# Association Of Prolonged Sitting And Forward Head Bending On Chest Expansion Among Tailors: A Cross-Sectional Study

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## ABSTRACT

**Background:**
The relationship between forward head bending and chest expansion involves several biomechanical and physiological factors. Forward head bending is characterized by the head being positioned forward relative to the spine. It often results from prolonged periods of sitting, especially with poor ergonomics, such as working on a computer or using mobile devices. The forward positioning of the head and rounded shoulders can restrict the expansion of the rib cage and limit diaphragm movement. This restriction can reduce lung capacity and chest expansion, making breathing less efficient and more shallow.

**Objective:** To determine association of prolonged sitting and forward head bending on chest expansion among tailors.

**Materials and methods:** A cross-sectional study was conducted among tailors in Lahore, with a sample size of 80 participants. The forward head bending was measured by using goniometer and chest expansion was measured by using inche tape.Chi square test was used to findout the association of prolonged sitting and forward head bending among tailors. Data was analyzed by using SPSS 26 software.

**Results:**
The chi-square value ($X^2 = 0.011$) indicates minimal association between chest size and sitting duration. A chi-square value of 0.000 indicates a perfect fit between forward head bending and chest expansion.

**Conclusion:**
The study found that prolonged sitting and forward head bending can reduce chest expansion among tailors.

**Key Words:**
Chest expansion, Forward head bending, Musculoskeletal health, Occupational health, Respiratory function, Tailors.

## INTRODUCTION

Noninvasive techniques for monitoring respiratory function have recently drawn more attention, particularly chest wall movement. (1)Measuring chest wall deformation objectively evaluates the rib cage behavior during breathing. (2). Evaluating respiratory function, such as chest expansion

(CE), might reveal a decline in respiratory function before the onset of clinical symptoms.(3). CE varied between 4 and 7 cm in healthy individuals, differing between ill and healthy patients. Men are 20% more likely than women to have a standard range of CE, which declines by 50% to 60% between the ages of 15 and 75(4).

Chest expansion depends upon soft tissue flexibility, chest shape, and inspiratory muscle strength. Strong muscle increases lung capacity and negative pressure in the pleural cavity. (5) Exercise and physical activity that increases respiratory muscle strength and decreases the sense of respiratory fatigue may improve respiratory weakness.(6). Exercise and inspiratory demands increase the recruitment of abdominal, scalene, and internal intercostal muscles, elevating the need for O2 uptake and delivery.(7) With the increase in exercise intensity, the end-inspiratory lung volume (EILV) increases to compensate for the decreased EELV capacity and allow VT to expand further. (8).

Previous research has investigated the connection between pulmonary function and chest expansion (CE). Some scholars have suggested that age and chronic chest diseases can significantly reduce the mobility of the chest wall. Consequently, upper and lower CE measurements may offer valuable clinical information for assessing chest mobility and indirectly evaluating lung function. (9). Research studies have indicated a correlation between lung function and chest wall mobility in people diagnosed with fibromyalgia and ankylosing spondylitis. However, the impact of chest expansion and forward bending on tailors, in particular, remains a topic that has yet to be extensively explored. Therefore, there is a need for further investigation to understand better the relationship between these factors and how they may affect the tailoring profession. (10).

Tailors' jobs sometimes require them to sit or stand for extended period of time in fixed postures. This can lead to bad posture and limited chest mobility. Due to the body having to work harder to make up for inefficient breathing, this diminished chest expansion may cause decreased lung capacity and poor respiratory function, contributing to tiredness.

Prolonged sitting and forwad head bending can cause tightness in the pectoral muscles. This tightness pulls the shoulders forward reduce the chest expansion and we check the association of

Prolonged Sitting And Forward Head Bending On Chest Expansion Among Tailors. Previous researchs on chest expansion was not have proper literature review of association of prolonged sitting and forwards head bending among tailors.

