

# The Effect of 12-Week Corrective Exercises on the Postural Angles of Beautician Females with Upper Crossed Syndrome: a Clinical Trial Study

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## Abstract

**Background:** Upper crossed syndrome (UCS) is believed to be a prevalent deformity among female beauticians. This study designed to investigate the effect of 12 weeks of corrective exercises on the postural angles, namely, forward shoulder, forward head, and kyphosis of female beauticians with UCS.

**Methods:** In this clinical trial study, 40 females were selected through purposive sampling. This study was conducted in Tehran between September 2020 and March 2021. Photogrammetric method was employed to measure forward head and forward shoulder angles. Thoracic kyphosis angle was measured using flexible ruler. The participants were assigned to two groups employing simple randomization. The intervention group carried out corrective exercises for 12 weeks. Paired-sample t-test and analysis of covariance (ANCOVA), at the significance level of  $P < 0.05$ , were used for data analysis. The clinical trial registration number of this study is IRCT20180626040244N2.

**Results:** The within group comparisons revealed significant changes in all of the postural variables ( $P = 0.001$ ), including forward head, forward shoulder, and thoracic kyphosis of the intervention group. The between group comparisons indicated that a 12-week corrective exercise program significantly decreased forward head ( $P = 0.001$ ) and shoulder ( $P = 0.001$ ), and thoracic kyphosis ( $P = 0.001$ ) angles.

**Conclusion:** The substantial reduction in forward shoulder, forward head, and thoracic kyphosis angles after corrective exercises indicated the effectiveness of these exercises in correcting the postural abnormalities in the beautician females.

**Keywords:** Kyphosis, Exercise, Posture, Neck, Shoulder

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## 1. Introduction

Beautician in the Cambridge dictionary has been defined as “a trained person whose work is to enhance the appearance of a client’s face, body, and hair, by means of make-up and beauty managements, often in a beauty salon” (1). Beauticians carry out a variety of tasks, such as nail polishing and sculpturing, massage, make-up, face and body hair removal, facial cleansing, and hairdressing (2, 3). Repetitive movements, non-optimal postures, maintaining a posture for a long time, and excessive vibration have been reported as contributing factors for

occupational related musculoskeletal disorders among beauticians (2, 4). Moreover, working in a non-neutral posture is a common characteristic of most daily activities of beauticians (3, 4). Postural analysis of beauty therapists by Rapid Entire Body Assessment (REBA) showed that approximately two-thirds of trunk, neck, and shoulder postures are non-neutral (4). Based on the kinesio-pathologic model proposed by Sahrman and colleagues (2017), repeated movement and sustained posture can result in micro and macro trauma (5). In this model, the musculoskeletal system, the nervous system, and the cardiopulmonary, and endocrine systems are

considered as the effector, regulator, and supporter of the movement system, respectively (5). According to previous studies, repeated movement and sustained alignments can result in micro and macro trauma in the movement system (4-6).

Upper crossed syndrome (UCS) is a condition of the movement system characterized by forward head and shoulder postures, and hyperkyphosis in the thoracic region (7). UCS has been associated with tightness or facilitation of postural muscles, such as pectoralis major and minor, and weakness or inhibition of phasic muscles, such as rhomboids and deep neck flexors (8). In a recent study by Masooma and colleagues (2020), the prevalence of rounded shoulder and forward head postures among beauticians was reported to be 75% (9). The prevalence of UCS is higher among beauticians compared to other populations (10, 11). UCS may have certain complications, including cervicogenic headache, pseudoangina pectoris, impingement syndrome, degeneration of hard and soft tissues in the body, and shoulder instability (8, 12, 13). In addition, Gu and colleagues (2016) reported that joint position sense would decrease according to the degree of UCS (14). Moreover, in a recent study, Kirthika and colleagues (2018) showed that the maximum voluntary ventilation is lower in recreational male athletes with UCS compared to healthy ones (15).

Corrective exercise is known to be a conservative treatment for musculoskeletal disorders and postural deformities. A new approach in corrective exercise was proposed by Clark and colleagues (2010) (8). In this approach, several techniques are used, including inhibitory, lengthening, activation, and integration techniques to correct postural abnormalities. Previous studies have investigated the effect of conservative modalities, such as corrective exercises, Kinesio taping, myofascial techniques, Mckenzie traction, muscle energy, conventional physical therapy, and manipulation on pain, posture, and function in different populations, including firefighters, students, teachers, computer users, athletes, and non-athletes (16-30), but none have focused on beauticians.

