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## Combined effect of Breuggers exercise and body blade exercise on craniovertebral angle and pain in patients with forward head posture: A case report

Chaithanya Prem, Libin George Babu and Vaishnavi Rao

### Abstract

**Background:** Forward head posture refers to a condition where the head is positioned in front of the body's natural alignment, often accompanied by increased cervical spine curvature, rounded shoulders, and thoracic kyphosis.

**Objective:** To evaluate the combined effect of Breuggers and body blade exercises on craniovertebral angle and pain in patients with forward head posture.

**Methodology:** The patient with forward head posture was assessed before and after four weeks of performing Breuggers and Body Blade exercises, four times a week. The craniovertebral angle was measured using photometry, and pain levels were evaluated with the visual analog scale.

**Results:** The study demonstrated that Breuggers and body blade exercises effectively improved craniovertebral angle and reduced pain in patients with forward head posture.

**Conclusion:** Combined effect of Breuggers exercise and body blade exercise showed improvement on craniovertebral angle and reduction in pain for patients with forward head posture.

**Keywords:** Cervical vertebrae, exercise therapy, posture, muscle weakness, neck pain, resistance training

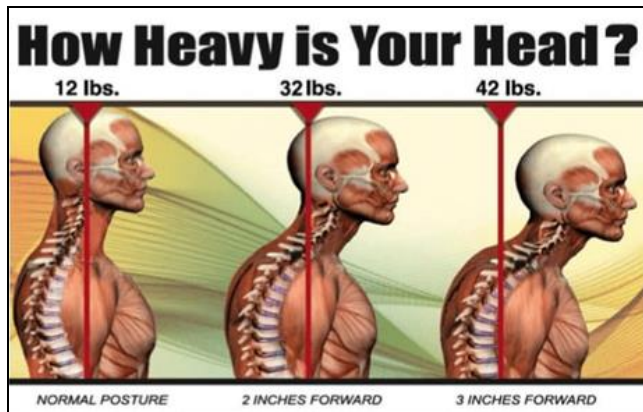
### 1. Introduction

Forward Head Posture (FHP) is a condition where the head is positioned excessively forward in relation to the body, leading to misalignment of the head and trunk. This misalignment is often seen in both sitting and standing positions and is accompanied by an exaggerated curve in the lower cervical spine, with the head shifted forward, the middle cervical spine extended, and the lower cervical spine flexed. Additionally, FHP is typically associated with rounded shoulders and an increased thoracic kyphosis [5]. FHP is one of the most prevalent postural issues seen in both younger individuals and middle-aged adults [1].

Forward head posture (FHP) typically develops in individuals who spend extended periods using computers in occupational settings or smartphones [1]. It is characterized by the forward positioning of the head in relation to the neck in the sagittal plane and is often accompanied by hyperextension of the C1-C3 vertebrae and flexion of the C4-C7 vertebrae [2].

Forward head posture can result in chronic pain in the neck, shoulders, and upper to mid-back, primarily due to the increased weight of the head when the neck is positioned forward [4]. This posture is often linked to tightness in muscles such as the pectorals, sternocleidomastoid, subscapularis, latissimus dorsi, upper trapezius, and levator scapulae, along with weakness in the serratus anterior, lower trapezius, and rhomboids. It is also associated with a reduced range of motion in the cervical spine [3]. Additional symptoms may include limited movement, teeth clenching, temporomandibular joint dysfunction, severe headaches, muscle spasms, facial pain, and sleep apnea [7]. If left untreated, forward head posture can lead to more serious issues, including disc herniation, spinal degeneration, and potential nerve and muscle damage [4]. The average weight of the human head is typically 10-12 pounds. However, this weight significantly increases when the neck is positioned forward or flexed, resulting in an added load on the posterior neck. This shift in the head's position leads to biomechanical strain, which can cause discomfort, fatigue, and pain [5]. The alteration in head position results in biomechanical strain, which can lead to discomfort, fatigue, and pain.

Continuous forward flexion disrupts the natural curvature of the cervical spine, impacting not just the vertebrae but also the supporting muscles, ligaments, and tendons. This imbalance can often lead to changes in posture and subsequent pain in the neck and surrounding areas. Furthermore, individuals with forward head posture frequently experience a shift in the position of their scapulae, which can lead to shoulder pain and negatively impact the functional movement of the arm. The muscle imbalances around the scapula contribute to these issues, further compromising the individuals movement and causing additional discomfort [6].



**Fig 1:** Pathophysiology of forward head posture

This image depicts the stress and weight on the neck and spine in individuals who spend prolonged time in usage of computers and smart phone due to which they develop a slouched posture with frequent forward flexion of the head. The head weighs 12lbs in a neutral position which is considered as a normal posture. As there is increase of forward bending the head weighs 32lbs at 2 inches forward bending and 42lbs at 3 inches bending.

