Effectiveness of Family Participation in Visual Care Program for School-Aged Children Using Digital Devices: A Quasi-Experimental Study

Sukritta Jaichomcheun, Wilawan Tuanrat, Sivaporn Aungwattana*

Abstract: Many cultures encourage children to learn through digital devices however, this can cause digital eye strain. Therefore, encouraging parental participation in visual care for school-aged children to promote the appropriate use of digital devices will aid in the prevention of digital device-induced eye strain. This quasi-experimental study aimed to determine the effect of eight-week family participation in the visual care programs for family practices and digital eye strain syndrome among school-aged children. Thirty-eight parents or guardians of school-aged children were randomly selected from two schools within two districts in Chiang Mai province in Thailand and randomly assigned to the experimental group (n = 19) or the control group (n = 19). The experimental group received family participation in the visual care program and routine health care services, and the control group received only routine health care service. Instruments for collecting the data were a personal information form, the Family Practice Questionnaire, and the Digital Eye Strain Syndrome Assessment Form for School-Aged Children. Descriptive statistics, Fisher's exact test, an independent t-test, and a paired t-test were used to analyze the data.

The findings revealed that the mean scores for family practice in the experimental group at posttest were significantly higher than on pretest and significantly higher than those of the control group. Additionally, the experimental group had substantially fewer digital eye strain syndrome than the control group. This program should be further verified by being studied over a more extended period and in different locations in Thailand. It has the potential for nurses to use as a model to promote visual care for school-aged children against digital eye strain syndrome by integrating it as part of their services based on family participation.

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Background

Nowadays, most families support school-aged children by utilizing digital devices such as computers, notebooks, tablets, and smartphones.[1] Furthermore, schools providing online learning encourage children to use digital devices more often. Especially during the COVID-19 pandemic, the average time spent using digital devices among school-aged children was substantially longer than before.[2-3] A study abroad showed that the most common display devices used were personal computers and smartphones for online

classes (61.70%) and non-academic purposes (57.80%). The mean duration of display device use was 71.10 ± 36.02 min without a break and 7.02 ± 4.55 hours a day.[4] The same as in Thailand, a survey found that children use digital devices on average for five hours a day (47.60%) and three to four hours a day (36.40%).[5] However, 35 minutes of screen time without a break is a significant risk factor for headaches, and 80 minutes without a break is significant for eye pain.[4] Moreover, spending more than two to three hours a day using digital devices is a significant risk factor for digital eye strain syndrome.[4,6]

A review of related literature about environmental factors of the eye regarding inappropriate use of digital devices consists of 1) looking at a digital device screen at close range, 2) using a digital device for a long period of time,[4,6] 3) using a digital device in improper lighting,[7] and 4) using digital devices without eye exercises.[6,8] These improper behaviors in using digital devices can cause digital eye strain syndrome which consists of three groups of symptoms: 1) visual impairments including looking hard at the light and slow focusing of eyes, 2) eye disorders include eye pain, burning, irritated and dry eyes, and constantly watery eyes, and 3) musculoskeletal disorders involving headaches, and neck and back pain.[9-10] Surveys found that 507 (92.80%) children reported experiencing at least one asthenopia/dry eye symptom (AS/DS). The most prevalent symptoms were eye pain (79.70%), burning eyes, and irritated eyes (69.10%).[11] In Thailand, digital eye strain syndrome has been reported among 460 (94.84%) children who suffer from digital eye strain. The most common complaints were neck pain (73.20%), followed by eye strain (70.30%), and irritated eyes (60.20%).[6]

Children's eye health has been strongly associated with learning and achievement in school, which impacts their quality of life and future economic productivity.[12] In this digital era, children have eye problems from digital eye strain syndrome. Moreover, if children have digital eye strain syndrome for a long time, it will change eye value and lead to myopia.[13-14] Especially, early school-aged children six to nine years are at risk of developing eye problems from the structural changes in the eyes prone to myopia.[3] A survey on the eye problems of children in Thailand found that 6.6% were visually impaired.[15] Consistent with a school health service report among school-aged children in Chiang Mai in 2019, it was found that the visual acuity was very high visual impairment (V.A. ≥ 6/12) at 8.88%, and they had a slight visual impairment (V.A. = 6/9) at 13.33%.[16]

However, the family is essential for the health care of school-aged children because families can care for and participate in giving advice and teaching school-aged children to have good self-care.[17] Especially during the COVID-19 pandemic, school-aged children need to use digital devices at home for online learning.[2] A literature review found a study involving programs promoting family participation. One theory is the Community Participation Theory,[18] which regards the family as an essential community context in personal health promotion. Moreover, this theory has a straightforward participatory process and encourages families to participate in every step. The family's participation will empower parents and children to practice appropriate health behaviors. Several studies of the included interventions were associated with a positive effect on family and children's outcomes.[19] There were improvements in parental knowledge and proper practice of children's health care at home.[20-21] The community participation approach in this theory has empowered children to appropriate health care behavior. It leads to the prevention of children's health problems.[22]

Therefore, our study applied the Community Participation Theory[18] using the four steps of the participative process as a guideline for designing activities that encourage families to participate in decisions to correct vision problems in school-aged children. This involves family participation in visual care for school-aged children to use the digital devices correctly and prevent eye strain syndrome and assessing the results of visual care for school-aged children.

Study Aim and Hypothesis

This study aimed to investigate the effectiveness of family participation in visual care program among families of school-aged children using digital devices with the following hypotheses:

1. At posttest (week 9), the mean scores for family practice in the experimental group will be significantly higher than those in the control group and higher than the pretest.

