Objective Assessment of Shoulder Girdle Muscle Endurance: Prediction of Rotator Cuff Disease

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Abstract: Rotator cuff disease is a complex condition. It includes a variety of pathologies, ranging from tendonitis to complete tear. This study was conducted in 2004 at the University Sports Hall. The study population was male and female students of Tabriz University. About 1124 people voluntarily participated in the study as a sample (593 girls and 531 boys). Subjects were divided into three age groups; 20, 21-24 and 25-28 years. The protocol used in this study was reviewed and approved by Tabriz University’s Institutional Review Board prior to participant recruitment and all participants provided written informed consent prior to beginning the study. The data’s were analyzed with a one way ANOVA and MANOVA an alpha level of (0.05) was used in determining statistical significance using the SPSS program for Windows, version 18.0. Also results of MANOVA test showed significant differences between three age groups of males and females (p=0.04, p=0.01 and p=0.01 respectively in three age groups) and males in three age groups had better results in comparison to females. Rotator cuff disease incidence in females was higher than males and this result could only justify for this matter that weakness problem in shoulder girdle muscle endurance can be one of the major and important causes for this disease.

Key words: Shoulder Girdle Muscle Endurance %Rotator Cuff Disease%Athletes and Non-Athletes

INTRODUCTION

The rotator cuff is composed of four muscles: the subscapularis, supraspinatus, infraspinatus and teres minor. These muscles all originate on the scapula and insert on the humerus. One of the major functions of the cuff is to rotate the humerus with respect to the scapula. All of the cuff muscles also abduct the arm, although the amount each muscle contributes to arm abduction at any given time depends on multiple factors [1-5].

Rotator cuff disease is a complex condition. It includes a variety of pathologies, ranging from tendonitis to complete tear. The cause seems to be multifactorial and is most likely a combination of major trauma, micro trauma from daily wear and tear and age-related degeneration. When establishing a program for the patient with rotator cuff dysfunction, the rehabilitation specialist should consider biomechanical factors, the patient’s functional goals and issues beyond the shoulder that may affect the course of the disease [6-11].

Several risk factors have been identified for the development of rotator cuff disorders, including weak shoulder girdle muscular strength/endurance, abnormal scapula/shoulder postures and repetitive use of the shoulder [11].

Physical fitness is one of the richest possession, it cannot be purchased; it has to be earned through systematic and daily routine of physical exercise/physical activity. One of the important, remarkable, beautiful, valuable and priceless things that God has created particularly on the earth is human life. Therefore, it is necessary to protect and maintain human life in order to achieve higher goals and objectives and also to live a happy and meaningful life. Fitness is the capacity of heart, blood vessels, lungs and muscles to function at optimum efficiency. Physical fitness is to the human body what fine tuning is to an engine. People can only fulfill their potential when their bodies are healthy and fit. In shoulder muscles fatigue (due to weak shoulder girdle muscular strength/endurance, abnormal scapula/shoulder postures), joint mechanics become altered, thus
possibly leading to rotator cuff pathologies. However, there is not a one-to-one relationship between local muscular endurance and muscle strength and endurance/fatigue tests are more reflective of functional use than isolated measure of muscle strength [6, 7].

The purposes of this study were to establish an objective assessment of shoulder girdle muscle endurance and to examine the comparison between three groups of males and females for prediction of rotator cuff disease.

**MATERIALS AND METHODS**

This study was conducted in 2004 at the University Sports Hall. The study population was male and female students of Tabriz University. About 1124 people voluntarily participated in the study as a sample (593 girls and 531 boys). Subjects were divided into three age groups 20 years and below, 21-24 and 25-28 years.

The protocol used in this study was reviewed and approved by Tabriz University’s Institutional Review Board prior to participant recruitment and all participants provided written informed consent prior to beginning the study. As assessed by a medical history questionnaire, all subjects were normal and free of vestibular disorders and none had suffered a mild head injury or lower extremity injury in the preceding 6 months. Participants attended having performed no vigorous exercise in the 24 h prior to testing and with diet standardized for 48 h proceeding in each test.

Average height and weight of male and female subjects were given in Table 1.

**Shoulder Girdle Endurance Testing:** To evaluate the shoulder girdle muscle endurance, the modified supine Pull up test was used (10). The way for doing this test is in such manner that subjects with knee straight, lied on their back and only the heel was in contact with the ground. Subject hanging the bar so that the back of hands and the hands toward the face and shoulder be width apart. In the starting position, bar height from the ground so that the elbows were completely straight, subject’s body hadn’t any contact with the ground and hands in vertical hanging position on the bars. Height of the bars was adjustable with subject’s height. After being ensure
to subject’s body was straight, subject took up with his/her arms so that the chest height, close to 15 cm of the bar. Then subject’s brought his/her down and return to start position. Subjects continued this drill until could and number of conducted repetitions was records of the subject.