Generally, Forward head posture can be diagnosed by calculating the Craniovertebral angle. It is an angle that is formed by the intersection of two lines: one drawn from the tragus of the ear through the C7 spinous process and the other being a horizontal line through C7 [3]. As the degree of forward head posture increases the Craniovertebral (CV) angle decreases [7]. It is said that an individual has forward head posture when the Craniovertebral angle is less than 48°-50°. The CV angle influences pain as a factor and it also shows that the cervical range of motion is reduced simultaneously when CV angle is smaller. This limits the joint movement as well as increases the pressure between the facet joints. This causes a limitation in the cervical range of motion, particularly in flexion and extension, and also results in pain [8].

Muscle shortening due to increased stress on the neck extensors in patients with forward head posture, can be improved through muscle strengthening for posture alignment or stretching for shortened muscles. In order to treat forward head posture, it is necessary to consider the correct posture, work environment, and exercise therapy [8]. In order to improve this posture, heat, traction, and exercise have all been used. Various other methods such as joint mobilization, stretching, isometric strengthening exercises, endurance exercises, and proprioceptive exercises have also been applied depending on the method and theory utilized by the therapist or the patient's condition [10].

The Body-blade is an active, responsive tool that generates oscillating resistance depending on the force applied through rapid shaking movements. This produces a vibratory effect that the muscles must counteract, resulting in up to 270 contractions per minute. Once activated, the Body-blade can be positioned in various locations and used through different movement patterns, providing flexibility in exercises. It can also be held in a stationary position for extended periods while continuing to oscillate. This dynamic motion can be applied through a range of shoulder and elbow movements, allowing for both static and dynamic training [1].

The Breuggers exercise is a targeted routine designed to stretch the tight pectoral muscles, trapezius, and rhomboids, while simultaneously engaging and strengthening the weakened deep flexors and extensors of the neck [11]. The trapezius muscle plays a key role in this exercise, as it is involved in upper limb movements. By pulling the arms backward, the exercise works to alleviate tension in the front muscles, specifically the chest and shoulders, while activating and stimulating the muscles of the upper back. This helps to improve overall posture and muscle balance in the upper body [14].

Forward head posture has nowadays become a new health concern and a common condition observed in individuals who habitually have a slouched posture due to prolonged sitting at desks, computer job individuals and smart phone users [5]. Subsequently, mobility in the cervical region is reduced and there is increase in compressive loading on the tissues in the cervical spine leading to discomfort, fatigue and pain [4]. Hence this study is aimed to examine the combined effect of breuggers exercise and body blade exercise to reduce pain and improve craniovertebral angle in patients with forward head posture.

## 2. Case Report

A 23-year-old female student from a physiotherapy college in Mangalore presented with persistent neck and upper back discomfort, which she attributed to poor posture resulting from prolonged sitting during academic activities, including computer and smartphone use. The patient's symptoms developed gradually and worsened over time, with increased discomfort and fatigue in the cervical and upper thoracic regions, especially after long study sessions. She also reported occasional tension headaches and restricted neck movement but had no history of cervical fractures, radiculopathy, previous cervical surgeries, or other spinal issues, and did not recall any significant trauma or acute onset of symptoms. On clinical examination, the patient displayed forward head posture, with a craniovertebral (CV) angle of 43°, indicating the presence of Forward Head Posture (FHP). Pain intensity was rated 7 on the Visual Analog Scale (VAS). The examination revealed noticeable tightness in the upper trapezius, levator scapulae, and pectoral muscles, along with weakness in the serratus anterior, lower trapezius, and rhomboids, contributing to her poor posture. Additionally, there was a reduction in cervical range of motion, particularly in flexion and extension, and tenderness was noted in the cervical paraspinals, upper trapezius, and levator scapulae muscles.

## 2.1 Interventions

### 1. Breuggers Exercise

**Table 1:** Exercise regimen of Breuggers Exercise

Exercise	Dosage and Time
<b>In Sitting Position:</b> The patient is positioned on edge of a chair with hips abducted, feet externally rotated, head up, chin tucked in, forearms supinated, and wrists and fingers extended. While actively moving their arms and spreading their fingers externally, hold the position for 15-30 seconds and take slow, deep breaths.	4 Sets of 10 repetitions with each Set for 15-30sec. 4 sessions per week for 4 weeks. Rest time: 2 minutes
<b>In Standing Position:</b> Subject is asked to stand against the wall with heels, buttocks, shoulders and head touching the wall. The hands are asked to be turned out so the palms face forward. Get the shoulder blades downward and towards midline and ask to tuck the chin slightly back.	4 Sets for 10 repetitions with each Set for 15-30 seconds. 4 sessions per week for 4 weeks. Rest time: 2 minutes



