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Objective gait analysis provides tools to document the gross biomechanical behavior of the human body during locomotion. It extends the ability of clinicians to observe movements not appreciable by human senses. Gait analysis allows for comparison of movement capacity before and after therapeutic intervention.

Using gait analysis in conjunction with other diagnostic evaluations and with new interpretation of existing output parameters extend the ability to assess disability and assess recovery for injury or disease. Use of therapeutic bracing and orthoses can be studied for overall biomechanical loading. Concurrent assessment of joint chemistry determines if the joint is healthy enough for normal use. Future studies should establish biomechanical health in the tissue and cellular levels to promote long term recovery. These studies will direct guidelines for tissue engineered solutions to degenerative changes.

Tissue mechanical properties determine how applied forces are attenuated and distributed within the body and its segments. Among the systems directly affected by the ground reaction forces in gait are the **ligaments and tendons** of the foot and ankle, the **cartilage** and subchondral bone plates of loaded joints and the **microcirculation of the sole** of the foot. Metabolic changes resulting in increased stiffness in extracellular structures affect the rate of destruction of some tissues resulting in chronic injuries. Gait analysis is effective in describing the magnitude, duration and frequency of applied loading but this information must be mated with appropriate assessment of tissue mechanical properties to predict the likelihood of injuries, such as chronic tendonitis, osteoarthritis, or plantar ulceration, and to engineer interventions which successfully resolve their manifestation or reduce the incidence of their occurance.

Research Recommendations:

1. The biomechanical behavior of ligamentous and tendinous tissues must be base-lined for young, healthy individuals and compared to those tissues in older individuals and individuals with disease states such as diabetes mellitus. Such research would be expected to elucidate the effect of glucose cross-linking in structural proteins and the benefits of early detection and arresting the process or possible reversal of that cross-linking.
2. Aberrant loading in the closed kinetic chain of posture and gait involves not only peak loading but frequency and duration. In the periarticular surfaces of bone, gas and nutrients are exchanged to serve the articular cartilage. The subchondral bone plate and extra cellular medium in the cartilage function not only in biomechanical duties, but in tissue maintenance as well. Joint rehabilitation after injury or surgery must be sensitive to those metabolic processes when planning recovery and return to duty.
3. Plantar loading in gait or posture causes immediate blanching of the sole of the foot. With normal tissue behavior, repetitive loading and unloading modulate the arteriole supply to the microcirculation. In the case of aging or in uncontrolled diabetes mellitus, glycation and glycosylation stiffen the soft tissue changing the biomechanical behavior of sof tissue. Early identification of these changes allow a window of therapy to reverse developing cross-links between glucose and structural proteins.