Evaluating isokinetic and hand-held dynamometer measurements of shoulder strength in NCAA Division III swimmers

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Overview

This study's objective was to compare dynamometry measures of athletes using, a hand-held dynamometer (HHD) and an isokinetic dynamometer (ISO) for Shoulder Flexion and Extension of the left and right upper extremity.

Introduction

Hand-held and isokinetic dynamometry are two different methods of strength testing. There have been many studies utilizing HHD and ISO but very few utilizing testing with both HHD and ISO

Purpose of Study

The purpose of this study is to compare hand-held and isokinetic dynamometry measures of shoulder flexion and extension strength in NCAA Division III male and female swimmers. In addition, this study will determine the relationship between the percent differences in the agonist/antagonist ratio in diagonal shoulder isokinetic testing.

Problem Statement

During HHD, the examiner may fail to match the resistance of the athlete during testing compared to ISO. HHD testing involves Isometric testing at one angle. ISO testing involves testing throughout the range of motion. There is a need to determine to compare the results of left and right differences in shoulder flexion and extension strength for males and females using both HHD and ISO testing.

Figure 1. HHD extension

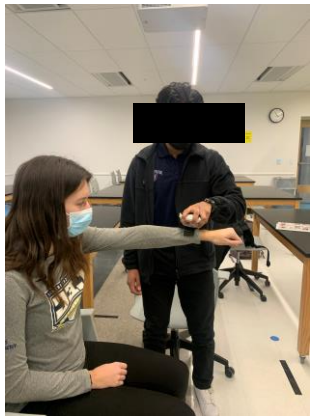
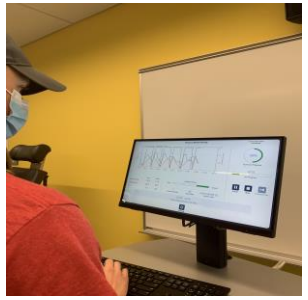


Figure 2. HHD flexion

Figure 3. Isokinetic testing



Methods

24 students from the men's and women's swim team at Eastern Connecticut State University participated in this study by first measuring their shoulder flexion and extension strength while sitting in a chair and holding their arm at 90 degrees. Next the athlete prepared for testing using the isokinetic dynamometer to measure strength with a diagonal shoulder flexion and extension concentric motion. The first Isokinetic trial was five repetitions at 90 deg/s and the second portion was 20 repetitions at 180 deg/s. Both arms were tested using this same procedure. The results were recorded through the Biodex System 4 Pro.

Statistical Analysis/Results

There were significant differences in left and right shoulder extension in female swimmer with HHD compared to ISO ($p<.05$). There were also significant differences in left and right shoulder extension strength tested ISO in female swimmers. There were no significant differences in HHD and ISO testing in male swimmers with both flexion and extension ($p> .05$). With combined and separate male and female data there were no significant differences in the agonist/antagonist ratios ($p>.05$)

Conclusion

Isokinetic testing for shoulder extension strength may be better to determine left and right differences in female swimmers in this study compared to HHD. HHD can be performed in an efficient cost- effective manner to assess male and female swimmer shoulder flexion.

Practical Applications

Assessing strength using HHD and/or ISO can help to identify potential muscular imbalances and can help aid in resistance program modification and may help improve performance and with injury prevention