EXERCISE IN FORWARD HEAD POSTURE AND ROUNDED SHOULDER: STRETCHING OR STRENGTHENING?

ORIGINAL ARTICLE

EXERCISE IN FORWARD HEAD POSTURE AND ROUNDED SHOULDER: STRETCHING OR STRENGTHENING?

Danish Hassan[1], Tehmina Irfan[2], Salman Butt[3], Muhammad Hashim[4], Asna Waseem[5]

Authors' Affiliation

[1,4]Riphah College of Rehabilitation & Allied Health Sciences, Riphah International University Lahore

[2]Riphah Rehabilitation Clinic, Riphah International University Lahore

[3]Clinical Trial Unit, The University of Punjab Lahore

[5]Department of Physical Therapy, Central Park Medical College, Lahore

Corresponding Author

Danish Hassan

Assistant Professor, Riphah College of Rehabilitation & Allied Health Sciences, Riphah International University Lahore

Email:danish.hassan@riphah.edu.pk

ABSTRACT

Objective: To determine the effects of stretching and strengthening exercises on asymptomatic adults diagnosed with forwarding head posture and rounded shoulders.

Material & Methods: A randomized controlled trial was conducted after the screening and confirmation of FHP and RS by measuring craniovetrebreal angle (CVA) and shoulder angle (SA) using Kinovea Software, 34 Patients were inducted into trial through consecutive sampling, with 17 patients in each of 2 groups i.e. "A" and "B". Subjects were distributed into two groups equally; Group A received a strengthening exercise approach and Group B received a stretching exercise approach. Data was analysed using SPSS version 25.

Results: There was a statistically significant difference (p-value < 0.001) in pre- and post-treatment CVA and SA within each treatment group. However, no significant difference (p-value > 0.05) was reported across each treatment while comparing pre- and post-treatment values for CVA and SA respectively.

Conclusion: Stretching and strengthening exercises are equally effective in the management of FHP and RS posture in asymptomatic individuals. However, strengthening exercise showed superior improvement in CVA and SA comparatively.

Key Words: Forward Head, Exercises, Posture, Photogrammetry, Physical Therapy.

This article may be cited as: Hassan D, Irfan T, Butt S, Hashim M, Waseem A. Exercise in forward head posture and rounded shoulder: stretching or strengthening? Ann Allied Health Sci. 2022;8(1):3-8.

INTRODUCTION

Forward head posture (FHP) and rounded shoulder (RS) are defined as the anterior displacement of head and shoulders in the sagittal plane and forward structural deviation of the skull from the midline of the body.[1,2] Various factors including a computer, mobile phone usage[3-6], faulty sitting, and lying positions may cause FHP.[7] Craniovertebral angle (CVA) is used to report FHP.[8,9] CVA ranges 49-50 degrees is taken as a reference angle to report FHP.[1,10,11] A shoulder angle (SA) is used to assess the RS. SA less than 52 degrees is the reference angle to diagnose the rounded shoulder posture.[12-14] The photogrammetric assessment is a valid and reliable tool, used to assess CVA and SA[15-17] and provide a reference to report FHP and RS.[16] FHP and RS or any other postural deformity tends to disturb the muscle balance and reduce the efficient work of muscles.[18]

An adequate amount of muscle work is required for a healthy posture,[19, 20] so the maintenance of the length-tension relationship is necessary for muscles to align the posture in a normal plane.[21] Several studies have suggested that strengthening of weakened elongated muscles and stretching of shortened muscles should be incorporated to re-attain the correct muscle balance between agonist and antagonists muscle group to improve posture and alleviate postural faults like FHP and RS posture.[7,22-25]

According to Nordin strengthening of muscles involve the active contraction of agonist muscle

and relaxation of the antagonist muscle.[20, 26] In this way, both of the components of the muscular system i.e. agonist and antagonist get activated. Similarly, when we stretch a muscle e.g. the agonist the antagonist will automatically contract as indicated by many studies.[3,5] McKenzie focused on the stretch exercise to treat the cervical pain and deformities which cause cervical pain and found them effective[6, 27] while F. Peterson emphasizes the Kendall exercises that are on strengthening exercises and indicate the efficacy of strengthening exercises.[9,10]

