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The effect of an eye health promotion program on the health protective behaviors of primary school students

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Abstract:

INTRODUCTION: Undiagnosed and uncorrected refractive errors in childhood can negatively affect the development of vision and cause students to have low academic success and even quit school before graduation. This study aims to determine the effects of an eye health promotion program on the health protective behaviors of primary school students.

MATERIALS AND METHODS: This experimental study using a pretest-posttest design with a control group was conducted in three public primary schools in Aydın, a city in the Western Anatolia Region of Turkey, between April and November 2014. The eye health promotion program was provided by the researchers to the experimental Group 2 days in 4 weeks. The data were analyzed using the *t*-test, Chi-square analysis, the Mann–Whitney U-test, the Wilcoxon signed-rank test, and the McNemar test.

RESULTS: The average age of the students was identified as 9.0 ± 3.64 years. The students wearing glasses all in the experimental group and 53.3% in the control group were found to always wear their glasses after the education program was completed ($P < 0.05$). These students, 97.9% in the experimental group and 58.1% in the control group underwent eye examinations from an ophthalmologist ($P < 0.05$). The eye health protective behaviors of the experimental group were found to have positively changed in the final follow-up, compared to the control group ($P < 0.05$).

CONCLUSION: The eye health promotion program was found to be effective in improving eye health protective behaviors within the experimental group.

Keywords:

Children, eye health, eye health promotion, school student health, student

Introduction

Approximately 285 million people worldwide are visually impaired. Of these people, 39 million are blind, and 246 million have a high loss of vision. Approximately 90% of visually impaired people live in developing countries.[1,2] Undiagnosed and uncorrected refractive errors in childhood can negatively affect the development of vision and cause students to have low academic success and even quit school before graduation.[3-5]

Many studies have been conducted on the eye health protective behaviors of children in different countries.[6-13] There is limited evidence about eye studies with vision screening among the school children in Turkey.[14-17] There is no research to support the effectiveness of eye health promotion program on the health protective behaviors of primary school students. This study aims to determine the effects of the eye health promotion program on the health protective behaviors of primary school students. It is thought that the results of the research and the training program applied in the research will guide the health professionals.

The PRECEDE-PROCEED model is a framework for the process of systematic development and evaluation of

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health education programs. The precede phase of the model consists of five phases. Phase 1 – social diagnosis (community forums, nominal groups, focus groups, surveys and interviews), Phase 2 – epidemiological diagnosis (vital statistics, years of potential life loss, disability, prevalence, and morbidity), Phase 3 – behavioural and environmental diagnosis (personal and environmental diagnosis), Phase 4 – education and organizational diagnosis (predisposing factors (knowledge, beliefs, and values), enablers (accessibility, availability and skills), Phase 5 – administrative and policy diagnosis (the analysis of policies, resources and circumstances prevailing organizational situations that could hinder or facilitate the development of the health program.

The PRECEDE-PROCEED model can be used to design and evaluate an eye health promotion effort. The PRECEDE component allows a researcher to work backward from the ultimate goal of the research to create a blueprint to instruct the formation of the intervention or strategy. The PROCEED component may lay out the evaluation, including pilot study and efficacy study methodologies. The model has been used by Drury *et al*. to explore the barriers and enablers to children in Singapore participating in outdoor activities;[18] by Xiao-qiu to investigate and strengthen the prevention and treatment of myopia and to college student.[19] This model is a planning model. Therefore, they cannot test mechanism of action or causal relationship.

This study aims to determine the effects of the eye health promotion program on the health protective behaviors of primary school students. Specific hypotheses of this study were as follows:

1. Positive health-promoting behaviors of students in the experimental group increase compared to the control group students after the eye health promotion program is completed
2. The knowledge of the experimental group students regarding eye health increases compared to the control group students after the eye health promotion program is completed.

