



Effectiveness of Ocular Muscle exercises on degree of Myopia

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ABSTRACT

There is an ever-rising prevalence of myopia in our population. Many individuals are being diagnosed with myopia; however, the treatment for myopia is relatively the same. Evidence has shown that there is the involvement of extraocular muscles as well in the development of myopia. These muscles can be trained and may prove useful in improving myopia. Thus it is important to study the effects of ocular exercises on myopia. The objective of this study was to find out the effect of ocular muscle exercises on the degree of myopia. There was a total of 46 subjects who were willing participants of this study. Pre-intervention and post-intervention visual acuity was analyzed. The experimental group received ocular exercises, and the control group was advised to follow a routine for six weeks. There was no significant effect of ocular muscle exercises on the degree of myopia post-intervention ($p = 0.3275$). Based on the result of the study, it can be said that the ocular exercise does not affect the improvement in the visual acuity in an individual. Similarly, the ocular muscle exercises were not effective in improving the degree of myopia.

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INTRODUCTION

A refractive defect in the eye in which collimated light produces image focus in front of the retina when accommodation is relaxed is known as myopia. The appearance of a distant object is blurred known as nearsightedness. (Fredrick, 2002)

The strength or optical power of a corrective lens that focuses distant images on the retina is used to

measure myopia in diopters. The classification of myopia by degree or severity is as follows, (Wu *et al.*, 2016)

Low myopia -0D to -1.5D

Moderate Myopia- -1.5D to -6.0D0

High myopia- -6.0D or more

Pathological myopia- -8.0D or more (Wu *et al.*, 2016)

In the beginning, the occurrence of myopia was very less. Its incidence has increased from 0.4% (1993) to 34.2% (2016). The highest prevalence of myopia is in South-East Asian countries. In India, the incidence of myopia in individuals older than 40 years of age is 34.6%. And in children, it is 4.7%, 7% and 10.8% in 5, 10 and 15-year-olds. Prevalence of myopia in India, which is globally accepted is 45% (2012). (Hartwig *et al.*, 2011) Generally, the first symptom of myopia is blurring of far objects. Other symptoms are eye strain, squinting, excessive bending forwards, resultant headaches, abnormal tilting of the head; excessive blinking may also

be present. (Saxena *et al.*, 2013) Any strain on the extraocular muscles on eyeball could also cause myopia. (Simensen and Thorud, 2009)

In a study done in 2013, female students with myopia were given designed eye exercise program. Significant improvement of visual acuity was seen in both eyes. This proved that eye exercises as vision therapy could improve visual acuity. (Adams and McBrien, 1992) Another study showed that strengthening of ocular muscles improved vision.

In the study done on myopic individuals, eye exercises and Trataka Yoga kriya were given to the participants. Eye exercises such as sunning, eyewash, palming, shifting and swinging, candlelight reading, playing with a ball, vaporization and cold pad were included. One line rectification on Snellen's chart reading was noted. This concludes that quality of vision can be improved using non-medical, affordable and relaxing approaches. (Szeto *et al.*, 2002)

Left and right hemispheres of the brain activate clear eyesight in left and right eyes and improves all brain functions. Effect of both left and right hemispheres is seen on close and far vision. Hence, cross crawl exercises are useful. Exercises such as palming exercise help in ocular muscle relaxation. Swinging exercises strengthens recti muscles and ciliary muscles. Strengthening of the ocular muscles alters the shape of the lens, which in turn results in improving the optical power and other problems associated with myopia. (Mohan *et al.*, 2009) Vision therapy is a type of physical therapy for the eyes and brain. Eye exercises, muscle relaxation techniques, biofeedback, eye patches or eye massages are included in visual training programs. Therefore, the focus needs to be put on studying the effect of ocular muscle exercises on myopic individuals.

Methodology

Approval for the study was obtained from the Protocol committee and the Institutional Ethical Committee of KIMSDU. Forty-six were selected according to the inclusion criteria of age 25-32, degree of myopia of -3.0 to -6.0D with a duration of myopia for five years and above. The subjects who were excluded were those who had a history of previous eye surgery, history of musculoskeletal trauma to the back and neck, hearing problems, pathological myopia, glaucoma, any congenital spinal deformities, visual vertigo, neurological problems. The procedure was explained and written informed consent was taken. Exercises were explained thoroughly. Exercises were given twice a week for six weeks which were palming exercises, swinging exercises, eye muscle exercises, cross crawl, Tibetan eye chart. Pre and post-intervention visual acuity was ana-

lyzed.

RESULTS

Demographic distribution and study variable distribution in both group A and group B

Interpretation

Table 1, shows that the mean age in group A was 28.13 1.36 and group B was 29.17 1.15. In the group, 52.17% of participants used electronic devices for 7.58 1.16 hours/day, and 47.83% of participants used electronic devices for 12.72 1.27 hours/day. In group B, 86.96% of participants used electronic devices for 8.66 0.57 hours/day, and 13.04% of participants used electronic devices for 12.35 1.42 hours/day. In group A, 47.83% were males, and 52.17% were females. In group B, 39.13% were males, and 60.87% were females. In group A 56.52% participants had myopia for 7.37 1.43 years and 43.48% for 12.5 0.71 years. In group B 60.87% for 7.39 1.26 years and 39.13% for 12.25 0.96 years.

Distribution of Degree of Myopia

Interpretation

Table 2, shows that the mean degree of myopia in group A pre-intervention was -4.25 1.43, and post-intervention was -4.24 1.44. In group B, it was -3.84 1.11 pre-intervention and -3.88 1.08 post-intervention. The paired t-test for Group A for a degree of myopia had t-value 1.000 and p-value 0.3282, which is not significant. For Group B, for a degree of myopia had t-value 1.438 and p-value 0.1646, which is not significant. Intergroup post-test values according to unpaired t-test t-value were 0.9902 and p-value was 0.3275, which is not significant.