2. At posttest (week 9), school-aged children in the experimental group will have less digital eye strain syndrome than the control group.

Methods

Design: This study used a quasi-experimental pretest and posttest design with the comparison group. The Transparent Reporting of Evaluations with Non-randomized Designs (TREND) checklist was used to guide reporting of this study.

Participants and Setting: The sample was parents or guardians of school-aged children in grades 1-3. The sample size was calculated using G*power,[23] with the significance level = .05, a power of test = .80, and an effect size of .50. Following the calculation, together with a 10% possible attrition rate,[24] the optimal total sample size was 38. Inclusion criteria included being parents or guardians who 1) aged between 18-60 years old; 2) cared a school-aged child for at least six months and lived in the same residence as the child; 3) capable of making their own decisions; 4) had the ability to listen, speak, read, and write Thai; and 5) were able to communicate through the LINE application (app). The inclusion criteria for school-aged children were 1) between 6 and 9 years old; 2) Participating in online teaching using digital devices such as computers, notebooks, tablets, and smartphones; and 3) having no disabilities or particular problems.

This study was conducted in Chiang Mai province, Thailand in the northern part. The principal investigator (PI) got access to the school/participants through the school health unit's teacher. Multi-stage random sampling was used to recruit the participants. In this province, there were 24 districts with 427 elementary schools, where the children aged 6-9 years attended. A simple random sample was used to select two districts. Then, two out of 46 medium-size schools in these two districts were randomly selected by lottery. After that, these two schools were randomly assigned to an experiment or control school. There were 92 parents or guardians of school-aged children in the experimental school and 400 in the control school. However, only 80 families in the experimental school and 158 families in the control school met the inclusion criteria. Then random sampling was used to select 19 parents or guardians of school-aged children from each school. **Figure 1** shows the flow of the participants.

Instrumentation: There were two parts to this study: instruments for collecting the data and the Family Participation in the Visual Care Program

Instruments for Collecting the Data. These were:

A Personal Information Form was used to obtain information about the family, including parents or guardians' age, gender, education, and relationship and a form for children, which included age, gender, grade, the type of digital device utilized, and using assistive devices while using digital devices.

The Family Practice Questionnaire, which was developed by the PI based on a review of related literature about caring for the eyesight of school-aged children using digital devices.[9,25-26] It consists of 20 items, divided into four sections: 1) The distance between the digital device and the eyes (5 items), such as "My family member maintained a distance of at least 30 cm. between the child's eyes and the smartphone screen"; 2) Controlling the usage time for digital devices (5 items), such as "My family member recommended that the children use their digital devices for no more than two hours a day"; 3) Lighting while using digital devices (5 items), such as "My family member warned when the children use digital devices in the dark without turning on the lights"; 4) Eye management while using digital devices (5 items), such as "My family member advised the child to manage their eyesight while taking a break from using digital devices." The questions

