



**Priority Statement Title:** Minor-axis neuromuscular control and movement training

**Priority Statement Code:** CJ1C

**Domain:** Joint

### Priority Statement

#### **Background and Relevance**

The human knee (and other joints) is free to move about the major flexion/extension axis, but injuries to the joint often occur under excessive *minor-axis* loading in the frontal/axial planes. Although 3-D multi-axis biomechanical analyses have been used in investigating various physiological and pathological conditions extensively, there is a lack of translational work and practical rehabilitation systems and protocols to train human subjects in controlling risky minor-axis movements and joint load.

#### **Objectives**

Translate 3-D and multi--axis neuro-mechanical investigations from research laboratories to exercise and clinical practice to benefit human subjects.

#### **Potential Impact**

Practical minor-axis training incorporated with major-axis movement and under real-time feedback of joint load will potentially help human subjects improve their multi-axis neuromuscular control, reduce musculoskeletal injuries, and improve post-injury rehabilitation.

#### **Recommended Actions**

Translate 3-D multi-axis biomechanical investigations on human joints and muscles into specific minor-axis training and rehabilitation protocols and address factors related to specific musculoskeletal injuries. The minor-axis training/rehabilitation should be impairment-specific, and be incorporated with major-axis movement to make the training functionally relevant.

To determine in real-time joint load (moments) about a minor axis (axes) specific to the injury and provide it as biofeedback to train individual subjects to improve minor-axis neuromuscular control and change joint loading according to their specific need.