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Change of Exercise Program According to Round Shoulders in Shoulder Height and Trunk Strength

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Abstract

Rounded shoulder posture (RSP) can be seen quite frequently today. As a result, there are many problems that occur concerning lung capacity, attention span and muscle strength. Therefore, this study investigates the effects of posture-improving exercises on lung capacity, concentration, and muscle strength.

At total of 24 college students participated in this study. Participants were measured for both shoulder height, and muscle strength (Trunk Muscle Strength Test). After pretest measurements, participants were divided into 2 groups. The shoulder stabilization exercise group (SSEG, n_1=12) and the antagonist strength exercise group (ASEG, n_2=12). Each group participated for 4 weeks. SSEG and ASEG exercised with a trainer 3 times a week for 30 minutes. Post-test measurements were taken after 4 weeks. There was a significant difference in both shoulders (left, right) RSP(p=.020, p=.030), and trunk muscle strength(p=.024) for SSEG and ASEG. Between two groups there were significant differences.

This study has found that strengthening exercise is more effective in RSP reduction. However, it is the opinion of the researchers that the 4 weeks exercise period was not long enough to achieve significant results for other measurements. Further comparative studies related to the effects of strength exercises on RSP reduction, lung capacity, and trunk muscle strength is necessary.

Keywords: *Round shoulder, Exercise, Neck, Strength.*

1. Introduction

With the repetitive daily-operation of smartphones, people habitually adapt a slouched posture which causes rounded shoulder posture (RSP) [1]. RSP features the protraction of the shoulders for increased cervical lordosis and upper thoracic kyphosis, their down ward rotation, and anterior tilt [2, 3]. Also, the loss of serratus anterior and middle-low trapezius activity, and tightness in the pectoralis and upper trapezius are found [4]. The abnormality in shoulder posture caused by abnormal activities of muscles around the shoulder joint leads to limited movement of the sternoclavicular joint which triggers hyper or hypo mobility of the shoulders when the upper extremity is in motion [5]. The overall pain of the upper extremity has been found to be the cause [2]. According to Stephanie et al. [6] shoulder stabilization exercises and pectoralis minor as RSP treatment were effective in improving shoulder pain and functional

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motion. Kendal et al.[7] and Sharmann et al. [2] reported that shortening muscle stretching and antagonist muscle strengthening exercises were effective at RSP in order to correct postural deformity.

The previous studies proved that shoulder stabilization exercises and antagonist muscle strengthening exercises with stretching as a recent exercise program for improving postures were found to be an intervention method effective for improving RSP. However, there is not much research on the treatment methods that are more effective in improving posture.

Therefore, the purpose of this study is to use stabilization exercises associated with stretching and antagonist muscle strengthening exercises as a treatment method of RSP to find a better RSP treatment method.

2. Methods

2.1. Subjects

The subjects of this study were 24 male and female adults from G university. The detailed criteria of the study subjects are presented as follows: those without pain in the scapular girdle or history of injuries; without an orthopedic and neurologic history on the cervical and upper extremity; and those who have more than 2.5cm in height from posterior border of acromion to table at their supine position. The 24 study subjects were divided into two groups.

The physical characteristics of the subjects are shown on Table 1.

Table 1.Demographic characteristics of the subjects (N=24)

	SSEG (n_1=12)	ASEG (n_2=12)	t(*p*)
Age (*year*)	22.41±2.23*	21.50±1.83	1.099(.284)
Height (*cm*)	166.78±8.37	168.45±9.86	-.448(.658)
Weight (*kg*)	62.95±10.74	63.89±14.23	-.183(.857)

Note. Values are presented as mean ± SD*.

SSEG: shoulder stabilization exercise group, ASEG: antagonist strength exercise,

2.2. Procedure

To find the improvement in RSP subjects' shoulder lift height and trunk strength, this study compared the two groups by performing an exercise program. The stabilization exercise group (SSEG) went under shoulder stabilization exercises, and the antagonist muscle strengthening exercises group (ASEG) group did antagonist strengthening exercises. Then, pre-test, post-test, and control group design methods were applied.