Considering the prevalence of forward shoulder and forward head postures (as the elements of UCS) among the beauticians and the lack of data concerning the effects of corrective exercises as a safe and cheap intervention on postural abnormalities of beauticians, the present research was conducted to examine the effect

of 12 weeks of corrective exercises on the specific postural angles, namely, kyphosis, forward head, and forward shoulder in females with UCS.

## 2. Methods:

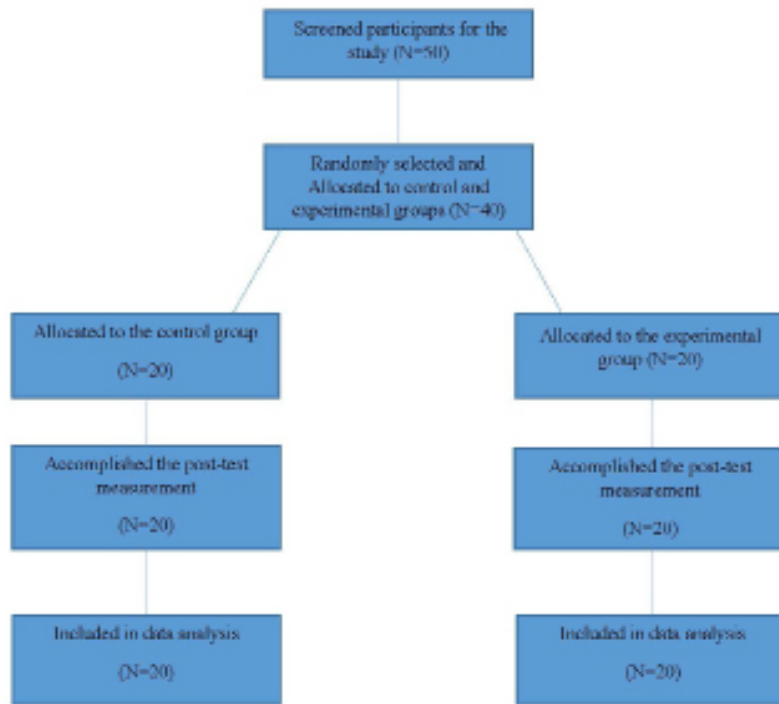
### *Participants*

In this clinical trial study, 40 females were selected via purposive sampling. This study was conducted in Tehran between September 2020 and March 2021. Considering  $P$  value=0.05,  $1 - \beta = 0.8$  and large effect size equal to 0.8, the sample size was determined as 34 participants using G<sup>X</sup>Power software (31). Given the probability of dropping out of the study and the non-adherence of the participants to the exercise program, 40 participants contributed to this study. Employing simple randomization, tossing a fair coin independently for each participant, the participants were randomly assigned into experimental and control groups. The research was single-blinded; the examiner responsible for assessing the participants' outcome measures was blind to the group assignments.

The inclusion criteria comprised female gender, forward shoulder angle of over 52°, forward head angle of over 46°, kyphosis angle of over 42°, and working in a beauty center as a beautician. The exclusion criteria were scoliosis, torticollis, and cervical spine instability. Furthermore, the participants were excluded if they were involved in other training programs and did not participate in training sessions regularly. The objective of the present work was explained to the participants in a simple language (32). Prior to participation, each participant signed an informed consent form. The Ethics Review Board of Science and Research Branch (Islamic Azad University) approved the present research under the following code: IR.IAU.SRB.REC.1399.167. The registration reference of this study is IRCT20180626040244N2.

### *Procedure*

Forward head and shoulder angles were measured using photogrammetric method. This method has optimal reliability (22). Ahead of angle measurement, three anatomic landmarks, namely tragus, spinous process of the C7, and acromion process were identified and marked. Forward head angle was considered as the



**Figure 1:** The figure demonstrates the RCT flowchart of this study.

angle between the perpendicular line through the spinous process of C7 and the line that connects the central point of the tragus to the spinous process of C7 (33). Forward shoulder angle was considered as the angle between the perpendicular line through the spinous process of the C7 and a line drawn from the acromion process to the spinous process of C7 (33). The mentioned angles were measured with Auto-CAD software. A comprehensive explanation of the procedure could be found in the literature (22).