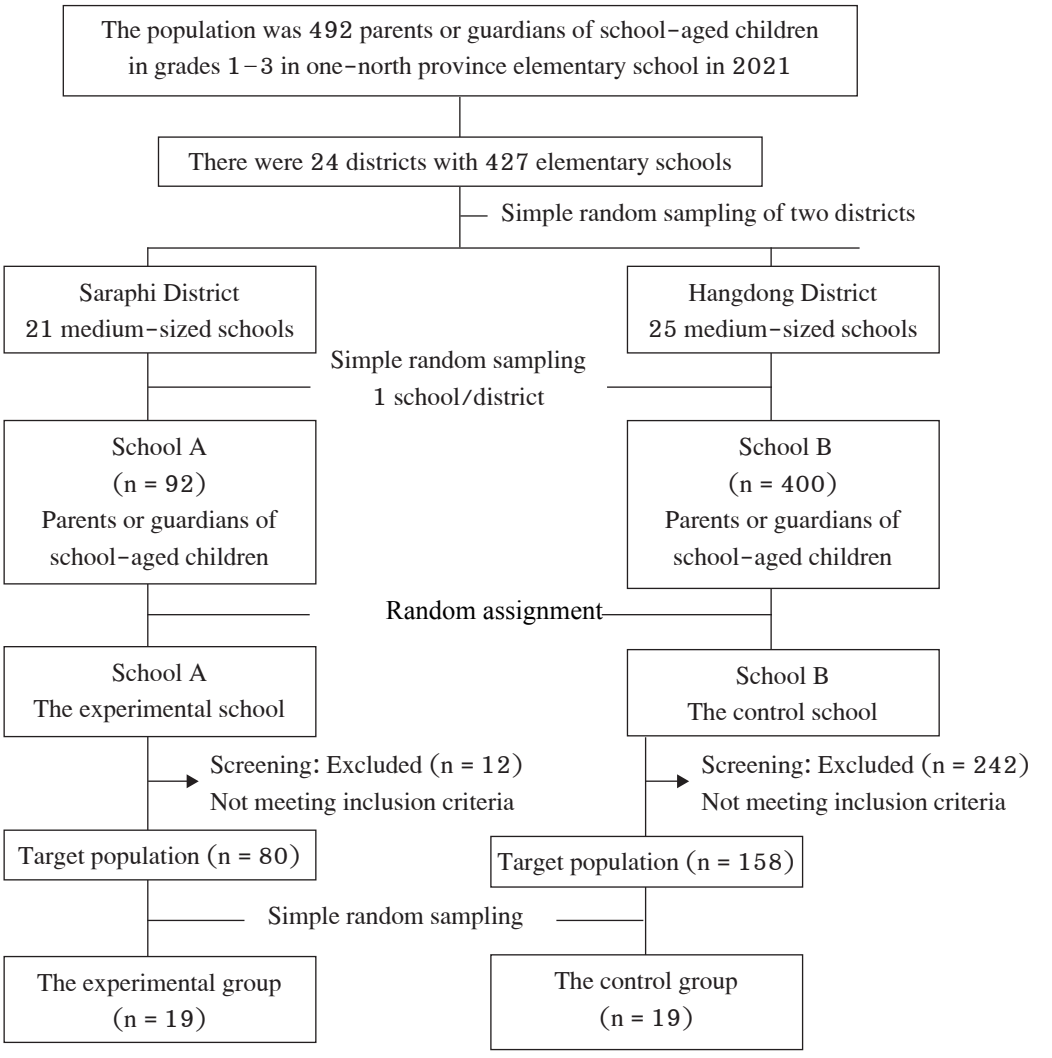

Figure 1. Flow diagram of participants and setting

are all positive and rated on a five-point rating scale (0 = never practice, 1 = practice 1-2 times per week, 2 = practice 3-4 times per week, 3 = practice 5-6 times per week, 4 = practice ≥ 7 times per week). The total score ranges from 0 to 80. A higher score indicates better families' visual care practice. One example of an item is "My family member advises the child to use the 20-20-20 eye rest formula, using digital devices for 20 minutes, resting their eyesight by looking 20 feet away for 20 seconds." Six experts validated this questionnaire: two physicians, one of which was an eye specialist, two nurse lecturers specializing in school health, and two community nurse practitioners specializing in school health. The content validity index (CVI) was equal to .90. The reliability was pretested with ten parents or guardians of school-aged children with the same characteristics as the studied participants. The Cronbach's alpha reliability was .98 in the pilot study and .95 in the main study.

The Digital Eye Strain Syndrome Assessment Form for School-Age Children: The PI developed this questionnaire based on a review of related literature

about digital eye strain syndrome assessment.[25-26] It consists of 10 items, including eyes pain, burning eyes, irritated eyes, dry eyes, constant watery eyes, hard to look the light, slow focusing eyes, headache, and neck and back pain. The questions have two responses, having symptoms (yes) and without symptoms (no). One example is, "Your child has pain in the eye socket, around the eyes, or deep pain in the eye socket while using or after using digital devices." The same six experts as previously mentioned validated this questionnaire, and the content validity index (CVI) was 1.

Part 2: The Family Participation in the Visual Care Program (FP-VCP)

The PI developed this program based on the concept of the Community Participation Theory,[18] and a literature review on caring for the eyesight of school-aged children using digital devices. The eight-week intervention consisted of four-steps; the content and implementation are described in detail in **Table 1.** The FP-VCP includes 1) an education plan; 2) a manual to encourage family participation containing knowledge about digital eye strain syndrome and visual care guidelines, observation form digital eye strain syndrome in children, and family visual care practice assessment form; 3) video instructions about visual issues in school-aged children and guidelines on visual care for school-aged children who use digital devices; 4) kits that encourage family engagement in visual care for school-aged children using digital devices, such as smartphone holders, tape measures, stopwatches, LED table lamps, and blue light filtering glasses; and 5) a LINE app used to communicate and stimulate family practice to follow action plans for school-aged children's visual care.

Table 1. Schedule, the theory of community participation, and activities of the FP-VCP

Week	The theory of community participation	Activities
Week 1 (30 min)	Introduction	**1st Group meeting** - Welcome to the program and introduce participation - Did the questionnaire (pretest) - Program overview
	Step 1: Participation in decision making	***Objectives***: *to analyze the problem situation and develop a family activity plan*
(30 min)	1.1 Decision-making initiative	- Introduction of situation and presenting a video instruction about the visual issue in children - Group discussion: The family shared experiences about children's eye problems, impacts, roles, and problems of family participation - Summary: The situation of problems and the role of family participation - "Should families take the initiative to decide whether to take part in the visual care of children using digital devices?"
(60 min)	1.2 Decision-making process	- Increasing knowledge and practice: Presented video instructions for visual care and demonstrated proper use of digital devices - Analyze the situation: The family considered the problem situation model and propose a solution - Summary: The guidelines for visual care for children - Group discussion: The family discussed the family practice - "Should families make planning decisions on visual care for children using digital devices?"

Table 1. Schedule, the theory of community participation, and activities of the FP-VCP (Cont.)

Week	The theory of community participation	Activities
(30 min)	1.3 Decision-making action	- Creation: The family participated in drafting an activity plan for visual care for children using digital devices - Presentation and consideration: The family presented and considered the implementation of the activity plan together - "Should the family decide to act on the activity plan?"
	Step 2: Participation in the operation	***Objective:*** *To involve the family in the implementation of the plan.*
(15 min)	2.1 Resource support	- Providing kits, manuals, and QR code video instructor on visual care - Building social network: Added LINE app group
Weeks 2-7 (5-10 min/week)	2.2 Participation in management	**LINE app group meeting** - Publication: Public of the complete activity plan through the LINE app group - Participation: The family joined in considering, implementing the activity plan, and sharing experience about implementation
Weeks 3-7 (5-10 min/week)	2.3 Coordination	**Telephone and personal LINE app follow up** - The family assessed the digital eye strain syndrome of a child and assessed family practices
Week 8 (30 min)	**Step 3: Participation in receiving benefits**	**2nd Group meeting:** ***Objective:*** *To allow the family to participate in the benefits of implementing the plan* - Welcome the participants The family reflected about
	3.1 Material	- Preventing costs of medical expenses and obtaining a kit
	3.2 Social	- The relationships in the family, caring for family, and cooperation of school-aged children
	3.3 Personal	- The families' practice, children received visual care from the family and did not have digital eye strain syndrome
(30 min)	**Step 4: Participation in evaluation**	**2nd Group meeting:** ***Objective:*** *To allow the family to participate in the evaluation of implementing the plan* The family commented and analyzed about
	4.1 Satisfaction	- The satisfaction with the activity plan
	4.2 Expectation	- The expectation of the families' practice of visual care of school-aged children
	4.3 View	- The advantages and disadvantages of families' practice. - Operation summary
Week 9 (15 min)		- Did the questionnaire (posttest)

