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The effectiveness of the eye exercise program of Personal Scope-EX for elementary students.

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In this study, eye exercise program by Personal Scope-EX was performed in each 60 elementary school students who are 3 ~ 6th grades with eye vision under 0.7). Those are both experimental and comparison group selected at random. This research was performed during 4 months.
After this, we get a conclusion as follows.
1) The eye vision of all students has joined at this test was improved as follows,
Left eye: Before .22±.17 After .74±.25 Averagely increased by .52
Right eye: Before .22±.17 After .72±.25 Averagely increased by .50
Under $p<.001$, both eyes experimental result have similar consequences.
2) There wasn't any difference of eye exercise program effectiveness by gender, comparison group.
3) The purpose of this research is that to survey on factors of student's eye vision decline by the viewpoint of national level, develop a proper eye health program, and offer a basic data to maintain a bright and healthy eye vision on the basis of this research.

Ⅰ. Preface

The modern people who live in 21st Century want to keep our eyes as healthy.
This is the one of the desires for all human beings.
However, vision information society needs to attain 80~90% of life information. Currently, the number of people having bad eye sight is increased up to 20 million.
Especially for students' eye vision degeneration in growth period, lower the study & physical capability. And over excess of stress on eye causes more possibility to get an eye disease.

As a result of test performed by Korea Education Office recently for overall 743 elementary, middle and high school students in 2011 said that 57.6% of students has lower eye vision than 0.7 or keep wearing glasses. This is the first time which is resulted over 50%.

In comparison with 2001 (39.5%), the increased rate is as much as 45%.
They said that this situation are Caused by growth of short distance working, excess of stress, increased studying amount of time, lack of exercise, increased of environmental pollution, excess using of smart phone and tablet PC, and so on. (Seoul Newspaper, 2012)
Most of student's low eye visions are short-sightedness that is caused by multiple factor for both heredity and environment (Saw et al., 2000).

Family history, as a genetic factor, the short-sightedness of parents and siblings has been reported

(Groos & Jackson 1996; Wu & Edwards, 1999) and as a environmental factor, long hours reading, the size of text, light, Increase amount time of TV Watching, using computer, stress, nutrition imbalance, lack of exercise, economical condition are existed.

It was reported that especially by short distance working and mental factor cause tension of eyes give pressure to medial rectus muscle, and then cause shrinking of medial rectus muscle. So, vision can be short-sightedness.
Recently they tend to consider environmental factor (social, culture, economic) more important than that of generic's. (Kang In San,1997,Saw et al,.2000;Goo bon sool.1998 ; Kim jae chan Goo bon sool 1988 ,Kim young gi 1994,Lee gyu young 1996,Jung young sook,1994)
The optic nerve disorder that is frequently observed is not natural, if they have a habit to do outside activity minimum 10 hours a week from childhood, then they can reduce a possibility of being short-sightedness, we can expect the prevention of short-sightedness by this.
(Asia today 2011)

As for the muscles of human body, the speed of muscle's contraction can be increased by exercise that makes muscle's cell bigger and higher capillary's density of myoglobin.
On the contrary, muscle's cell is smaller and decreased the physiological factor regarding muscles without exercise, and then all the functions are aggravated. (Baek il young 2002 : 1976;Fox 1979)

Bate(1943),Lee bok min(1997) comments about influence of the eye exercise to eye muscles and eye vision that hyperopia is occurred when rectus muscle have a problem, and myopia can be when oblique muscle is in not good condition. So they said that short sightedness, strabismus, hyperopia, astigmatism can be cured by exercise.

They said that acquired sightedness, strabismus, hyperopia, astigmatism, eye fatigue, can be cured by eye exercise program through some theories below.
Theory of eye relaxation (Helmholtz, Germany),Ocular muscle(Bate,USA),Eye vision recovering training(Paper,USA),Short sightedness training(Dagawa,Japan),Eye vision cure training(Freeman,USA). (Kim tae su, 1991)

Also, Jang suk jong(1990),Kim dong sup(1992) said that eye vision can be improved by yoga massage. Cho chun je(1984) report that eye vision can be recovered by eye training.
As a result of survey regarding eye vision trouble, and short sightedness for city resided student, short sightedness was recovered by exercise. (Reported by Kim jae chan(1986))
Park ki ho reported that both right and left eye visions were improved at the level of $p<.01$, as a result of survey through elementary school students.

