ROLE OF PRESSURE BIOFEEDBACK IN MANAGEMENT OF FORWARD HEAD POSTURE FOR COMPUTER USERS

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ABSTRACT

Background: Forward Head Posture (FHP) characterized by hyperextension of upper cervical spine. It is a common condition among computer users and can affect their daily life activities. Pressure biofeedback can be a useful tool to detect FHP among computer users.

Objective: The aim of present study is to explore the effectiveness of pressure biofeedback in treatment of occupational forward head posture on computer users.

Methods: This was a Randomized Control Trial (NCT05135741) conducted at Bahria University College of Physical Therapy, (BUMDC) Karachi during January to December 2021. There were 32 participants selected randomly allocated in experimental and control group. Both male and female were included with age of 25 to 55 years currently employees of Bahria University (BUMDC) having forward head posture and complaining neck pain were included. Exclusion was age less than 25 years, history of cervical trauma or surgery, any neurological conditions or cervical pathology. Experimental Group given DCF exercises with Pressure Biofeedback Unit (PBU) and Control Group given Conventional DCF Exercises. SPSS version 23.0 used for analysis.

Results: Mean pre and post sub occipital resting posture, sub occipital flexion, sub occipital extension, cervical flexion, cervical extension, lateral flexion resting posture, lateral flexion left side, lateral flexion right side, right rotation, left rotation found to be significant in both experimental and control group respectively with P-Value <0.001.

Conclusion: Pressure biofeedback had equal effect in reducing pain positive impact in decreasing pain among forward head posture individuals due to excessive use of computers.

Key Words: Bio Feedback, Deep Cervical Flexor, Neck pain, Forward head posture, Neck Disability Index.

INTRODUCTION: In Pakistan prevalence of forward head posture in working age group was found 51.7%[i]. Forward head act (FHP) is the foremost situating of the cervical spine with the prevalence of 60.63%[ii], It is a postural issue that is brought about by a few elements incorporating laying down with the head raised too high, expanded utilization of PCs, workstations, absence of created back muscle strength and absence of supplements like calcium[iii]. FHP can include both an upper cervical extension and a lower cervical flexion[iv]. research on FHP proposed that Deep cervical flexor (DCF) assume a significant part in supporting and fixing the cervical spine[v]. Forward head posture effects an enormous level of public and can cause critical neck torment, while in this stance; the skull is conveyed front to the body's focal point of gravity there by educating a constant condition that puts expanded weight on the postural musculature of the whole spine particularly cervical spine[vi].

Impacts of forward head posture incorporates with expanded age related with decreased cervical ROM, forward head posture related with more prominent shortfalls in cervical rotation and flexion ROM.[vii]

Bio feedback is a device through which we can get accurate data of patient's progress. So far more than the data that is normally accessible to them rather than the physical feedback that gives self-created data from patient.[viii]

There is emergent evidence that DCF training with pressure biofeedback is effective for pain decrease and endurance training in patients with forward head posture[ix]. Effectiveness of pressure bio feedback was evaluated by Fariba Eslamian MD et.al, which showed pressure bio feedback was more effective for the treatment of myofascial pain.[x] Ahn JO et.al reported the efficacy of pressure bio feedback on hamstring muscles which shows significant increase in active knee extension in experiment group as compared to control group.[xi]

The rationale of this study was to know the increasing prevalence of FHP because literature showed its high prevalence in Pakistan. The efficacy of pressure biofeedback on forward head posture is more effective than traditional deep cervical flexors exercises.

Material & Methods:

A Non-Pharmacologic Treatment Interventions used in this Randomized Control Trial. The trial was registered in clinicaltrials.gov USA with identifier number NCT05135741. Ethical approval was prior taken from Institute Review Board. Written and verbal consent was taken from each participant by researchers. It was carried out at Bahria University College of Physical Therapy, BUMDC Karachi during January to December 2021. Sample size calculated on OpenEpi.com by using prevalence of forward head posture in Pakistan 55.6% with 95% Confidence Interval and reducing estimated size 5%. The required sample size was found to be n=32. The samples were then divided in two groups n=16 in experimental and n=16 in controls. Probability sampling used was simple random sampling. It was a single blind study in which patients were aware of the treatments. Blinding was done by using Researcher's selection criteria of participants in which balloting was conducted.