Routine health care services: are those available to children provided by school health nurses under the standard system[27] covering four dimensions: 1) health promotion screening of children's eyes and re-screening to confirm teachers' preliminary results from eye screening, 2) prevention of eye problems in children by providing academic support, including delivering knowledge and promoting an appropriate environment for children's eyesight, 3) primary medical care and referral for children with eye disease due to eye accidents or a visual impairment, and 4) rehabilitation of impairments.

Ethical considerations: This study was approved by the Research Ethics Committee of the Faculty of Nursing, Chiang Mai University, Chiang Mai, Thailand (ID 2564 – EXP066). After the IRB was approved and received permission from the school's director, the PI clarified the objectives and process of the study and asked for the children and parents or guardians' consent forms to participate from both families and school-aged children.

Data collection procedures: This study was conducted from September 2021 to December 2021. The PI approached the parents or guardians and school-aged children through the teacher who worked in the school health unit at each school to make an appointment and provide a private room. The PI completed the eight-week study in the control group first to prevent intervention contamination, then the intervention program was started in the experimental group. The PI collected demographic characteristics of the family and the children, and the family practice questionnaire as the baseline data (week 1), then provided the FP-VCP program to the experimental group in the first group meeting in the school. After that, the PI had activities in the LINE app group (week 2-7) and telephone and personal LINE app follow-up (week 3-7). At the second meeting, the PI provided the FP-VCP program to the experimental group in the school. One week later (week 9), the PI collected the data regarding the families' visual care practice for school-aged children using digital devices of both groups. Both participant groups received a gift set as compensation for participating in the program on the activity day, valued at 100 baht (3.5 USD).

Data analysis: Analysis was conducted using the eSPSS program version 26. The statistical significance level was determined at .05. Descriptive statistics, the independent t-test, and the Fisher exact test were used to describe and compare the two groups in the demographic data. The independent t-test was used to describe the statistical difference in the mean score of family practice between the two groups. A paired t-test was used to describe the statistical difference in the mean score of family practice in the experimental group between pre- and post-intervention. The Fisher exact test was used to test the difference in children's digital eye strain syndrome in the experimental group between pre- and post-intervention and between the two groups.

Results

Characteristics of participants

There were 38 parents or guardians of school-aged children in grades 1-3, with 19 participants in each group. The demographic data of school-aged children for these two groups showed significant differences in average daily use of digital devices on Monday to Friday (M = 4 hrs. 30 min in the experimental group and M = 6 hrs. 53 min in the control group). The type of digital devices used most by children in the experimental and control groups was a smartphone, at 94.73% and 89.48%, respectively.

However, most children did not use assistive devices while using digital devices. Moreover, most school-aged children used digital devices for more than two hours/day, while their families did not assess most children in the experimental and control groups for digital eye strain syndrome at 73.68% and 89.47%, respectively **(Table 2).** The demographic data of parents or guardians for these two groups showed significant differences in the relationship to the child (94.73% were mother and father in the experimental group and were mother, relative, or grandparents in the control group) (**Table 2**).

Table 2. Comparison of demographic characteristics between experimental and control groups

Characteristics	Experimental (n = 19)		Control (n = 19)		t	λ^2	*p*-value
	n	%	n	%			
Children							
Children's age (years)	M = 7.50 (SD = 1.04)		M = 7.61 (SD = 1.09)		.457		.650[a]
6-7	10	52.63	7	36.84			
8-9	9	47.37	12	63.16			
Children's gender							
Female	11	57.90	12	63.16		8.061	.063[b]
Male	8	42.10	7	36.84			
Children's grade							
Grade 1	5	26.32	8	42.10		18.548	.071[b]
Grade 2	7	36.84	6	31.58			
Grade 3	7	36.84	5	26.32			
Type of digital devices							
Smartphone	18	94.73	17	89.48			
Computer/Notebook	5	26.32	6	31.58			
Tablet	5	26.32	6	31.58			
Using assistive devices							
Did not use	12	63.16	18	94.73		1.810	.368[b]
Use	7	36.84	1	5.27			
Average daily use of digital devices							
Monday to Friday	0 - 11 hrs. M = 4 hrs. 30 mins (SD = 2.58)		4 - 15 hrs. M = 6 hrs. 53 mins (SD = 2.61)		2.804		.008[a]
Holiday	1 - 9 hrs. M = 4 hrs. 14 mins (SD = 2.08)		0 - 15 hrs. M = 5 hrs. 24 mins (SD = 3.60)		.069		.234[a]
Getting a digital eye strain assessment from the family							
Did not receive	14	73.68	17	89.47		6.259	.058[b]
Received	5	26.32	2	10.53			
Parents							
Parents' age (years)	M = 38.37 (SD = 10.16)		M = 40.66 (SD = 7.20)		.896		.376[a]
20-29	3	15.79	4	21.05			
30-39	6	31.57	9	47.37			
40-49	9	47.37	5	26.31			
50-59	1	5.27	1	5.27			
Parents' gender							
Female	13	68.42	17	89.47		4.843	.088[b]
Male	6	31.58	2	10.53			

Table 2. Comparison of demographic characteristics between experimental and control groups (Cont.)