Hong jeong ja(1993) reported that short sightedness was improved by eye vision care training. The aggravation of eye vision (short sightedness etc.) of elementary and middle school students was caused by eye vision care training and modifying life style.

Especially by survey of nakaue(1978), the reason of short sightedness is 95% in environmental factor, only 5% generic factor. He said that 95% of eye vision can be cured by exercise.

So, the main reason of this survey was performed on the basis of prior experiments, to verify and supply the effect of Personal Scope-EX that was invented to prevent and recover eye vision

aggravation of elementary school students, and let them maintain, recover and have bright and healthy eye vision.

I I . Survey Method

1. The object of Study

This survey was performed through “S” 120 elementary students that has eye vision lower than 0.7,were selected at random, divided with 60 students as experimental group and 60 students as comparison group.

We select the students who sincerely joined this survey; the features of them are as below table 1.

Table 1. Feature of object

Classification \ Group		Experimental Group (n=60)		Comparison Group (n=60)	
Number of people	Male	29		29	
	Female	31		31	
Division of Left & Right eye		L	R	L	R
Eye Vision	Standard(1.5 ~ 0.7)	3	3	3	3
	Light short sightedness(0.7 ~ 0.5)	3	4	6	5
	Middle short sightedness(0.5 ~ 0.2)	19	18	17	19
	Height short sightedness(under 0.2)	35	35	34	33

2. Contents of eye exercise

1) Composition of eye exercise program.

We performed preliminary practice for students to learn and be accustomed to Personal Scope-EX for 1 week,

We kept surveying during 4 month from September 2011 to December 2011, 5days a week (55 minutes), once a day.

The exercise program of eye training equipment developed for this survey is like as below. (Table 2)

Table 2. Composition of Eye exercise program

Steps of exercise	Program	Contents of Exercise	Frequency of Exercise	Time of Exercise
Preparation Exercise	Deep breathing, Stretching, Acupressure Massage, Eyeball training Pressure as much as Palm's	Joint relaxation, Eye blinking Acupressure Massage, Eyeball training Staring (Long & short distance) Long term pressure Deep breathing	Once a day	10 min
Main Exercise	Eyeball training of Personal Scope-EX	Contraction, Relaxation Adjustment exercise, Mind control	Once a day	25 min.
Main Exercise	Eyeball training of Personal Scope-EX	Unlimited focusing, Circuit moving, Short distance,(Staring) Long distance(Staring) Close & Shut repeated (Eye) Cerebrum stimulation, Binocular fusion	Once a day	15 min.
Final (Warm -down) Exercise	Meditation breathing Deep breathing	Tapping shoulder Meditation breathing Deep breathing	Once a day	5 min.
Total	5 times a week			55 min

3. Eye exercise method and time

1) Preliminary exercise method (Total 7 minutes) : composed by gymnastics

(1) Relaxation of joint : Lock fingers together (count to 32)
(2) Relation of Shoulder : Lock fingers together over head and raise highly,
At this time, eye should stare the back of hands. (count to 32)
(3) Eye blinking : Lightly blink eyes to clockwise direction, repeat 2times of viewpoint exercise.
(4) Eye massage,
It can relax the eye optic nerve, make good blood circuit around of eyes, especially promote tension and relaxation of ciliary body then help to control focusing.

<Massage method>
Press deeply from 1 to 3, and press softly at 4, deeply press from 5 to 7, and safely press at 8 again.

① Cheon-ung acupuncture point massage exercise (count to 16)

Picture 1. Cheon-ung acupuncture point

Place both thumb (finger side) at inner of upper eyebrow, then press and turn.

② Jung myoung acupuncture point massage exercise (count to 16)

Picture 1. Jung myoung acupuncture point

With thumb of right hand and indexfinger, press Jung myoung acupuncture point and rub it up and downward.

