

# Research Status of Body Function Training on Forward Head and Round Shoulders of College Students

Ge Han, Gaoye Zhao, Sijia Ma

North China University of Science and Technology, Tangshan Hebei, 063000, China

**Abstract:** Body posture is the reflection of both the physical posture and the mental outlook of the individual at the same time, the quality of which directly impacts an individual's physical and mental health. Contemporary college students frequently encounter postural problems due to academic pressure and long-term use of electronic products. This paper mainly focuses on the research of the students with poor forward head posture and round shoulder, and improves poor posture by self-designed shoulder and neck health gymnastics.

**Keywords:** College Students; Poor Posture; Forward Head; Round Shoulders; Self-designed Shoulder and Neck Health Gymnastics.

## 1. Introduction

In recent years, the incidence of cervical spondylosis among university students has shown a significant upward trend, reflecting a distinct trend toward younger onset. Currently, college students' excessive use of electronic devices, reduced physical activity, and prolonged periods of maintaining incorrect postures have gradually led to muscle strain, resulting in poor posture such as rounded shoulders and forward head posture [1]. These issues have adversely affected their physical function and even their daily lives. Li Yingling's research indicates that college students are the age group with a high prevalence of round shoulders and hunched posture [2]. "Healthy China" is a national strategy in China, and the physical health of adolescents has garnered widespread attention from all sectors of society. However, physical education classes tend to overemphasize the development of students' motor skills and physical fitness, while neglecting the cultivation and improvement of their posture. This study aims to improve the posture of college students. Based on practical investigations and research, a set of shoulder and neck gymnastics has been developed, with the goal of exploring practical and highly operable solutions to address postural issues among college students.

## 2. The Mechanisms of Forward Head Posture and Rounded Shoulders

### 2.1. Research on Muscle Imbalance Patterns

Muscle strength imbalance refers to a state in which the strength of the agonist muscles is disproportionate to that of the antagonist muscles. In patients with cervical vertebra leans forward, certain physiological changes occur in the related muscle tissues, myofascial structures, etc. Modern biological theories and research indicate that muscle imbalance not only leads to static imbalance but also results in dynamic imbalance. The role of bones, muscles and ligaments in maintaining joint balance and stability is referred to as static balance, while the role of muscle contraction in maintaining joint stability and balance is known as dynamic balance. Prolonged maintenance of a forward neck posture increases the likelihood of neck muscle groups being subjected to high external stress, leading to muscle strength

imbalance in the cervical region.

### 2.2. Research on the Disruption of Agonist-Antagonist Muscle Balance

Prolonged periods of working or studying with the head lowered can lead to excessive fatigue in the shoulder and neck muscle groups. The chest muscles become stiff and tense due to prolonged contraction, while the antagonist muscles, such as the rhomboid muscles, splenius cervicis, as well as the medial and inferior part of trapezius, are passively stretched. Over time, without strength training interventions, these muscles become weak and inactive. Conversely, the agonist muscles, such as the levator scapulae, pectoralis major, and sternocleidomastoid muscle, become tight and shortened, pulling the shoulders forward and contributing to muscle imbalance in the neck. This imbalance in neck muscle strength ultimately leads to cervical vertebra leans forward.

## 3. Assessment

In this study, posture assessment charts were used to screen participants, and evaluation criteria jointly established by the American College of Sports Medicine (ACSM) and the Asian Fitness Association (AFA) were applied. Two bony landmarks were utilized for assessment, and the criteria for forward head posture were as follows:

- (1) The earlobe does not align with the coronal plane passing through both acromions;
- (2) The line connecting the superior angle of the ear and the corner of the eye is not parallel to the horizontal plane.

### 3.1. Assessment of Cervical Vertebra Leans Forward

Cervical vertebra leans forward refers to a postural condition in which the cervical spine is displaced anteriorly, causing the earlobes to be positioned in front of the acromions of the shoulders. Cervical vertebra leans forward can lead to an increase in compression force on the posterior part of the cervical vertebrae and the length of the intervertebral joints, thereby causing tension and pain in the neck [3].

Neck joint range of motion: The range of motion of the cervical joints reflects the flexibility of the joints around the cervical region. The stiffness of the cervical joints is

significantly related to cervical spondylosis of the neck type. Under the condition that the trunk below the neck remains immobile, the normal range of cervical flexion and extension is between 70 and 90 degrees, the range of lateral flexion on both sides is around 90 degrees, and the range of lateral rotation on both sides is between 120 and 160 degrees[4].

Muscle strength assessment: Muscle strength is a key factor in resisting imbalance. Stable and balanced muscle strength can alleviate the pressure on cervical vertebrae and the degenerative changes of intervertebral discs. The normal range is 4-5 grades[4].

### 3.1.1. Neck Disability Index (NDI)

Cervical vertebrae dysfunction: The strength of cervical vertebrae function has a certain relationship with the onset of cervical type cervical spondylosis. When symptoms occur in cervical vertebrae function, it can cause radiating pain, which will lead to neck pain and decreased joint range of motion. The normal score should be within 25 points [4].

