (2, 10, 11, 14, 18, 21, 24, 26, 28, and 29) are reversely coded. In the analysis, these reversely coded items are adjusted, and "correct" answers are assigned 1 point, while "incorrect" and "Don't Know" responses receive 0 points. The minimum possible score is 0, and the maximum score is 30, with higher scores indicating a higher level of knowledge. The reliability coefficient of the scale is KR21 = 0.74 [30].

Considering the students' visual impairments, the researcher provided additional explanations for the concepts of "acquaintance" and "stranger" related to item 2 ("You can always tell who the strangers are because they look bad") and item 13 ("Strangers look like ordinary people"). Examples were given to clarify these concepts, explaining to the students that "not all strangers are people who speak badly or look bad. Even those who speak kindly and appear nice can still be strangers if you do not know them."

Data collection

Data were collected during the fall and spring semesters of the 2021–2022 academic year through face-to-face interviews conducted in an interview room located on the same floor as the classrooms. The students were escorted from their classrooms to the interview room individually by the researcher, who read the questions aloud. All responses were recorded based on the students' self-reports. The Sociodemographic Characteristics Form and the Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R) were used as pre-tests.

Two weeks after the pre-test, nurse-led body protection education was delivered to the intervention group.

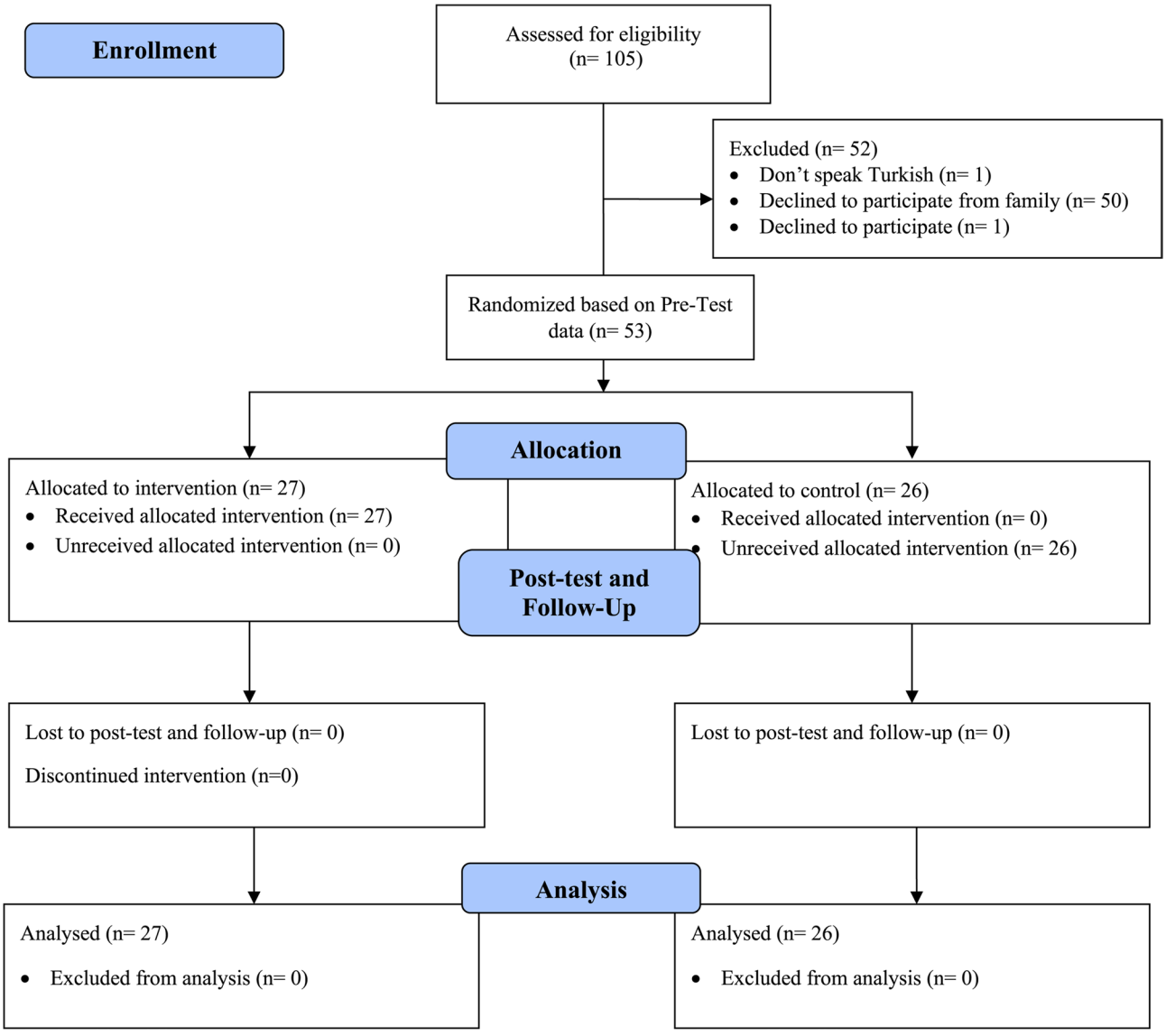

Fig. 1 Consort flow diagram

Following the education, the CKAQ-R was administered as a post-test. Two weeks after the post-test, a Reminder Education Brochure, prepared in Braille, was distributed to the students in the intervention group, who were instructed to review it at home with their families. A follow-up test was administered six weeks after the post-test. After the follow-up test, the control group also received nurse-led body protection education. The research process is outlined in Fig. 2.

Intervention- nurse-led body protection education (NLBPE)

Scientific dimension and content of the education

No body protection education program specifically aimed at preventing sexual abuse among individuals with visually impaired was found in the literature. Therefore, based on the Body Safety Training (BST) and Safe Touches education programs, and in line with studies conducted with children who do not have visual impairments, the Nurse-Led Body Protection Education (NLBPE) program was created by the researchers [2, 21–23]. Children with intellectual disabilities, in addition to visual impairments, were excluded from the study. The research sample consisted of students with visual impairments without communication problems. As such, the content of body protection education designed for non-visually impaired children served as the foundation for the education in this study.

NLBPE consists of the following topics: "We know our body," "We know bad touches on our body," "We protect our body from bad touches," and "We know what to do when we are exposed to bad touches." The program's content covered body parts, the distinction between good

