THE APPLICATION OF A SPORT-SPECIFIC 3D STEREOSCOPIC STIMULUS TO EXAMINE PRE-PLANNING TIME AND GAZE CHARACTERISTICS DURING EVASIVE SIDE-STEPPING MANOEUVRES.

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INTRODUCTION: It is well established that anterior cruciate ligament (ACL) injuries are serious, debilitating and costly for an individual, while also creating a significant public health burden at a societal level. ACL injuries occur when inappropriate external loads are applied to the knee and most commonly occur during the performance of a side-stepping (Ssg) manoeuvre (Besier et al., 2001a). Previous laboratory based investigations of evasive Ssg have employed generic light or mannequin visual stimuli in an effort to simulate the time and space constraints experienced by athletes, in the preparation and execution of the Ssg manoeuvre (Besier et al., 2001b; Besier et al., 2003; Mclean et al., 2004). However, a possible outcome of attempts to impose these constraints in lab environments is that the use of unrealistic visual stimuli may not accurately reflect or identify the relationship of the perceptual demands of the task with injury risk variables, during a sidestep in game based situations. This study proposes that the presentation of a three dimensional (3D) stereoscopic stimulus (3DSS), featuring a 3D video based sport specific reconstruction of an opposing defender(s) simulating a tackle, may improve the ecological validity of laboratory based investigations. Additionally, the incorporation of the 3DSS tool with eye tracking will allow for the subject's gaze characteristics (fixations, durations on the 3DSS image) to be assessed. The general aims of this study were to:

Technical

- develop a 3DSS that delivers realistic sport-specific constraints to footballers during evasive Ssg manoeuvres,
- create 3DSS scenarios that incorporate realistic game based variations of imposed time and space constraints (e.g. 3DSS tackle scenarios with one or two defenders),
- develop an interface and protocol that integrates the 3DSS system with a commercial eye tracking system (ASL Eye Tracking Recorder), for the purpose of quantifying the lab based subject's gaze characteristics on the projected stimulus during a Ssg manoeuvre,

Experimental

- identify differences in biomechanical variables (kinematic, kinetic and neuromuscular) associated with increased injury risk during Ssg manoeuvres, using a traditional light (light emitting diode) based stimulus (LBSS) compared with a 3DSS stimuli.

METHOD: The 3DSS, featuring scenarios of single and multiple tacklers on a football field, was developed in collaboration with the Western Australian Supercomputer Program (Mr Paul Bourke). While stereoscopic projection is not a new technology, the developed projection format allowed for the scaling of two converging fields of view (FOV). The first FOV was the 3D stereoscopic projection (stimuli) of an oncoming opponent performing a tackle, while the second converging FOV comprised a 'real' lab based footballer performing an evasive Ssg manoeuvre of the 3DSS stimuli.

Two stimuli conditions were examined: 1) the developed 3DDS and 2) an LED based stimuli (LBSS) consisting of a panel of three lights, one of which was illuminated to indicate the required direction of sidestep to be performed. A 12 camera Vicon motion capture system operating at 250 Hz and a 1200 mm x 1200 mm AMTI force plate sampling at 2000 Hz were