The neck disability index refers to a scale used to assess the severity of cervical spine dysfunction in patients. The contents of the NDI scale are basically consistent with the clinical symptoms of patients with cervical vertebra leans forward, and it can be used to objectively assess the degree of cervical dysfunction in patients with cervical lordosis. This scale consists of ten questions, each of which is divided into five different degrees of impairment. Patients can assess themselves based on their specific conditions. Higher scores indicate a higher degree of impairment, while lower scores suggest a lower degree of cervical dysfunction.

### 3.1.2. Evaluation of Cervical Joint Range of Motion (ROM)

The standards for measuring the range of motion of cervical joints vary. In this study, the measurement methods and reference values in "Rehabilitation Assessment Techniques" were used as the basis to determine the normal values of the range of motion of cervical joints in all directions for normal adults. The normal values are 85° for flexion, 70° for extension, 40° for left lateral bending, 40° for right lateral bending, 80° for left rotation, and 80° for right rotation [2].

## 3.2. The Decision to Tilt Forward Head

### 3.2.1. Determination Standard

Forward Head Angle (FHA) is a common index to evaluate the neck posture of patients with cervical spine anteversion in the static state, which has been widely used in clinical evaluation and diagnosis with certain validity. If the forward head angle is too large, reaching more than 36°, it is manifested as Cervical vertebra leans forward [5]. Forward head posture (FHP) is considered a poor posture. In the studies on forward head posture, most scholars use cranial vertebral angle to measure the degree of forward head posture. Cranial vertebral angle is the angle between the line between the seventh cervical spinous process and the center of the tragus and the line parallel to the ground through the seventh cervical spinous process. If its angle is less than 53°, it can be judged as forward head posture [6].

The most commonly used and accurate method for estimating head tilt is to measure the cranial vertebral angle (CVA), which is the angle between the line of the seventh cervical spinous process to the tragus and the horizontal line. When  $CVA \leq 50^\circ$ , forward head posture will occur. The smaller the angle, the more serious the head forward tilt, and

the smaller the range of cervical vertebra movement, especially affecting neck rotation and flexion. Holding the head forward for a long period of time in this poor posture can cause cervical vertebrae to misalign, increase the pressure on the apical node and the back of the vertebra, affect the length tension relationship of the neck muscles, and thus limit neck movement. Smaller CVA and reduced cervical flexion range may be associated with the development of neck pain[7].

Incidence: A body survey of college students in Wuhan found that the incidence of poor body posture among college students was as high as 97.2%, with forward head posture and hunchback posture ranking first. Another study found that 68 percent of 119 students were in a forward head position. A study of female college students found that the forward neck flexion, round shoulder hunchback and excessive pelvic anterior tilt three bad posture performance[6].

### 3.2.2. Measured Content

Forward head angle (FHA): The subject is relaxed and stands sideways in front of a wall chart for posture assessment, eyes straight ahead and neck and shoulder skin exposed [8]. With the spinous process of the seventh cervical spinous process (C7) and the highest point of acromion as two reference points, the subjects were photographed in the upright position. FHA is the angle at which the center of the tragus and the highest point of acromion are connected to C7 by a straight line perpendicular to the ground over C7.

## 3.3. Round Shoulder Decision

### 3.3.1. Determination Standard

SPSS 26.0 statistical software was used to analyze the research data. The research data were expressed as mean  $\pm$  standard deviation ( $\bar{x} \pm S$ ). Normal distribution test was performed on the data first. The comparison between the experimental group and the control group was analyzed by independent sample t test, and the comparison before and after the training of observation indicators was analyzed by paired t test.

### 3.3.2. Measured Content

Subjects were positioned laterally in front of the posture assessment wall chart, relaxed and looking forward, exposing the skin of the neck and shoulders. With the spines of the 7th cervical vertebra (C7) and the highest point of acromion as the two reference points, the camera was taken at the middle of the cervical vertebra. In image processing, the C7 process was taken as the reference point, and the vertical line was made downward. The point was connected with the tragus and acromion in a straight line, respectively. The Angle between the line from acromion to C7 and the vertical line of C7 was FSA. Take three photos on each side and average them [8].

## 4. Improvement of Therapeutic Regimen

The Self-designed shoulder and neck gymnastics are designed to improve the poor posture of rounded shoulders and humpback. According to the judgment criteria of forward head and rounded shoulders posture and the status of questionnaire survey, combined with the structure of human body and muscle group distribution, and referring to the movements in the book "Body Motor Function Training", the experimental group has prepared a set of shoulder and neck gymnastics suitable for daily training of college students, as follows (Table 1):