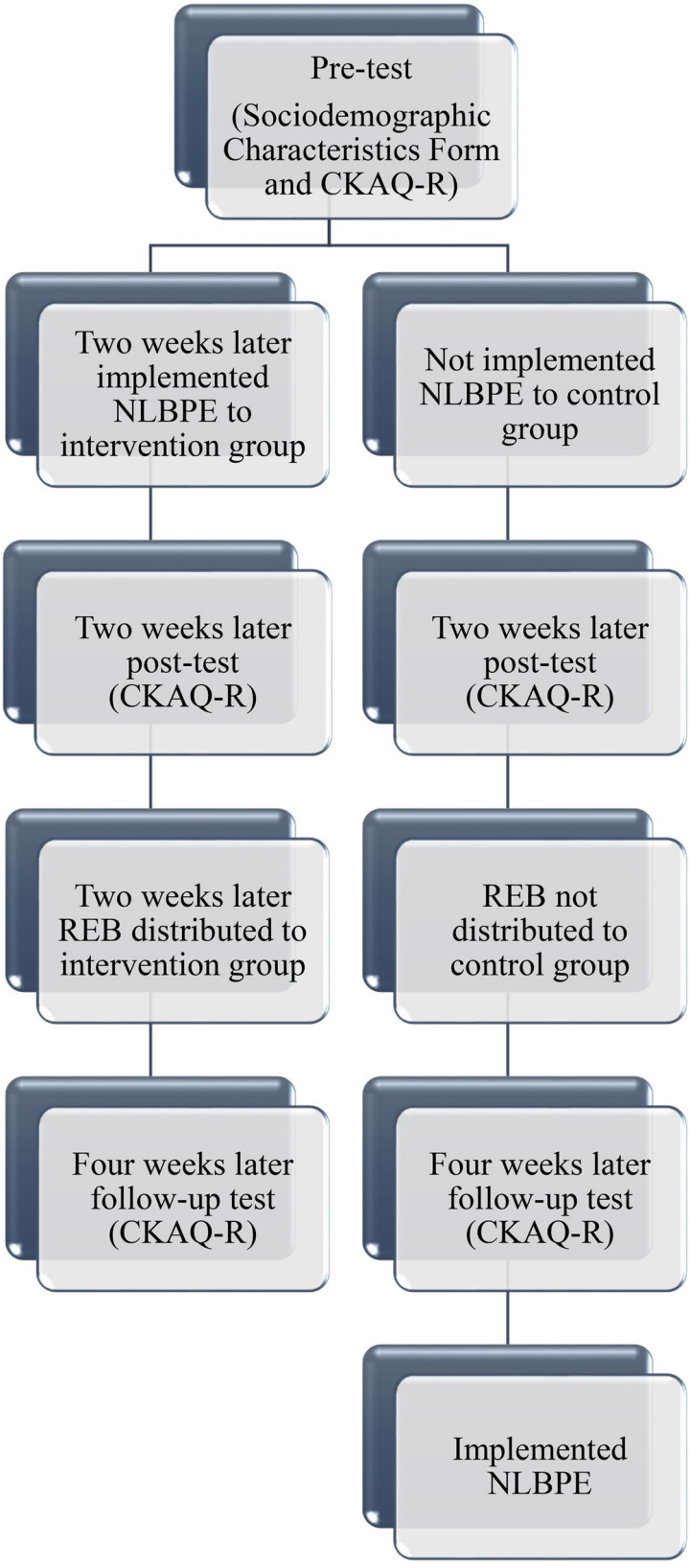

Fig. 2 Research process (CKAQ-R: Children's Knowledge of Abuse Questionnaire-revised, NLBPE: Nurse-led Body Protection Education, REB: Reminder Education Brochure)

and bad touches, examples of both, the understanding that bad touches are harmful secrets that should not be kept hidden, and the appropriate actions to take when encountering bad touches.

Purpose of the education

The program aims to teach children with visual impairment how to protect the private parts of their bodies, distinguish between good and bad touches, recognize the difference between good and bad secrets, and how to say no, scream, and ask for help when necessary.

Education process

NLBPE was delivered to the intervention group in groups of 3–4 students by the first researcher in the school's individual education classroom. The educational program was delivered through verbal narration, with each session lasting 40 min. A total of seven sessions were held, with each session conducted for the entire intervention group. Each student participated in a single session, ensuring that all students in the intervention group received the same educational content. These sessions were spaced out over a period of time to allow for effective delivery and comprehension. The first researcher holds a certification in practitioner training on body safety for preventing sexual abuse.

Dolls and distress whistles were used as educational tools. To help the children learn about the private parts of their bodies, a doll was utilized. The "Say No, Scream, Run, and Blow Your Whistle While Running" practice, aimed at teaching students how to protect themselves from bad touch, was first practiced individually by the students and later in groups. To facilitate this, distress whistles were distributed to the children, which they were encouraged to carry around their necks. They were taught to use the whistle to alert others if they encountered a bad touch. At the end of the education, the students were given their whistles and instructed to carry them at all times. The purpose of using dolls and whistles was to engage sensory learning processes beyond just the sense of sight.

