ORIGINAL ARTICLE

Effect of Figure Eight Vision Exercise Combined with Chin Nodding and Neck Stretching Exercises on Computer Vision Syndrome

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ABSTRACT

Purpose: Main aim of the study is to evaluate the effectiveness of vision exercise with chin nodding and neck stretching among computer users and also intend to show the effect of figure eight vision exercise only.

Methods: This randomized controlled trial study was carried out among computer users in Islamabad and Rawalpindi. Computer vision syndrome symptoms data will be collected from self-administered questionnaire and computer vision syndrome level instrument questionnaire. 33 participants (17=male, 16=female) in group A (experimental group) will be given figure eight vision exercise and chin nodding and neck stretching. 33 participants (17=male, 16=female) in group B (control group) will be given only figure eight vision exercise with one month follow up. Intervention will be given 4 to 5 times per week (once in a day). Data analysis will be done through SPSS.

Results: In both the questionnaires, in between the groups, pre and post intervention P value shows non-significant results. While within groups, in questionnaire 1, pre and post intervention P-value was 0.00 which shows significant results and in questionnaire 2, P-value of group A was 0.02 which shows significant results while in group B, P-value was 0.13 which shows non-significant results.

Practical Implication: Regarding comparison of exercises difference between group A and B was non- significant. But, in within groups, in self-administered questionnaire both groups' shows significant results individually while in CVS level instrument questionnaire, group A shows significant result and group B shows non-significant

Conclusion: Study concludes that both groups showed non-significant results regarding comparison of exercises but in within groups, in self-administered questionnaire both groups' shows significant results individually while in CVS level instrument questionnaire, group A shows significant result and group B shows non-significant.

Keywords: Randomized controlled trial, computer vision syndrome, vision exercise, neck stretching (exercise therapy).

INTRODUCTION

A combination of eye and vision problem connected with tasks which increased stress for eye when it is closed to the screen is characterized as Computer vision syndrome [1]. It includes a combination of eye problems which occur as a result of the continuous looking to the digital screen, when the requirement of the work exceeds the capabilities of the user.[2] Computer vision syndrome envelops many eye and environment related problem when computer operators concentrate on computer images then the need of work increase eye capabilities of users. Another name of Computer vision syndrome is a Digital eye strain [3].

The continuous pandemic of COVID-19 has caused huge pressure in the medical services framework and adjusted the everyday way of life of normal individuals. Period of lockdown and community disconnection have split person to person relationship, schooling and tasks. Individual have dependent on computer for data, tasks and enjoyment during the lockdown period which promote high risk of computer vision syndrome [4]. The everyday use of computer for three hours or more made the person is at higher prevalence of Computer vision syndrome.[5] In Pakistan there are limited resources, knowledge, awareness and training about disease and accessibility of resources.[24,25,26,27,28,29,30] Computer vision syndrome (CVS) is a computer related medical problems. CVS-related issues are present in 70% of computer users. CVS is characterized by American Optometric association as a combination of eye and vision problems associated with the utilization of computer. Computer users' report visual complaint include redness, blurred vision, dry eyes, tearing of eyes, burning sensation and eye strain.[6]

Increasing dependence on computer leads to CVS symptoms which include dry eye, headache, blurred vision, eye redness, burning eye sensation, neck and shoulder pain. Factor contributing in Computer vision syndrome include low screen brightness, no of hours spend on computer per day, sitting position, position of screen, inappropriate viewing angle and viewing distance, eye diseases, light is inappropriate between computer screen and surrounding.[7,8,9,10,]

Trapezius: It is a large, superficial muscle at the back of neck, originating from the cervical to thoracic area. The muscle inserts on the acromion, spine of scapula and on clavicle's lateral third. The muscle attaches to the external occipital protuberance, medial of superior nuchal line, and (cervical) C7 - T12 (thoracic) spinous process .Its function is to extend neck, side bending to the same side and opposite side rotation. It also extends the neck.[11,12,13,14,15,16]

In this research study stretching is perform in such a way, to asked the participants to flex the neck, opposite side bending and rotation on same side and perform on both sides.

