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Original Article

The Effectiveness of E-Backnshou Exercise to The Improvement of Neck, Shoulder and Back Pain in Computer Vision Syndrome Patient

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Abstract

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Background : Extra-ocular complaints of Computer Vision Syndrome (CVS) are neck, shoulder, back pain. The 20-20-20 rule and E-BACKNSHOU exercise are expected to improve accommodative mechanisms, ocular surface of the eye and extra ocular symptoms of CVS. This study was aimed to proving the effectiveness of E-BACKNSHOU exercise for the improvement of neck, shoulder and back pain in CVS patient.
Methods : The research design was Pre-Post Test with Control Design. Subjects were 30 medical students of Faculty of Medicine, Diponegoro University, Semarang, Indonesia who experienced CVS and neck, shoulder and back pain. The treatment group got the 20-20-20 rule and E-BACKNSHOU exercise and the control group got the 20-20-20 rule for 1 month. Pain was measured by Visual Analogue Scale (VAS). Statistical test was conducted using paired t-test, unpaired t-test and Chi-Square. Value of significance $p<0.05$.
Results : There were significant differences in VAS score of neck, shoulder, upper back pain (p=0.00), and low back pain (p=0.022) before and after the intervention in the treatment group and VAS score of neck (p=0.002), shoulder (p=0.020), upper back (p=0.011), and low back pain (p=0.019) in the control group. Delta VAS score of the treatment group was greater than the control group and there was a significant difference in delta VAS score of shoulder pain (p=0.030), but there were no significant differences in delta VAS score of neck (p=0.934), upper back (p=0.356), and low back pain (p=0.150).
Conclusion : The effectiveness of 20-20-20 rule and E-BACKNSHOU exercise is better than the 20-20-20 rule alone on treating neck, shoulder and back pain in CVS patient.

Keywords : CVS, E-BACKNSHOU exercise, pain

INTRODUCTION

Excessive use of computers can cause Computer Vision Syndrome, neck, shoulder and back pain. Computer Vision Syndrome (CVS) which is also referred as digital eye strain, is defined as a collection of problems related to eyes and vision caused by prolonged use of computers, tablets, e-readers, cellular phones or cellphones.[1] Symptoms of CVS are broadly classified into four categories: 1) asthenopic (sore eyes, eye strain), 2) ocular surface related (dry eye, irritation, watering), 3) visual (double vision, blurred vision, slowness of focus change), 4) extra ocular (shoulder pain, neck pain, back ache).[2]

E-BACKNSHOU exercise is a range of motion and stretching (flexibility) exercise therapy for the eyes, extremities, back, neck, and shoulders with Central Java musical accompaniments created by the researchers. The 20-20-20 rule consists of every 20 minutes, the subjects shift their eyes to look at an object at least 20 feet away, for at least 20 seconds.

Therefore, in this study, the researchers want to prove that the improvement of neck, shoulder, upper and low back pain in CVS patient is better by the addition of E-BACKNSHOU exercises rather than the 20-20-20 standard therapy method only.

METHODS

This research is an experimental research, pre-post test with control group design and was conducted at Faculty of Medicine, Diponegoro University at Semarang from May to June 2019.

Based on the calculation, the sample size needed for this study were 15 subjects in the treatment group and 15 subjects in the control group with a total of 30 subjects. The method of selecting samples was simple random sampling. The research subjects were students of the Faculty of Medicine, Diponegoro University, Semarang who met the criteria, which are those who experienced CVS, neck pain, shoulder pain and back pain after a minimum of 4 hours using computer or cellphone without rest, or resting time less than 10 minutes after using computer. Diagnosis of CVS was total score of more than 6 point in Computer Vision Syndrome Questionnaire (CVS-Q). The exclusion criteria were subjects who had a history of mental disorders, high myopia, and refused to participate. This study has been approved by Diponegoro University Ethical Review Board with number 121/EC/KEPK/FK-UNDIP/V/2019.

The treatment group got the 20-20-20 rule and E-BACKNSHOU exercises, while the control group only got the 20-20-20 rule. The 20-20-20 rule consists of every 20 minutes, the subjects shift their eyes to look at an object at least 20 feet away, for at least 20 seconds. E-BACKNSHOU exercises were range of motion and stretching exercises for extremity, eye, back, neck, and shoulder with 18 minutes and 48 seconds duration, with warming up for 1 minute 36 seconds repeated once (moving eyes to all 8 directions, range of motion exercise of the neck by moving the head to all directions, range of motion of both shoulder and elbow), main exercise 15 minutes 36 seconds repeated 3 times each (elbow, wrist and finger stretching, lower extremity stretching, moving eyes to all 8 directions, blink for 20 seconds, neck and back stretching) and cool down 1 minute and 36 seconds repeated once (moving eyes to all 8 directions, neck and arm stretching), 3–5 times a week for 4 weeks.