**Statistical Analysis:** The data’s were analyzed with a one way ANOVA and MANOVA an alpha level of (0.05) in determining statistical significance using the SPSS program for Windows, version 18.0.

**RESULTS**

**Comparing Shoulder Girdle Muscular Endurance in Different Age Groups of Males:** Chart 1 shows the number of Pull up test repetition in males at different ages. As can be seen in this diagram, the mean Pull up test repetition in male students in 1st, 2nd and 3rd groups was 20.74±7.60, 22.10±7.97 and 22.27±6.8 respectively. The results indicated significant differences between groups. Results revealed that, there was difference between 1st and 2nd groups but, this difference wasn’t significant (p=0.12). There was 1.53±2.37 difference between 1st and 3rd groups, but this differences wasn’t significant (p=0.79). Comparing Pull up test repetitions between 2nd and 3rd groups revealed that shoulder girdle muscular endurance in 21-24 and 25-28 years old subjects wasn’t significant and concluded that age cannot be an important factor for Pull up test execution.

**Comparing Shoulder Girdle Muscular Endurance in Different Age Groups of Females:** Results revealed that there were significant difference in Pull up test repetitions between # 20 and 21-24 yrs old groups (p=0.04). Differences amount between 1st and 2nd groups was 0.68±1.20 and between 2nd and 3rd groups was 0.58±1.22, that wasn’t statistically significant (p=0.84 and p=0.89 respectively) (Chart 2).

Also results of MANOVA test showed significant differences between three age groups of males and females (p=0.04, p=0.01 and p=0.01 respectively in three age groups) and males in three age groups had better results in comparison to females.

<table>
<thead>
<tr>
<th>Age groups sex</th>
<th>Height</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male 20 Yrs and below</td>
<td>174.9±6.21</td>
<td>69.4±9.89</td>
</tr>
<tr>
<td>Male 21-24 Yrs</td>
<td>175.2±5.98</td>
<td>68.47±10.92</td>
</tr>
<tr>
<td>Male 25-28 Yrs</td>
<td>174±6.15</td>
<td>70.55±11.71</td>
</tr>
<tr>
<td>Female 20 Yrs and below</td>
<td>160.3±5.62</td>
<td>56.58±8.87</td>
</tr>
<tr>
<td>Female 21-24 Yrs</td>
<td>159.6±6.27</td>
<td>56.7±8.84</td>
</tr>
<tr>
<td>Female 25-28 Yrs</td>
<td>159.8±4.51</td>
<td>57.74±7.34</td>
</tr>
</tbody>
</table>
DISCUSSION

In this study, for evaluation of shoulder girdle muscle endurance, the modified supine Pull up test was used. Comparing Pull up test repetitions between 2nd and 3rd groups revealed that shoulder girdle muscular endurance in 21-24 and 25-28 years old males wasn’t significant and it was concluded that age cannot be an important factor for Pull up test execution but, shoulder girdle muscle endurance was significantly different in the three age groups of females. This showed that age differences (only in middle stages (20-28yrs old)) cannot be effective factor for shoulder girdle muscle endurance weakness. For determining the exact cases of shoulder girdle muscle endurance weakness, we should look for other important relationships and factors. Weakness in female’s shoulder girdle muscle endurance can be important reason for high incidence of rotator cuff disease in females. Also results showed significant differences between three age groups of males and females and males in three age groups had better results in comparison to females [11].

Rotator cuff disease incidence in females is higher than males and this result can only justification for this matter that weakness problem in shoulder girdle muscle endurance can be one of the major and important cases for this disease [11].

In male subjects it is revealed that as the age advances, the shoulder muscular strength also increases. This improvement must be due to the sexual maturity and the boys become more muscular and strong due to the secretions of anabolic-androgenic hormones [1, 11, 12].

Some authors showed significant difference among the different age groups. For example, one of the studies showed that thirteen years high school boys irrespective of rural and urban areas had the lowest shoulder muscular endurance. Significant differences in shoulder muscular endurance were found between 13 and 14 and 13 and 15 year age groups, whereas no significant differences in shoulder muscular endurance were found between 14 and 15 year old high school boys. Irrespective of rural and urban areas, 15 year age group was found superior in shoulder muscular endurance compared to the other two age groups. Rural high school boys superseded their urban counterparts in shoulder muscular endurance strength. It was noticed from the results that there was an increasing trend in shoulder muscular endurance from 13 to 15 years [13].

It can be concluded that training could include working with the patient on timing and control of the rotator cuff muscles and the scapular stabilizing muscles so that they work together in an appropriate manner during a variety of arm positions and speed of movement. Because these muscles function in an integrated pattern, they should be rehabilitated by using integrated patterns.

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REFERENCES