**Fig 1:** Breuggers exercise in sitting position    **Fig 2:** Breuggers exercise in standing

**2. Body blade exercise using a flex bar**

**Table 2:** Treatment regimen of flexi bar

Exercise	Dosage and Time
<b>Exercise (1):</b> Subject in standing position is asked to grab the centre of the pole with both hands with shoulder joint flexed to 180° in an overhead position and is asked to perform an oscillation exercise in the sagittal plane.	2 Sets for 2 minutes with each Set for 1 minute. 4 sessions per week for 4 weeks. Rest time: 5 minutes
<b>Exercise (2):</b> Subject in standing position is asked to grab the centre of the pole with both hands with shoulder joint flexed to 90° and is asked to perform oscillation exercise in the transverse plane.	2 Sets for 2 minutes with each Set for 1 minute. 4 sessions per week for 4 weeks. Rest time: 5 minutes
<b>Exercise (3):</b> Subject in standing is asked to grab the centre of the pole with both hands with both of the arms behind the back and is asked to perform oscillation exercise in the sagittal plane.	2 Sets for 2 minutes with each Set for 1 minute. 4 sessions per week for 4 weeks. Rest time: 5 minutes



**Fig 3:** Body Blade exercise with a flexi-bar in overhead position in sagittal plane



**Fig 4:** Body Blade exercise with a flexi-bar at 90 degree flexion in transverse plane



**Fig 5:** Body Blade exercise with a flexi bar behind the back in sagittal plane

## 2.2 Outcome Measures

### 2.2.1 Craniovertebral angle

The Craniovertebral (CV) angle was assessed by using photometry method by Kinovea software in patients with forward head posture [28]. The patient is made to sit in a comfortable position. The therapist observes the patient from the lateral side while standing and then took a picture of the participant from a distance. Two points were located: one at the tragus of the ear and the other at the C7 spinous process. A line was drawn between these two points, and a second horizontal line was aligned with the C7 spinous process. The craniovertebral (CV) angle was then defined as the angle formed by the intersection of the horizontal line at C7 and the line extending from the tragus to the C7 spinous process.<sup>10</sup> It has excellent inter rater (0.85-0.90) and intra rater (0.80-0.88) reliability coefficients [24].

#### Interpretation

- A decreased craniovertebral angle CV angle is associated with a more noticeable forward head posture.
- A CV angle of under 48° to 50° is often utilized in the diagnosis of Forward Head Posture.

### 2.2.2 Visual Analog Scale (VAS)

The visual analog scale is widely recognized as one of the most reliable methods for measuring pain intensity. VAS provides a continuous scale for magnitude estimation and consists of a straight line of 10cm, with starting point 0 that is referred to no pain and ending point 10, defined as severe or extreme pain [7]. There are no gradations on VAS, so it is thought to be more sensitive than scales with intermediate markers. The patients were instructed to indicate a point on a 10cm line that most accurately represents the intensity of their pain. The distance from no pain anchor point is measured in cm or mm to calculate the score [23]. It is a simple, reliable and valid tool for measuring pain intensity in both research and practical use, showing consistency across different patient populations and settings [27].

#### Interpretation

- 0 = No pain
- 1-3 = Mild pain
- 4-6 = Moderate pain
- 7-10= severe pain

## 3. Results and Discussion

**Table 3:** Pre and Post data of CV angle and VAS

Outcome measure	Pre-data	Post-data
Craniovertebral (CV) Angle	43°	48°
Visual Analog Scale (VAS)	7cm	5cm

This study was aimed to evaluate the effect of Breuggers exercise and Body Blade exercise on improving craniovertebral angle and reducing pain in patients with Forward Head Posture. Forward Head Posture (FHP) is a common postural misalignment frequently observed in the general population, caused by the prolonged and involuntary forward positioning of the head during the occupational use of modern devices such as computers and smartphone [1]. After 4 weeks of intervention it was found that combined effect of breuggers exercise and body blade exercise shows significant results on improving craniovertebral angle and reducing pain in patients with forward head posture. In forward head posture (FHP), the craniovertebral (CV) angle decreases as the head

shifts forward relative to the spine. This shift causes a misalignment of the cervical spine and the head, altering the angle between the horizontal line and the line connecting the cervical spine to the cranial base [4]. The reduction in CV angle is associated with increased strain on the neck muscles, particularly the upper trapezius and levator scapulae, while also compromising the function of the deep cervical flexors. This abnormal posture often leads to musculoskeletal discomfort and long-term postural imbalances [10]. In the present study, after 4 weeks of treatment, it was found that the combined effects of Breuggers exercises and Body blade exercises significantly improved the craniovertebral (CV) angle in patients with forward head posture. This finding aligns with the study by Gurudut P, *et al.* (2020), which indicated that Breuggers exercises enhance craniocervical flexion endurance, leading to improved posture, reduced discomfort, and a significant improvement in the CV angle in individuals with forward head posture [17]. Substantially, a study by Nourhan Ahmed, *et al.* (2021) highlighted the effectiveness of Body blade exercises in improving the CV angle, demonstrating a positive correction in head posture following a 5 week intervention [1].