Both male and female were included with age of 25 to 55 years currently employees of Bahria University (BUMDC) having forward head posture or complaining neck pain. Students of Bahria University with age less than 25 years, history of cervical trauma or surgery, any neurological conditions or cervical pathology were excluded.

Interventions:

Neck Disability Index Questionnaire (NDI), Pressure Biofeedback Unit (PBU) and CROM (Cervical Range of Motion instrument) were used as study tools to measure the outcomes. Forward head posture was measured through CROM device.

Thirty-two Employees currently working in Bahria University Medical and Dental College having forward head posture or neck pain were selected. After selection, they were randomly divided into two groups: Group A: Experimental Group, DCF exercises with a Pressure Biofeedback Unit (PBU) and Group B: Control Group, Conventional DCF Exercise. All the subjects were briefed about the aim of study and results to be expected after having their informed consent. All the measurements and assessments were carried out pre and post treatment of 4 weeks of DCF training in both groups. Neck mobility was assessed by using Cervical Range of Motion CROM instrument before and after training. Cervical Flexion & Extension, Lateral Flexion, Right and Left Rotation was recorded after measuring on CROM recording sheet. Before training, subjects were asked to score their neck pain on Neck Disability Index and after training to measure the effects of DCF training on them. All movements (Flexion, extension, lateral flexion, and rotation) were performed and measured while the subjects were seated on a static chair.

Subjects were first demonstrated how to perform Deep Cervical Flexors training by using Pressure Biofeedback Unit (PBU) by viewing a 3-minute video to standardize the instructions and the content of information. Experimental Group perform in a neutral position, which was determined visually by maintaining a horizontal plane between the forehead and the chin, ensuring that a line bisecting the neck longitudinally was parallel to the treatment plinth6. The pressure biofeedback unit was placed between the plinth and the posterior aspect of the neck just below the occiput and inflated to a baseline of 20 mmHg7. A trained physiotherapist was observing and correcting any substitution movements to ensure that all subjects could perform the exercises correctly. All exercise protocols and programs were taken from previously published studies8–10. A conventional DCF exercise protocol was performed three times a week for four weeks in both groups. The duration of the conventional DCF exercise protocol was 20–30 minutes, once a day in the control group, and 15–20 minutes, once a day in the experimental group. The cranio-cervical flexion exercise using a PBU was conducted for 5–10 minutes once a day, three times a week (Stabilizer TM, Chattanooga Group Inc., USA) in the experimental group. This exercise was performed sequentially to reach 5 target pressures in 2 mmHg increments, from a starting baseline of 20 mmHg to a final level of 30 mmHg). The subjects

were advised to avoid other exercises and maintain proper posture during activities of daily life. The exercise program was performed under the supervision of the researcher. After completion of four weeks of training subjects were again analyzed and measured on NDI, CROM score sheet to assess any significant changes.

Statistical analysis: Data analysis was done using SPSS version 23.0. Quantitative variables presented as mean and standard deviation while nominal data or Fischer exact test was applied. P-value of ≤ 0.05 considered to be significant.

Results:

There were 32 individuals equally divided into two groups. There were 22 male and 10 female. Mean age of participants was 25.65±6.2. Mean pre and post sub occipital resting posture, sub occipital flexion, sub occipital extension, cervical flexion, cervical extension, lateral flexion resting posture, lateral flexion left side, lateral flexion right side, right rotation, left rotation found to be significant in both experimental and control group respectively with P-Value <0.001.(Table-1)

Experimental group Pre and Post Pain: There were 0% respondents in pre-treatment and 7 (43.8%) respondents with no pain in post treatment group. No respondents were seen in severe pain after treatment with significant P-value of 0.008. Experimental group Pre and Post Lifting: There were 6 (37.5%) respondents in pre-treatment progress to 10 (62.5%) who can lift heavy weights without extra pain. There were no respondents in post treatment group who can manage heavy weight if placed on a table or can manage light to medium weights if they are conveniently positioned. (Table 2)

Table 1: Comparison of both groups with different Parameters on Pressure Bio Feedback.