## METHODOLOGY

This research is a cross-sectional study in which data were gathered from 80 tailors in Lahore by using the convenience sampling method. Inclusion Criteria was aged between 30-45 years, non-smokers, and those with no history of any musculoskeletal, respiratory, or neuromuscular disorders and without comorbidities, chest deformities, or a history of medication changes over the past three months. The exclution criteria included patients with comorbidities, such as heart disease, bronchial asthma, bronchiectasis, pulmonary fibrosis, and ankylosing spondylitis, Patient with any chest wall deformities, Decline to participate in this study, active fracture and dislocations and patients with difficulty in seeing and hearing. Chest expansion was measured in centimeters with a measuring tape, and forward head bending was measured with a goniometer. Chest expansion was measured by warping the measuring tape on the level of nipple or the fourth intercostal space. Take the measurement at the end of a normal exhalation. Ask the person to inhale deeply and hold their breath, then take a measurement at the peak of inhalation. Record the difference between the measurements taken at maximum inhalation and normal exhalation was the chest expansion. A goniometer was used to measured forward head bending, which is also known as cervical flexion. The individual should sit or stand in an upright position with their head in a neutral position. Placed the fulcrum of the goniometer over the external auditory meatus (the ear canal). The stationary arm should be aligned with the vertical axis of the head, and the movable arm should follow the natural curve of the nose. Ask the person to bend their head forward as far as comfortably possible, bringing their chin towards their chest. The movable arm of the goniometer will follow the movement. Read the angle on the goniometer to determine the degree of forward head bending or cervical flexion. Data was analyzed by using SPSS 26 software.

## RESULTS

Cross Tabulation of Farword head Bending ROM and Measurement of Chest. Notably, Chest expansion of 4 individauls was 1 cm and angle of forward head bending was 61-90 degree. Chest expansion of 3 individuals was 1cm and angle of forward head bending was 31 -60 degree. Chest expansion of 13 individuals was 1cm and angle of forward head bending was a 0-30 degree.Chest expansion of 18 individuals was 2cm and angle of forward head bending was 61-90 degree. Chest

expansion of 5 individuals was 2cm and angle of forward head bending was 31-60 degree. Chest expansion of 8 individuals was 2cm and angle of forward head bending was 0-30 degree. Chest expansion of 29 individuals was 3cm and angle of forward head bending was 61-90 degree. Chest expansion of 0 individual was 3cm and anlge of forward head bending was 31 -60 degree. Chest expansion of 14 individuals was 1cm and anlge of forward head bending was 0-31 degree. . A chi-square value of 0.000 indicates a perfect fit between forward head bending and chest expansion.(Table :4)The crosstabulation shows sitting durations by chest measurement. Notably, Chest expension of 16 individuals was 1 cm and they were sit more then 10 hours , Chest expension of 1 individual was 1 cm and they was sit 6 to 10 hours ,Chest expension of 3 individuals was 1 cm and they were sit 3 to 5 hours , no individual was lying in 1 to2 hours sitting duration Chest expansion of 0 individual was 2cm and they was sit more then 10 hours. Chest expansion of 24 individuals was 2cm and they were sit 6-10 hours. Chest expansion of 5 individuals was 2cm and they were sit 3-5 hours. Chest expansion of 2 individuals was 2cm and they weresit 1-2 hours. Chest expansion of 18 individuals was 3cm and they were sit more then 10 hours. No individual with chest expansion 3cm sit 6-10 hours. No individual with chest expansion 3cm sit 3-5 hours. Chest expansion of 11 individuals was 3cm and they were sit 1-2 hours. The chi-square value ($X^2 = 0.011$) indicates minimal association between chest size and sitting duration. (Table :3)

**Table1 : Descriptive Statistics of Gender ,Sitting Duration and Forward head bending**

| Variable | Construct | Frequency | Percentage% |
|---|---|---|---|
| Gender | Male | 49 | 61.3 |
| | Female | 31 | 38.8 |
| Siting Duration | 1-2 Hour | 13 | 16.3 |
| | 3-5 Hour | 8 | 10.0 |
| | 6-10 Hour | 25 | 31.3 |
| | More Than 10 Hour | 34 | 42.5 |
| Forward head Bending | 0-30 Degree | 35 | 43.8 |
| | 30-60 Degree | 8 | 10.0 |
| | 60-90 Degree | 37 | 46.3 |

**Table 2: Descriptive statistics of Age of tailors and Measurement of chest**

| Descriptive Statistics | Mean | SD |
|---|---|---|
| Age of tailors | 36.8 | 5.38 |
| Measurement of Chest | 2.85 | 0.722 |