Materials and Methods

This quasi-experimental study using a pretest-posttest design with a control group was conducted in three public primary schools in Söke, Aydın, a city in the Western Anatolia Region of Turkey, between April and November 2014. Simple random was performed in the selection of the schools. According to this data, there are 41 primary schools in Söke. Three primary schools were selected by simple random sampling method.

With the power analysis performed, 5% error, 95% confidence interval, and minimum sample size of 0.5 effect magnitude were determined as 87, respectively, according to significance level. Two of these three primary schools were randomly assigned as experimental school control groups. In the randomization of the students who are in these schools, the students in the experimental and control groups were determined with simple random order. Ninety-eight students were included in the study group. The two students in the control group were separated due to relocation due to health problems in three students without research. The difference between the individual characteristics of the experiment and control group (age, gender, socioeconomic status, and social security) was examined. As a result of the analyzes made, it was found that the experiment and control group were identical in terms of the examined factors ($P < 0.05$).

Criteria for entering the study were agreeing to participate in the study, studying in the third grade, not having received education on eye health protection. Moreover, exclusion criteria were a not agreeing to participate in the study, having received education on eye health protection. All students who had inclusion criteria for the study were invited. Of the 196 students who were eligible for entering the study, 191 students were ready to participate in research. The data were collected through a six-part questionnaire including.

An anonymous 20-item questionnaire was compiled and distributed to students. The form was categorized into three sections including, the knowledge (8 questions), attitude (7 questions), and practice related (5 questions). Knowledge questions focused on issues such as how long should you use the television (TV) and computer, how long and when the eyes should rest, what is the effect of outdoor activity on eye health, how near working behaviors affect eye health.

Participants were also asked questions such as regular eye examinations, whether he regularly used glasses and sunglasses. To make more accurate judgments about students' answers, a numerical value was assigned to each correct answer: knowledge (each correct answer = 5), attitude (each correct answer = 5), and practice (each correct answer = 5) questions. The minimum and maximum scores were 0 and 100, respectively, questions. Scores were not categorized as poor, medium, and good scores. Statistical comparison of the difference between the scores obtained.

The content validity of the designed questionnaire was approved by 5 education specialists and 5 eye health specialists. The content validity of the questionnaire was assessed by the content validity ratio (CVR) and content validity index (CVI). The CVR was calculated

between 0.69 and 0.78 to reject or retain each item of the questionnaire. For CVI, the wordings of the questions were evaluated in terms of relevance, simplicity, and clarity and found to range from 0.75 to 0.96. The internal consistency reliability was calculated using Cronbach's alpha ($\alpha = 0.96$).

Training materials

Three training materials were developed for the eye health promotion program. These are eye health information booklet for children, a CD for children's eye health education and a booklet for children's eye health information for parents. The contents of these materials include information about eye as a sense organ, protective behaviors of child's eye health, puzzles, and games. Below are the expert opinion scores for the clarity of these materials.

An eye health information booklet was prepared by the researchers considering the objectives and the desired behaviors of the education and the age group, to strengthen what the students learn during the education. DISCERN, a list used to determine the appropriateness or quality of written materials, was used to analyze the education booklet's comprehensibility and appropriateness for reading.[20,21] The scores submitted by the experts were analyzed using Kendall's goodness-of-fit test ($W = 0.187$, $P = 0.16$, $P > 0.05$).

The eye health education CD was prepared by the researchers as a visual support for the information provided to the children. The expert opinions were found to be statistically concordant ($W = 0.185$, $P = 0.15$, $P > 0.05$).

They scored the children's eye health information booklet for parents considering its constructional characteristics 19.6 ± 1.3 (min: 16, max: 20), content-related characteristics 17.7 ± 1.8 (min: 16, max: 20), characteristics about Turkish expression 20.3 ± 1.6 (min: 20, max: 25), characteristics about print quality 13.0 ± 1.4 (min: 11, max: 15), and its overall characteristics 80.6 ± 5.0 (min: 64, max: 80) ($W = 0.195$, $P = 0.19$, $P > .05$).