Prolonged use of computers and smartphones often leads to slouched posture and forward head flexion. With each inch of forward flexion, the head's effective weight on the neck increases, reaching 32 lbs at 2 inches and 42 lbs at 3 inches. This added strain on the cervical spine and muscles commonly causes chronic pain and discomfort [4]. Following 4 weeks of intervention, the combined effects of Breuggers exercises and Body blade exercises led to a reduction in pain in patients with forward head posture. This finding is corroborated by a study conducted by Dalawar *et al.* (2022), which concluded that the Breuggers exercises was effective in reducing pain and discomfort in individuals with forward head posture [9]. Relatively, a study by Kang J, *et al.* (2018) indicated a significant reduction in pain and discomfort in patients with forward head posture following a 3 week intervention of body blade exercise [25].

Kinovea software was utilized in this study to measure the craniovertebral angle in patients with forward head posture using the photometry method. Zarate-Tejero, *et al.* (2023) reported that Kinovea software exhibited excellent inter-rater and intra-rater reliability [24]. Similarly, Kamble *et al.* (2022) also employed Kinovea software to assess the craniovertebral angle in patients with forward head posture [28]. The Visual Analog Scale (VAS) was utilized in the current study to assess pain intensity in patients with forward head posture. Lee, *et al.* (2020) reported that the VAS exhibited strong convergent validity, as well as high intra-rater and inter-rater reliability [27]. Similarly, Ahmed, *et al.* (2021) employed the VAS to measure pain intensity in patients with forward head posture, and their findings supported the results of the present study [1].

Forward Head Posture (FHP) is a prevalent musculoskeletal condition often associated with chronic pain, discomfort, and poor posture. Evaluating the impact of exercises targeting postural correction and muscle endurance can provide valuable insights into effective treatment strategies. This study focused on two exercises: Breuggers exercise, which aims to improve posture by stretching the thoracic and cervical spine and engaging postural muscles, and the Body Blade exercise, which utilizes oscillatory resistance to strengthen deep stabilizers and enhance proprioception. Following a 4-week intervention, the study revealed significant improvements in the craniovertebral angle and

pain reduction, highlighting the potential benefits of combining these exercises as a non-invasive, cost-effective approach for managing FHP.

This study had few limitations. Firstly, the sample size was limited; future research can be conducted with a larger sample to enhance generalizability. Secondly, while strengthening exercises were included in the intervention, strength was not assessed as an outcome measure. Thirdly, although the body blade exercise focuses on improving the proprioception; Dong-Kyu Lee, *et al.* (2018) highlighted the use of Flexi-Bar exercises as an effective intervention for stroke rehabilitation, particularly in enhancing proprioceptive function, which is commonly impaired following a stroke. However, it is important to note that while their study demonstrated the potential benefits of this intervention, the present study did not employ specific outcome measures to directly assess improvements in proprioception among the participants [22]. Lastly, the study duration was limited, which may prevent any conclusions about the long-term effects of the intervention. Future research on the combined effect of Breuggers and Body Blade exercises on craniovertebral angle and pain in forward head posture can focus on several areas. Long-term studies could assess whether the benefits are sustained beyond 4 weeks. Comparative studies with other treatment modalities, such as postural training or manual therapy, would help determine the superiority of this combined approach. Research could also explore the impact of varying exercise durations and frequencies, and how these exercises affect functionality and quality of life, using tools like the Neck Disability Index (NDI). Investigating neurophysiological mechanisms through EMG or brain imaging would deepen understanding. Expanding studies to larger, more diverse populations and incorporating advanced biomechanical tools would enhance insights. Additionally, considering psychological factors and conducting randomized controlled trials with control groups would strengthen findings. Lastly, exploring the effects on other postural deviations, such as scoliosis or lordosis, would also broaden the therapeutic scope.

#### 4. Conclusion

The findings of this study concluded that combined effect of Breuggers exercise and Body blade exercise showed improvement in Craniovertebral Angle and reduction in Pain in patients with Forward Head Posture

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