Characteristics	Experimental (n = 19)		Control (n = 19)		t	λ^2	*p*-value
	n	%	n	%			
Education level							
Junior high school	3	15.79	1	5.27		20.63	.064[b]
High school	10	52.63	10	52.63			
Higher diploma	1	5.27	2	10.52			
Bachelor's degree	5	26.31	6	31.58			
Relationship to child							
Mother	12	63.15	16	84.21		12.667	.013[b]
Father	6	31.58	1	5.27			
Relatives and grandparents	1	5.27	2	10.52			

Note: a = Independent t-test, b = Fisher's exact test

Effects of FP-VCP

Results revealed that the mean score of families' visual care practice for school-aged children using digital devices at the pretest was not significantly different between the experimental and control groups. However, when comparing the two groups after completion of the program (week 9), the mean family practice score in the experimental group was significantly higher than the control group ($p = .01$) for all four categories ($p < .05$), except for 'lightening while using digital devices, as shown in **Table 3.** In addition, at the post-test, the children's digital eye strain syndrome in the experimental group was significantly lower than in the control group, such as neck pain, constantly watery eyes, eye pain, and slow focusing eyes ($p < .05$), while at the pretest, these were not significantly different in both groups (see **Table 4**).

At post-intervention (week 9), the score of families' visual care practice for children in the experimental group was significantly higher than the pretest means score ($p < .001$) for all four categories ($p < .05$), as shown in **Table 3.** Moreover, the school-aged children's digital eye strain syndrome was significantly lower than pre-intervention ($p < .05$), as shown in **Table 4.**

In summary, the Family Participation in the Visual Care Program (FP-VCP) improved families' visual care practice for school-aged children using digital devices. Furthermore, it reduced the digital eye strain syndrome in children.

Table 3. Comparison of mean score of family practice of visual care for school-aged children using digital devices

Family practice of visual care for children	Experimental (n = 19)				*p* value Exp. Before-After	Control (n = 19)				*p* value Experimental and control	
	Before		After			Before		After		(Before)	(After)
	M	SD	M	SD		M	SD	M	SD		
1. The distance between the digital device and the eyes	9.26	4.70	14.47	3.40	.002	9.52	4.83	9.89	6.88	.866	.015
2. Controlling the usage time of digital devices	11.78	4.70	15.15	2.60	.005	10.42	5.55	11.73	6.21	.418	.037
3. Lighting while using digital devices	11.63	4.74	15.05	1.50	.009	11.36	5.16	13.15	6.50	.871	.230
4. Eye management while using digital devices	8.47	5.43	14.42	4.03	.001	8.73	5.94	10.10	5.69	.887	.011
Overall	41.15	16.39	59.10	6.02	<.001	40.05	15.52	44.89	22.87	.832	.01
Level	Moderate		High			Moderate		Moderate			

Table 4. Comparison of difference in digital eye strain syndrome before and after receiving program and between experimental and control groups

Digital eye strain syndrome	Experimental (n = 19)				*p* value Experimental Before-After	Control (n = 19)				*p* value Experimental and control	
	Before		After			Before		After			
	Yes n (%)	No n (%)	Yes n (%)	No n (%)		Yes n (%)	No n (%)	Yes n (%)	No n (%)	Before	After
1. Eye pain	4 (21.06)	15 (78.94)	2 (10.52)	17 (89.48)	0.015	10	9	4 (21.06)	15 (78.94)	.087	.035
2. Burning eyes	5 (26.31)	14 (73.69)	2 (10.52)	17 (89.48)	0.025	1	18	8 (42.10)	11 (57.90)	.263	.164
3. Irritated eyes	4 (21.06)	15 (78.94)	1 (5.26)	18 (94.74)	0.575	9	10	5 (26.31)	14 (73.69)	.087	.263
4. Dry eyes	2 (10.52)	17 (89.48)	1 (5.26)	18 (94.74)	0.010	5	14	6 (31.57)	13 (68.43)	.058	.316
5. Constant watery eyes	3 (15.78)	16 (84.22)	2 (10.52)	17 (89.48)	0.003	8	11	3 (15.78)	16 (84.22)	.058	.018
6. Hard to look the light	4 (21.06)	15 (78.94)	1 (5.26)	18 (94.74)	0.065	1	18	4 (21.06)	15 (78.94)	.211	.211
7. Slow focusing eyes	3 (15.78)	16 (84.22)	2 (10.52)	17 (89.48)	0.114	1	18	4 (21.06)	15 (78.94)	.158	.035
8. Headache	5 (26.31)	14 (73.69)	1 (5.26)	18 (94.74)	0.023	2	17	6 (31.57)	13 (68.43)	.058	.316
9. Neck pain	6 (31.57)	13 (68.43)	3 (15.78)	16 (84.22)	0.002	2	17	5 (26.31)	14 (73.69)	.088	.010
10. Back pain	3 (15.78)	16 (84.22)	2 (10.52)	17 (89.48)	0.190	1	18	3 (15.78)	16 (84.22)	.158	.018

Discussion

The results of the FP-VCP supported all hypotheses. The program was developed based on the Community Participation Theory[18] and a literature review on caring for the eyesight of school-aged children using digital devices was found to encourage the family to increase visual care practice and reduce the children's digital eye strain syndrome.