Data collection method and education process

The objectives and the desired behaviors of the education were determined at the first stage of the study. The content of the education was prepared in line with the opinions of three experts: at least 5 years experienced eye doctor in the field two ophthalmologists and a faculty member. The students were informed about the importance of the education program and their need to attend the education sessions. Finally, the parents and teachers were informed about thoroughly completing the forms.

The eye health promotion program was prepared, presented to the students and evaluated using the precede-proceed model. The precede phase was used while determining the educational requirements and concerns about eye health behaviors, and the proceed phase was used while determining the education objectives and planning, presenting, and evaluating the education program. The model takes into account many factors of a health behavior. It is a guide for community health promotion methods.[20] It is important that the health education to be provided is appropriate and that the target group is correctly selected.[21]

The eye health promotion program was implemented in eight-course hours. The developed educational materials were distributed to students and their parents free of charge. The pretest was administered before the program began and the posttest was administered 3 weeks after the eye health promotion program was completed to the two groups. The experimental group was followed up for 6 months.

Any intervention was made to the control group during this period. At the end of the 6-month follow-up, again the final test data were collected from the experimental and the control group. If the parents have any questions, they called the first researcher through phone, and they were informed. The written follow-up forms prepared by the researchers were given to the parents. Parents' questions were answered through phone calls every month.

The education was provided only to the experimental group. In addition, during the follow-up, the students provided the researcher with the medical report of their eye examination. The parents' questions were answered through phone calls during the follow-up. Three weeks after the education program ended, the posttest was administered. The parents were asked to fill out the follow-up form on students eye health-protective behaviors and instructed to follow-up their children for 1 month.

The researcher held a face-to-face interview with the parents of the students in the experimental and control groups in June and collected the 1 month follow-up forms. During this interview, the parents were educated on the importance of follow-up. They were asked to monitor their children's eye health-protective behaviors during the 3-month summer holiday and record the data. They were given three follow-up forms, one to be completed each month. After the holiday, the students gave the completed follow-up forms to their teachers, and the researcher collected the forms from the teachers.

Data analysis

The data obtained from this study were analyzed using SPSS 17.0 software SPSS Inc., 233 South Wacker Drive, 11th Floor, Chicago, IL 60606-6412. Using two types of statistics; descriptive statistics (frequency, mean, and standard deviation) and inferential statistics such as Pearson's Chi-square test, Fisher's Chi-square test, *t*-test, Mann–Whitney U-test, McNemar test, and Wilcoxon Signed Rank test.[22]

Results

The sociodemographic characteristics of the participants in experimental and control group have been shown in Table 1. There was no meaningful difference except for the father's education level ($P > 0.05$). A total of 191 subjects asked to the questionnaires completely. There was no statistical difference in the mean increase in the wearing glasses, frequency of wearing glasses, use of sunglasses, go to eye examination, read >5 books in a week, close working behaviors (studying, watching, and using computer), knowledge score on eye health between the experimental ($n = 98$) and control ($n = 93$) groups ($P > 0.05$) [Table 1].

The frequency wearing glasses by the experimental group increased from 9 (81.8%) pretest to 19 (100.0%) posttest ($P < 0.05$). In the control group, frequency wearing glasses of 10 (66.6%) pretest decreased 8 (53.3%) posttest ($P > 0.05$). The rate of negative opinions concerning wearing glasses was 19.4% for the experimental group and 16.1% for the control group in the pretest. There was also no statistically significant difference in the distribution of values between the experimental and the control groups in the pretest ($P > 0.05$). In the final follow-up, 85.7% of the experimental group and 22.6% of the control group expressed positive opinions regarding wearing glasses. The difference in the values in the pretest and posttest was significant for the experimental and the control groups ($P < 0.05$) [Table 2].

The experimental group's mean score on eye health knowledge increased from 58.31 ± 12.4 in the pretest to 72.16 ± 11.40 in the final follow-up. The difference in the scores in the pretest and posttest was significant for the experimental group ($P < 0.05$). The average time spent outdoors per week was found to have changed from 7.78 ± 0.42 in the pretest to 10.46 ± 5.37 in the final follow-up for experimental group. The difference in the scores in the pretest and posttest was significant for the experimental group ($P < 0.05$) [Table 2].