**Table 1.** A set of shoulder and neck gymnastics suitable for daily training of college students

	Name of Movement	Funtion
Section 1	Shoulders rotate backwards	Improve shoulder flexibility by stretching the levator scapulae, trapezius, rhomboideus and deltoid
Section 2	Circle shoulders left and right	Enhance and maintain the function of shoulder joint extension and pronation adduction, stretch rhomboideus, erector spine, deltoid, pectoralis major to prevent scapulohumeral peri-arthritis
Section 3	Flat elbow clamp	Stretch trapezius, erector spine, rhomboideus, latissimus dorsi, teres major, teres minor, while stretching the upper limb biceps, triceps to improve the round shoulder hunchback
Section 4	Clasp hands behind head and open shoulders	Stretch biceps brachii, triceps brachii, deltoids, trapezius, and levator scapulae enhances the toughness of the tendons around the shoulder joint and releases shoulder and neck pressure
Section 5	Expand chest and lift flat	Adjust the balance of chest and back muscles, stretch latissimus dorsi, teres major, trapezius, rhomboideus and deltoid, accelerate the body's metabolic function and prevent spinal diseases
Section 6	Expand chest and lift up	Enhance the strength and strength of the neck muscles, stretch trapezius and levator scapulae, improve the strength and stability of the shoulder joint, and relax the shoulder muscles
Section 7	Expand chest and circle around	Pull the neck and chest, stretch trapezius, lats and other back muscles to improve shoulder joint flexibility
Section 8	Draw circles with straight arms	Stretch biceps, triceps, trapezius, deltoids and rhomboides to improve shoulder joint flexibility
Section 9	Side-to-side stretching	Stretch the left and right teres minor, teres major, latissimus dorsi, trapezius, serratus anterior, relieve muscle stiffness and fatigue, increase muscle elasticity, and shape a good posture
Section 10	Neck stretching	Stretch sternocleidomastoid, platysma and other superficial muscle groups, prevent cervical spine recurve, relax cervical muscle group
Section 11	Draw cross neck gymnastics	Stretch the anterior, middle and posterior scalene muscles, suboccipital muscles, splenius cervicis and other deep muscle groups, accelerate the neck blood flow, relieve the neck muscle tension, and activate the neck muscle group to a greater extent

## 5. Summary and Prospect

Due to the constraints of actual conditions, the subjects of this experiment are relatively limited. The research is mainly aimed at the intervention and exploration of poor posture among college students, hoping to improve the poor posture of college students' forward head posture and rounded shoulders through self-designed shoulder and neck gymnastics, enhance their physical fitness, and guide them toward establishing a healthy lifestyle while fostering good exercise habits. This approach diversifies their daily exercise routines and sports activities. Furthermore, it allows college students to achieve the dual goals of treating and preventing chronic injuries while balancing study and leisure, offering a simple, effective, and convenient self-practice method for maintaining proper body posture.

## References

- [1] Chen Li, Zhang Fan. A Study on the Effect of Partner Calisthenics on Improving Poor Posture in Junior High School Students [C]// China Sport Science Society. Proceedings of the 13th National Sports Science Congress: Poster Presentations (Division of Sports Training) (3). College of Physical Education and Sport, Beijing Normal University; 2023: 3. DOI: 10.26914/c.cnkihy.2023.074206.
- [2] Li Yingling, Shi Ce. Exercise Rehabilitation for Rounded Shoulders and Thoracic Kyphosis in Students of Shenyang Normal University [J]. Technology Wind, 2017, (09): 250. DOI: 10.19392/j.cnki.1671-7341.201709216.
- [3] Zhao Zhihua. Intervention Effects of Different Exercise Protocols on Forward Head Posture in General College Students [D]. Chengdu Sport University, 2023. DOI: 10.26987/d.cnki.gcdtc.2023.000077.
- [4] Zhou Jiabo. Experimental Study on the Intervention of Aerobic Calisthenics in Female College Students with Cervical Spondylopathy [D]. Gannan Normal University, 2024. DOI: 10.27685/d.cnki.ggnfsf.2023.000006.
- [5] Zhao Zhihua. A Study on the Intervention Effects of Different Exercise Protocols on Forward Head Posture in College Students [D]. Chengdu Sport University, 2023. DOI: 10.26987/d.cnki.gcdtc.2023.000077.
- [6] Wang Kaili, Zhang Enming. Effects of Lumbar Control Combined with Corrective Training on Balance Ability in College Students with Forward Head Posture [C]// Chinese Rehabilitation Medicine Association. Proceedings of the 2023 Comprehensive Academic Annual Meeting and International Rehabilitation Medical Industry Expo of the Chinese Rehabilitation Medicine Association. Beijing Sport University, 2023: 9. DOI: 10.26914/c.cnkihy.2023.058570.
- [7] Sun Ximei, Liu Hua, Chai Liangwei, et al. Effects of Therapeutic Exercise on Neck Function and Quality of Life in Patients with Forward Head Posture and Concurrent Neck Pain: A Meta-Analysis [J]. Chinese Journal of Rehabilitation Theory and Practice, 2023, 29(02): 214-222.
- [8] Yao Yuan, Xu Lili, Ye Jiling, et al. Reliability of Sagittal Plane Photography for Assessing Head-Neck Posture in Healthy Individuals [J]. Chinese Journal of Rehabilitation Medicine, 2021, 36(02): 172-176.