Sternocleidomastoid: Sternocleidomastoid (SCM) muscle located at anterior to the neck and present superficially. Its origin is from the anterolateral surface of the manubrium of sternum and the medial third of the clavicle .It insert on the mastoid process on its lateral surface and lateral half of superior nuchal line. Its function is opposite side rotation or obliquely rotation of the head and neck flexion. Its action is moving the mastoid process down toward the same side which causes the chin to turn up toward the contra lateral side.[17]

In this research study stretching is perform in such a way, to asked the participants to extend the neck, opposite side bending and same side rotation and perform on both sides. The type of stretching is Static Active Stretching that holds at end range. Hold stretching 15 to 20 second.

Chin Nodding: In chin nodding, Participants were told to sit straight or comfortable in a chair and tuck in the chin by placing finger on the chin and pulling the chin in to hold it for 25 seconds as far as the expected or good stretch is felt at the neck in order gain strengthening of deep sub occipital muscles and this exercise is performed once in a day.[18]

Figure 8 Vision Exercise: In sitting position focus on a point 10 feet away. Trace an imaginary figure 8 with your eyes. Keep tracing for 30 second once a day. [19]

Physical therapy point of view, Type of stretching is self-stretching. This stretching is very helpful in future. Stretching are performed because it is cost effective, participant easily perform at home there is no need to go to hospital. There is no need to taking medicine. Participant performs stretching themselves.

SUBJECTS AND METHODS

A randomized controlled trial study was conducted targeting computer users in twin cities of Islamabad and Rawalpindi. The consent from the participants was taken before their enrollment. The participants with their approval were enrolled in the study. The privacy and data of the respondents will remain confidential.

Through open Epi tool we calculated the sample size in which standard deviation was 5.8. Data was collected through convenient sampling technique. There were two groups in study that were experimental and control group. In control group 33 participants (17=male, 16=female) will be given only figure eight vision exercise. In experimental group 33 participants (17=male, 16=female) will be given figure eight vision exercise along with chin nodding and neck stretching with one month follow up. Intervention will be given 4 to 5 times per week.

Computer vision syndrome symptoms data was collected from self-administered questionnaire and computer vision syndrome level instrument questionnaire. The respondents who answer one or more symptoms of computer vision syndrome (burning eye sensation, blurred vision, dry eyes, headache, and shoulder /neck pain) were taken. Questionnaire has been checked in case if their answers left or not. Those participants who did not perform exercise were excluded from study. Exercise performed by the participants 4 to 5 times in a week was recorded as videos on daily basis and also guided by researchers through live session recordings, audio and video calls with daily reminder. Participants performed exercises for one month and after that post data was collected through questionnaires. After retrieving data from all the respondents SPSS 22 software was used to perform statistical analysis which included descriptive statics, independent t-test, and paired t-test to interpret the set parameters and justify the research hypothesis.

RESULTS

The sample of 66 participants was selected according to computer users in Islamabad and Rawalpindi, which were further divided into two groups. The first group represents Group A whereas the second group represents Group B and each group contains 33 participants. The data was analyzed through SPSS 22 and following results are achieved.The table 1 contains demographic data of age in which mean and standard deviation of both groups were calculated. The group A shows age in years with mean and standard deviation was 24.3±4.8 and the group B show age in years with mean and standard deviation was 23.3±5.8.

The table 2 contains data of computer usage according to number of years. In group A 11(33.3%) participants used computer since 3 to 4 years, 5(15.2%) used computer since 5 to 6 years, 8(24.2%)used computer since 7 to 10 years and 9(27.3%) used computer since 11 or more years. While in group B 12(36.4%) participants used computer since 3 to 4 years, 10(30.3%) used computer since 5 to 6 years, 6(18.2%) used computer since 7 to 10 years and 5 (15.2%) used computer since 11 or more years.