The experimental group's the number of books read in 1 week, studying time, TV watching time, and computer using time significantly decreased compared to the control group ($P < 0.05$) [Table 3].

Table 1: Sociodemographic characteristics of experiment and control group

Sociodemographic variables	Experimental group, *n* (%)	Control group, *n* (%)	Significance test
Gender			
Female	50 (51.0)	44 (47.3)	χ^2=0.263
Male	48 (49.0)	49 (52.7)	P^a=0.608
Age			
8-9	85 (86.7)	81 (87.1)	χ^2=0.014
10-11	13 (13.3)	12 (12.9)	P^a=0.944
Mean age	9.0±3.64		
Mother's education			
Literate	5 (5.1)	1 (1.1)	χ^2=12.260
Primary school + middle school	33 (33.7)	20 (21.5)	P^b=0.027
High school + university	60 (61.2)	72 (77.4)	
Father's education			
Literate	2 (2.1)	-	χ^2=19.357
Primary school + middle school	46 (46.9)	24 (25.8)	P^b=0.000
High school + university	50 (51.0)	69 (74.2)	
Mother's profession			
Not working	50 (51.0)	45 (48.4)	χ^2=1.234
Working	48 (49.0)	48 (51.6)	P^a=0.866
Father's profession			
Not working	6 (6.1)	2 (2.2)	χ^2=1.456
Working	92 (93.9)	91 (97.8)	P^a=0.084
Monthly income			
Less than income	26 (26.5)	22 (23.7)	χ^2=0.444
Income equivalent	48 (49.0)	50 (53.8)	P^b=0.801
Over income	24 (24.5)	21 (22.6)	
Health insurance			
Available	91 (92.9)	84 (90.3)	χ^2=0.399
Unavailable	7 (7.1)	9 (9.7)	P^b=0.527
Total	98 (100)	93 (100)	

[a]Fisher Ki Square test, [b]Pearson Ki Square test

Parents' knowledge, attitudes, and behaviors on children's eye health

There was statistical difference in the mean change positively in the how frequently children should be taken to an ophthalmologist, believed it was necessary to wear sunglasses on sunny days, knew the symptoms of visual problems in children, had bought their children's sunglasses from an optical store, children spend time outdoors to protect their eye health between the experimental ($n = 98$) and control ($n = 93$) groups' parents ($P < 0.05$) [Table 4].

Discussion

This study showed that the eye health promotion program-positively affected the eye health protective behaviors of the students living in a rural area in Turkey. The frequency of wearing glasses and having

Table 2: Eye health protective behaviors of the experimental and control group before the education and at the end of the follow-up

The students' knowledge, attitudes, and behaviors on eye health	Intergroup comparison					
	Pretest		Significance test	Final follow-up		Significance test
	Experimental, *n* (%)	Control, *n* (%)		Experimental, *n* (%)	Control, *n* (%)	
Wearing glasses						
Yes	11 (11.2)	15 (16.1)	χ^2=0.976	19 (19.4)	15 (16.1)	χ^2=0.346
No	87 (88.8)	78 (83.9)	*P*=0.323*	79 (80.6)	78 (83.9)	*P*=0.556
Frequency of wearing glasses[a]						
Always	9 (81.8)	10 (66.6)	χ^2=0.851	19 (100)	8 (53.3)	χ^2=2.874
Occasionally	2 (18.2)	5 (33.4)	*P*=0.349*	-	7 (46.7)	*P*=0.055
Opinions on wearing glasses						
Positive opinions	16 (16.3)	26 (28)	χ^2=0.986	84 (85.7)	21 (22.6)	χ^2=16.247
Negative opinions	18 (19.4)	15 (16.1)	*P*=0.237**	4 (4.1)	13 (14.0)	*P*=0.000
No opinions	64 (65.3)	52 (55.9)		10 (10.2)	59 (63.4)	
Wearing sunglasses						
Yes	37 (37.8)	39 (41.9)	χ^2=0.348	58 (59.2)	41 (44.1)	χ^2=4.357
No	61 (62.2)	54 (58.1)	*P*=0.555*	40 (40.8)	52 (55.9)	*P*=0.037
Knowledge score on eye health	58.31±12.4	54.55±12.61	*U*=3538.50	*t*=9.810	−8.46***	*t*=9.810
			P=0.077	*P*=0.000		*P*=0.000
Having eye examination						
Yes	58 (59.2)	52 (55.9)	χ^2=0.025	96 (97.9)	54 (58.1)	χ^2=17.521
No	40 (40.8)	41 (44.1)	*P*=0.875*	2 (2.1)	39 (41.9)	*P*=0.000
Time spent outdoors	7.78±8.42	8.64±9.15	*U*=4149.50	10.46±5.37	7.65±6.68	*U*=2664.00
			P=0.284			*P*=0.000
Total	98 (100)	93 (100)		98 (100)	93 (100)	