A flexible ruler was used for kyphosis angle measurement. This method has been reported to be a reliable method (34). Primarily, spinous processes of the 2nd and 12th vertebrae of the thoracic region were identified as anatomic landmarks. Afterwards, the flexible ruler was placed on the thoracic spine of each participant. After taking the shape of the thoracic spine and marking the landmarks on the flexible ruler, the flexible ruler was removed and the curve of the flexible ruler was drawn on a white sheet. Finally, the thoracic kyphosis angle was calculated via the following formula:

$$\theta = 4 \left[ \text{Arctan} \left( \frac{2H}{L} \right) \right]$$

#### *Training protocol*

A corrective exercise program was implemented for 12 weeks (20). Each training session began with ten

minutes of warm-up and ended with ten minutes of cool-down. The self-myofascial release technique was executed in the first phase of the corrective exercise continuum to inhibit and release latissimus dorsi, upper trapezius, sternocleidomastoid, levator scapula muscles, and thoracic spine. In the second phase of the corrective exercise continuum stretching exercises were prescribed for pectoral, latissimus dorsi, upper trapezius, sternocleidomastoid, and levator scapula muscles. Isolated strengthening exercises were accomplished in the activation phase, including resisted cervical posterior translation, floor prone scaption, quadruped ball chin tucks, and ball combo I. In the last phase of the corrective exercise program, integrated dynamic movements were performed, including single-leg Romanian deadlift, squat to row, ball combo I /cervical retraction, and standing 1-arm cable chest press (20).

#### *Statistical analysis*

For data analysis, SPSS software version 26 and Microsoft Excel were utilized. Normality of data was evaluated with the Shapiro-Wilk test. For within and between group comparisons the paired-sample t-test and analysis of covariance (ANCOVA) were employed respectively. A P value <0.05 was considered as significant.

### 3. Results:

Based on the Shapiro-Wilk test results, all of the variables were normally distributed. The participants' (n=40) age, height, weight, BMI, and job experience were  $32.67 \pm 2.04$ ,  $166.19 \pm 5.74$ ,  $57.57 \pm 12.82$ ,  $20.96 \pm 5.17$ ,  $5.2 \pm 1.87$ , respectively. Table 1 represents their demographic characteristics in each group. Paired-sample t-tests were used to evaluate within group changes.

The outputs of paired-sample t-tests indicated a significant change in the forward shoulder ( $P=0.001$ ), forward head ( $P=0.001$ ), and thoracic kyphosis angles ( $P=0.001$ ) in the intervention group (Table 2). Using pre-test angles as a covariate, ANCOVA was utilized for the between group comparisons. The results of ANCOVA indicated that a 12-week corrective exercise program significantly decreased forward shoulder  $F(1, 37)=73.88$ ,  $P=0.001$ , forward head  $F(1, 37)=0.01$ ,  $P=0.001$ , and thoracic kyphosis angles  $F(1, 37)=44.41$ ,  $P=0.001$  in the intervention group.

### 4. Discussion

The objective of this research was to examine the impact of 12-week corrective exercises on the forward head, forward shoulder, and thoracic kyphosis angles of female beauticians with UCS. The results revealed a substantial reduction in the postural angles, namely, forward head, forward shoulder, and thoracic kyphosis of female beauticians afflicted with this syndrome.

In this research, 12 weeks of corrective exercises decreased the kyphosis angle by 4.5 degrees in female beauticians. Our results are in line with those of previous studies (18, 20, 23, 30). Karimian and colleagues (2019) reported that participation in a 12-week corrective exercise program in association with ergonomic intervention reduces thoracic kyphosis angle in teachers (20). Maarouf and colleagues (2020) showed that a corrective exercise program based on stretching and strengthening training could result in thoracic angle reduction in wheelchair basketball athletes afflicted with spinal cord injury (18). The significant effect of

