

Effect of Two Weeks Cervical Stabilization Exercises on Forward Head Posture, Peak Expiratory Flow Rate and Chest Expansion in Smartphone Users

Dr. Sweety Shah¹, Tahemeena Momin²

¹PT, Ph.D., SBB College of Physiotherapy, VS General Hospital, Ahmedabad, India.

²Postgraduate student, SBB College of Physiotherapy, VS General Hospital, Ahmedabad, India.

Corresponding Author: Tahemeena Momin

DOI: <https://doi.org/10.52403/ijhsr.20240306>

ABSTRACT

Aim: To know if there is any effect of cervical stabilization exercises on FHP, PEFR and chest expansion in smartphone users.

Background: The number of smartphone users are increasing worldwide. Prolonged use can lead to a number of health problems, including forward head posture [FHP]. FHP can also have a negative impact on respiratory function. Because of this FHP can compress the chest cavity and restrict lung expansion. As a result, people with FHP may have difficulty breathing deeply and may experience decreased peak expiratory flow rate [PEFR].

Setting & Design: An experimental study was conducted on smartphone users (>1 year) of Ahmedabad. Includes individuals of Forward head [Tragus to wall distance (TWD):>10 cm], mean age: 22.46±2.66, both genders.

Methodology: In this study 30 subjects were divided into 2 groups. An experimental group did cervical stabilization exercises, Thoracic expansion exercise and pectorals stretching. Control group did cervical isometric exercises. Both groups Performed exercises twice a day for two weeks. Pre and post outcome measures was taken: TWD, PEFR, Chest expansion.

Result: The result analyzed by paired T-test. The intervention group showed significant improvements in TWD (11.01±0.34 to 10.05±0.35cm; p<0.05), PEFR (346.66±30.39 to 370.33±24.67lpm; p<0.05) and Chest expansion (4.09±0.29 to 4.72±0.28cm; p<0.05) within the group after the intervention. The control group showed no significant changes in any outcome measures.

Conclusion: Cervical stabilization exercises are effective in improving FHP, PEFR, and chest expansion in smartphone users. These exercises can help to reduce the risk of health problems associated with FHP.

KEYWORDS: Cervical stabilization exercises, smartphone users, FHP, PEFR, chest expansion.

INTRODUCTION

Recently, the number of smartphone users has been increasing worldwide.^[1] Moreover, smartphone overuse could lead to musculoskeletal problems and decreased activity in smartphone users may affect their respiratory function.^[2]

Any deviation in normal posture pattern adversely affects the adjacent joints and muscles and leads to various pathological conditions. The FHP is the most common deviation from normal curvature in cervical spine.^[3]

Forward head posture refers to the posture that accompanies forward bending of the

lower cervical vertebrae and excessive extension of the upper cervical vertebrae.^[4]

Forward head posture is indicated by tragus to wall distance⁽⁵⁾

Tragus Wall Distance - "The horizontal distance between the tragus, the auricular cartilaginous flap anterior to the external auditory meatus, and a wall."⁽⁶⁾

The FHP not only affects the functional movement of neck but also the act of breathing.⁽⁷⁾ The damage in motor control of cervical spine associated with damage in respiratory muscles. Thus, in addition FHP has a negative effect on chest expansion.⁽⁸⁾ As a result, people with FHP may have difficulty breathing deeply and may experience decreased PEFR.

Peak Expiratory Flow Rate (PEFR) can be determined by volume of the lungs, elastic properties of the lung and the power and coordination of expiratory muscles in healthy people.⁽⁹⁾ Peak Expiratory Flow Rate (PEFR) is a measurement of ventilator function defined as "The largest expiratory flow rate achieved with a maximally forced effort from effort from a position of maximal inspiration, expressed in liters/min."⁽¹⁰⁾

Chest expansion measure at 3 level: 2nd intercostal, 4th intercostal and xiphoid process.⁽¹¹⁾

Aim of the study: Only few studies are done to know effect of cervical stabilization exercise on correction of forward head posture, chest expansion and PEFR.

Therefore, it is important to know the effect of cervical stabilization exercise on chest expansion and PEFR in FHP. so that proper exercise intervention can be implemented to improve respiratory status in population with forward head posture.