The findings of previous studies are similar to this study.[20-22,28] The parents or guardians of children in the experimental group were knowledgeable about childcare and had more child health promotion behaviors. The concept of the four-steps participation process was found to promote family roles and responsibilities by implementing an activity plan, which is a guideline for organizing activities following the objectives and covering appropriate practice guidelines.[29] In addition, educating the family through video instructors and demonstrations helps encourage decision-making to take part in childcare. The video instructors present problems with visually engaging audio narratives and the content clearly,[30] and the demonstration and return demonstration allow families to learn from role models and receive practical training so that the family is ready to perform childcare.[31]

Moreover, this study also used an educational plan on visual care approaches for school-aged children using digital devices enabling the PI to organize learning activities in the correct steps and help encourage families to have effective learning.[32] A manual encouraging family participation is a good teaching tool that is easy to use, convenient, and can review additional knowledge later. It helps promote knowledge and the ability to face situations and provides more practice than those who receive regular services.[33] Kits providing materials and equipment help in arranging a suitable home environment to use children's digital devices. This supports the readiness of the family to operate according to the activity plan and helps promote the learning of school-age children. Appropriate materials and equipment also help support confidence and a good sense of learning.[34] LINE app groups used in the program created family gatherings to encourage action-planned decision-making and enabled families to exchange information, opinions, and practical experiences. Gatherings also allowed families to be reinforced by group members in their continued

practice.[35] The LINE app and telephone follow-up was implemented five times during the intervention for 5-10 minutes each time. When children had a digital eye strain syndrome, the family recorded this in their manual, and the PI could provide accurate advice and guidance. This activity helps promote family participation in the phase of action.

The FP-VCP used in this study demonstrated support for family visual care practice for school-aged children using digital devices, as shown in **Table 3**. After the intervention, the post-test mean score of family practice in the experimental group increased significantly. The mean family practice score in the experimental group was significantly higher than the control group. Furthermore, it was shown that the school-aged children's digital eye strain syndrome was significantly fewer than those pre-intervention. This may be because family involvement implies that family members are part of the operation. In particular, the development of the participation program was based on the Community Participation Theory,[18] a theory that engages those involved in the issue to join from beginning to the end. Thus, the family can genuinely participate in the visual care of their children.[36] In addition, in this study the researcher asked the family to design and draft an activity plan jointly. This led the family to comment on the visual care approach of school-aged children using digital devices following the family context,[29] and promoted implementation of the activity plan. At the end of the intervention, the researcher involved the family in receiving benefits by reflecting on family practices. If the family assessment results found that implementation of the activity plan benefits the eye health of school-aged children, it will result in the family having continuous practice.[37] After that, participating in the evaluation will allow the family to find a solution to improve the practice of visual care for school-aged children.[38]

Therefore, it can be seen that our findings support the benefit of the FP-VCP and support the validity of the Community Participation Theory,[18] which can encourage knowledge and support participation in family practice in proper health care for children and prevent children's health problems. In addition, encouraging the children's participation in taking care of their health will have a more significant impact on their health[17] employing appropriate health behaviors. This study's findings were consistent with the several studies on the development of the family participation model in promoting child health where it was found that the family increased children's health promotion knowledge and behavior and improved health outcomes in children.[20-22,39] In addition, a study of the effects of parental participation in eye health intervention regarding children's screen use showed that this participation positively influenced parents' eye health knowledge, action, and parenting efficacy.[40] The results supported implementing a child-based eye health intervention program with parental participation, which could potentially enhance children's and parents' eye health practices leading to good eye health.

Limitations

The participants in this study were parents or guardians of school-aged children in Chiang Mai province, Northern Thailand. Therefore, generalization to other settings is limited. In addition, the PI provided the intervention and the different data collection times of the experiment and control groups. Thus, internal validity could not be totally controlled. Moreover, the outcomes were assessed one week after the program's completion. The program might have been too short to measure the sustainability of family practice and school-aged children's digital eye strain syndrome.

Conclusions and Implications for Nursing Practice

The nurse can use the FP-VCP for family members or caregivers of school-aged children who use digital devices. It can also be extended to early childhood or adolescent digital device users. Nevertheless, this program

needs be tested with different groups of school-aged children for a longer length of time, approximately 6 or 12 months before early implementation in practice. This testing needs to evaluate other visual acuity results in school-aged children before and after the intervention and to assess the sustainability of family practice utilizing an RCT with a blind study to assess the sustainability of the family practice. Nurses should also build training materials such as online platforms to support the family participation in the program, especially intervention in COVID 19 situation to be more effective and expanded.