③ Saback acupuncture point massage exercise (count to 16)

Picture 3. Saback acupuncture point

Support chin by thums, and press and turn Saeback acupuncture point with index finger of both hands,

④ Taeyang acupuncture point massage exercise (count to 16)

Picture 4. Taeyang acupuncture point massage

Place a thumb on Taeyang acupuncture point, and make half fisk, turn up and downwards.

⑤ Yepung acupuncture point massage exercise (count to 16)

Picture 5. Yepung acupuncture point

Place attached index and middle fingers on Yepung acupuncture point, then press and turn while

the other four fingers grapping ears.

⑥ Punji acupuncture point massage exercise (count to 32)

Picture 6. Pung ji acupuncture point

Put thumb on punji acupuncture point, then press and turn while the other four fingers grapping ears.

⑦ Hapgok acupuncture point massage exercise (count to 32)

Picture 7. Hapgok acupuncture point

Place thumb on Hapgok acupuncture point and turn inner side of palm by index finger.

(5) Nape (Back of neck) massages (count to 32)
Massage (Strongly press) nape by right palm and left palm.
(count to 16 per each time, count to 32)

(6) Eyeball training
This can let them recognize the object brightly by moving eyeball to every direction by 2 rectus and 4 oblique muscles with distance control.
Eyeball exercise :

① Up and downward
Direction : 12 o'clock – 6 o'clock (count to 16)

② Left and right
Direction : 9 o'clock – 3 o'clock (count to 16)

③ Up, down, left, right
Direction : 12 o'clock – 6 o'clock - 9 o'clock - 3 o'clock (count to 16)

④ Bevel(1)
Direction : 11 o'clock – 5 o'clock (count to 16)

⑤ Bevel(2)
Direction : 1 o'clock – 7 o'clock (count to 16)

⑥ Revolving(1)
Direction : Clockwise (count to 16)

⑦ Revolving(2)
Direction : Counterclockwise (count to 16)

(7) Perspective(Staring)
For relaxing the tension of the ciliary muscle
① staring the edge of thumbs (count to 8), then see the long distance as far as possible. (count to 32)

(8) Palm pressure (count to 32)
By rubbing hands (count to 8) and make them warm, then press the closed eyes. (count to 8) repeat 2 times.

(9) Head massage (count to 16)
Press head forward enough and raise up with breast stretching (count to 4) by lock fingers together,
(10) Turning shoulder (count to 16)
Make shoulders relaxed then lightly turn it forward. (count to 8 backwards, count to 8 lightly)
(11) Deep breathing (count to 16)
Raise up and down both hands repeatedly and breathe deeply

2) Main exercise (25 Min.)

Picture 8. Eye exercise by Personal Scope-EX

(1) Eyeball exercise by the program of Personal Scope-EX (25 Min.)
① Relaxation of ocular muscle – Eye level exercise (5~7 min.)
② Reinforcement of ocular muscle – Eye width exercise (8~10 min.)
③ Control of ocular muscle – Eye depth exercise (5-6 min.)
④ Meditation- Relaxation (3-4 min.)

(2) Eyeball exercise by the program of Personal Scope-EX (15 Min.)
① Unlimited focusing (2 min.)
② Short distance staring (2 min.)
③ Long distance staring (2 min)
④ Point staring (2 min)
⑤ Short and long distance staring (2 min)
⑥ Binocular fusion (2 min.)
⑦ Cerebrum stimulation(1 min)

3) Final (Warm-down) exercise (5 Min.)

① Shoulder tapping (2min) : tapping shoulders by finger. (Put the thumb inside and lightly close fingers)
② Meditation (2min.):
Make the palms warm by rubbing and place them on eyes, do meditation with abdominal breathing
③ Deep breathing (1min.): Raise up the natural vitality by abdominal breathing, Hypogastric breathing, 88 breathing.

5. Acuity determination method
In the optometry laboratory, we changed overall brightness 50 Lux and the brightness of Han Cheon Seok's optometry chart to 200 Lux. After that, the projector and the brightness of Han Cheonseok's optometry chart was installed. And then, we conducted the experiment that measures the right and left eyesight of experimental group (Ex) and comparative group (Con) each twice before and after using Eye exercise program of Eyesight recovery apparatus (Personal Scope-EX).