DISCUSSION

This study aimed to find out the effect of ocular muscle exercises on the degree of myopia. An effort to find the association between the effects of the ocular muscle exercises with the effects of not administering any exercise program was made.

Total of 46 individuals fulfilling inclusion and exclusion criteria were selected. Forty-six subjects of both the genders of age group 25-32 and degree of myopia ranging -3.0 to -6.0 D were selected. They were divided into two groups, A and B respectively, where group A was administered an exercise protocol. Group B underwent no form of the exercise protocol, palming, cross crawl, swinging exercises, eye muscle exercises and Tibetan eye chart were included in the exercise protocol for group A. Exercises were given twice a week for six continuous

Table 1: Demographic distribution and study variable distribution in both group A and group B

	Group A			Group B		
Age	Participants	Percentage	Mean SD	Participants	Percentage	Mean SD
	23	50%	28.13 1.36	23	50%	29.17 1.15
Use of Electronic Devices	Group A			Group B		
	Participants	Percentage	Mean SD	Participants	Percentage	Mean SD
6-10	12	52.17%	7.58 1.16	20	86.96%	8.66 0.57
11-15	11	47.83%	12.72 1.27	3	13.04%	12.35 1.42
Total	23	100%	10.56 2.42	23	100%	9.86 1.84
Gender	Group A			Group B		
	Participants	Percentage		Participants	Percentage	
Male	11	47.83%		9	39.13%	
Female	12	52.17%		14	60.87%	
Total	23	100%		23	100%	
Duration of Myopia (in years)	Group A			Group B		
	Participants	Percentage	Mean SD	Participants	Percentage	Mean SD
6-10	13	56.52%	7.37 1.43	14	60.87%	7.39 1.26
11-15	10	43.48%	12.5 0.71	9	39.13%	12.25 0.96
TOTAL	23	100%	10.87 3.19	23	100%	9.47 2.76

Table 2: Distribution of degree of myopia

Degree of Myopia	Mean SD				t- value	p-value
	Pre Intervention		Post Intervention			
Group A	-3.25	1.43	-3.24	1.44	1.000	0.3282(NS)
Group B	-1.84	1.11	1.88	1.08	1.438	0.1646(NS)
Unpaired t-test	t- value	p-value	t- value	p-value		
	1.097	0.2785(NS)	0.9902	0.3275(NS)		

weeks. Visual acuity was measured using Snellen’s chart and auto refractometer. Pre and post-measurement for visual acuity were taken.

In this study, 46 individuals with myopia were chosen, of which 52.17% and 60.87% were females in group A and group B, respectively. 47.83% and 39.13% were males in group A and group B, respectively.

In group A, 56.52% and 43.48% had myopia since 5-10 and 11-15 years of duration respectively. In group B, 60.87% and 39.13% had myopia since 6-10 and 11-15 years of duration respectively.

The mean degree of myopia in group A pre-intervention was -2.25 1.43, and post-intervention was -2.24 1.44. In group B, it was -1.84 1.11 pre-intervention and -1.88 1.08 post-intervention. Statistical analysis was done using a paired t-test. It was found that these eye exercises were not effective in reducing the degree of myopia, i.e. visual acuity as seen by a non-significant p-value of 0.3282 and 0.1646 of group A and group B, respectively. Inter-

group post-test values according to unpaired t-test t-value were 0.9902 and p-value was 0.3275, which is not significant.

In this study, the exercises were carried out two times a week which may not have been sufficient to overcome the higher amount of near workload, head positions while performing tasks. Stress on eyes generated by high exposure to electronic devices, improper postural adaptations while using these devices may also be the factors due to which the exercises may not be effective in improving visual acuity. (Marumoto *et al.*, 1999) Increasing the interventional period could help improve the effectiveness of ocular muscle exercises on posture.

Similar studies previously have shown varied results. A study by (Rathod *et al.*, 2011) studied the effect of eye exercises on myopia. It concluded that visual acuity in myopic individuals is not quiet improved by eye exercises which co-relates with the present study.

The reasons behind their results were thought to be

because they strengthened the accommodation of the eye. Individual muscles of the eye were targeted by the exercises which helped strengthen them. This improves the accommodation power and in turns the near point convergence only and not the visual acuity in them.

Another study by (Joshi and Retharekar, 2017) assessed the effect of eye exercises on visual acuity and refractive error of myopics. Exercises and relaxation techniques were implied in this study. They found that according to statistics, there was no significant improvement in visual acuity in subjects of myopia, which goes in hand with the results of the current study of no significant improvement in reducing myopia. They justified their result, stating that the exercises may have been effective in bringing about a change but proved insufficient due to near-continuous workload.

The ocular muscle exercises used in this study were not effective in improving the degree of myopia. In the previous researches, there are studies which are supporting the present study, but some contradict it. By adding more exercise, increasing the frequency and duration of exercises, including individuals with consistent demographic data, the same occupation may have a positive outcome. As a result, there is immense scope for further research on this topic.

CONCLUSIONS

There was no association between the effects of the ocular muscle exercises with the effects of not administering any exercise program. Based on the result of the study, it can be said that the ocular exercise does not affect the improvement in the visual acuity in an individual. Similarly, the ocular muscle exercises were not effective in improving the degree of myopia.

Ethical Clearance

Ethical clearance was taken from the institutional committee of Krishna Institute of Medical Sciences, Deemed to be University, Karad.

Conflict of Interest

The authors declare that they have no conflict of interest.

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