*Fisher kiSquare test, **Pearson ki Square test ***Wilcoxonsigned rank test, U: Mann–Whitney U-test, [a]Numbers and percentages were calculated over the students wearing glasses

Table 3: Students' eye health behaviors of the experimental and control group before the education and at the end of the follow-up

Students' eye health behaviors	Intergroup comparison					
	Pretest		Significance test	Final follow-up		Significance test
	Experimental, *n* (%)	Control, *n* (%)		Experimental, *n* (%)	Control, *n* (%)	
The number of books read other than textbooks (in 1 week)						
5 books and less	89 (90.8)	81 (87.1)	χ^2=0.468	97 (99.0)	81 (87.1)	χ^2=22.691
>5 books	9 (9.2)	12 (12.9)	*P*=0.185	1 (1.0)	12 (12.9)	*P*=0.008
Frequency of taking a break while studying						
Once an hour	68 (69.4)	61 (65.6)	χ^2=0.023	84 (85.7)	59 (63.4)	χ^2=18.547
More than once in an hour	30 (30.6)	32 (34.4)	*P*=0.823	14 (14.3)	34 (36.6)	*P*=0.000
Frequency of taking a break while watching TV						
Once an hour	38 (38.8)	58 (62.3)	χ^2=0.033	65 (66.3)	48 (51.6)	χ^2=6.961
More than once in an hour	60 (61.2)	35 (37.7)	*P*=0.623	33 (33.7)	45 (48.4)	*P*=0.004
Frequency of taking a break while using the computer						
Once an hour	57 (58.2)	60 (64.5)	χ2=0.286	78 (79.6)	49 (52.7)	χ^2=9.834
More than once in an hour	41 (41.8)	33 (35.5)	*P*=0.961	20 (20.4)	44 (47.3)	*P*=0.000
Total	98 (100)	93 (100)	-	98 (100)	93 (100)	

*Fisher ki square test, **Mcnemar test

eye examinations, using sunglasses, along with the time spent outdoors were found to increase in the experimental group compared to the control group ($P < 0.05$).

Many school-based education programs have been carried out in various countries to promote positive eye health behaviors among school-aged children. Studies that cover these programs have examined various eye health behaviors.[6-8,13] In the present study, the frequency of wearing glasses increased in the experimental group in the final follow-up, compared to the pretest ($P < 0.05$).