In the table 3 the comparison between the group in Self administered questionnaire , with help of Mann Whitney test the Pre intervention median (IQR) of Group A was 13(5) and pre intervention median (IQR) of Group B was 11(3).In table 4, post intervention median (IQR) of group A was 9(2.5) and post intervention median (IQR) of group B was 8(2.5). The P-value of pre intervention was 0.19 which is non-significant and the P-value of post intervention was 0.12 which is also non-significant.

In the table 5, Wilcoxon test applied within group in Self administered questionnaire , In group A pre intervention median (IQR) was 13(5) and post median (IQR) was 9 (2.5).Where as In

table 6, within group test shows pre intervention median and IQR of group B was 11(3) and post median and IQR was 8(2.5).The P-value of group A was 0.00 and group B was also 0.00 which shows that both values are significant.

In the table 7, independent t test applied in between groups of CVS level instrument questionnaire, pre mean and standard deviation of group A was 8.2±3.0 while in group B pre mean and standard deviation was 7.18± 3.7. The P-value of pre intervention of group A and B was 0.21 which is non-significant.

In the table 8, post intervention data of CVS level instrument questionnaire shows Mean± SD of group A was 6.9±3.4 and Mean± SD of group B was 6.3±3.4. The P-value of pre intervention data of group A and B was 0.4 which is also non-significant.

In table 9, paired t test applied within group comparison of CVS level instrument questionnaire, in which pre mean and standard deviation of group A was 8.2±3.8 and post intervention mean and standard deviation was 6.9±3.4. The P-value was 0.02 which is significant. While In table 10, with the help of paired t test, pre mean and standard deviation of group B was 7.18±3.7 and post intervention mean and standard deviation was 6.3±3.4. The P-value was 0.13 which is non-significant.

In symptom questionnaire, between groups A and B the p-value shows non-significant result i.e. pre intervention P- value was 0.19 and post intervention p-value was 0.12, so there was no effect of intervention in self-administered questionnaire .

The P-value within both groups of symptoms questionnaire shows significant results i.e. P-value of both the groups A and B was 0.00 which shows there was marked effect of intervention in both groups.

In between group data of CVS level instrument questionnaire, the pre intervention data contains p- value of both groups A and B was 0.21 while in post intervention data the P-value of group A and B was 0.4 which shows non-significant results that indicates no effect of intervention between group in CVS level instrument questionnaire .

Table 1: Demographic information of Experimental and Control Group

Variable	Group A (n=33) Mean±S.D	Group B (n=33) Mean±S.D
Age (Years)	24.3±4.8	23.3±5.8

Table 2: No of years using computer

Number of Years	Frequency of computer usage	
	Group A (n=33)	Group B (n=33)
3-4 years	11(33.3%)	12(36.4%)
5-6 years	5(15.2%)	10(30.3%)
7-10 years	8(24.2%)	6(18.2%)
11 or more years	9(27.3%)	5(15.2%)

The comparison within group of CVS level instrument questionnaire, P-value of group A was 0.02 which shows significant results i.e. there was effect of intervention in group A of CVS level instrument questionnaire.

While P-value of group B was 0.13 which shows non-significant results i.e. there was no effect of intervention in group B of CVS level instrument questionnaire.

Table 3: Between the groups (Baseline/pre intervention data) (Mann Whitney test)

Variable	Groups	Mean Rank	Median(IQR)	P-value
Self-administered questionnaire	Experiment	36.55	13 (5)	0.19
	Control	30.45	11(3)	

Table 4: Between the groups (Post intervention data) (Mann Whitney test)

Variable	Groups	Mean Rank	Median (IQR)	P-value
Self-administered questionnaire	Experiment	37.11	9(2.5)	0.12
	Control	29.89	8(2.5)	

Table 5: Within Group (Experimental) (Wilcoxon Test)

Variable	Pre-Median (IQR)	Mean Rank	Post-Median (IQR)	Mean Rank	P-value
Self-administered questionnaire	13(5)	5.25	9(2.5)	17.76	0.00

