ABSTRACT FORM

XXIV International Conference of Sport Rehabilitation and Traumatology
Football Medicine Strategies for Player Care
London, 11th – 12th April 2015

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The presenting author will be Dr Brendan Marshall

TITLE	ATHLETIC GROIN PAIN: A BIOMECHANICAL DIAGNOSIS	
AUTHORS	**Marshall B [1,2,3], Richter C[2,3] Gore S [1,2,3], King E [1], Halpin R [1], West S [1], Franklyn-Miller A [1,5], Moran K [2,3], Strike S [4], Falvey E [1]**	
AFFILIATIONS	[1]Sports Medicine Department, Sports Surgery Clinic, Santry Demesne, Dublin, Ireland [2]School of Health and Human Performance, Dublin City University, Dublin, Ireland [3]Insight Centre for Data Analytics, Dublin City University, Dublin, Ireland [4]Department of Life Sciences, Roehampton University, London, UK [5]Centre for Health, Exercise and Sports Medicine, University of Melbourne, Melbourne, Australia	
TOPIC	Knee injuries in football players	
PRESENTATION PREFERENCE	ORAL √ *(please tick)*	POSTER ☐ *(please tick)*

TEXT (4500 characters maximum spaces included)

Introduction: Chronic athletic groin pain is commonly experienced in a range of football codes including soccer (Holmich et al. 2014) and gaelic football (Murphy et al. 2012). Much debate surrounds the specific aetiology of AGP but several authors have implicated, at least in part, abnormal movement control and loading in and around the hip and pelvis during play (Rabe et al. 2010, Pizarri et al. 2008). Movement control during change of direction cutting is of particular interest as it is this dynamic movement that is frequently associated with groin pain development (Falvey et al. 2009). No previous studies have attempted to describe the key characteristics of cutting mechanics that may be prevalent in AGP populations, that is, what are the potential biomechanical diagnoses that exist in this cohort.

Purpose: To describe the key characteristics of three dimensional cutting mechanics that exist within a large cohort of AGP patients.

Methods: Four hundred (n = 400) recreational field sports players diagnosed with chronic athletic groin pain were recruited (mean ± *SD*: age, 27 ± 8 years; height, 1.80 ± 0.06m; mass, 81.9 ± 9.4 kg; time with groin pain, 66.2 ± 96.7 weeks). The study attained ethical approval and participants completed and signed an informed consent form before taking part.

Participants underwent biomechanical testing before commencing rehabilitation. Testing involved three trials (both left and right side) of a change-of-direction cut. For the cut, participants ran as fast as possible for five meters toward a marker placed on the floor and performed an approximate 75° cut before running maximally to the finish. An eight camera 3D motion analysis system (Vicon - Bonita B10, UK), synchronized with two 40x60cm force platforms (AMTI – BP400600, USA), collected biomechanical data.

Data analysis utilized the mean of each participant's three trials on the symptomatic side, or for those with bi-lateral (ankle, knee, hip, pelvis and trunk angles). Repeated measure ANOVAs with bonferroni post-hoc corrections were then used to determine between sub-group differences in biomechanical variables of interest. A significance level of (α = 0.05) was adopted.

Results: Three distinct subgroups were created:
C1 (containing 40% of participants), C2 (containing 15% of participants) and C3 (containing 45% of participants).

C1 had significantly greater hip flexion and hip-pelvo-trunk rotation than C2 and C3.
C3 and C2 had significantly greater hip-pelvo-trunk lateral side flexion than C1.
C2 had significantly greater trunk flexion than both C1 and C3.

Table 1. Between sub-group differences in key kinematic variables

Movement Plane	**Variable**	**F - value**	**P - value**	**Summary**
Sagital	Hip flexion	176.2	< 0.001	C1 > C2 > C3
	Knee flexion	31.3	< 0.001	(C1, C2) > C3
	Trunk flexion	56.0	< 0.001	C2 > C1 > C3
Transverse	Pelvis external rotation	113.3	< 0.001	C1 > (C2,C3)
	Trunk external rotation	86.6	< 0.001	C1 > (C2,C3)
	Hip internal rotation	44.3	< 0.001	C1 > (C2,C3)
Frontal	Ipsilateral trunk side flexion	136.2	< 0.001	(C2,C3) > C1
	Contralateral pelvis drop	77.0	< 0.001	(C2,C3) > C1
	Hip abduction angle	13.0	< 0.001	(C2,C3) > C1

Conclusion:
Different sub-groups existed within the large cohort that exhibited distinctive cutting mechanics. Our findings may go some way toward identifying the potential cutting characteristics/diagnoses that exist in AGP patients. Rehabilitation specilaists may look to utilise such information when attempting to affect their patients cutting mechanics. Future studies are required to confirm the clinical relevance of the cutting characteristics/diagnoses identified herein. An examination of the effects of individualising groin rehabilitation programs based on a cutting mechanics assessment appears warrented.

Given the inter-individual differences in cutting mechanics observed, caution is advised in the use of traditional group based analyses in future AGP biomechanical studies. This is due to the potential masking of significant findings when using heterogenous data (Bates 2005). Clustering techniques, such as employed here, may be useful in identifying homogenous sub-groups before undertaking more traditional statistical analyses.