Table 4: Parent's knowledge, attitudes and behaviors on protecting children's eye health before the education and at the end of the follow-up

Parents' knowledge, attitudes and behaviors on children's eye health	Intergroup comparison					
	Pretest		Significance test	Final follow-up		Significance test
	Experimental, *n* (%)	Control, *n* (%)		Experimental, *n* (%)	Control, *n* (%)	
Knowing the recommended frequency of taking children to an ophthalmologist						
Knowing	55 (56.1)	53 (56.9)	χ^2=0.876	89 (90.8)	59 (63.4)	χ^2=13.905
Not knowing	43 (43.9)	40 (43.1)	*P*=0.423*	9 (9.2)	34 (36.6)	*P*=0.002
The opinion on when children should wear sunglasses						
Always	14 (14.3)	15 (16.1)	χ^2=0.386 *P*=0.554*	45 (45.9)	14 (15.1)	χ^2=15.972 *P*=0.003
Occasionally	23 (23.5)	25 (26.9)		13 (13.3)	28 (30.1)	
Rarely	5 (5.1)	4 (4.3)		4 (4.1)	4 (4.3)	
Never	56 (57.1)	49 (52.7)		36 (36.7)	47 (50.5)	
The place where parents had bought their children's sunglassesa						
Market	9 (22.0)	12 (28.0)	χ^2=0.286 *P*=0.734*	3 (5.4)	12 (26.6)	χ^2=0.436
Peddler	2 (4.8)	3 (7.0)		-	3 (6.6)	*P*=0.574
Optical store	30 (73.2)	28 (65)		52 (94.6)	30 (66.8)	
Knowing the symptoms of visual problems in children						
Knowing	54 (55)	39 (41.9)	χ^2=0.378 *P*=0.565*	94 (95.9)	41 (44.8)	χ^2=17.423 *P*=0.003
Not knowing	44 (45)	54 (58.1)		4 (4.1)	52 (55.2)	
Giving importance to the time spent outdoors for children's eye health						
None + little	13 (13.2)	12 (12.9)	χ^2=2.670 *P*=0.12*	1 (1.0)	11 (11.8)	χ^2=10.280 *P*=0.002
Moderately	34 (34.8)	21 (22.6)		14 (14.3)	22 (23.7)	
Very	51 (52.0)	60 (64.5)		83 (84.7)	60 (64.5)	
Total	98 (100)	93 (100)		98 (100)	93 (100)	

*Fisher ki kare test, **Mcnemar test, ***Mcnemar Bowker test, [a]Numbers and percentages were calculated over the students wearing glasses

Kodjebacheva *et al*. conducted an interventional study in California, USA and found that of the children, 6.7% were wearing glasses before and 73.3% were wearing glasses after the 6-month intervention program, which is a significant increase.[6] Pavithra *et al*. conducted a study with 1.378 children aged between 7 and 15 and monitored their frequency of wearing the glasses given them free of charge during the 3-month follow-up. They found that after 3 months, 57.8% of the children were wearing the glasses given to them, and 42.2% of them were not.[7]

The programs that encourage students to wear glasses are believed to have been effective. The findings of the present study, regarding the frequency of wearing glasses, show similarity to the findings of Kodjebacheva *et al*. (2014) and the findings of Pavithra *et al*. (2014). In the present study, a significant difference was found between the groups in the final follow-up in terms of using sunglasses ($P < 0.05$). The rate of using sunglasses increased in the experimental group ($P < 0.05$) and did not significantly increase in the control group ($P > 0.05$) in the final follow-up, compared to the pretest.

Geller *et al*. analyzed the effects of the sun protection program presented to the students in 130 schools and found that of the students aged between 5% and 12%, 23.8% in the pretest and 25.7% in the posttest were wearing sunglasses, showing a low level of increase.[8] The education program provided in the present study caused a higher increase in the level of using sunglasses than in the study of Geller *et al*. (2002).

A study of the Ministry of Health conducted in Ankara, Turkey, in 2013 to identify the prevalence of refractive errors among the primary school first graders found that of the students, 77.7% had had eye examinations, and 21.2% had not had eye examinations before starting school, and 11.3% had asked for eye examinations due to visual impairment during the previous year.[23]

In the present study, 59.2% of the experimental group and 55.9% of the control group were found to have had eye examinations before the education. No significant difference was found between the rates of having eye examinations in the experimental and control groups before the education program ($P > 0.05$).