Most of the treatment protocols work on activation of upper spine deep UCS flexors because they have a major role in stabilizing and aligning the cervical spine.[28] Effects of exercises are highly significant to correct the postural faults and improve the normal alignment of the head and shoulders.[29,30] However, FHP is not always reported with complaints of neck pain; many patients remain asymptomatic specifically in their initial stages of FHP.[22]

Several pieces of research enlightened the effects of exercise to correct the FHP, RS, and other postural deformities [1,7,18,26] but the uniqueness of our study is that it set the comparison between the effects of strengthening and stretching exercise. The objective of our study was to determine the effectiveness of stretching and strengthening exercises in asymptomatic healthy individuals with rounded shoulders and forward head posture.

MATERIAL AND METHODS

A randomized control trial (Registry # NCT04216862) was conducted on 34 healthy individuals during a period of July-December 2020. This study was conducted in the physiotherapy department of a Riphah Rehbaliation Clinic, Lahore. Ethical approval was obtained from institutional review board (IRB) of Ripah International University (REC/RCRS/19/1006).

Subjects, aged 22-40 years, measuring the craniovertebral (CVA) angle < 50º, shoulder angle (SA) < 52º, and not following any specific exercise program in the last one year were selected. A total of 40 participants were recruited for screening. A sample size of 34 was used to measure the data fulfilling the inclusion and exclusion criteria. Purposive sampling was used to recruit the participants for screening. After screening participants were randomly manipulated using the dice roll method into strengthening (n1=17) and stretching (n2= 17) groups.

Each group performed three sessions of exercise per week for a study duration of 10 weeks. Each session consisted of one set of exercises with five repetitions. The strengthening group received exercises which included chin tuck, Y to I exercises, abduction, and external rotations for weak and lengthened cervical muscles. The stretching group received unilateral, statistic sternocleidomastoid muscle (SCM) stretch, static levator scapulae stretch, and chin drop for relaxing the shortened cervical muscles.

Photogrammetry for imaging included the requisites of a mobile camera (Vivo Y 91), tripod mobile camera stand, grid sheet as background, square sticking tape to mark the reference landmarks on the body. The postural assessment including CVA and SA was made using the Kinovea PC software. Comparing to radio-images by using LODOX, the photographs proved to provide a valid and reliable orientation of the spine.[31]

Landmarks were made on the floor to make sure the accurate distance allocation of all participants to the camera and also to make sure that subjects were standing straight perpendicular to that of the camera lens. The camera was maintained on a tripod stand to adjust camera lens at the level of the external auditory meatus. The participants were asked to exposed cervical, upper thoracic, and shoulder areas. The tip of the C7 spinous process and acromion (tip of the shoulder) palpated to attach sticky markers. The third marker was positioned on the tragus of the ear. The three markers guided the reference points in photos during analysis. two images were taken at a distance of 80cm to capture a sagittal standing posture, one image from the right, and the other image from the left side of the individual. It is valid to use I-Pad or mobile camera for photogrammetry.[32] The reliability of this kind of evaluation was reported as being satisfactory in the sagittal view.[33,34]. SPSS version 25 was used for data

analysis. P-value <0.05 was considered as significant.

RESULTS

Thirty-four subjects (17 in each group) completed the study with a drop out of three subjects in each treatment group. Demographic detail of the patients like average age, BMI, and numbers of hours spent on computer / mobile were comparable in each group (p-value > 0.05) **(Table 1)**. There was a statistically significant difference (p-value < 0.001) in pre and post-treatment CVA and SA within each treatment group. However, no significant difference (p-value > 0.05) was reported across each treatment while comparing pre and post-treatment values for CVA and SA respectively **(Table 2)**.

