Commentary Article

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Kinematic Technique of Instant Centre Analysis of the Knee

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Description

The kinematic technique of instant centre analysis of the knee is described. Determination of the instant centre or cent rode permits identification of the type of motion of the joint surfaces. Twenty-five normal knees were studied and the centroids were located for the range of motion between full extension and 90 degrees of flexion. In all cases, the contacting surfaces rotated about centroids which produced motions whose velocities at the joint surface were tangent to the surface. Thirty knees with internal derangements were also analysed. These joints had instant centre pathways which were abnormal in some portion of the range of motion of each joint. The cent rode abnormalities were associated with surface velocities which tended to force the joint surfaces together or apart and to increase surface friction. Damage to articular cartilage was present at the contact areas corresponding to the knee joint positions which had abnormal cent rode positions. A mechanism of development of degenerative joint disease secondary to a remote traumatic internal derangement is described. The throwing motion is a complex movement pattern that requires flexibility, muscular strength, coordination, synchronicity of muscular firing, and neuromuscular efficiency. During the act of throwing, excessively high stresses are generated at the shoulder joint because of the unnatural movements frequently performed by the throwing. The thrower's shoulder must be flexible enough to allow the excessive external rotation required to throw a baseball. The overhead throwing motion places tremendous demands on the shoulder joint complex musculature to produce functional stability. The overhead throwing motion places tremendous demands on the shoulder joint complex musculature to produce functional stability. The surrounding musculature must be strong enough to assist in arm acceleration but must exhibit neuromuscular efficiency to produce dynamic functional stability.

Discuss the Biomechanics

Tremendous forces are generated at the shoulder joint, at times up to one times body weight. Because of these tremendous demands, at incredible angular velocities, various shoulder injuries may occur. An understanding of the biomechanics of throwing will assist the clinician in the recognition of various injuries and their specific treatment approaches. In this paper, we discuss the biomechanics of the overhead throwing motion for baseball as well as football. Many old adults have difficulty in performing activities of daily living, in maintenance of postural balance, and in recovering from impending falls. It is not yet fully clear to what extent these difficulties arise from age, or diseaserelated declines in muscle function. The strength requirements for the performance of many common physical tasks are not often large. When the time available to make an appropriate response is short, maximum joint torque strengths may not be as important a consideration as abilities to develop joint torques rapidly. Even old adults who are fit and healthy, compared to young adults, have substantially diminished abilities to do this. Recent findings suggest that the source of this decline, at least sometimes, lies in muscle physiology more so than in central processing delays. A considerable amount of research to explore the issues relevant to the relations among muscle function and mobility is currently underway, but much remains to be learned. The effects of altered levels of activity on the biomechanical properties of a ligament were investigated. After eight weeks of immobilization, anterior cruciate bone-ligament-bone preparations of wild primates tested in tension showed significant decreases in maximum failure load and energy absorbed to failure the long-term effects of disuse were shown in a second group. After twenty weeks of resumed activity following immobilization, there was only partial recovery in ligament strength, although ligament compliance had nearly returned to normal. In a third group, a voluntary isotonic exercise of one lower limb performed by the primate during immobilization did not prevent disuse-induced changes in ligament failure properties.

Minimal Footwear

Studies have shown a reduction in injuries to shod forefoot strikers as compared with rearfoot strikers. In addition to a forefoot strike pattern, barefoot running also affords the runner increased sensory feedback from the foot-ground contact, as well as increased energy storage in the arch. Minimal footwear is being used to mimic barefoot running, but it is not clear whether it truly does. The purpose of this article is to review current and past research on shod and barefoot/minimal footwear running and their implications for running injuries. Clearly more research is needed, and areas for future study are suggested. It has been suggested that the cushioning features of modern footwear alter the way that we run and that the controlling features may decondition our feet. Proponents of modern shoes believe that these cushioning and motion control features are needed in order to protect us from injury. Although much has been learned in recent decades about the deterioration of muscular strength, gait adaptations, and sensory degradation among older adults, little is known about how these intrinsic changes affect biomechanical parameters associated with slip-induced fall accidents. In general, the objective of this laboratory study was to investigate the process of initiation, detection, and recovery of inadvertent slips and falls. We examined the initiation of and recovery from foot slips among three age groups utilizing biomechanical parameters, muscle strength, and sensory measurements. Forty-two young, middle-age, and older participants walked around a walking track at a comfortable pace. Slippery floor surfaces were placed on the track over force platforms at random intervals without the participants' awareness. Cadavers are generally still the closest to the actual clinical situation, but they are limited by interspecimen variability, which often requires a matched pair design that can address only one question. Simulated bone specimens limit variability and can replicate normal and osteoporotic bone. In planning the physical testing, the critical mechanical variables involved in answering the research question must be identified and due consideration given to deciding how best to measure them. To summarize, experimental design should be carefully planned before initiating mechanical testing. Sample size calculations should be performed to ensure adequate power and that clinically relevant differences can be detected. This pregame analysis can save significant time and cost and greatly increase the likelihood that the results will advance knowledge.