

# ORIGINAL RESEARCH

## Y BALANCE TEST™ ANTERIOR REACH SYMMETRY AT THREE MONTHS IS RELATED TO SINGLE LEG FUNCTIONAL PERFORMANCE AT TIME OF RETURN TO SPORTS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

J. Craig Garrison, PhD, PT, SCS, ATC<sup>1</sup>

James M. Bothwell, MD<sup>1</sup>

Gina Wolf, SPT, ATC<sup>2</sup>

Subhash Aryal, PhD<sup>3</sup>

Charles A. Thigpen, PhD, PT, ATC<sup>4</sup>

### ABSTRACT

**Background:** Restoration of symmetrical strength, balance, and power following anterior cruciate ligament reconstruction (ACL-R) are thought to be important factors for successful return to sports. Little information is available regarding early rehabilitation outcomes and achieving suggested limb indices of 90% on functional performance measures at the time of return to sports (RTS).

**Hypothesis/Purpose:** To examine the relationship between symmetry of the anterior reach of the Y Balance Test™ at 12 weeks and functional performance measures at time of return to sports after anterior cruciate ligament (ACL) reconstruction.

**Study Design:** Retrospective Cohort

**Methods:** Forty subjects (mean  $\pm$ SD age, 17.2 $\pm$ 3.8 years) who were in the process of rehabilitation following ACL reconstruction. Each subject volunteered and was enrolled in the study during physical therapy following ACL-R. Participants averaged two visits per week in physical therapy until the time of testing for RTS. The Y Balance Test™ was assessed at 12 weeks. Participants completed a battery of tests at RTS (6.4  $\pm$  1.1 months) including triple hop distance (THD), single hop distance (SHD), isometric knee extension strength (KE), and the Vail Sport Test™. Side to side difference was calculated for the Y Balance Test™ anterior reach and limb symmetry indices (LSI) were computed for THD, SHD, and KE. Multiple regression models were used to study the relationship between variables at 12 weeks and RTS while controlling for age, gender, type of graft, and pain score. In addition, subjects were dichotomized based on a side-to-side Y Balance anterior reach difference into high risk (>4 cm) or low risk ( $\leq$ 4 cm) categories. A receiver operating characteristic (ROC) curve was used to identify individuals at 12 weeks who do not achieve 90% limb symmetry indices at time of RTS testing. .

**Results:** A statistically significant association was seen between Y Balance ANT at 12 weeks and SHD at RTS ( $\beta = -1.46$ ,  $p = 0.0005$ ,  $R^2 = 0.395$ ), THD at RTS ( $\beta = -1.08$ ,  $p = 0.0011$ ,  $R^2 = 0.354$ ) and KE at RTS ( $\beta = -1.00$ ,  $p = 0.0025$ ,  $R^2 = 0.279$ ) after adjusting for age, gender, type of graft and pain score at week 12. There was no significant association between Y Balance ANT at 12 weeks and Vail Sport Test at RTS ( $p = 0.273$ ). ROC curves indicated that the Y Balance ANT at 12 weeks identified participants who did not achieve 90% LSI for the SHD (AUC = 0.82  $p = 0.02$ ) and THD (AUC = 0.85,  $p = 0.01$ ) at RTS with a sensitivity of 0.96 (SHD) and 0.92 (THD) respectively.

**Conclusions:** Participants following ACL-R who demonstrated >4 cm Y Balance ANT deficits at 12 weeks on their involved limb did not tend to achieve 90% LSI for the SHD and THD at time of return to sports. The Y Balance ANT at 12 weeks and Vail Sport Test™ appear to measure different constructs following ACL-R.

**Levels of Evidence:** Level 3

**Keywords:** Anterior cruciate ligament, Single Leg Squat, return to sport

<sup>1</sup> Texas Health Ben Hogan Sports Medicine, Fort Worth, TX, USA

<sup>2</sup> University of North Texas Health Science Center, Professional Program in Physical Therapy, Fort Worth, TX, USA

<sup>3</sup> University of North Texas Health Science Center, Department of Biostatistics and Epidemiology, Fort Worth, TX, USA

<sup>4</sup> ATI Physical Therapy, Greenville, SC, USA

This study has been approved by the Institutional Review Board of Texas Health Resources.

Acknowledgements: The authors would like to thank the staff physical therapists at Texas Health Ben Hogan Sports Medicine for their help in recruitment of subjects and assistance in data collection.

### CORRESPONDING AUTHOR

J. Craig Garrison

800 5th Avenue, Suite 150

Fort Worth, TX 76104

E-mail: craiggarrison@texashealth.org