2.3. Intervention

2.3.1. Shoulder stabilization exercises: The stabilization exercise was shoulder stabilization in the research of Lynch et al.[6]. In the case of the starting position of Y to W exercise, glenohumeral joint is made to a 120 ˚ flexion and abduction at the pron of the Swiss ball, and the elbow is extended for the Y posture. During the adducted of the glenohumeral joint, elbow flexion is conducted for the W posture. At this position, shoulder retraction is

done for keeping the W posture. In the case of the starting position of L to Y exercise, at the Swiss ball on pron position, the arms are put down comfortably. Then, the shoulder joint makes a 90° horizontal abduction, and elbow 90 ° flexion. After the shoulder retraction, the glenohumeral joint conducts external rotation for the L posture. Then, the upper extremity stretches to the cranial direction in order to keep the Y posture. stabilization exercise 10 times and rested for 5 seconds. The process was counted as one set. They did two sets of the exercise.

2.3.2. Antagonist strength exercises: The strengthening exercise was developed in reference to the exercise of Mark Kluemper [8]. In the case of the shoulder retraction strength training exercise, the study subjects held a thera-band with both arms at a standing position and abducted it on the both sides by taking the position of the arms horizontally. In the case of the glenohumeral joint external rotation strengthening exercise, the study subjects held a theraband at a standing position and put up the hands in the horizontal flexion state of the elbows. In the case of the shoulder flexion strengthening exercise for the lower trapezius, the study subjects held a thera-band at a standing position, stretched the arms forward, and then raised them over the head the study subjects performed it 10 times and rested for 5 seconds. The process was counted as one set, and they did two sets. After a set of each exercise or before the next exercise, the study subjects rested for 30seconds.

2.4. Assessments

2.4.1. Shoulder height: RSP assessment methods at a supine position describe the distance between the table and acromion [2]. They have been used for assessing the length of the pectoralis minor. As the assessment of the position of the shoulders relating to RSP, there is the reliability (intraclass correlation coefficient; ICC=.97) of the shoulder with or without symptoms [9]. This study used the T-square for posture assessment. In the case of male subjects, they took off their tops and then their main scapular girdle's RSP was measured. In the case of female subjects, their scapular girdles on the main side were exposed and then the RSP was measured. The study subjects took a relaxed posture on a table at a supine position and put their both arms next to the trunk at a neutral position, and the changes are measured before exercises and after the four-week exercise [10].

2.4.2. Strength measurement: For trunk extension strengthening measurement, back strength measurement (SH-2000E, Korea) was made. The study subjects put both 15cm feet apart on the superior foothold of measuring devices, flexed the upper extremity forward to 30°, held onto a handle with both hands, palms out toward the median ward, and then pulled the handle.

Measurements were made twice, and the higher value was recorded in the unit of ㎏. To increase the reliability of measurements, one tester measured all the study subjects, and another tester continued to make observations.

2.5. Data analysis

All statistical analysis was used as SPSS ver. 21.0 (SPSS Inc., Chicago, USA), and all variables were calculated with mean and standard deviations. The Shapiro-Wilk method was used for normality tests of all subjects, Descriptive statistical analysis was used for general traits of subjects. Independent t-tests and paired t-tests were used in

order to examine the differences between groups and compare the significance of before and after the experiment within the groups respectively. The statistical significance was set as α=.05.

3. Results

3.1 Comparison of RSP between two groups

This study shows the following left and right RSP difference before and after the exercise program (Table 2). Regarding the RSP change before and after the exercise program, in the SSEG group, the left side significantly decreased from 7.88±.88 to 6.09±1.01 by 1.78 (p=.000), and the right side significantly decreased from 8.33±.86 to 7.14±.85 by 1.83 (p=.000). In the ASEG group, the left side significantly decreased from 8.12±.61 to 7.38±1.00 by .74 (p=.024), and the right side significantly decreased from 8.28± .67 to 7.63± .85 by .65 (p=.012). According to the analysis on the inter-group significance, the SSEG group had more significant decreases in the left (p=.020) and right sides (p=.030).

