

Case study of upper body biomechanics during 2 common strike types in an elite level hurler.

Breen D¹, Marshall BM^{1,2}, Falvey É^{1,3}, Franklyn-Miller A^{1,3}

¹ Sports Medicine Department, Sports Surgery Clinic, Dublin, IRELAND

² School of Health and Human Performance, Dublin City University, Dublin, IRELAND

³ Centre for Exercise, Health and Sports Medicine, University of Melbourne, AUSTRALIA

Introduction

Little is known on the kinematics of the Irish national game of hurling. Given the unrestricted nature and frequency of the various types of stick swings, the weights of the stick (0.6kg), the length of the stick (33in – 37in), and the rate of swing, it is pertinent to assume an ever present risk of injury in the game¹.

To date there has been no previous research detailing swing kinematics in hurling. Swing mechanics provide valuable information for both injury rehabilitation and performance conditioning specific to the sport².

Shoulder injuries account for the highest proportion of non-traumatic upper body injuries in hurlers, 6.7% of total body injuries³.

Aim: To establish upper body joint ranges of motion during two common strikes in hurling. This will help inform injury prevention criterion for non-contact upper body injuries incurred in the sport. A better understanding of the movement mechanics associated with the sport will benefit performance enhancement strategies for hurling athletes.

Methods

An elite, injury free, hurling player (age 27 years; height 195.8; mass 94.6) undertook three trials on the dominant side for a strike from the hand on the run and a free strike from a placed ball position.

A six camera 3D motion analysis system (Vicon - Bonita B10, UK) were used to collect kinematic and kinetic data. Reflective markers (14mm diameter) were placed at bony landmarks on the lower limbs, pelvis, trunk, upper limbs and head according to Vicon Plugin Gait marker locations. Vicon Nexus software controlled collection of motion data at 200Hz. Motion data were filtered using a Woltring filter routine (MSE=20). A Vicon Plug in Gait modeling routine (Dynamic Plug in Gait) defined rigid body segments (foot, shank, thigh, pelvis, torso, upper arm, forearm and hand) and the joint angles between these segments. The model then used standard inverse dynamics techniques (Winter 1990) to calculate segmental and joint kinetics.

Figure 1

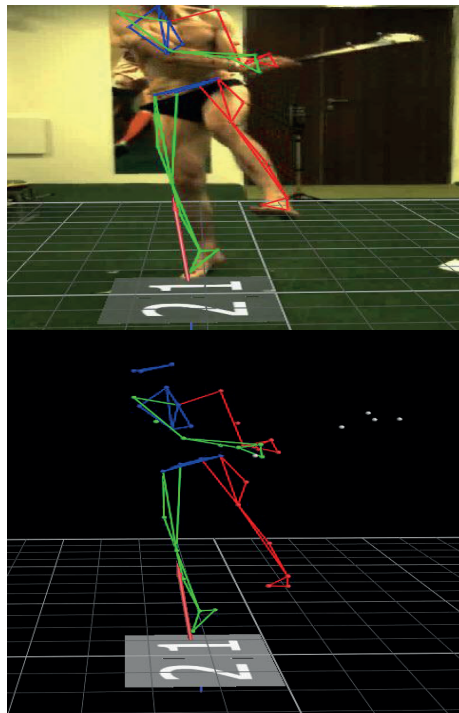


Fig 1. Image of 3D generated analysis of a hurler during the follow through of a right sided free strike

Figure 2

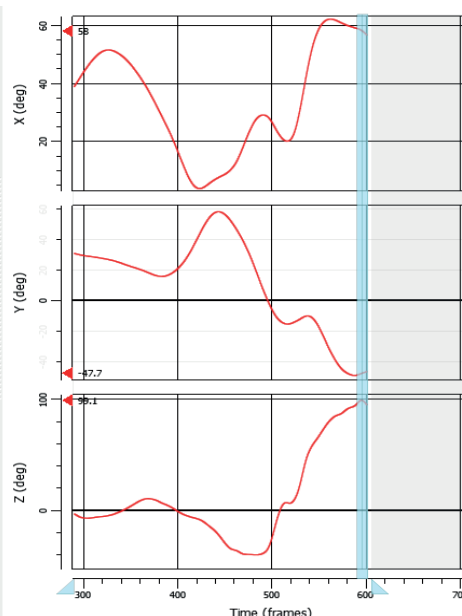


Fig 2. Right shoulder angles at follow through of the free strike on the right. x = flexion / extension, y = abduction / adduction, z = internal rotation / external rotation

Results

Notable differences in joint kinematics were seen between both strikes. Striking on the run is a more wrist dominant strike with total flexion/extension range of 225.7° compared to 66.2° during a free strike, and a total supination range of 213.5° compared to 86.5°, respectively. The free strike is a more shoulder and thorax dominant strike with a thorax rotation range of 156.6° compared to 109.3° during the strike on the run.

The late swing phase of the free strike may increase the risk of shoulder impingement as flexion, adduction and internal rotation were at near peak values. In this position flexion was 58° / 62.1°, adduction was 47.7° / 49.2°, internal rotation was 99.1° / 99.3°.

Discussion

Kinematic data shows striking on the run is a wrist dominant strike. The free strike is a more shoulder and thorax dominant strike. Shoulder subluxations are at highest risk during the late swing phase of the free strike where shoulder angles are at their largest range. This has implications for injury prevention, rehabilitation, and conditioning of the upper body joints for hurling players.

This case study highlights the value of biomechanical investigations into common hurling strikes. A greater understanding of the biomechanics of hurling will facilitate the identification of injury risks and areas where physiotherapists and strength and conditioning specialists can work together to reduce the risk of injury⁴. From the findings of this study, it would appear appropriate that hurlers should focus on the dominance of the wrist joint in their strike and be prescribed exercises that focus on wrist strength and control through a large range of movement.

References

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