Table 1: Demographic characteristic of the patients in two treatment groups

	Treatment Groups		P-value
	Strengthening Exercises (Mean ± SD)	Stretching Exercises (Mean ± SD)	
Age (Years)	30.76 ± 3.50	32.41 ± 4.47	0.241
BMI (kg/m^2)	26.86 ± 3.83	28.39 ± 2.82	0.678
Time spend on Computer (h/day)	6.41 ± 0.93	6.38 ± 1.59	0.948
Time spent using Mobile (h/day)	3.35 ± 0.93	3.23 ± 0.97	0.721
Years of working	5.35 ± 2.34	6.76 ± 3.80	0.202

[a] Mann Whitney U Test, [b] Chi-square Test of Independence

Table 2: Across and Within the Group Comparison for CVA and SA for two treatment groups

Outcome Measure	Treatment Groups		Mean Difference [c]
	Strengthening Exercises (Mean ± SD)	Stretching Exercises (Mean ± SD)	[95% CI]
Baseline CVA	35.52 ± 2.29	35.05 ± 2.04	0.47 [-1.04, 1.98]
Post Treatment CVA	49.70 ± 1.04	48.52 ± 2.03	1.17 [0.04, 2.03]
Mean Difference [b] [95% CI]	14.17** [13.05, 15.30]	13.47** [12.30, 14.63]	
Baseline SA	47.05 ± 2.53	47.76 ± 3.89	0.70 [-2.98, 1.57]
Post Treatment SA	51.23 ± 1.25	50.94 ± 0.82	0.29 [-0.44, 1.03]
Mean Difference [b] [95% CI]	4.17** [3.14, 5.20]	3.17** [1.55, 4.79]	

[c] Across the group difference – Independent sample T-test,
[d] Within the Group difference – Paired Sample T test, Craniovertebral Angle (CVA), Shoulder Angle (SA), * p value < 0.05, ** p value <0.001

DISCUSSION

According to Punjabi's model, spinal stability is a constituent of interaction between three systems; passive (structural), active (contractile), and control (neurologic) systems.[35] The focus of this exercise program was to influence the active and passive systems of spinal stability by strengthening the weak and stretching the tight musculature.

A research study reported the effects of the McKenzie postural correction exercises based on stretching with Kendall exercises involving the strengthening of deep cervical muscles and shoulder retractors along with stretches of pectoral muscles.[36] Results at the end of the 8th week concluded that both exercise interventions proved effective in increasing the CVA and SA supporting the findings of our study. Smartphone usage and desk job for a prolonged period without an appropriate ergonomic position is considered a strong risk factor for developing FHP.[37] In our study, subjects in both treatment groups had an average mobile usage of 3 hours per day while results of previous studies report that longer during of mobile phone usage (>30 minutes) is associated with muscle fatigue (cervical flexors and trapezius) and pain. Kim et al in another study also reported that short-term exercise (4 weeks) was also effective in improving CVA in smartphone users.[29]

Altered scapular humeral rhythm is seen in most of the subjects with FHP and RS along with fatigue and pain in shoulder muscles. The function of the trapezius and serratus anterior is essential in normal shoulder mechanics.[38] Y to I exercise was used in this study since it can externally rotate the shoulder to end range at 90º causing maximum depression leading to activation of lower fibers of trapezius.[36] Though the evidence for activation of upper fibers is weak without resistance to head or neck. Fathollahnejad K et al (2019) reported more favorable outcomes with the addition of manual therapy to a stabilization exercise program in FHP subjects compared to stabilization exercise alone.[39] Although the stabilization exercises alone were also effective, but the magnitude of improvement in pain and function was greater with the addition of manual therapy. Stretching of the pectoralis minor and concomitant strengthening of scapular stabilizers as performed in this study is important in improving rounded shoulder posture.

CONCLUSION

Stretching and strengthening exercises are equally effective in the management of FHP and RS posture in asymptomatic individuals. However, strengthening exercise showed superior improvement in CVA and SA comparatively.