6. Data processing
Data analysis of the study was used Window SPSS/PC 14.0 program to process the data. An average (M) and a standard deviation (SD) were computed through technical statistic analysis. And then, we carried out repeated measures analysis of variance to verify the difference in each group. Finally, we conducted independent t-test to prove the difference of eye exercise program in gender. Before all of data processing, level of significance of every statistics was set $p < .05$.

I I I . Research finding

1. Changes in visual acuity by Eye exercise program

As follow Table 3, the result of experiment was drawn by Experiment targets from third grader through sixth grader for four months.

Table 3. Changes in visual acuity by Eye exercise program that was used before and after

Separation	Visual Acuity	Before (M±SD)	After (M±SD)	t
Ex.	Left eye	.22±.17	.74±.25	-19.096
	Right eye	.22±.17	.72±.25	-18.764
Com.	Left eye	.22±.19	.21±20	1.034
	Right eye	.24±.22	.22±22	1.311

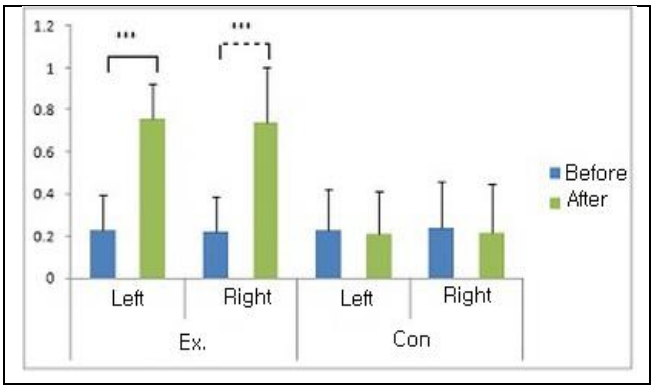

Image 10. Visual acuity before and after taking part in eye exercise program

According to Table 3, left visual acuity of Experiment group was increased an average of .52 from .22±17 which was before participating eye exercise program to .74±25 which was after participating eye exercise program. In addition, Right visual acuity of Experiment group was increased an average of .50 from .22±17 which was before participating eye exercise program to .72±25 which was after participating eye exercise program. The high statistical significance that is level of p<.001 appeared on both Left and Right visual acuity.
However, the comparative group was not appeared that is no significant change. Left visual acuity of the comparison group didn't show any significant change which was from .22±17 to .21±20 after 6 months. Also, Right visual acuity of Experiment group didn't show any significant change which was from .24±22 to .22±22 after 6 months. Therefore, the statistical significance that is level of p<.001 was not appeared on both Left and Right visual acuity.

2. Changes in visual acuity of the experimental group and the comparative group depend on gender.
As follow Table 4 and Table 5, there is comparison analysis results between differences of changes in visual acuity of the experimental group depend on gender, which participated on eye exercise program for 4 months, and differences of change in visual acuity of the comparative group by gender, which did not participate.

Table4. Differences in changes in visual acuity of the experiment group by gender

separation	gender	n	M	SD	t
before left eye	m	29	.291	.192	1.832
	f	31	.214	.152	
before right eye	m	29	.256	.165	.639
	f	31	.228	.178	
after left eye	m	29	.774	.235	.751
	f	31	.732	.292	
after right eye	m	29	.761	.233	.778
	f	31	.708	.286	

According to Table 4, differences of eye exercise program of the experiment group depend on gender was not found (p>.05).

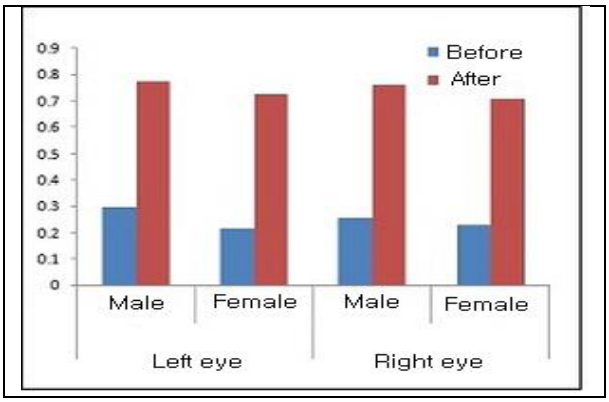

Image11. Change in visual acuity of the experimental group depend on gender

According to Table 5, there was also no difference of sex on comparative group, which did not participate on eye exercise program (p>0.5). Thus, it appeared that the factor of differences by gender of eye exercise program is not occurred.

