What really causes low back injury? Why may only one individual become injured among a group of workers performing an identical job? How is it that a worker can perform a physically demanding job all day and then “throw their back out” at night picking up a pencil? Is compression the most important loading variable when considering injury? Why do some exercise based rehabilitative approaches work with some patients yet exacerbate others? We have all experienced injury of various sorts throughout our lives, but why do we become injured at all – and why do some not recover? The purpose of this lecture is to introduce some biomechanical concepts of low back injury to be directed towards developing better injury risk reduction strategies together with how they may be employed to enhance rehabilitative outcome.

Reducing the risk of low back injury, and rehabilitating those who have suffered injury is assisted and enhanced by an understanding of the cause. No clinical approach will be successful with therapy if the mechanical cause of the troubles is not removed. Likewise, prevention efforts must address the real cause – which is quite often misreported as the “culminating event”. Very few back injuries occur from a single event, but rather result from the accumulation of trauma. Many clinicians, engineers and ergonomists, believe that the key involves reducing the magnitude of applied loads to the various anatomical components at risk of injury. Without question, reduction of excessive loads is beneficial but this is an overly simplistic view - optimal tissue health requires an envelope of loading, not too much or too little and this is modulated by many biomechanical parameters.

Success in parlaying biomechanics to the clinical/treatment world depends on the recognition of the reality that clinicians must make decisions, and in order to offer assistance, the biomechanical story needs four parts. Part one is a brief review of the injury mechanisms of individual tissues of the low back, and the second section describes injury pathogenesis and injury scenarios. Mechanically based provocative testing of patients forms the next part to identify exacerbators of pain and motions and loads to be avoided. The final component is to quantify the mechanical demands of various exercises and match them to the tolerable capabilities, and rehabilitation objectives, of each patient.

Many low back exercise programs are based on the philosophy to enhance the range of motion and build strength. Yet following this approach sometimes leads to the creation of more patients and/or current patients are exacerbated. Because spine instability both causes incidents that lead to tissue damage and is a consequence of damage, stabilization exercises have become popular. The final component of this presentation is to develop a synthesis of the scientific foundation and quantification of stability as it pertains to the lumbar spine, and then discuss specific guidelines for enhancing stability to advance spine rehabilitation.