Table 2. Comparison of RSP between two groups (N=24)

		SSEG (n_1=12)	ASEG (n_2=12)	t(*p*)
Left	Pre	7.88±.88*	8.12±.61	-.778(.445)
	Post	6.09±1.01	7.38±1.00	
	Chang	1.78±1.05	.74±.98	2.510(.020)
	t(*p*)	5.876(.000)	2.621(.024)	
Right	Pre	8.33±.86	8.28±.67	-.159(.875)
	Post	7.14±.85	7.63±.85	
	Chang	1.83±.25	.65±.75	2.325(.030)
	t(*p*)	16.527(.000)	2.98(.012)	

Note. Values are presented as mean ± SD*.
SSEG: shoulder stabilization exercise group, ASEG: antagonist strength exercise.

3.2. Comparison of back strength between two groups

This study shows the following left and right back muscle strengthening changes before and after the exercise program (Table 3). In the case of the back strength change before and after the intervention method, the SSEG group significantly decreased from 72.25±20.96 to 79.00±19.46 by -6.75 before the program (p=.000). The ASEG group also significantly decreased from 62.25±19.40 to 65.50±18.19 by -3.25 (p=.012). According to the analysis on inter-group significance, the SSEG group had a more significant increase (p=.024).

Table 3. Comparison of back strength between two groups (N=24)

	SSEG (n_1=12)	ASEG (n_2=12)	t(*p*)

Back strength	Pre	72.25±20.96*	62.25±19.40	1.213(.238)
	Post	79.00±19.46	65.50±18.19	
	Chang	-6.75±2.70	-3.25±4.22	-2.418(.024)
	t(*p*)	-8.657(.000)	2.982(.012)	

Note. Values are presented as mean ± SD*.
SSEG: shoulder stabilization exercise group, ASEG: antagonist strength exercise.

4. Discussion

Students and workers who frequently used computers tend to have an increase in musculoskeletal disorders in the cervical and shoulder area [11].

Kendall et al.[7] explained that funnel breast was caused by shoulder anterior posture and shoulder elevation and abduction in terms of RSP. As shown in the results of this study, RSP changes were significant in the left and right, and especially the SSEG group with more significant effects.

It is considered that the flexibility triggered by stabilization exercises and thera-band based strengthening exercises led to stretching strengthening weakened muscles which helped the shoulders return to their original position and helped to decrease RSP.

However, the weak muscles suggested by Kendall et al.[7], which are the serratus anterior, and the middle and lower trapezius, are typically the stabilization muscles of the shoulders[12]. In this study, the SSEG group, to which shoulder stabilization exercise rather than simple shoulder strengthening exercise was applied, had a more significant effect.

Min[13] applied the 12-week shoulder relation exercise program to 200 subjects in their 20s to 60s and reported that back muscle strength increased. This study also revealed that the two groups had significant increases and especially the SSEG group had a more significant increase ($p<.05$). That is attributable to the large activation of the agonist of the middle and lower trapezius of the stabilization exercise applied to the SSEG group. Arlotta et al.[14] conducted an analysis with the use of the electromyograph and presented that the activities of the middle and lower trapezius had a significant correlation with back muscle strength ($F=61.18$, $p=.000$). Therefore, given previous studies and this study, it was inferred that back muscle strength was improved by strengthening the middle and lower trapezius during shoulder stabilization exercises.

A number of previous research revealed that the typical poor postures such as ‘forward head posture’ and ‘RSP’ are closely related to many different chronic diseases. To improve poor posture, various kinds of exercise methods have been found. However, they have many limitations in the contraction of chronic diseases. If cervical and thorasic stretching or exercise is applied to persons who have forward head posture and RSP but have no subjective symptoms, it is possible to keep a normal posture and prevent chronic diseases. Therefore, in respect to prevention, it is necessary to conduct more research and come up with various effective posture improvement exercise programs for persons who have poor posture, but have no subjective symptoms.

5. Conclusion

With regard to RSP change, there was a left-right significant decrease. The SSEG group had a significant difference. Regarding the change of back muscle strength, both groups increased, and the SSEG group had a significant difference.

Given the results, the shoulder stability exercise was found to be more effective in decreasing RSP. Therefore, this study believes to have contributed to the prevention and decrease of RSP through exercise. In addition, it is considered that the shoulder stability exercise can easily be applied to daily the life as an exercise method.

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