REFERENCES

1. Bergqvist U, Wolgast E, Nilsson B, Voss M. Musculoskeletal disorders among visual display terminal workers: individual, ergonomic, and work organizational factors. Ergonomics 1995; 38(4): 763-76.
2. Hales TR, Sauter SL, Peterson MR, et al. Musculoskeletal disorders among visual display terminal users in a telecommunications company. Ergonomics 1994; 37(10): 1603-21.
3. Kim E-K, Kim JS. Correlation between rounded shoulder posture, neck disability indices, and degree of forward head posture. Journal of physical therapy science 2016; 28(10): 2929-32.
4. Harrison DE, Harrison DD, Betz JJ, et al. Increasing the cervical lordosis with chiropractic biophysics seated combined extension-compression and transverse load cervical traction with cervical manipulation: nonrandomized clinical control trial. Journal of manipulative and physiological therapeutics 2003; 26(3): 139-51.
5. Szeto GP, Straker L, Raine S. A field comparison of neck and shoulder postures in symptomatic and asymptomatic office workers. Applied ergonomics 2002; 33(1): 75-84.
6. Cailliet R. Soft tissue pain and disability: FA Davis Company; 1977.
7. IJmker S, Blatter BM, van der Beek AJ, van Mechelen W, Bongers PM. Prospective research on musculoskeletal disorders in office workers (PROMO): study protocol. BMC musculoskeletal disorders 2006; 7(1): 55.
8. Chaitow L, Baldry P. Fibromyalgia syndrome: a practitioner's guide to treatment: Elsevier Health Sciences; 2003.

9. Janda V. Muscles and motor control in cervicogenic disorders: assessment and management. Physical therapy of the cervical and thoracic spine 1994.
10. Sahrmann S, Azevedo DC, Van Dillen L. Diagnosis and treatment of movement system impairment syndromes. Brazilian Journal of Physical Therapy 2017; 21(6): 391-9.
11. Lukasiewicz AC, McClure P, Michener L, Pratt N, Sennett B. Comparison of 3-dimensional scapular position and orientation between subjects with and without shoulder impingement. Journal of Orthopaedic & Sports Physical Therapy 1999; 29(10): 574-86.
12. Silva AG, Punt TD, Sharples P, Vilas-Boas JP, Johnson MI. Head posture assessment for patients with neck pain: Is it useful? International Journal of Therapy and Rehabilitation 2009; 16(1): 43-53.
13. Darling D, Kraus S, Glasheen-Wray M. Relationship of head posture and the rest position of the mandible. Journal of Prosthetic Dentistry 1984; 52(1): 111-5.
14. Kendall FP, McCreary EK, Provance PG, Rodgers M, Romani WA. Muscles: testing and function with posture and pain. Philadelphia PA 2005: 212-3.
15. Capuano-Pucci D, Rheault W, Aukai J, Bracke M, Day R, Pastrick M. Intratester and intertester reliability of the cervical range of motion device. Archives of physical medicine and rehabilitation 1991; 72(5): 338-40.
16. Singla D, Veqar Z, Hussain ME. Photogrammetric assessment of upper body posture using postural angles: a literature review. Journal of chiropractic medicine 2017; 16(2): 131-8.
17. Griegel-Morris P, Larson K, Mueller-Klaus K, Oatis CA. Incidence of common postural abnormalities in the cervical, shoulder, and thoracic regions and their association with pain in two age groups of healthy subjects. Physical therapy 1992; 72(6): 425-31.
18. Janwantanakul P, Sitthipornvorakul E, Paksaichol A. Risk factors for the onset of nonspecific low back pain in office workers: a systematic review of prospective cohort studies. Journal of manipulative and physiological therapeutics 2012; 35(7): 568-77.
19. Kang J-H, Park R-Y, Lee S-J, Kim J-Y, Yoon S-R, Jung K-I. The effect of the forward head posture on postural balance in long time computer based worker. Annals of rehabilitation medicine 2012; 36(1): 98.
20. Yip CHT, Chiu TTW, Poon ATK. The relationship between head posture and severity and disability of patients with neck pain. Manual therapy 2008; 13(2): 148-54.
21. Hanten WP, Lucio RM, Russell JL, Brunt D. Assessment of total head excursion and resting head posture. Archives of physical medicine and rehabilitation 1991; 72(11): 877-80.
22. Ruivo RM, Pezarat-Correia P, Carita AI. Cervical and shoulder postural assessment of adolescents between 15 and 17 years old and association with upper quadrant pain. Brazilian journal of physical therapy 2014; 18(4): 364-71.
23. Wright EF, Domenech MA, FISCHER JR JR. Usefulness of posture training for patients with temporomandibular disorders. The Journal of the American Dental Association 2000; 131(2): 202-10.
24. Lee M-H, Park S-J, Kim J-S. Effects of neck exercise on high-school students' neck–shoulder posture. Journal of physical therapy science 2013; 25(5): 571-4.
25. Kim JY, Kwag KI. Clinical effects of deep cervical flexor muscle activation in patients with chronic neck pain. Journal of physical therapy science 2016; 28(1): 269-73.
26. Berolo S, Wells RP, Amick III BC. Musculoskeletal symptoms among mobile hand-held device users and their relationship to device use: a preliminary study in a Canadian university population. Applied ergonomics 2011; 42(2): 371-8.
27. Mohammed S. Myofascial Pain and Fibromyalgia Syndromes: A Clinical Guide to Diagnosis and Management. LWW; 2003.
28. Boyd-Clark L, Briggs C, Galea M. Muscle spindle distribution, morphology, and density in longus colli and multifidus muscles of the cervical spine. Spine 2002; 27(7): 694-701.
29. Do YL, Nam CW, Sung YB, Kim K, Lee HY. Changes in rounded shoulder posture and forward head posture according to exercise methods. Journal of physical therapy science 2017; 29(10): 1824-7.
30. Harman K, Hubley-Kozey CL, Butler H. Effectiveness of an exercise program to improve forward head posture in normal adults: a