MATERIALS & METHODS

MATERIALS:

- Consent form
- Ruler
- Measure tap
- Plinth
- Peak expiratory flow meter

- Pen, paper

METHODOLOGY:

- Study Design: Prospective Follow-up, Experimental
- Study Setting: SBB college of physiotherapy, Ahmedabad
- Participants: Smartphone users (>1 year)
- Sample Size: 30
- Duration of study: Two weeks (28 session)

INCLUSION CRITERIA:

Subject willing to participate
Smartphone users 18-30 years of age
Both genders
Forward head according to Tragus to wall distance (>10cm)

EXCLUSION CRITERIA:

Any history of cervical fracture
Who had undergone any thoracic or abdominal surgery
History of smoking or current smokers
Other unstable cardiac conditions, any neurological or orthopedic conditions
★ Pre intervention outcome measure will be recorded (Tragus to wall distance, PEFR, chest expansion)

- Tragus wall distance⁽⁶⁾

Feet separated the length of the individual's foot. Heels 10.0cm from the wall and Buttocks and posterior thorax against wall

Head: Looking straight ahead, Level (horizontal between bottom of nose and tragus)

Measurement: with ruler, Distance between posterior aspect of tragus and wall and taken average of both sides

Conditions: Comfortable and Neck retracted: occiput back as far as possible (chin drawn in)

- Peak expiratory flow rate⁽⁷⁾
3 readings were taken. Highest among 3 was considered as peak expiratory flow rate.
- Chest expansion measure at 3 level: 2nd intercostal, 4th IC, xiphisternum

Group A: intervention group⁽¹²⁾

Did cervical stabilization ex.: With chin tuck 10 rep. With 10 sec. hold

- In supine: Shoulder flexion end range
Shoulder abduction end range
Shoulder external rotation with arm at sides

Diagonal pattern

- In prone: Arm at side: laterally rotate sh. And adduct scapula
Arm at side: horizontally abduct sh. And adduct scapula
- Elevation of sh. In full flexion
- Thoracic expansion ex.: 10rep.
- Pectoral stretching: 30 sec. hold, 3 rep.

Group B: control group

- Did cervical isometric ex. Direction: forward, backward, right, left rep: 10 times with 10 sec. hold

Duration: twice in a day, up to two weeks (28 session)

- ★ Post intervention outcome measure will be recorded; tragus to wall distance, PEFR, chest expansion

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS version 20. Data was checked for normal distribution using Shapiro-Wilk test. Data was normally distributed and are presented as mean \pm standard deviation. Data analysis was performed using unpaired t-test for comparison between both groups and paired t-test for within group. $P < 0.05$ was considered as statistically significant.

RESULT

Mean age of intervention group: 22.46 ± 2.66

Mean age of control group: 22.33 ± 2.71

- The result analyzed by paired T-test within group.

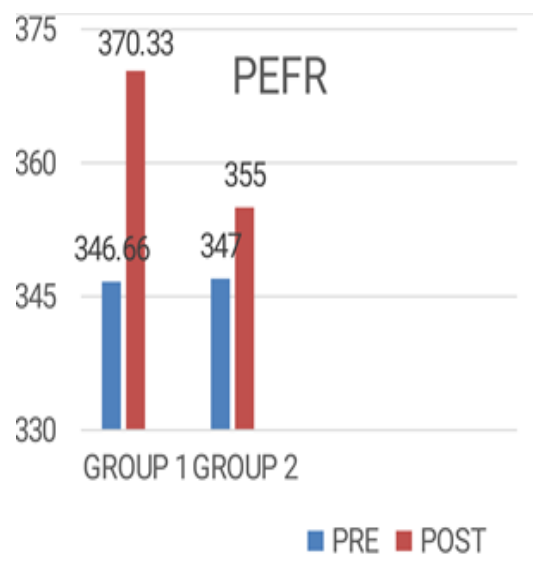
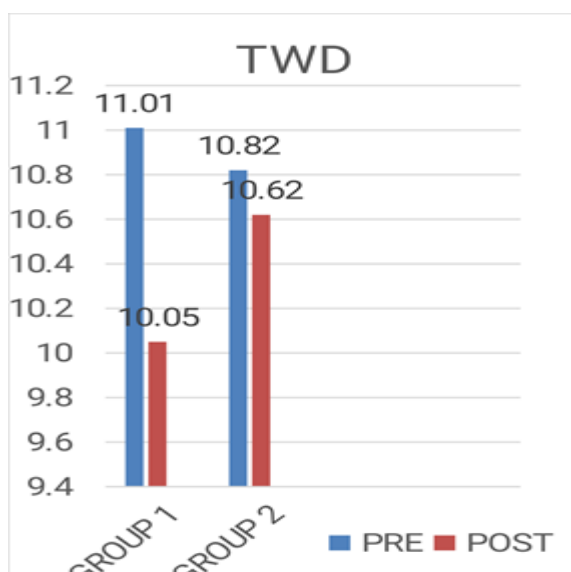
The intervention group showed significant improvements ($p < 0.05$) in TWD, PEFR and Chest expansion after the intervention.