Table5. Differences in changes in visual acuity of the comparative depend on gender

Separation	gender	n	M	SD	t
before left eye	m	29	.239	.180	.463
	f	31	.214	.219	
before right eye	m	29	.260	.238	.650
	f	31	.222	.202	
after left eye	m	29	.211	.268	.179
	f	31	.202	.220	
after right eye	m	29	.231	.220	.099
	f	31	.225	.247	

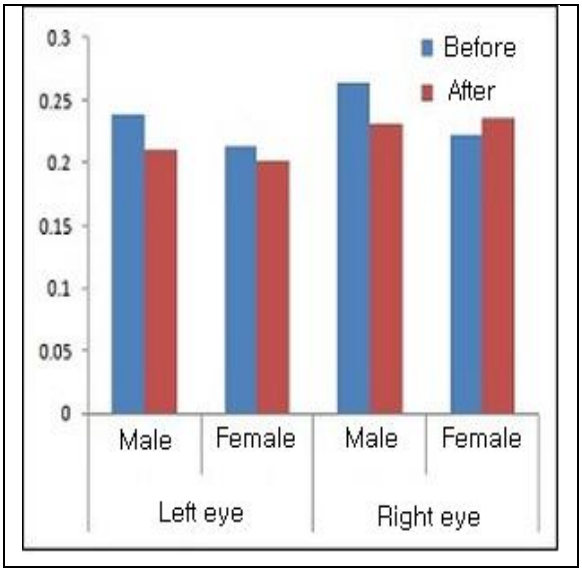

Image 12. Change in visual acuity of the comparative group depend on gender

IV . Discussion

This study was compared changes in visual acuity between the experiment group and the comparative group, which is targeted 60 students who is from third grader through sixth grader whose eyesight is lower than 0.7, to prove effect of eye exercise program and to supply it. According to ministry of education science and technology of Korea, they found that a percentage of students who has eyesight less than 0.7 with glasses are 57.6% for the first time ever. In addition, if it compared to a percentage of students who has eyesight less than 0.7 in 2001(39.%), the growth of rate, 45% that has become one of serious problems. effected crucial on growth amount of close range work, such as watching TV, using computer, studying hard for entrance examination, using smart phone or tablet PC for a long time that is reason why eyesight problem increases.

In this study, an average rate of increase in acuity of left and right eye is increased .52 and .50 by the result of conducting eye exercise program of devised and developed eyesight recovery