Pressure Bio Feedback	Experimental Group			Control Group		
	Mean	Std. Deviation	P-value	Mean	Std. Deviation	P-value
Pre-Sub occipital Resting Posture	1.44	1.36	0.001	2.19	1.22	0.029
Post Sub occipital Resting Posture	0.56	0.81		1.75	0.77	
Pre-Sub occipital Flexion	12.06	1.61	0.000	10.25	1.44	0.000
Post Sub occipital Flexion	14.25	1.34		11.38	1.15	
Pre-Sub occipital Extension	9.94	1.73	0.000	8.38	1.41	0.000
Post Sub occipital Extension	12.00	1.46		10.00	0.97	
Pre-Cervical Flexion	49.25	2.82	0.000	48.44	3.05	0.000
Post Cervical Flexion	52.81	2.66		50.00	2.90	
Pre-Cervical Extension	45.94	7.24	0.000	39.06	3.11	0.000
Post-Cervical Extension	49.63	6.57		40.50	2.83	
Pre-Lateral Flexion Resting Posture	1.31	1.01	0.001	2.19	1.22	0.000
Post Lateral Flexion Resting Posture	0.50	0.52		1.44	0.81	
Pre-Lateral Flexion Left	40.69	3.63	0.000	39.88	3.50	0.000
Post Lateral Flexion Left	43.75	3.26		42.38	2.90	
Pre-Lateral Flexion Right	40.06	3.70	0.000	40.13	2.55	0.000
Post Lateral Flexion Right	43.00	3.27		41.56	2.37	
Pre-Rotation Left	71.75	2.18	0.000	71.31	2.44	0.000
Post Rotation Left	75.50	2.48		73.25	2.27	
Pre Rotation Right	70.25	3.55	0.000	69.75	2.65	0.000
Ps.Rotation Right	74.63	3.14		71.31	3.09	

Table 2: Table 2: Pain intensity pre and post exercise effect in both Groups

Neck Disability Index (NDI) Paramet	Experimental Group "DCF Exercise with Pressure Bio Feedback Unit"			Control Group "Conventional DCF Exercise"		
	Pre Treatment	Post Treatment	P-value	Pre Treatment	Post Treatment	P-value
Pain Intensity						
No Pain	0	7	0.008	4	6	0.504
	0.0%	43.8%		25.0%	37.5%	
Mild Pain	4	6		7	9	
	25.0%	37.5%		43.8%	56.3%	
Moderate Pain	7	3		5	1	
	43.8%	18.8%		31.3%	6.3%	
Fairly severe Pain	4	0		0	0	
	25.0%	0.0%		0.0%	0.0%	
Very Severe Pain	1	0		0	0	
	6.3%	0.0%		0.0%	0.0%	
Lifting						
I can lift heavy weights without extra pain	6	10	0.023	2	4	0.339
	37.5%	62.5%		12.5%	25.0%	
I can lift heavy weights, but it gives extra pain	5	6		9	10	
	31.3%	37.5%		56.3%	62.5%	
I can manage heavy weight if placed on a table	5	0		4	2	
	31.3%	0.0%		25.0%	12.5%	
I can manage light to medium weights	0	0		1	0	
	0.0%	0.0%		6.3%	0.0%	

Experimental group Pre and Post Headache: There were 3 (18.8%) respondents in pre-treatment group progress to 7 (43.8%) in post treatment group. No cases found in post treatment group who have moderate headache before with significant P-value of 0.049. (Figure 1)

Figure 1:

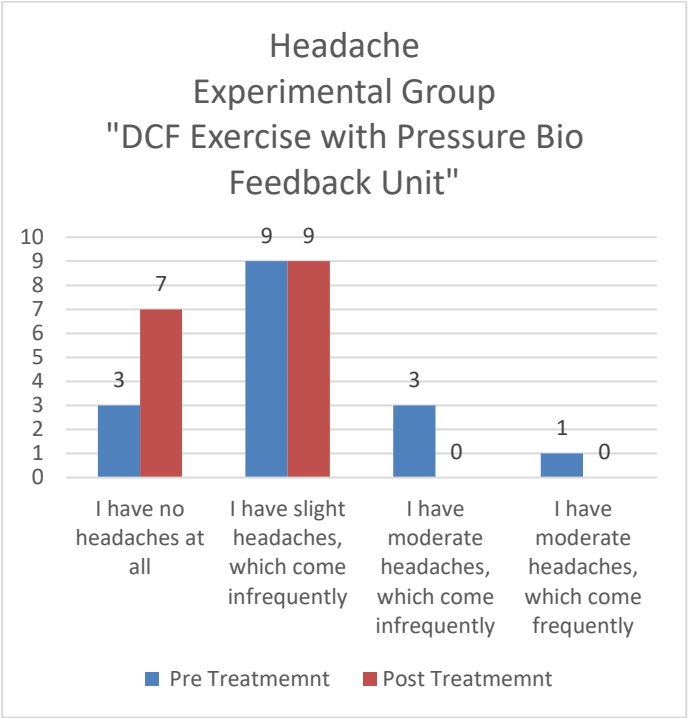
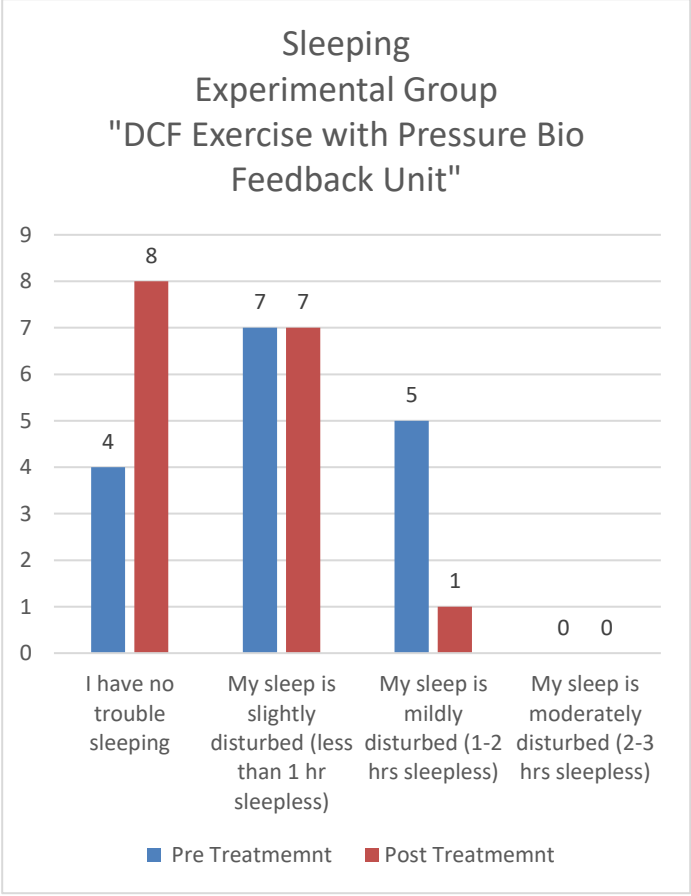


Figure 2:



Experimental group Pre and Post Sleeping: There were 4 (25.0%) respondents in pre-treatment group progress to 8 (50.0%) in post treatment group. Similarly, 5 (31.3%) observed in mild disturb sleep pre-treatment which decreased to 1(6.3%) respondent after training with significant P-value of 0.012. (Figure 2).

Discussion:

The aim of present study is to explore the effectiveness of pressure biofeedback in treatment of occupational forward head posture on computer users.

Current study showed efficacy was higher in controlling pain in experimental group after four weeks of deep cervical flexors (DCF) exercises with pressure biofeedback compared to control group.

Pressure biofeedback is a device, intended to enhance re-education of muscles by change in air pressure, filled in device. It has been recommended that utilizing a pressure biofeedback unit (PBU) is a more powerful technique for DCF strengthening than common activities. [xii]

Current study showed efficacy was higher in controlling pain in experimental group after four weeks of deep cervical flexors (DCF) exercises with pressure biofeedback compared to control group who had conventional DCF exercises with significant P-Value 0.008. (Table 2) similar results were presented in randomized control trial by Ma C et.al in which effect of pressure bio feedback among working individuals had neck and shoulder pain assessed through active and passive exercise regime.