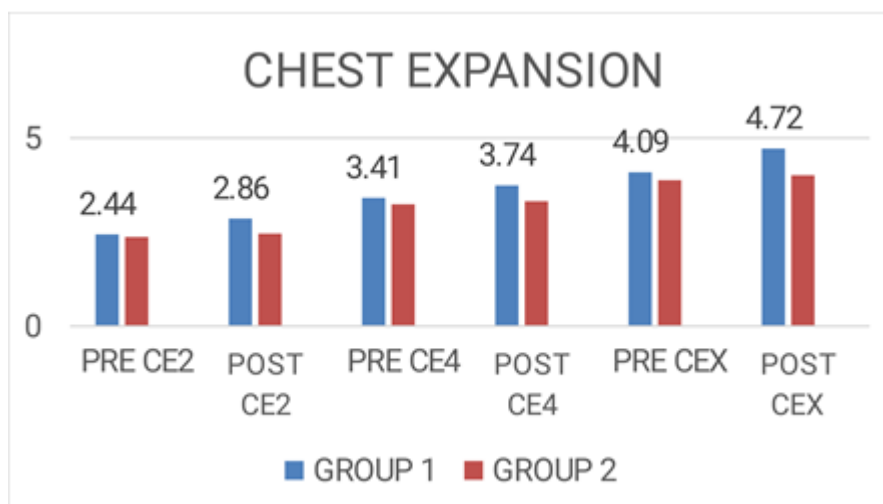
- Independent sample T test used for compare 2 groups.

Significant improvement in intervention group compare to control group.

The control group showed no significant changes in any outcome measures.

OUTCOME MEASURE	PRE (GROUP 1)	POST (GROUP 1)	PRE (GROUP 2)	POST (GROUP 2)
TWD	11.01 ± 0.34	10.05 ± 0.35	10.82 ± 0.43	10.62 ± 0.42
PEFR	346.67 ± 30.39	370.33 ± 24.67	347 ± 24.33	354 ± 21.23
CE 2	2.44 ± 0.35	2.86 ± 0.29	2.37 ± 0.34	2.46 ± 0.30
CE 4	3.41 ± 0.28	3.74 ± 0.36	3.24 ± 0.30	3.32 ± 0.26
CE X	4.09 ± 0.29	4.72 ± 0.28	3.88 ± 0.22	4.01 ± 0.18





DISCUSSION

The prime objectives of the study were to evaluate the effect of exercise program on FHP, PEFR and CE. The results of the study show that TWD, PEFR and chest expansion improve in all the subjects of intervention group following exercise program.

The number of smartphone users are increasing worldwide. Prolonged use can lead to a number of health problems, including FHP. FHP can also have a negative impact on respiratory function. Because of this FHP can compress the chest cavity and restrict lung expansion. As a result, people with FHP may have difficulty breathing deeply and may experience decreased PEFR. Cervical stabilization ex. Include strengthening of deep neck flexor, stretching of tight muscles and by promoting proper muscle activation that lead to pull the head back and improve posture. This ex. Improve chest wall mobility by stretching of tight chest muscle and strengthening supportive muscles that lead to allow deeper and more forceful exhalation, it lead to increase peak expiratory flow rate.

