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Research Paper

Prediction of Scapular Dyskinesis through Strength and Range of Motion of Shoulder Joint Rotation in Competitive Boxers

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ABSTRACT

Background and Aims This study investigated the relationship between shoulder rotation Range of Motion (ROM), shoulder rotation strength, and sports history with scapular dyskinesia in competitive boxers.

Methods The present study was a descriptive correlational study performed on 60 male boxers (age: 24.01±3.90 years; weight: 74.61±6.73 kg; height: 176.97±6.06 cm; and sports history: 5.16±1.84 years) in Guilan. Scapular dyskinesia by lateral scapular slide test, shoulder rotation ROM using a manual goniometer, and shoulder rotation strength using a manual dynamometer were measured. Data were analyzed by Pearson and Spearman correlations and multiple regression analysis.

Results There were significant correlations between sports history (P=0.001, r=0.589), shoulder internal rotation ROM (P=0.040, r=-0.255), shoulder external rotation ROM (P=0.001, r=0.486), shoulder internal rotation strength (P=0.009, r=0.334), and shoulder external rotation strength (P=0.001, r=-0.620) and scapular dyskinesia. Regression analysis showed that 63.1% of scapular dyskinesia changes were related to the independent variables mentioned in this study.

Conclusion It can be concluded that there is a significant relationship between shoulder rotation ROM, shoulder rotation strength, sports history, and scapular dyskinesia. Therefore, by strengthening and improving the scapular stabilizing muscles and consequently improving the shoulder rotation strength and shoulder rotation ROM in boxers, scapular dyskinesia or its intensification can be prevented.

Keywords Scapular Dyskinesia, Competitive Boxer, Range of Motion, Shoulder Rotation Strength

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Extended Abstract

Introduction

Scapular dyskinesis, which is very common among boxers, is a change in the posture or normal position of the scapula at rest or in an active position that interferes with the proper transfer of energy from the lower limb to the upper limb. In the past literature, a significant relationship has been reported between the strength and range of motion (ROM) of shoulder rotation with scapular dyskinesis. The aim of this study was to investigate the predictive relationship between independent variables, including sports history, shoulder rotation) and shoulder rotation strength and dependent variable (scapular dyskinesis) in competitive boxers.

Materials and Methods

In this study, 60 competitive boxers of Guilan (age: 24.01±3.90 years; weight: 74.61±6.73 kg; height: 176.97±6.06 cm; and sports history: 5.16±1.84 years) who had scapular dyskinesis were selected. To measure the variables, scapular dyskinesis with lateral scapular slide test, anthropometric characteristics by measuring tape and caliper, sports history through oral questioning, shoulder rotation strength by manual dynamometer, and shoulder ROM by manual goniometer were measured. Spearman and Pearson correlation coefficients were used to determine the relationship between variables. Simultaneous multiple regression analysis was used to investigate the predictive relationship between independent variables and the dependent variable (scapular dyskinesis). Inclusion criteria included male gender, age between 20 to 30 years, having scapular dyskinesis, activity in active boxing clubs in Guilan, having at least three years of professional training in boxing, participating in training sessions (three sessions per week) in the last six months, and having a history of attending official boxing matches. Exclusion criteria were a history of surgery on the shoulder and/or spine, pain in the shoulder girdle, and dissatisfaction with the subject or the coach of the club. In order to obtain the satisfaction of the subjects, a written consent form was collected for the subjects to participate in the study. For reliability within a group of five subjects, measurements were performed at 3-day intervals, as reported in the findings section.

Results

According to the results of Kolmogorov-Smirnov test, weight (P=0.200), height (P=0.200), scapular dyskinesis (P=0.068), ROM of shoulder external rotation (P=0.200), the relative strength of the internal rotation of the shoulder (P=0.200), and the relative strength of the external rotation of the shoulder (P=0.200) had normal scattering and therefore, the Pearson parametric test was used to determine the correlation coefficient of the variables. The research results showed that there were significant correlations between sports history (P=0.001; r=0.589), shoulder internal rotation ROM (P=0.040; r=-0.255), shoulder external rotation ROM (P=0.001; r=0.486), shoulder internal rotation strength (P=0.009; r=0.334), and shoulder external rotation strength (P=0.001; r=-0.620) and scapular dyskinesia. Regression analysis showed that 63.1% of scapular dyskinesia changes are related to the independent variables mentioned in this study.