The study recruited 72 participants and stratified them in four groups i-e., pressure bio feedback applied bilaterally over upper trapezius muscles while using computers, standardized exercise regime group, passive regimes group including interferential therapy and hot packs over neck and shoulder and a control group. Pre and post evaluation was done through NDI, visual analogue scale (VAS) and surface electro myography. Results showed significant decrease in NDI and pain scales in experimental group with highest values in pressure biofeed group.[xiii]

A contrast result was presented by Salwa F et.al that there is no significant difference in all flexion movements of cervical by applying pressure biofeedback on deep cervical flexors.[xiv]

Another randomized Control trial conducted by Iqbal ZA et.al[xv] among secondary school teachers with two groups, one experimental while other is control group. Occupational neck pain was very common among schoolteachers due to prolonged head down posture in order to complete their daily tasks of lecture preparing with the help of book reading and using their laptops or desktop computers, checking of subjects' copies and assignments. In his study deep cervical muscles were trained by using pressure bio feedback in order to reduce pain and disability around neck. Total 30 secondary school teachers

were taking part in this study aged between 25 to 45 along with cranio-cervical flexion and pain. Participants in experimental group received pressure bio feedback training and conventional training on deep cervical flexors while participants in control group only received conventional training of deep cervical flexors. Pain and cervical disability were assessed at the end of second and fourth week of exercise plan using numeric pain rating scale and NDI. Pain and disability were markedly reduced in participants of experiment group , Present study showed contrast result within group analysis findings were clinically same after exercises but statistically significant P-Value of 0.000 .

Lwin NN et.al[xvi] conducted randomized control trial which showed significant decreased in cervical pain with the use of pressure bio feedback having p value ($p<0.05$).

KIM GC et.al[xvii] conducted a study in which they evaluated the effect of pressure bio feedback on chronic neck pain patients with forward head posture and change in quality of sound. Chronic neck pain and forward head posture can also affect acoustics character of an induvial. Twenty individuals were participated in this study, each participant was involved in 50 minutes of exercise regime three times a week for eight weeks. Pain, cranio-cervical angel of neck and frequency and amplitude of sound were evaluated in each participant of study pre and post to exercise plan. Significant reduction in pain and forward head posture were noted in each participant of this study along with the modulation in amplitude and frequency of sound. Study was concluded that using pressure bio feedback in pain, forward head posture and change in acoustics characteristics can be reduced in patients with chronic neck pain, likewise in present study pain was reduced after post exercises evaluated through NDI with statistically significant P-value 0.008 in experimental group whereas no significant difference was found in control group after post exercises .

Jokubauskas L et.al[xviii] reported that the use of pressure bio feedback on patient with disturbed sleep due to bruxism can significantly reduce symptoms if applied on neck while sleeping and reduced cervical pain due to bruxism, similar result was noted in present study in which there were 3 (18.8%) respondents in pre-treatment group progress to 7 (43.8%) in post treatment group. No cases found in post treatment group who have moderate headache before with significant P-value of 0.049.

Tsiringakis G et.al[xix] presented a meta-analysis on motor control training of deep neck flexors with pressure biofeedback was institute to have identical or improved efficacy on amount of neck pain and incapacity in contrast to other control interventions. The meta-analyses show that motor control training of deep neck flexors with pressure biofeedback is more operative than strength-endurance training of

cervical muscles for refining pain and disability in patients with neck pain.

Campo M et.al[xx] presented a systemic review and meta-analysis on effect of pressure bio feedback which showed that pressure bio feedback had mild to moderate effect on pain and disability of neck.

Flexion of cervical was significantly increased in experimental group with the P-value of 0.000 same result was noted in systemic review conducted by Matsi AE et.al[xxi] in which they concluded that craniocervical flexion was significantly increased in experiment group who had craniocervical flexion exercises with pressure biofeedback.

Manzoor T et.al[xxii] conducted a study in which they compare the effectiveness of pressure bio feedback with mulligan technique, result shows that pressure bio feedback had less significant difference as compared to mulligan technique.

Single centered study only use of one tool for forward head posture was the limitations of present study.

CONCLUSION: The efficacy of pressure biofeedback was found to had considerable impact in reducing pain by targeting deep cervical flexors in forward head posture.

Furthermore, few recommendations were suggested for future research, since data was only collected on working individuals in future study data will be collected from any population with more associated factors of neck pain.

Conflict of Interest: None

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