apparatus (Personal Scope-EX). The high statistical importance that is a standard of $p<.001$ appeared on both left and right visual acuity. However, on the comparative group who did not take part in eye exercise, there were no big differences of change in acuity of both eyes after 4 months. The statistical significance that is level of $p<.001$ was not appeared on both Left and Right visual acuity. Moreover, it appears that the factor of differences in both experiment group and comparative group by gender of eye exercise program is not occurred. According to Park, Kim, Cho, Sin and Hwang's paper (1991), they carried out Eyesight Enhancement Program with elementary school students, after that, they reached a conclusion and made a report that the vision of left and right was improved. Jinju Oh and Heesun Sin(2001) reported that the result of the moderating effects of vision enhancement program was verified with 742 elementary school students' visual acuity improved. Furthermore, Gwonik Jang(2004) said that middle school students' eyesight, which is lower than 0.2, was improved gradually by vision training. In addition, Donghwan Joo's experimentation(2002) found that both eyes of 60 elementary school students was improved at a level of $p<.01$ for the high statistical importance in the experiments which was conducted by 12 weeks. Kiho Park(1990, 1991) reported that elementary school students' vision was improved in terms of a level of $p<.01$ for the high statistical importance by eye training. Taesu Kim(1991) also said that Myopia could be recovered. Yongsu Oh(1992) emphasized that glasses affect eyes getting worse. Jeongja Hong(1993) reported that myopia was recoverd by eye exercise training with 7th grade girls. Youngki Kim(1994), Jinju Oh(2001) reported that the eye exercise training is effective to improve elementary school students' eyesight. According to Hyewon Baek's research(2002), she said that rhythmic eye training could be helped 36 students for improving eyesight and reducing fatigue of their eyes. These results of many studies and this study demonstrated that eye exercise is much helpful to improve students' low eyesight and visual recovery exercise is the major factor of improvement of acuity. Therefore, to recover degraded eyesight that need regular training for the eye, the correct habit of using the eye, sufficient nutrition for the eyes, moderate exercise. According to Bates and Curtin and Doners, they said that Most of problems of students' eyes are myopia. That mean the cause of myopia can be influenced by close range work or read for a long time, size of letter, light, time and distance for watching TV, how long using computer, many kind of stress, Nutritional imbalances, lack of exercise. Especially, close range work and some psychological factors might be able to cause myopia. In addition, they said that the relationship between eye and muscle is important to improve eyesight by eye exercise. In terms of exercise physiology, the muscles of the body can be bulk up that influenced the size of muscle cells and enzymes, the density of capillaries, an increase in myoglobin, the smooth supply of oxygen, and faster speed of muscle contraction. However, otherwise, the size of muscle cells as well as all the physiological factors associated with muscle can be reduced or subsided(Ilyoung Beak,2002; Fox, 1979). Moreover, Richler & Bear(1980) found that environmental factors of the cause of acquired myopia are affected by amount of close range work. Young(1987) reported about Eskimo who started first compulsory education that growth of amount time of close range work is main cause of losing eyesight. Sako(1978) said that high education levels and growth of amount time of close range work are the main cause of losing eyesight. Bonsul Koo(1988) reported that the distance for watching TV and reading a book are associated with the cause of losing eyesight. Also, it is important to the health of the eye that economic rate, reading attitude, and amount of the light. In addition, Youngmee Yun(2006), Youngki Kim(1994), Jaechan Kim, Bonsul Koo(1988), Kyuyuong Lee(1996), Youngsook Jeong(1993) reported that amount of break time, distance and time for watching TV, attitude, and using computer is the main cause of losing eyesight. Then, they said that the incidence of myopia is related to age, gender, and the life habit. As the result of their studies, distance of reading the book, amount of close range work, and the

size of the letters on the blackboard or whiteboard are connected statistically with the losing eyesight. Chung On(1978) said that there is 95% of the cause of myopia at environmental factors and the rest of 5% is Genetic factors therefore, 95% of myopia can be recovered by eye exercise. Furthermore, Bates(1943) said about influence of eye muscle and ocular, as the problem in a rectus muscle become hypeopia and the problem in oblique muscle become myopia. Also, he said that myopia, strabismus, hyperopia, astigmatism can be recovered by eye exercise. If we consider the result of Kyuyoung Lee(1996), Duke-Elder(1970)' s studies that randomly picked experimental targets from third grader's low eyesight to fifth grader's low eyesight, the following results can be derived. As the result, the eye exercise program of the Eyesight Recovery Apparatus (Personal Scope-EX) is effective program much helpful to both genders to prevent the losing eyesight and to improve eyesight.

VI . Conclusion

In this study, it was applied Personal Scope-EX's an ocular movements program to the experimental group that randomly selected 60 students from third to sixth grade elementary school and comparative group which contains another random picked 60 elementary school students from third to sixth grade. We chose those two groups to participate in an ocular movements program of Personal Scope-EX for 4 months and the following results were obtained. Before participating in an ocular movements program, their left visual acuity was .22±.17. After participating that program, their left visual acuity changed to .74±25 that increased .52 on average. Their right visual acuity was changed from .22±17 to .72±25 that also increased .50 on average. Both right and left visual acuity showed very of significance in the level of $p<.001$. Both experiment that depends on gender and the experiment of comparative group did not show any change in visual acuity ($p>.05$)

During this study, we found that it is possible to improve low visual acuity, which is getting worse by environmental and acquired factors, by regular ocular movements exercise. Therefore, we propose for following-up study. At the national level, our government is needed to research the factors for decreasing visual acuity of elementary school students, solve this problem by developing a personalized eye health programs, and provide school or education system to maintain the clean and healthy-looking eyes for the future.