To minimize the risk of contamination between groups, educational sessions were held in individual education rooms instead of regular classrooms. Furthermore, students were kindly advised not to share the session content with peers from other groups.

Reminder education brochure (REB)

In the study conducted by Daigneault et al. (2012), a decrease in students' knowledge levels was observed in the follow-up test, and therefore, reminder education was recommended [31].

To ensure the retention of the knowledge gained through the education, a reminder brochure was distributed to the students in the intervention group two weeks after the post-test. The brochure was designed based on the NLBPE and included information on what constitutes a good touch and a bad touch, how to distinguish between them, examples of both, and the appropriate actions to take when encountering a bad touch (Say No, Scream, Run, and Blow Your Whistle While Running). To help retain the information learned during the intervention, the key points of the education were emphasized in the content of the brochure. The content of the brochure, prepared by the researcher, was translated into Braille by a teacher with visually impaired at the school where the study was conducted before it was distributed to the intervention group members.

Ethical aspects

Throughout the research process, the principles of the Helsinki Declaration were adhered to. Ethics Board approval (No: 09.2020.172) was obtained from the Marmara University Faculty of Medicine Clinical Research Ethics Committee. Institutional permission was granted by the Istanbul Provincial National Education Directorate and the school, and verbal consent was obtained from the participants, along with written consent from their parents. Additionally, permission to use the Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R) as a data collection tool was obtained.