Hypothetical testing for differences in VAS score of neck, shoulder pain, upper and low back pain improvement before and after the intervention in each group were done using paired t-test. Hypothetical testing for differences in VAS score of neck, shoulder, upper back pain and low back pain after the intervention between both groups were done using unpaired t-test. Hypothetical testing for differences in score improvement between the delta treatment group and the control group was done using unpaired t-test. Hypothetical testing for VAS scores improvement on neck pain, shoulder pain upper back pain and low back pain events after the interventions between the treatment and control groups were done using Mann-Whitney U test. P value is considered significant if <0.05. Statistical analysis was performed using SPSS version 21 for Windows.

RESULTS

There were significant differences in VAS score of neck pain (p=0,000), shoulder pain (p=0.000), upper back pain (p=0.000), and low back pain (p=0.022) before and after the intervention in the treatment group. There were significant differences in VAS score of neck pain (p=0,002), shoulder pain (p=0.020), upper back pain (p=0.011) and low back pain (p=0.019), before and after intervention in the control group. The VAS score of neck pain, shoulder pain, upper back pain and low back pain before and after intervention in the treatment and control group (Table 1).

The VAS scores of neck, shoulder, upper back pain after the intervention in the treatment group were lower than in the control group, but there were no significant differences VAS scores of neck (p=0.808), shoulder (p=0.600), upper back pain (p=0.725) after the intervention between treatment and control group. There were significant difference in VAS score low back pain after the intervention (p=0.013) between the treatment group and the control group (Table 2).

Delta VAS score of treatment group were greater than the control group, but there were no significant differences in delta VAS score of neck pain (p=0.934), upper back pain (p=0.356), and low back pain (p=0.150)

TABLE 1
VAS score neck, shoulder, upper and low back pain, before and after intervention in each group

	Treatment Group			Control Group		
	Mean (SD) before intervention	Mean (SD) after intervention	*p*	Mean (SD) before intervention	Mean (SD) after intervention	*p*
VAS score neck pain	4.80 ± 1.373	2.13 ± 1.995	0.000	4.93 ± 1.486	2.33 ± 2.440	0.002
VAS score shoulder pain	5.00 ± 1.254	2.13 ± 1.807	0.000	3.80 ± 2.145	2.53 ± 2.295	0.020
VAS score upper back pain	4.20 ± 1.568	1.93 ± 1.792	0.000	3.80 ± 2.541	2.20 ± 2.305	0.011
VAS score low back pain	4.13 ± 1.727	2.73 ± 1.944	0.022	2.87 ± 2.356	1.07 ± 1.438	0.019

TABLE 2
VAS score neck, shoulder, upper and lower back pain after intervention between groups

	Treatment Group Mean (SD)	Control Group Mean (SD)	*p*
VAS score neck pain	2.13 ± 1.995	2.33 ± 2.440	0.808
VAS score shoulder pain	2.13 ± 1.807	2.53 ± 2.295	0.600
VAS score upper back pain	1.93 ± 1.792	2.20 ± 2.305	0.725
VAS score low back pain	2.73 ± 1.944	1.07 ± 1.438	0.013*

between the treatment group and the control group. There were a significant difference in delta VAS score of shoulder pain (p=0.030) between the treatment group and the control group. The delta VAS scores of neck pain, shoulder pain, upper back pain and low back pain between group can be seen in Table 3.

The results showed that there were no significant differences in the symptoms of neck pain (p=0.705), shoulder pain (p=0.690), upper back pain (p=0.099), low back pain (p=0.256) after the intervention between group (Table 4).

DISCUSSION

Computer Vision Syndrome is caused by continuous accommodation involving the intra and extra ocular muscles so that the eye muscles experience fatigue,[3–7] causing static positions in the neck muscles, shoulders, upper back and lower back. The static position causes the muscles to spasm and cause pain in the muscles.[3–7,8]

The treatment group got the 20-20-20 rule and E-BACKNSHOU exercises. The 20-20-20 rule aims to accommodate the eye so that the intra and extra ocular muscles can relax and blink 20 times to wet the surface of the eyeball. E-BACKNSHOU exercises consist of extra ocular muscles exercises (medial rectus, superior rectus, inferior rectus, lateral rectus, superior oblique, and inferior oblique), range of motion and stretching exercises in the muscles of the extremities, neck, shoulder and back. E-BACKNSHOU exercises, like other stretching exercises have been able to increase the range of joint motion, flexibility, stretch muscles, decrease muscle spasm, increase endorphin hormone production and decrease cortisol response.[9]