Before the exercise program the mean value of TWD 11.01cm which rises to 10.05cm after the exercise program. The mean value of chest expansion at 2nd intercostal was 2.44cm and it moves to 2.86cm after the exercise program, the mean value at 4th intercostal level was 3.41cm which moves to 3.74cm after the exercise

program and that of xiphisternum level was 4.09cm and it rises to 4.72cm after exercise. It is observed in this study that at 2nd intercostal and xiphisternum level there is more increase in chest expansion as compared to 4th intercostal level also the PEFR 346.67 to 370.33 liter /min increase in all the subjects which is statistically significant.

A study done by Taiichi Koseki et.al in 2019 shows that the forward head posture significantly affects the chest expansion and thus alter the respiratory function.^[8] A study done in 2019 shows the relationship between FHP and CE and found the negative correlation between FHP and CE.^[9] Their study also suggested that there is decrease in CE at the Axillary level as compared to the other two levels which may due to the tight scalene and levator muscles due to the FHP.

CONCLUSION

This cervical stabilization exercises are effective in reduce FHP in smartphone users. It is concluded from the results of the study that increase chest expansion and PEFR by treating the forward head posture. These exercises can help to reduce the risk of health problems associated with FHP.

Declaration by Authors

Ethical approval: We have done it according to the declaration of Helsinki.

Acknowledgement: We wish to thank all the participants in the present study.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Park N, Kim YC, Shon HY, Shim H. Factors influencing smartphone use and dependency in South Korea. *Computers in Human Behavior*. 2013 Jul 1;29(4):1763-70.
2. Raustorp A, Pagels P, Fröberg A, Boldemann C. Physical activity decreased by a quarter in the 11-to 12-year-old Swedish boys between 2000 and 2013 but was stable in girls: a smartphone effect?. *Acta Paediatrica*. 2015 Aug;104(8):808-14.
3. Thakur D, Motimath B, Raghavendra M. Forward head posture correction versus shoulder stabilization exercises effect on scapular dyskinesia and shoulder proprioception in athletes an experimental Study. *International Journal of Physiotherapy*. 2016 Apr 8:197-203.
4. Hanten WP, Olson SL, Russell JL, Lucio RM, Campbell AH. Total head excursion and resting head posture: normal and patient comparisons. *Archives of physical medicine and rehabilitation*. 2000 Jan 1;81(1):62-6.
5. Tudini FT, Myers BJ, Bohannon RW. Forward flexed posture: reliability and determinants of tragus-to-wall measurement. *Physiotherapy Theory and Practice*. 2022 Apr 3;38(4):579-86.
6. Shipe NK, Billek-Sawhney B, Canter TA, Meals DJ, Nestler JM, Stumpff JL. The intra-and inter-rater reliability of the tragus wall distance (TWD) measurement in non-pathological participants ages 18–34. *Physiotherapy theory and practice*. 2013 May 1;29(4):328-34.
7. Kang JI, Jeong DK, Choi H. Correlation between pulmonary functions and respiratory muscle activity in patients with forward head posture. *Journal of physical therapy science*. 2018;30(1):132-5.
8. Koseki T, Kakizaki F, Hayashi S, Nishida N, Itoh M. Effect of forward head posture on thoracic shape and respiratory function. *Journal of physical therapy science*. 2019;31(1):63-8.
9. Joshi S, Sheth M. Effect of McKenzie self-therapy protocol on forward head posture and respiratory functions of school going adolescent girls. *International Journal of Health Sciences Research*. 2019;9(12):293-8.
10. American Thoracic Society: Standardization of Spirometry; 1994 uptake. *Amer J Respiratory & Critical Care Med* 1995; 152: 1107-1136
11. Pagare, Rajani S., and Ratnaprabha B. Pedhambkar. "Assessment of reference values of chest expansion among healthy adults in Pune, India." *Int J Physiother Res* 5.1 (2017): 1819-23.
12. Kisner C, Colby LA. *Therapeutic Exercise: Foundations and Techniques*. 7th ed. Philadelphia, PA: F.A. Davis Company; 2017.

How to cite this article: Sweety Shah, Tahemeena Momin. Effect of two weeks cervical stabilization exercises on forward head posture, peak expiratory flow rate and chest expansion in smartphone users. *Int J Health Sci Res*. 2024; 14(3):30-34. DOI: <https://doi.org/10.52403/ijhsr.20240306>