Data analysis

The study data were analysed using SPSS 25 software. Descriptive statistics were presented as frequencies, percentages, medians, and means. The sociodemographic characteristics of the intervention and control groups were compared using the Chi-square test. However, for comparing continuous age, the Student's t-test was used where assumptions of normality were met. The distribution of scale scores was assessed for normality using the Shapiro-Wilk test. As the data were not normally distributed, non-parametric tests (Mann-Whitney U test, Wilcoxon Signed Ranks test, and McNemar test) were used to evaluate the effectiveness of the NLBPE. The effect size was calculated using Cohen's d. A statistical significance level of $p < .05$ was set.

To minimize bias, the groups were coded as Group A and Group B prior to analysis, and the statistician conducting the data analysis was blinded to which group represented the intervention or control condition.

Results

No significant difference was found between the intervention and control groups in terms of sociodemographic characteristics ($p > .05$) (Table 1).

It was determined that the intervention group's GTS pre-test mean score of 6.4 increased to 7.9 in the

Table 1 Comparison of sociodemographic characteristics of the students in the intervention and control group

Variable		Intervention(*n*:27)		Control(*n* = 26)		Statistics	
		x̄	SS	x̄	SS	t	*p*
Age		10.07	2.26	9.62	2.38	1.217	0.651
		n	%	n	%	x^2	*p*
Gender	Female	13	48.1	14	53.8	*0.172	0.786
	Male	14	51.9	12	46.2		
Living people	With parents	24	88.9	23	88.5	3.337	0.400
	Only with mom	2	7.4	1	3.8		
	Only with dad	1	3.7	0	0.0		
	In the dormitory	0	0.0	1	3.8		
	Other	0	0.0	1	3.8		
Mom education level	Primary school and less	14	51.9	18	69.2	3.594	0.166
	Middle School	4	14.8	5	19.2		
	High school and above	9	33.3	3	11.5		
Dad education level	Primary school and less	11	40.7	15	57.7	1.688	0.430
	Middle School	6	22.2	5	19.2		
	High school and above	10	37.0	6	23.1		
From whom did you receive BPE before?	Not received before	20	74.1	19	73.1	1.084	0.582
	From teacher	7	25.9	6	23.1		
	From mom	0	0.0	1	3.8		
Total		27	100	26	100		

t Student's T Test, x^2Chi-Square Test

*Fisher Exact Test

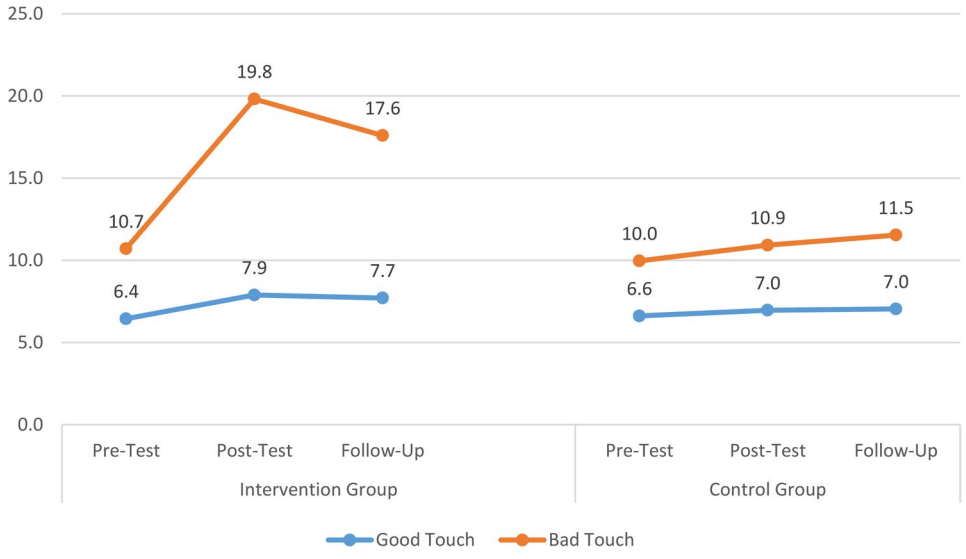

Fig. 3 Good touch and bad touch subdimension mean scores of the intervention and control group

post-test, with a mean score of 7.7 in the follow-up test. Their BTS mean score rose from 10.7 in the pre-test to 19.8 in the post-test, with a mean score of 17.6 in the follow-up test. In contrast, the control group's GTS pre-test mean score of 6.6 increased to 7.0 in the post-test, with no change in the follow-up test, maintaining a mean score of 7.0. Their BTS pre-test mean score was 10.0, which increased to 10.9 in the post-test and rose further to 11.5 in the follow-up test (Fig. 3).