The effect of the education program on students having eye examinations was analyzed as the main parameter in this study. The rate of having eye examinations increased in the posttest (97.9%) compared to the pretest for the experimental group ($P < 0.05$) and did not significantly change for the control group (58.1%) ($P > 0.05$).

Ayanniyi *et al*. (2010) analyzed parental knowledge and attitudes regarding children's eye health with 1393 parents in Nigeria. They found that of these parents, approximately 62% sought treatment at a hospital, 22% ignored the problem, 10% administered medications by themselves, and 8% used traditional treatment methods when they encountered eye problems.[24]

Another eye health behavior that needs to be improved among students is their near working behaviors. The literature indicates that activities such as studying, reading books, using the computer, and watching TV are regarded as near working behaviors.[11] Paudel *et al*. conducted a study with 2238 students aged between 12 and 15 in 13 schools in Vietnam and found that the average time spent reading per week was 18.2 h for myopic students (20.4%) and 15.4 h for nonmyopic students (0.7%), which indicated a significant difference. They also found that each hour spent reading increased the risk for myopia by 5% for the students.[13]

Saw *et al*. (2002) conducted a study with 957 school-age children aged between 7 and 9 in China. They found that the prevalence of myopia increased by 1.71 times due to reading >2 books per week, by 1.83 times due to reading for >2 h/day, and by 1.70 times due to studying for >8 h/day.[25] Another study conducted in Amman, the capital city of Jordan, with 1777 students aged between 12 and 17 found that the average time spent reading and writing per day was 3.07 h for myopic students (17.6%) and 2.54 h for nonmyopic students (82.4%), which indicated a significant difference.[9]

In the present study, the students in the experimental group were educated on improving their close-reading behaviors within the scope of the eye health protective behaviors. The near working behaviors of the experimental group improved in the final follow-up, compared to the pretest ($P < 0.05$). No significant change was observed in the control group ($P > 0.05$).

It was found that increasing the time that children spend outdoors is important. This reduces the time spent in near working activities, increases the visibility range of eyes, and helps prevent the development and progression of myopia in children.[26]

Paudel *et al*. (2014) reported that the average time spent outdoors per week was 4 h for myopic children, and 4.5 h for nonmyopic children and that the difference was significant. They also found that myopic children spent more time (4.2 h) indoors, and less time in outdoor activities (1.9 h) per week, than nonmyopic children. They indicated that the time spent outdoors has a protective effect in the prevention of myopia development.[13]

In the present study, the students in the experimental group were found to spend more time outdoors (10.46 ± 5.37 h) than those in the control group (7.65 ± 6.68 h) in the final follow-up ($P < 0.05$). The students' knowledge on eye health increased in the experimental group in the final follow-up compared to the pretest ($P < 0.05$), and no significant difference was found between the students' knowledge on eye health in the pretest and final follow-up for the control group ($P > 0.05$).

Hobday *et al*. (2015) presented a 9-week education program on eye health in several schools. They reported a significant increase in students' knowledge after the education program was completed.[27] Similarly to the findings of Hobday *et al.* (2015), a significant increase was seen in the students' knowledge on eye health after they participated in the education program.[27]

Conclusion

The eye health promotion program and the educational materials prepared to help primary school students develop positive behaviors to protect and promote eye health were found to be effective in improving the eye health protective behaviors of the students in the experimental group.

School health nurses can coordinate eye health protection and promotion programs using the educational materials and the education program included in this study, to help students acquire positive behaviors.

The permanence of the behaviors provided in this study can be analyzed in thr future studies by monitoring the students. In addition, the effect of eye health protective and promoting behaviors on the occurrence or prevention of visual problems can be analyzed in the future studies.

Limitations of the study

The period of time (6 months) for evaluating behaviors to improve eye health in students after the end of the eye health promotion program is the limit of this research. Another limitation of the assessment of behavioral changes expected of students, other than going to the eye doctor for examination, is due to the memory factor of the students, the parents, and the teachers' self-reports.

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Conflicts of interest

There are no conflicts of interest.

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