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References

1. Danet M. Parental concerns about their school-aged children's use of digital devices. JCFS. 2020;29(4): 2890-2904. doi: 10.1007/s10826-020-01760-y.
2. Mohan A, Sen P, Shah C, Jain E, Jain S. Prevalence, and risk factor assessment of digital eye strain among children using online e-learning during the Covid-19 pandemic: digital eye strain among kids (DESK study-1). Indian J Ophthalmol. 2021;69(1): 140-4. doi: 10.4103/ijo.IJO_2535_20.
3. Enthoven CA, Tideman JW, Polling JR, Yang-Huang J, Raat H, Klaver CW. The impact of computers on myopia development in childhood: the generation R study. Prev Med. 2020;132:105988. doi: 10.1016/j.ypmed.2020.105988.
4. Demirayak B, Tugan BY, Toprak M, Cinil R. Digital eye strain and its associated factors in children during the COVID-19 pandemic. Indian J Ophthalmol. 2022;70(3):988-92. doi: 10.4103/ijo.IJO_1920_21.
5. Department of Children and Youth Affairs. Report of a survey of children and youth on the topic "Children and youth think and do on a daily basis" [internet]. 2020 [cited 2021 Oct 23]. Available from: https://www.dcy.go.th/webnew/main/ services/pdf/Report_of_the_Survey _of_ Juvenile_Thoughts.pdf (in Thai)
6. Lavin W, Taptagaporn S, Khruakhorn S, Kanchanaranya N. Prevalent and associated risk factor of digital eye strain among children in secondary schools in Pratumthani Province, Thailand. J Med Assoc Thai. 2018;101(7):957-63.
7. Mehra D, Galor A. Digital screen use and dry eye: a review. Asia Pac J Opthalmol. 2020;9(6):491-7. doi: 10.1097/APO.0000000000000328.
8. Gupta SK, Aparna S. Effect of yoga ocular exercises on eye fatigue. Int J Yoga. 2019;13:76-9. doi: 10.4103/ijoy.IJOY_26_19.
9. Rosenfield M. Computer vision syndrome (a.k.a. digital eye strain). OiP. 2016;17(1):1-10.
10. American Optometric Association. Computer vision syndrome [internet]. 2020 [cited 2021 Oct 20]. Available from: https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome?sso=y
11. Gupta R, Chauhan L, Varshney A. Impact of e-schooling on digital eye strain in coronavirus disease era: a survey of 654 students. J Curr Ophthalmol. 2021;33(2):158-64. doi: 10.4103/joco.joco_89_20.
12. Minto H, Ho M. What is comprehensive school eye health? CEHJ. 2017;30(98):21-5.
13. Rizwana HJ, Aparna G, Viswanathan S, Meenakshi S. Managing the myopia epidemic and digital eye strain post COVID-19 pandemic-What eye care practitioners need to know and implement? Indian J Ophthalmol. 2020;68(8): 1710-12. doi: 10.4103/ijo.IJO_2147_20.
14. Foreman J, Salim AT, Praveen A, Fonseka D, Weiting DS, He MG, et al. Association between digital smart devices use and myopia: a systematic review and meta-analysis. Lancet Digit Health. 2021;3(12): e806-18. doi: 10.1016/S25 89-7500(21)00135-7.
15. Teerawatananon K, Wongkittirak K, Myint CY, Teerawatananon Y. Assessment of accuracy and feasibility of visual acuity examination in Thai children in kindergarten and primary school levels by teachers; 2013 (in Thai).
16. Faculty of Nursing, Chiang Mai University. School health service practice report. Chiang Mai: Department of Public Health Nursing; 2019 (in Thai).
17. Bally JM, Buries M, Smith NR, Holtslander L, Mpofu C, Hodgson-Viden H, Zimmer M, et al. Exploring opportunities for holistic family care of parental caregivers of children with life-threatening or life limiting illness. QSW. 2020;29:1-19. doi: https://doi.org/10.1177/1473325020967739

18. Cohen JM, Uphoff NT. Participation place in rural development: seeking clarity through specificity. New York: World Development; 1980.
19. Marston C, Renedo A, McGowan CR, Portela A. Effects of community participation on improving uptake of skilled care for maternal and newborn health: a systematic review. PLoS Digit Health. 2013;8(2):e55012. doi: 10.1371/journal.pone.0055012.
20. Chokprajakchad M, Phuphaibul R, Sieving RE, Phumonsakul S. Effectiveness of parent participation in a technology-based adolescent sexuality education program: a randomized control trial. Pacific Rim Int J Nurs Res. 2020;24(2):219-33.
21. Kunnavasate A, Chaipibansarit P, Kreuchotikun S. Effect of participation in supporting language development program toward knowledge and self-efficacy of pre-school care giver. Vajira Nurs J. 2018;20(1):40-53 (in Thai).
22. Nkwake AM, Trandafili H, Hughey J. Examining the relationship between community participation and program outcomes in metaevaluation. JMDE. 2013;9(20):1-17.
23. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. Behav Res Methods. 2009;41(4): 1149-60. doi: 10.3758/BRM.41.4.1149.
24. Gupta KK, Attri JP, Singh A, Kaur H. Basic concepts for sample size calculation: critical step for any critical trials. Saudi J Anaesth. 2016;10(3):65-8. doi: 10.4103/1658-354X.174918.
25. Brennan CC, Sulley A, Young G. Management of digital eye strain. Clin Exp Optom. 2018;102(1):1-12. doi: 10.1111/cxo.12798.
26. Goh WL, Bay S, Chen VH. Young school children's use of digital devices and parental rules. Telemat Inform. 2015; 32: 787-95. doi: http://dx.doi.org/10.10 16/j.tele. 2015.04.002
27. Ministry of Public Health. Guidelines for the implementation of the good eyesight Thai children project to increase learning opportunities according to the policy, reduce study time, increase learning time [internet]. 2017 [cited 2021 Oct 22]. Available from: https://hp.anamai.moph.go.th/th/general-of-30/193628 (in Thai)
28. Aarthun A, Qymar KA, Akerjordet K. Parental involvement in decision-making about their child's health care at the hospital. SON. 2019;6:50-8. doi: 10.1002/nop2.180.
29. Bailey RR. Goal setting and action planning for health behavior change. Am J Lifestyle Med. 2019;13(6):615-8. doi: 10.1177/1559827617729634.
30. Ketchum C, Lafave DS, Yeats C, Phompheng E, Hardy JH. Video-based feedback on student work: an investigation into the instructors' experience, workload, and student evaluations. Online Learning. 2020;24(3):85-105. doi: https://doi.org/ 10.24059/olj.v24i3.2194
31. Basheer A. The effectiveness of teachers' use of demonstrations for enhancing students' understanding of and attitudes to learning the oxidation-reduction concept. EURASIA J Math Sci Tech Ed. 2017;13(3):556-70. doi: 10.12973/eura sia.2017.00632a.
32. Shi H. Planning effective educational programs for adult learners. WJE. 2017;7(3):79-83. doi: https://doi.org/10.5430/wje.v7n3p79
33. Starwhacker A, Lee M, Bers MU. Teaching tools, teacher's rule: exploring the impact of teaching styles on young children's programming knowledge in Scratch Jr. Int J Technol Des Educ. 2018;28(5044):78-85. doi: 10.1007/s10798-017-9400-9.
34. Kob CG, Shah A, Shamsuddin H, Norizan NA. The effect of using learning kit material among students. IJRTE 2019; 7:239-42.
35. Chen KH. Using LINE Apps to encourage active participation in evidence-based practice journal club. University of Sydney: ISDM ISEHC Conference; 2015.
36. Stern RT. Implementing article 12 of the UN convention on the rights of the child: participation, power, and attitudes. Boston: Brill Nijhoff; 1974.
37. Rabeleanu A, Soitu DT. Perception of the family receiving social benefits regarding access to health care. SSCD. 2016; 66:157-71.
38. Odera EL. Capturing the added value of participatory evaluation. AJE. 2021;7(2): 210-9. doi: https://doi.org/10.1177/1098214020910265
39. Polmark J, Thisara P, Weiangkham D, Duangpanya A. Development of a family participation model for promoting child development: a case study of Ban Sanpamuang childcare center. JRTAN. 2019;20(2):241-250 (in Thai).
40. Liu SM, Chang FC, Chen CY, Shih SF, Meng B, Ng E, et al. Effect of parental involvement in a preschool-based eye health intervention regarding children's screen use in China. Int J Environ Res Public Health. 2021;18: 1-14. doi:https://doi.org/10.3390/ijerph182111330