No statistically significant difference was found between the mean scores of the intervention and control groups in terms of GTS and BTS pre-test scores ($p > .05$). However, the GTS and BTS post-test and follow-up test mean scores of the intervention group were statistically significantly higher than those of the control group ($p < .05$). Both the intervention and control groups showed higher GTS and BTS post-test and follow-up test scores compared to their pre-test scores ($p < .05$) (Table 2).

Table 2 Comparison of children's knowledge of abuse questionnaire-revised sub-dimensional scores of intervention and control group

Scale	Group	Intervention			Control			Statistics		
	Test	x̄±SS	Median	25th-75th quarter	x̄±SS	Median	25th-75th quarter	z	p	r
GTS	Pre- Test [a]	6.44 ± 1.2	7	6–7	6.62 ± 1.8	8	5–8	−1.2	0.231	−0.165
	Post- Test [b]	7.89 ± 0.3	8	8–8	6.96 ± 1.5	8	6–8	−2.9	*0.003	−0.412
	Follow- Up [c]	7.70 ± 0.8	8	8–8	7.04 ± 1.4	8	6–8	−2.2	*0.022	−0.315
Stats.	Wx [2]	b = c > a			b = c > a					
BTS	Pre- Test [a]	10.70 ± 3.2	11	9–13	9.96 ± 3.4	9	7.75–10.50	−1.2	0.227	−0.166
	Post- Test [b]	19.81 ± 1.4	20	19–21	10.92 ± 3.7	10	8.75–12.75	−6.1	*0.000	−0.768
	Follow- Up [c]	17.59 ± 2.0	18	16–19	11.54 ± 3.8	10,50	9-14.25	−4.7	*0.000	−0.658
Stats.	Wx [2]	b > c > a			c > b > a					

GTS Good touch Sub-dimension, *BTS* Bad touch Sub-dimension, *z* Mann-Whitney U, Wx^2 Wilcoxon Signed Rank Test, r = Cohen's d

*$p < .05$

In the post-test, a medium to large effect size was observed for the Good Touch Sub-Dimension (*r*= -.412), and this effect slightly decreased at follow-up (*r*= -.315). For the Bad Touch Sub-Dimension, a large effect size was found in the post-test (*r*= -.768), which slightly decreased but remained substantial at follow-up (*r*= -.658) (Table 2).

Considering the items, the rate of students who answered 23 out of 30 questions correctly in the post-test was statistically significantly higher than their rate in the pre-test ($p < .05$). It was determined that all students in the intervention group correctly answered a total of 13 items, with 5 in GTS and 8 in BTS. Furthermore, the rate of students who correctly answered 15 out of 30 questions in the follow-up test was higher compared to the pre-test ($p < .05$) and similar to the post-test ($p > .05$) (Table 3).

Only for three items, the rate of students who responded correctly in the follow-up test was lower than in the post-test. These items were: item 10, "If a friend tells you that unless you give him/her the last piece of candy/chocolate you have, s/he will not be friends with you anymore, you should give the last piece to him/her"; item 14, "If an adult tells you to do something, you should always do what s/he says"; and item 26, "If the father of a friend of yours asks you to help him find their missing cat, you should immediately go and help him" (Table 3).

Discussion

This study, the first in Türkiye aimed at preventing sexual abuse among students with visual impairments, demonstrated the effectiveness of Nurse-Led Body Protection Education (NLBPE). The intervention group's post-test and follow-up scores on both the Good Touch Scale (GTS) and Bad Touch Scale (BTS) were statistically significantly higher than those of the control group. Additionally, the intervention group's scores at both time points surpassed their pre-test scores. These findings support the hypothesis that "the sexual abuse knowledge score of the intervention group is significantly higher than that of the control group after receiving nurse-led body protection education."

