



Figure 1: Tri-Axial Force Platform

Introduction

1. Females are observed to perform the depth jump with greater scores on the Landing Error Scoring System, and with kinematics that are commonly associated with a greater risk for ACL injury in comparison with males¹
2. To the best of our knowledge there has not been a comprehensive study on the effects of sex on the landing kinetics of depth jumping

Methods

1. 9 males and 11 female NCAA Division I Student Athletes performed depth jumps from drop heights of 0.51, 0.66, and 0.81 meters
2. The following dependent measures were estimated from vertical ground reaction force data collected using an in-ground tri-axial force platform (Figure 1): Peak Force (N), Rate Force Development ($N*s^{-1}$), Reactive Strength Index($m*s^{-1}$), Jump Height (m), Ground Contact Time (s), and Peak Force Reduction (N)
3. The sensitivity and specificity of dependent measures to sex was evaluated using Receiver Operating Characteristic curve analysis

Results

1. There was significant area under the curve for Jump Height from a height of 0.81m but no other variable had significant area under the curve

Conclusions

1. A larger sample size is needed to detect greater sensitivity for the variables to sex
2. An acceptable area under the curve is 0.7 and above² and multiple variables approached this value

Sensitivity and Specificity of Sex for Detecting Differences in the Kinetics of Depth Jumps Performed by NCAA Athletes

Variable	Male (mean ± SD)	Female (mean ± SD)
Peak Force 0.51m	3496 ± 1047	2982 ± 441
Peak Force 0.66 m	4289 ± 1395	3582 ± 472
Peak Force 0.81m	5000 ± 1290	4538 ± 788
Rate Force Development 0.51m	42457 ± 26684	41514 ± 9326
Rate Force Development 0.66m	69602 ± 30090	50994 ± 6098
Rate Force Development 0.81m	85711 ± 27487	70535 ± 18113
Reactive Strength Index 0.51m	1.2 ± 0.50	0.9 ± 0.17
Reactive Strength Index 0.66m	1.1 ± 0.52	1.1 ± 0.26
Reactive Strength Index 0.81m	1.2 ± 0.38	0.96 ± 0.18
Jump Height 0.51m	0.48 ± 0.15	0.34 ± 0.07
Jump Height 0.66m	0.47 ± 0.11	0.38 ± 0.10
Jump Height 0.81m	0.52 ± 0.10	0.35 ± 0.05
Ground Contact Time 0.51m	0.45 ± 0.15	0.37 ± 0.07
Ground Contact Time 0.66m	0.46 ± 0.14	0.37 ± 0.07
Ground Contact Time 0.81m	0.45 ± 0.11	0.38 ± 0.08
Peak Force Reduction 0.51m	1327 ± 862	1012 ± 509
Peak Force Reduction 0.66m	2065 ± 1135	1593 ± 319
Peak Force Reduction 0.81m	2715 ± 1289	2077 ± 1278

OTHER RESOURCES USED:

- MatLab (The Mathworks, Natick, MA)
- R Studio (open source, version 1.1.456)

Variable	AUC	P-Value
Peak Force 0.51m	0.6162	0.93
Peak Force 0.66 m	0.6566	0.69
Peak Force 0.81m	0.6263	0.86
Rate Force Development 0.51m	0.5253	1
Rate Force Development 0.66m	0.6869	0.5
Rate Force Development 0.81m	0.6566	0.68
Reactive Strength Index 0.51m	0.6869	0.5
Reactive Strength Index 0.66m	0.5152	1
Reactive Strength Index 0.81m	0.6768	0.56
Jump Height 0.51m	0.8081	0.08
Jump Height 0.66m	0.7071	0.4
Jump Height 0.81m	0.9798	<0.001
Ground Contact Time 0.51m	0.6818	0.53
Ground Contact Time 0.66m	0.7626	0.19
Ground Contact Time 0.81m	0.7374	0.27
Peak Force Reduction 0.51m	0.6364	0.8
Peak Force Reduction 0.66m	0.6869	0.5
Peak Force Reduction 0.81m	0.6061	0.5

References

1. Mandrekar, J. N. (2010). Receiver operating characteristic curve in diagnostic test assessment. *Journal of Thoracic Oncology*, 5(9), 1315-1316.
2. Beutler, A. I., Sarah, J., Marshall, S. W., Padua, D. A., & Boden, B. P. (2009). Muscle strength and qualitative jump-landing differences in male and female military cadets: The jump-ACL study. *Journal of sports science & medicine*, 8(4), 663.