The variables of the relative strength of external shoulder rotation with a regression coefficient of 0.622, sports history with a regression coefficient of 0.072, and ROM of external shoulder rotation with a regression coefficient of 0.061 had the most effect on scapular dyskinesis, respectively.

Discussion

It can be concluded that there was a negative relationship between the ROM of shoulder internal rotation and scapular dyskinesis and a positive relationship between the ROM of external shoulder rotation and scapular dyskinesis. Since the internal rotation of the shoulder is accompanied by the rotation of the scapula during punching, the existence of a negative relationship between the ROM of the shoulder internal rotation and the scapular dyskinesis can be justified. The results of the present study showed a significant positive relationship between sports history and scapular dyskinesis. As the number of years in boxing training and competitions increased, the amount of scapular dyskinesis increased accordingly. Boxing, with its one-sided guard and overhead punches, causes changes in the soft tissue around the joint as well as in the shoulder girdle muscles (especially the anterior serratus muscle). The changes lead to abnormalities in the position and movement of the scapula (scapular dyskinesis). The results of the present study showed that there is a positive relationship between scapular dyskinesis and strength of the shoulder internal rotation and a negative relationship between scapular dyskinesis and strength of the shoulder external rotation. The increasing strength of the shoulder internal rotation as well as disturbing the ratio of inter-

nal to external rotational strength in the shoulder (which is usually associated with increasing internal rotational strength and decreasing external rotational strength) disrupts the scapulohumeral rhythm, resulting in an increase in scapular dyskinesis. According to the length-tension relationship, the length of a muscle determines the amount of tension that can be created in that muscle. There is a significant relationship between shoulder rotation ROM, shoulder rotation strength, sports history, and scapular dyskinesia. Therefore, by strengthening and improving the scapular stabilizing muscles and consequently improving the shoulder rotation strength and shoulder rotation ROM in boxers, scapular dyskinesia or its intensification can be prevented. According to the results of the present study, there was a significant relationship between shoulder rotation strength and ROM of shoulder rotation and history of boxing with shoulder dyskinesis. Also, a strong relationship was observed between the variables of the strength of shoulder external rotation and ROM of shoulder external rotation and the history of participating in boxing and scapular dyskinesis. Therefore, evaluation and screening and subsequent rehabilitation of strength in the stabilizing muscles of the scapula (especially the anterior serratus) and increasing the ROM of internal rotation, and also to adjust the ratio of ROM of shoulder internal rotation to external rotation in boxing athletes are recommended to all relevant coaches and specialists to prevent or reduce the severity of scapular dyskinesis.

Since scapular dyskinesis is more common in boxers than in non-boxers, researchers are advised to do research and study in terms of the effect of other factors, such as scapular-pectoralis muscles length and neck postural direction to have a better understanding of the disorder, in boxers with scapular dyskinesis as well as rehabilitation methods and improvement of scapular dyskinesis in boxers with the aim of preventing injury and increasing performance to achieve optimal sports results.

Ethical Considerations

Compliance with ethical guidelines

In the implementation of the present study, ethical considerations were taken into account according to the instructions of the ethics committee of Gilan University, and this research was approved by the ethics committee of Gilan University (Code: 12/9/2013-152347).

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Authors' contributions

Conceptualization and supervision: Soroush Momenpour, Seyed Hossein Hosseini and Hassan Daneshmandi; Methodology, research, writing the main draft, review and editing, information gathering, data analysis, financing and sources: Soroush Momenpour.

Conflict of interest

The authors declared no conflict of interest.

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