In the study, it was determined that the sexual abuse knowledge scores of the students with visual impairments in the intervention group were statistically significantly higher compared to those in the control group. This increase, observed consistently across both the post-test and follow-up assessments, suggests that the intervention had not only an immediate but also a lasting impact on students' understanding. A medium to large effect size for the GTS in the post-test, which remained substantial in the follow-up, suggests that the intervention had a considerable immediate impact, with some retention over time. More strikingly, the large effect size found for the BTS at post-test, which remained substantial at follow-up, highlights the enduring effect of the program in reinforcing the key knowledge areas, particularly those concerning the prevention of bad touch. This pattern further supports the effectiveness of NLBPE in improving students' understanding of body protection, as reflected in both the quantitative increase in their knowledge and the lasting effect sizes observed. A review of the literature revealed no studies conducted specifically on students with visual impairments in this context. However, a study by Warraitch, Amin and Rashid (2021) on 15 girls with mild intellectual disabilities found that the sexual abuse prevention program applied was effective in increasing the students' knowledge and skill levels [32]. Similarly, after body protection education was provided to children without visual impairments by nurses [2, 23, 33] and other professional groups [19, 34–42], it was found that the intervention group's knowledge level was higher than that of the control group. These results generally support the positive effects of education, and this study contributes to the literature by demonstrating the effectiveness of NLBPE when applied to children with visual impairment.

In the present study, similar to the intervention group, the post-test and follow-up test scores of the control

Table 3 Comparison of the intervention group's percentages of correctly answering the CKAQ-R items in the pre-test- post-test-follow-up test

Good Touch Sub-dimension	**Pre-Test[a] %**	**Post-Test[b] %**	**Follow-Up[c] %**	**Statistics***
A loved one can hug you.	81.5	100.0	100.0	not meaningful
Many children enjoy getting kisses from their parents before they go to bed at night; because it is a good touch for them.	77.8	100.0	96.3	b > a
If you fall off the bike and injure your private parts, it is okay for a doctor or nurse to look at these areas.	70.4	96.3	96.3	c = b > a
It is okay to have an adult you love hug you.	81.5	100.0	96.3	not meaningful
It is a good touch to have a teacher you love lightly touch your back after you have done a good job at school.	81.5	96.3	96.3	not meaningful
If your mother starts talking to a neighbor you have not seen before while walking on the street with your mother, it is okay for you to talk to that person as well.	74.1	96.3	92.6	b > a
It's a Good touch if you took first place in the school painting competition and a favorite neighbor hugs you to congratulate you on it.	88.9	100.0	96.3	not meaningful
If you lose your parents at a mall, you can ask a salesperson or security guard for help, even if they are strangers.	88.9	100.0	96.3	not meaningful
Bad Touch Sub-dimension	Pre- Test [a] %	Post-Test [b] %	Follow-Up [c] %	Statistics *
You can always tell who the strangers are; because they are bad-looking.	40.7	55.6	51.9	not meaningful
Sometimes you can say "no" to an adult.	51.9	100.0	88.9	c = b > a
If someone touches you in a way you do not like, it is okay to say "no" and walk away.	77.8	100.0	100.0	c = b > a
Even if someone says they know you, if you do not know them, they are strangers.	66.7	96.3	88.9	b > a
Even if it is embracing, hugging and tickling, if these behaviors continue for too long, these behaviors can be bad touch.	37.0	100.0	96.3	c = b > a
If someone touches you in a way that you do not like, you should tell someone you trust.	77.8	100.0	100.0	c = b > a
If a friend says that unless you give him/her the last piece of your candy/chocolate, s/he will not be friends with you any more, you should give him/her the last piece.	22.2	92.6	70.4	c < b; c, b > a
If someone touches you in a way you do not like, it is your fault.	40.7	88.9	70.4	c = b > a
If you do not like the way someone is touching you, it is okay to say "no" to them.	70.4	100.0	96.3	c = b > a
Strangers look like ordinary people.	14.8	37.0	29.6	not meaningful
If an adult tells you to do something, you should always do what he or she says.	22.2	88.9	66.7	c < b; c, b > a
Some touches may be pleasant at first, but they can become confusing later on.	55.6	96.3	85.2	c = b > a
You can trust your feelings whether a touch is good or bad.	48.1	96.3	88.9	c = b > a
If a rude/bad boy at school orders you to do something, you had better do what he wants.	63.0	92.6	77.8	b > a
Even someone you love can touch you in a way that makes you feel bad.	37.0	81.5	63.0	c = b > a
Whether you like it or not, you need to let adults touch you.	48.1	88.9	88.9	c = b > a
If someone touches you in a way you do not like, you should keep telling about it until someone believes you.	44.4	100.0	96.3	c = b > a
Sometimes, someone in your family may touch you in a way you do not like.	51.9	92.6	81.5	c = b > a
Boys do not have to worry about their private parts being touched.	51.9	96.3	85.2	c = b > a
If the father of a friend of yours asks you to help him find their missing cat, you should immediately go and help him.	25.9	77.8	55.6	c < b; c, b > a
If your caregiver tells you to take off all your clothes even though it is not a change time for bed, you should do as s/he says.	51.9	100.0	88.9	c = b > a
If someone walks into the bathroom while you are taking a bath, and even if you are uncomfortable with it, you should keep quiet.	70.4	100.0	88.9	b > a