การวิจัยกึ่งทดลองประสิทธิภาพของโปรแกรมการมีส่วนร่วมของครอบครัวในการดูแลสายตาของเด็กวัยเรียนที่ใช้งานอุปกรณ์ดิจิทัล

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บทคัดย่อ: สังคมไทยในปัจจุบัน มีการนำอุปกรณ์ดิจิทัลมาใช้ในการเลี้ยงดู และส่งเสริมการเรียนรู้เด็กวัยเรียน ส่งผลให้เกิดกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัล ดังนั้น การส่งเสริมการมีส่วนร่วมของครอบครัวในการดูแลสายตาของเด็กวัยเรียนที่ใช้งานอุปกรณ์ดิจิทัลอย่างเหมาะสม จะช่วยป้องกันกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัล โดยมีวัตถุประสงค์เพื่อศึกษาผลของกิจกรรม 8 สัปดาห์ของโปรแกรมการมีส่วนร่วมของครอบครัวในการดูแลสายตาต่อการปฏิบัติของครอบครัว และกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัลของเด็กวัยเรียนที่ใช้งานอุปกรณ์ดิจิทัล กลุ่มตัวอย่างจำนวน 38 คน เป็นบิดามารดาหรือผู้ปกครองของเด็กวัยเรียนชั้นประถมศึกษาปีที่ 1-3 ได้รับการสุ่มเลือกจาก 2 โรงเรียน ใน 2 อำเภอ จังหวัดเชียงใหม่ และได้รับการสุ่มเข้ากลุ่มทดลอง (n = 19) และกลุ่มควบคุม (n = 19) โดยกลุ่มทดลองได้รับโปรแกรมการมีส่วนร่วมของครอบครัวในการดูแลสายตาของเด็กวัยเรียนที่ใช้งานอุปกรณ์ดิจิทัลควบคู่กับการดูแลสุขภาพตามระบบปกติ และกลุ่มควบคุมได้รับการดูแลสุขภาพตามระบบปกติ เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลได้แก่ ข้อมูลส่วนบุคคล แบบสอบถามการปฏิบัติของครอบครัว และแบบประเมินกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัลของเด็กวัยเรียน วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา สถิติทดสอบฟิชเชอร์เอ็กแซค สถิติทดสอบค่าทีแบบอิสระ และสถิติทดสอบสองกลุ่มแบบสัมพันธ์กัน

ผลการศึกษาพบว่า ภายหลังการทดลอง กลุ่มทดลองมีคะแนนเฉลี่ยการปฏิบัติของครอบครัวสูงกว่าก่อนทดลองอย่างมีนัยสำคัญทางสถิติ และกลุ่มทดลองมีคะแนนเฉลี่ยการปฏิบัติของครอบครัวสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ นอกจากนี้ ภายหลังการทดลอง กลุ่มทดลองมีกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัลน้อยกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ โปรแกรมนี้ควรได้รับการพัฒนาเพิ่มเติมโดยใช้ระยะเวลานานขึ้นและศึกษาในโรงเรียนอื่นๆ โดยพยาบาลสามารถนำโปรแกรมไปใช้เป็นต้นแบบการส่งเสริมการดูแลสายตาสำหรับเด็กวัยเรียน เพื่อป้องกันกลุ่มอาการตาล้าจากอุปกรณ์ดิจิทัล โดยบูรณาการเป็นส่วนหนึ่งของการให้บริการและอาศัยการมีส่วนร่วมของครอบครัว

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