Previous study by Kurunhikattil (2016) stated that eye and neck exercises are very effective in reducing eye strain and neck pain. The eye exercise in this previous study was moving eyes toward right, left, up and down to relax the eye muscles. Neck exercise consists of moving neck right, left, up and down, rotating clockwise and counter-clockwise every 3 hours. E-BACKNSHOU eye exercises in this study used more direction of eye movement, compared to Kurunhikattil's study.[10]

Another study by Gaikwad (2021) stated that 4 weeks of isometric neck setting exercises and eye exercises, significantly improved pain on VAS and improving score of quality of life, compared to isometric neck exercises alone in subjects with bifocal lens.[11] 20-20-20 rule has induced significant changes in reducing CVS sign, although can't eliminate CVS completely, according to the previous study.[12]

E-BACKNSHOU exercises in this study used neck, shoulder, elbow range of motion, followed by stretching movements for eye, neck, shoulder, back and extremities.

TABLE 3
Delta VAS score neck, shoulder, upper and lower back pain between the treatment group and the control group

Delta	Treatment Group Mean (SD)	Control Group Mean (SD)	*p*
VAS score neck pain	2.67 ± 1.839	2.73 ± 2.463	0.934
VAS score shoulder pain	3.00 ± 1.852	1.53 ± 1.642	0.030*
VAS score upper back pain	2.53 ± 1.356	2.00 ± 1.732	0.356
VAS score low back pain	1.13 ± 1.598	2.20 ± 2.274	0.150

TABLE 4
Symptoms of neck pain, shoulder pain, upper back pain, low back pain after the intervention between group

Incidence	Treatment Group Mean (SD)	Control Group Mean (SD)	Total	*p value*
Neck pain (-)	6	5	11	0.705
Neck pain (+)	9	10	19	
Total	15	15	30	
Shoulder pain (-)	5	4	9	0.690
Shoulder pain (+)	10	11	21	
Total	15	15	30	
Upper back pain (-)	6	2	8	0.099
Upper back pain (+)	9	13	22	
Total	15	15	30	
Lower back pain (-)	4	7	11	0.256
Lower back pain (+)	11	8	19	
Total	15	15	30	

Compared to the previous studies, this study combined E-BACKNSHOU exercises with the 20-20-20 rule to decrease extraocular pain due to CVS. E-BACKNSHOU exercises has been able to improve the mechanism of extra ocular pathogenesis, namely musculoskeletal pain disorders including low back pain and shoulder pain.

The results showed significant differences in VAS scores of neck pain, shoulder pain, upper back pain, and lower back pain before and after the intervention in both the treatment and control groups. The difference is in the form of a decrease in the mean VAS score before and after the intervention in both the treatment and control groups. The decrease in CVS score were greater in the treatment group than in the control group. This shows that E-BACKNSHOU and the 20-20-20 rule both were effective in reducing the complaints of neck, shoulder, upper back pain and lower back pain.

VAS score of neck, shoulder, upper back pain after the intervention in the treatment group was lower than the control group, but there was no significant difference in VAS scores of neck, shoulder, upper, and lower back pain after the intervention between the treatment group and the control group. There was significant difference in VAS score of lower back pain after the intervention between the treatment group and the control group.

Delta VAS score of the treatment group was greater than control group, but there were no significant differences in delta VAS score of neck pain, upper back, and lower back pain between the treatment group and the control group. There was significant difference in delta VAS score of shoulder pain between the treatment group and the control group. This could be due to neck ROM and stretching component of E-BACKNSHOU in the intervention group that relaxed the shoulder muscles and

reducing pain.

The results showed no significant differences in the occurrence of neck pain, shoulder pain, upper back pain, and lower back pain after the intervention between the treatment and control group.

This study's results showed that both control and intervention group experienced improvement of VAS in neck, shoulder, upper back and lower back pain, although there were no statistical significances for delta VAS of neck, upper and lower back pain. The delta VAS in shoulder pain and VAS for lower back pain in intervention compared with control group, were reduced significantly and showed that E-BACKNSHOU with 20-20-20 exercise could improved extra ocular symptoms of CVS.

The limitation of this study is the short intervention time, only about 1 month, and the limited number of participants. The participants all came from the same department (Faculty of Medicine of Diponegoro University). So, further research with more intervention duration, more participants with more varieties of department or university can be implemented.

CONCLUSION

Shoulder and low back pain were decreased by performing the 20-20-20 rule and E-BACKNSHOU exercises rather than the 20-20-20 rule only.

The 20-20-20 rule and E-BACKNSHOU exercises can be used in CVS patients with neck, shoulder, and back pain.

Future studies can use control group with the same characteristics (using exercise) rather than 20-20-20 rule only and longer duration (more than 4 weeks). E-BACKNSHOU exercises can be studied with larger sample and more detailed inclusion criterias.

Expression of Gratitude

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