* McNemar Test

group were also higher than their pre-test scores. This increase in the control group's scores may be explained by the fact that the groups were selected from the same school, and the students had interactions during the three-week period when NLBPE was implemented. A similar study in the literature on the same topic observed an increase in students' knowledge levels, even without providing any education [23]. Future studies could select

different schools for the intervention and control groups to better assess the effectiveness of NLBPE.

In the present study, following the implementation of NLBPE, the intervention group's Good Touch subdimension score increased to 8, and the Bad Touch subdimension score rose to 20. Unlike traditional teaching methods that heavily rely on visual aids, NLBPE incorporated tactile, auditory, and kinesthetic elements specifically tailored to students with visual impairments. The education sessions utilized physical models, role-playing scenarios with tactile cues, and audio materials, enabling the children to understand and internalize the content through multiple senses. This approach was especially effective in helping students grasp abstract concepts such as "safe vs unsafe touch," "private body parts," and "how to say no and seek help," which are otherwise difficult to teach in conventional settings. In a similar study conducted by Akgul et al. (2021) with children without visual impairments, the students' knowledge levels increased to 7 for Good Touch and 19 for Bad Touch after receiving the education [23]. It was anticipated that NLBPE would be more challenging to implement with children with visual impairment, so the education method and tools were adapted accordingly. The fact that the intervention group's knowledge levels in both good and bad touch improved more significantly compared to the control group after the education highlights the strength of the program's methodology. Nevertheless, it is important to acknowledge the potential influence of unmeasured external variables—such as parental attitudes, the home environment, or previous exposure to similar content—which may have contributed to the observed outcomes. Future studies should take these contextual factors into account to provide a more comprehensive understanding of the intervention's effectiveness.

In the present study, the intervention group's follow-up test GTS and BTS mean scores were found to be higher than their pre-test scores. The follow-up test GTS score, which was higher than the pre-test and similar to the post-test score, indicates that the effect of NLBPE persisted into the second month. However, the follow-up test BTS score, while still higher than the pre-test, was lower than the post-test score, suggesting that the effect of NLBPE was maintained but somewhat diminished over time. In a study conducted in Australia, the knowledge levels of the students in the intervention group were found to be sustained in a follow-up test administered six months later [36]. Similarly, a study in China showed that the knowledge and skills gained through the education were retained in a follow-up test administered 12 weeks later [20]. Kızıltepe et al. (2022) also found that the knowledge acquired from the education was preserved in the 2-month follow-up test [38]. Likewise, Bustamante et al. (2019) observed that the knowledge level remained stable six months later, even without reminder education [43]. Although this study did not include a 6-month follow-up, future research could explore the long-term effects of NLBPE. To assess the sustainability of knowledge gains over time, follow-up assessments and booster sessions may be beneficial, especially for students with visual impairments.