Table 6: Within Group (Control) (Wilcoxon Test)

Variable	Pre-Median (IQR)	Mean Rank	Post Median (IQR)	Mean Rank	P-value
Self-administered questionnaire	11(3)	3	8(2.5)	16.43	0.00

Table 7: Between the groups (Baseline/pre intervention data) (Independent t-test)

Variable	Groups	Mean±S.D	P-Value
CVS level instrument questionnaire	Experiment	8.2±3.0	0.21
	Control	7.18±3.7	

Table 8: Between the Groups (Post intervention data) (Independent t-test)

Variables	Groups	Mean ±S.D	P-Value
CVS level instrument questionnaire	Experiment	6.9±3.4	0.4
	Control	6.3±3.4	

Table 9: Within group (Experimental) (Paired t- Test)

Variables	Pre-Mean± SD	Post-Mean± SD	P-value
CVS level instrument questionnaire	8.2 ±3.8	6.9±3.4	0.02

Table 10: Within group (Control) (Paired t-Test)

Variables	Pre-Mean± SD	Post-Mean ±SD	P-value
CVS level instrument questionnaire	7.18±3.7	6.3±3.4	0.13

DISCUSSION

Main objective of this research is to analyze the Effect of figure eight vision exercises combined with chin nodding and neck stretching exercises on computer vision syndrome among computer users. For that purpose participants are selected from twin cities of Islamabad and Rawalpindi. Study was conducted on 66 participants with equal divisions of participants in group A and group B with ratio of 17 male and 16 female in each groups. Symptoms are assessed before and after the interventional techniques through symptom questionnaire that graded as mild moderate and severe and frequency of CVS through computer vision syndrome level instrument questionnaire.

Considering the literature, various researches justify effect of 20/20/20 rule on CVS but there were no literature about the effect of figure of 8 vision exercise and chin nodding and neck stretching in computer vision syndrome population. A research was conducted by department of physical therapy in India aimed to compare the effect of vision exercises combined with neck stretching exercises in Experimental group and neck stretching exercises in Control group targeting the Trapezius with scalene muscle on neck pain and quality of life.[1,5,8,9,14,17] This study showed that after the intervention of four weeks, it reduces neck pain and quality of life was enhanced. It is proven form researches that eye exercises facilitate the pathways which help to move our eyes in different directions medial, lateral, upward, downward and in oblique direction. It will enhance the eye muscle in performing alternating movements and significantly improve vision and memory function.[3,8,12,17,21,24]

Another research was conducted to determine the results of self-stretching exercises on postural correction with neck pain due to forward head posture. In this study participants were divided into equally divide into two groups, one performed self-stretching exercise and other performed passive stretching exercise for 4 week. Before intervention, Electromyography (EMG) was used for neck muscle activity; X-ray was used for neck rotation and Craniovertebral angle.[8,11] The study showed that muscles activity and neck alignment within both groups after intervention was significantly different by using self-stretching or passive stretching exercise. Muscle activity of Trapezius and splenius capitis muscle was significantly different. Study concluded that by delaying contraction of the muscle, self exercises activate effector response in posture alignment by inhibiting the muscle activity.[13, 15,18] Likewise the current research finding also validated the self-stretching exercises to improve symptoms of Computer vision syndrome.

Based on the existing literature ,the current research justify that the neck stretching (Trapezius, SCM) and chin nodding and figure 8 vision exercise showed significant improvement on the symptoms of computer vision syndrome. However as the follow up only four weeks with four to five times in each week, if the follow up was for the longer duration the results and outcomes would be more effective.

CONCLUSION

It is concluded that, the frequency and duration of the exercises greatly improve their work rate and productivity. Regarding comparison of exercises difference between group A and B was non- significant. But, in within groups, in self-administered questionnaire both groups' shows significant results individually while in CVS level instrument questionnaire, group A shows significant result and group B shows non-significant among computer vision syndrome population.

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