**Table 1:** Demographic description of the participants and normality distribution

Variable	experimental group (n=20)	Control group (n=20)	P value
	Mean $\pm$ SD	Mean $\pm$ SD	
Age (Year)	$33.40 \pm 2.30$	$31.95 \pm 1.47$	0.33
Weight (Kg)	$55.60 \pm 11.61$	$59.55 \pm 13.95$	0.34
Height (Cm)	$167.95 \pm 6.37$	$164.43 \pm 4.13$	0.47
BMI (Kg/M2)	$19.82 \pm 4.47$	$22.12 \pm 5.53$	0.15
Job experience (Year)	$5.3 \pm 1.52$	$5.1 \pm 2.2$	0.74

**Table 2:** Within group differences in postural angles

Group	Variable	Mean $\pm$ SD		t	P value
		Pretest	Post-test		
Control	Forward head angle	$48.41 \pm 5.7$	$48.25 \pm 5.45$	0.6	0.56
	Forward shoulder angle	$57.92 \pm 1.91$	$56.82 \pm 3.3$	1.99	0.06
	Kyphosis angle	$49.14 \pm 8.34$	$49.39 \pm 7.88$	-0.92	0.37
Intervention	Forward head angle	$47.06 \pm 3.23$	$44.45 \pm 3.06$	7.95	0.001
	Forward shoulder angle	$58.61 \pm 1.56$	$51.96 \pm 1.20$	23.56	0.001
	Kyphosis angle	$48.22 \pm 3.63$	$43.65 \pm 2.63$	6.42	0.001

comprehensive and modified corrective exercises on kyphosis has also been reported in other studies (23, 30). Herein, the effect of 12-week corrective exercises based on the National Academy of Sports Medicine (NASM) without other interventions was investigated.

The reduction in thoracic kyphosis angle could be the direct result of improvement in flexibility of shortened muscles, such as pectoralis minor, and improvement in the strength of lengthened muscles, such as erector spinal in the thoracic region, following myofascial release, stretching, and strengthening exercises. Moreover, the integration techniques in this work may reeducate the synergistic function of all the muscles through integrated dynamic movements, such as deadlift, chin-tuck or cervical retraction, and unilateral cable chest press (35).

In the current study, forward head angle was measured as the angle between the perpendicular line and a line that connects the tragus to the C7 (33). In this technique, the subjects with abnormal head posture in the sagittal plane have a larger angle compared to normal cases. The results of the current study indicated that forward head angle decreased by 2.6 degrees in female beauticians after participating in 12 weeks of corrective exercises. This finding is consistent with those of previous studies (20-22). Prescribing exercise, such as chin-tuck that stretches the upper cervical extensor and lower cervical flexor and strengthen the upper cervical flexor could correct the posture in people with forward head (22). Additionally, inhibition and stretch of the upper trapezius and levator scapula have been reported to increase posterior neck temperature, which has a positive effect on tissue elasticity per se (24). Furthermore, the synergistic function of the muscular system might be retrained through dynamic integrated movements (35).

In this study, the angle between the perpendicular line through the spinous process of the C7 and a line drawn from the acromion process to the spinous process of C7 was considered as the forward shoulder angle (33). In this technique, the subjects with forward shoulder posture have a larger angle relative to normal cases. In the present study, 12 weeks of corrective exercises decreased the forward shoulder angle by 6.6 degrees in female beauticians. This finding is in line with those of former studies (8, 20, 22, 30, 36). It has been reported that complex and comprehensive training could correct complex postural abnormalities, such as upper and lower

crossed syndromes (30, 36). Our participants applied several techniques, including self-myofascial release, stretching, strengthening, and integration. We could consider the NASM corrective exercise continuum as complex training. Corrective exercises may improve posture by addressing hypomobility and shortness in the body (8). The current study had certain limitations that must be addressed. Initially, the durability of the effect of corrective exercise was not evaluated. Secondly, the present study investigated the impacts of corrective exercise on females; therefore, the findings may not be generalized to males. Ultimately, the daily working hours of the participants were not monitored.

## 5. Conclusion

The results of this study implied that participating in 12-week corrective exercises could reduce thoracic kyphosis, forward shoulder and forward head angles in female beauticians with UCS. Corrective exercise specialists and other health and fitness professionals could use these exercises for preventive and rehabilitative purposes.

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## Conflict of interest

The authors declared no conflict of interest.

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## Ethical Approval

The Ethics Review Board of Islamic Azad University, Tehran Science and Research Branch approved the present study under the following code: IR.IAU.SRB.REC.1399.167

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