Another reason for the positive change observed in the intervention group may be the accessibility and repetition of information. The use of the Reminder Education Brochure allowed students to review the content after the sessions, which likely reinforced learning and facilitated long-term retention. The distribution of the Reminder Education Brochure (REB), prepared in Braille, to the intervention group two weeks after the post-test helped reinforce the knowledge gained in the program. The REB contained a limited amount of information to ensure it was concise, and the rates of correct answers to the questions on the scale that assessed the brochure's content were similar in both the post-test and follow-up test. This suggests that the REB was effective in preserving the knowledge on the topics it covered. However, it is recommended that the knowledge related to the three items with low correct answer rates in the follow-up test, which were not included in the brochure (I10, "If a friend says that unless you give him/her the last piece of your candy/chocolate, s/he will not be friends with you anymore, you should give him/her the last piece"; I14, "If an adult tells you to do something, you should always do what he or she says"; and I26, "If the father of a friend of yours asks you to help him find their missing cat, you should immediately go and help him"), be reinforced with a second brochure in future studies.

In the present study, along with the increase in the average scores, the rate of correct answers to the items in the CKAQ-R also increased among students in the intervention group. Similarly, in a study conducted with a sample of students without visual impairments using the same scale, it was found that the rate of correct answers in the post-test increased for the intervention group [23]. The similarity between the results of this study, which included children with visual impairment, and the study with children without visual impairments supports the effectiveness of the Nurse-Led Body Protection Education Program (NLBPE).

It is also important to emphasize that the educational sessions were conducted by a nurse who was knowledgeable about communicating with children with visual impairments. This professional guidance likely enhanced student engagement and contributed to the safe atmosphere required for addressing such a sensitive topic. The presence of a trusted healthcare professional enabled students to express their concerns and ask questions without fear, thereby deepening their understanding.

In the present study, the items with the lowest rate of correct answers in both the post-test and follow-up test were I2, "You can always tell who the strangers are because they look bad," and I13, "Strangers look like ordinary people." Although the first researcher provided explanations for these items during the education, it is believed that the students did not fully understand them. Therefore, it is recommended to revise these two items specifically for students with visual impairments to improve their clarity and understanding.

Limitations

One of the main limitations of this study is the lack of a scale specifically designed for children with visual impairments, which may have impacted the accuracy of the knowledge assessment. Additionally, the fact that both the intervention and control groups were drawn from the same school introduces a potential bias, as interactions between students during the study period may have influenced the results. Furthermore, while the educational intervention was carefully designed to raise awareness and improve understanding of body safety concepts, it represents only an initial step in behavior change. Knowledge acquisition is crucial before assessing behavioral practices or skills, especially in younger populations. Future studies could address these limitations by using a larger and more diverse sample across different schools to enhance generalizability. Moreover, incorporating observational or scenario-based assessments would allow for a more comprehensive evaluation of how acquired knowledge translates into real-world behaviors. Additionally, longer follow-up periods are needed to assess the long-term sustainability of the effects of NLBPE, and future research could examine the influence of external factors, such as parental attitudes or prior exposure to similar programs, which may have contributed to the observed outcomes.

Conclusion

In conclusion, nurse-led body protection education was shown to be effective in enhancing the knowledge levels of students with visual impairments regarding sexual abuse prevention.

Abbreviations

BST	Body Safety Training
BTS	Bad Touch Scale
CKAQ-R	Children's Knowledge of Abuse Questionnaire-Revised
ECPAT	End Child Prostitution, Child Pornography and Trafficking of Children for Sexual Purposes
GTS	Good Touch Scale
NLBPE	Nurse-Led Body Protection Education
REB	Reminder Education Brochure
SPSS	Statistical Package for the Social Sciences
USA	the United States of America

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

All listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.E. A. : Conceptualization and Methodology; Data curation; Formal analysis and Validation; Investigation; Visualization; Writing - original draft; Writing - review & editing.A. E.: Conceptualization and Methodology; Formal analysis and Validation; Investigation; Visualization; Writing - original draft; Writing - review & editing.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethics Board Approval (No: 09.2020.172) was obtained from the Marmara University Faculty of Medicine Clinical Research Ethics Committee, and institutional permission was granted by the Istanbul Provincial National Education Directorate and the school for the study to be conducted.

Consent for publication

In order for the study to be conducted, verbal consent was obtained from the participants, and written consent was obtained from their parents.

Competing interests

The authors declare no competing interests.

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