**Table 3: Cross Tabulation of Siting Duration and Measurement of Chest**

| **Measurement of Chest* Siting Duration Crosstabulation** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | | Siting Duration | | | | Total | $x^2$ |
| | | 1-2 Hour | 3-5 Hour | 6-10 Hour | More Than 10 Hour | | |
| Measurement of Chest | 1 cm | **0** | **3** | **1** | **16** | **20** | 0.011 |
| | 2 cm | **2** | **5** | **24** | **0** | **31** | |
| | 3 cm | **11** | **0** | **0** | **18** | **29** | |
| Total | | **13** | **8** | **25** | **34** | **80** | |

| **Measurement of Chest* Forward head Bending ROM Crosstabulation** | | | | | | |
|---|---|---|---|---|---|---|
| Variable | | Forward head Bending ROM | | | Total | $x^2$ |
| | | 0-30 Degree | 31-60 Degree | 61-90 Degree | | |
| Measurement of Chest | 1 cm | 13 | 3 | 4 | 20 | 0.000 |
| | 2 cm | 8 | 5 | 18 | 31 | |
| | 3 cm | 14 | 0 | 15 | 29 | |
| Total | | 35 | 8 | 37 | 80 | |

**Table 4 : Cross Tabulation of Forward head Bending ROM and Measurement of Chest**

## DISCUSSION

According to a recent study, tailors who sit for a prolonged time and incline their necks forward can have less chest expansion. The study team gathered relevant information, including the subjects' age, height, weight, gender, chest expansion measurement, and length of sitting. In 2019, a study with 169 participants was conducted in Sri Lanka. Results indicate a significant need for interventions to improve the health and well-being of individuals in Sri Lanka and reduce obesity rates and sedentary behavior.(11).

The job of a sewing machine operator can be quite physically demanding, involving long hours of sitting and repetitive shoulder and elbow movements using hands. A recent study revealed that 70% of workers in this profession experience workplace musculoskeletal disorders (WMSDs). Low back pain was the most common site of pain reported among these workers.(12). However, in contrast to other research, this study did identify that chest expansion is minimally associated with prolonged sitting among sewing machine operators (p=0.011).

In (2020) Rustem M. et al was determine the variables that influence the chest wall's hypermobility or normal range of motion. Two groups of young people were created to test chest wall mobility. Group 1 consisted of patients with normal mobility, and Group 2 consisted of patients with hypermobility. Results showed that forced vital capacity, maximal inspiratory pressure, and obsessive-compulsive characteristics were significant predictors of chest wall mobility. FVC and obsessive-compulsive characteristics were significant predictors of chest wall mobility using backward linear regression models (R2 = 0.27; P <.001 and P =.01, respectively). Maximal inspiratory pressure, FVC, and obsessive-compulsive characteristics were all significant predictors of normal mobility/hypermobility of the chest wall in logistic regression models (R2 = 0.42; P <.001, P =.01, and P =.03, respectively). Chest wall mobility, including regular or hypermobility, is significantly predicted by forced vital capacity, maximal inspiratory pressure, and obsessive-compulsive characteristics. [17].

A 2019 Taiichi Koseki et al. research demonstrates that the forward head position significantly impacts chest expansion, which changes respiratory function.[17]. Similarly, Mylonas K stated in 2020 that forward head posture strongly affects chest expansion and respiratory function, a typical postural aberration. When the rib cage is compressed, it cannot extend entirely upon inhalation.[18] In recnet study found that prolonged sitting and forward head bending can reduce chest expansion among tailors.

## CONCLUSIONS

The study found that prolonged sitting and forward head bending can reduce chest expansion among tailors.

## LIMITATIONS

- Captures data at a single point in time, making it difficult to establish causal relationships between forward head bending, prolonged sitting, and musculoskeletal issues. It was difficult to collect a data multiple times. This study design can only identify associations, not determine cause and effect**.**
- The sample size of research was small because we have shorter duration study.

## RECOMMENDATIONS

- Future studies should use larger sample sizes to make their findings more applicable to a broader population. Including participants from different age groups, genders, and experience levels can provide a more detailed understanding of how these factors influence the impact of forward head bending and prolonged sitting.
- By including control groups from other professions or those with varying exposure levels to forward head bending and prolonged sitting, researchers can better determine the specific effects that tailoring has on musculoskeletal health.
- Research should investigate how effective various ergonomic solutions, such as adjustable workstations, ergonomic chairs, and proper lighting, are in reducing the negative impacts of forward head bending and prolonged sitting on tailors.

### CONFLICT OF INTEREST

Authors declare no conflict of interest

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