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The relationship between dynamic balance and isokinetic ankle strength in female college athletes



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Background

Because athletes regularly subject their joints to over-use and heavy strain, balance is important in reducing the risk of injury to the legs and feet. Balance can be defined statically as the ability to maintain a stable base of support while moving minimally, and dynamically as the ability to perform a task while continuing to maintain a stable base of support (Bressel, Yonker, Kras, & Heath, 2007). Although both types of balance are required for athletes to successfully execute skills specific to their sports, the present study focused on dynamic balance because of the prevalence of foot and ankle injuries in sports that require sudden starts and stops and quick directional changes like soccer and basketball (McGuine & Keene, 2006).

The literature surrounding the relationships between ankle strength and dynamic balance is very conflicting. While one study has linked weak plantarflexors to unstable ankles, and consequently to poor balance (Fox, Docherty, Schrader, & Applegate (2008), another study failed to produce a significant gain in balance ability after strengthening an unstable ankle joint (Powers, Buckley, Kaminsky, Hubbard & Ortiz (2004).

Introduction

This study was designed to examine the relationship between dynamic balance and ankle plantar (PF) and dorsiflexion (DF). Female college athletes were assessed to determine whether their ability to maintain a stable base of support through an activity was influenced by the isokinetic strength of the PF and DF muscle groups.

Purpose

The purpose of this study was to investigate the relationship between ankle isokinetic strength and dynamic balance across female athletes.

Figure 1: Cybex Isokinetic Dynamometer, used to measure torque produced by knee contractions



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Advisor: Dr. Barbara L. Warren

Results

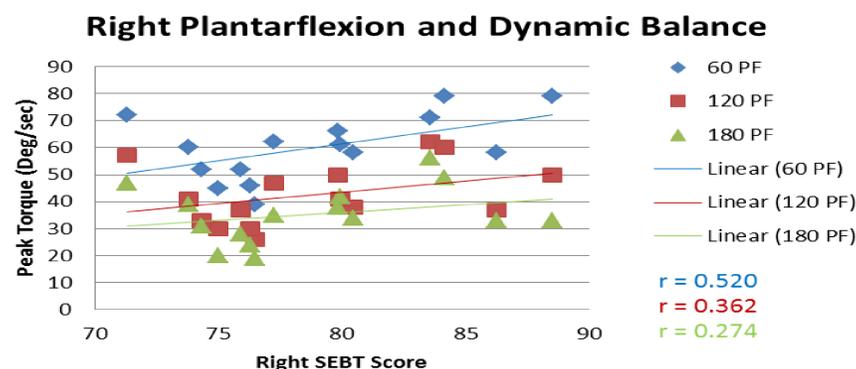


Figure 2. Right plantarflexor peak torque and dynamic balance

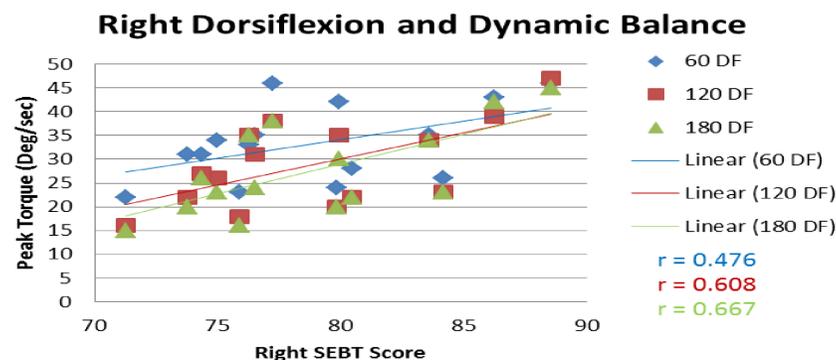


Figure 3. Right dorsiflexor peak torque and dynamic balance

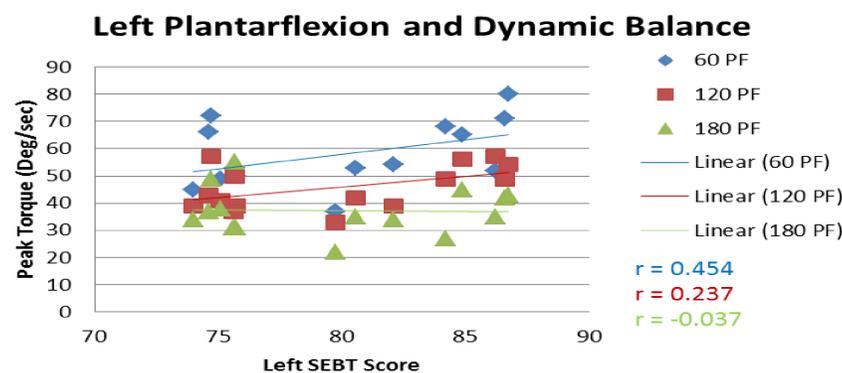


Figure 4. Left plantarflexor peak torque and dynamic balance

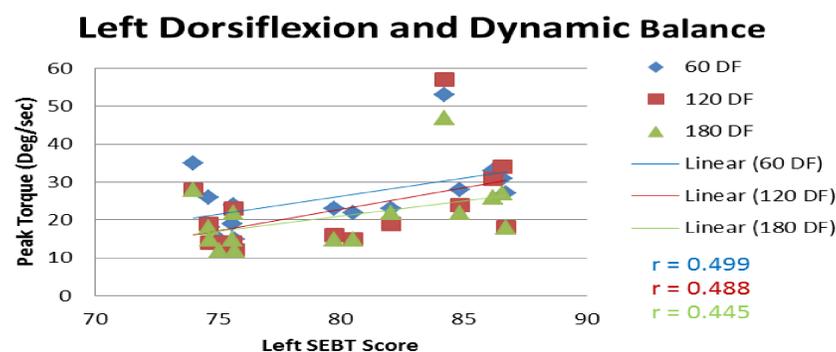


Figure 5. Left dorsiflexor peak torque and dynamic balance.

Materials and Methods

Subjects

15 apparently healthy college-age female athletes

Testing Protocol

A Cybex NORM isokinetic dynamometer was used to collect peak torque data (Figure 1).

Warm up

- 5 minute warmup on a cycle ergometer
- 2 minutes of lower extremity stretching
- 4 sub-maximal contractions at 60, 120 and 180 %s

Testing: ankle plantar and dorsiflexion

- 2 familiarization sessions:
 - 8 reciprocal max contractions of PF and DF for each ankle at 60, 120, 180 %s with 1 min rest
- 1 experimental session:
 - 8 reciprocal max contractions of PF and DF for each ankle at 60, 120, 180 %s with 1 min rest

Subjects also completed 3 cycles of the Star Excursion Balance Test (SEBT) for each leg during all sessions.

Data Analysis

Pearson correlations were used to assess relationships between strength and balance scores ($\alpha < 0.05$).

Results and Conclusion

Moderate correlations were found between ankle dorsiflexors and dynamic balance in this population of female collegiate athletes. These findings are in agreement with Brown & Mynark (2007) and Ross & Guskiewicz (2004), which found that subjects with greater ankle strength have superior dynamic balance. However, the results were contrasting to Fox (2008), which found weak correlations between ankle plantarflexion and dynamic balance. These findings suggest that dynamic balance may be related to dorsiflexion strength but not plantarflexion strength.

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