randomized, controlled 10-week trial. Journal of Manual & Manipulative Therapy 2005; 13(3): 163-76.
31. Van Niekerk S-M, Louw Q, Vaughan C, Grimmer-Somers K, Schreve K. Photographic measurement of upper-body sitting posture of high school students: a reliability and validity study. BMC musculoskeletal disorders 2008; 9(1): 113.
32. Ágústsson A, Gíslason MK, Ingvarsson P, Rodby-Bousquet E, Sveinsson T. Validity and reliability of an iPad with a three-dimensional camera for posture imaging. Gait & Posture 2019; 68: 357-62.
33. Paušić J, Pedišić Ž, Dizdar D. Reliability of a photographic method for assessing standing posture of elementary school students. Journal of manipulative and physiological therapeutics 2010; 33(6): 425-31.
34. Ferreira EAG, Duarte M, Maldonado EP, Burke TN, Marques AP. Postural assessment software (PAS/SAPO): validation and reliabiliy. Clinics 2010; 65(7): 675-81.
35. KAMAL SA. CROSS-LATTICE-STRUCTURE-BASED MODELING OFTHE HUMAN SPINAL COLUMN. Int J Biol Res 2019; 7(2): 121-34.
36. Khosrokiani Z, Letafatkar A, Sokhanguei Y. Long-term effect of direction-movement control training on female patients with chronic neck pain. Journal of bodywork and movement therapies 2018; 22(1): 217-24.
37. Kong Y-S, Kim Y-M, Shim J-m. The effect of modified cervical exercise on smartphone users with forward head posture. Journal of physical therapy science 2017; 29(2): 328-31.
38. Lim JY, Lee JS, Mun BM, Kim TH. A comparison of trapezius muscle activities of different shoulder abduction angles and rotation conditions during prone horizontal abduction. Journal of physical therapy science 2015; 27(1): 97-100.
39. Fathollahnejad K, Letafatkar A, Hadadnezhad M. The effect of manual therapy and stabilizing exercises on forward head and rounded shoulder postures: a six-week intervention with a one-month follow-up study. BMC musculoskeletal disorders 2019; 20(1): 86.