FUNCTIONAL KNEE stability primarily depends on the stiffness of the musculoskeletal tissues spanning the joint.\textsuperscript{1,2} Musculotendinous stiffness (MTS) attenuates joint perturbations encountered during the execution of functional tasks, such as ambulation and jump landing.\textsuperscript{1,3} The attenuation of joint perturbations prevents excessive joint displacement and modifies the loads that would otherwise be imposed on the anatomic structures of the knee.\textsuperscript{1-4}

Basic science experiments have yielded conflicting data concerning donor-site MTS response to autograft tissue harvest.\textsuperscript{5-8} The defect created by harvesting of the bone-patellar tendon-bone (BPTB) autograft for anterior cruciate ligament reconstruction (ACL-R) has been hypothesized to decrease patellar tendon stiffness and to contribute to joint degeneration.\textsuperscript{9} Interestingly, a greater incidence of knee osteoarthritis (OA) has been reported for BPTB ACL-R compared to utilization of a semitendinosus and gracilis (STG) autograft.\textsuperscript{10-12} This difference suggests that the STG ACL-R autograft may better preserve joint health.\textsuperscript{13} The purpose of this report is to provide athletic trainers and therapists with a synopsis of the literature pertaining to MTS response following ACL-R surgery. Possible mechanisms for the discrepancy in the incidence of knee OA following BPTB and STG ACL-R will be presented.

Musculotendinous Stiffness and Dynamic Restraint

Dynamic restraint of abnormal joint displacement is dependent upon muscle activation, which ultimately creates MTS.\textsuperscript{1,14} There are multiple factors that contribute to the development of MTS, which can be classified as either neurogenic (reflex-mediated) or myogenic (non-reflex-mediated) factors (Figure 1). Joint kinematics, tissue transition characteristics, and variation in tendon insertion site can also influence MTS.\textsuperscript{15} Existing biophysical models for MTS are limited in terms of the proportional contributions of the individual factors to resultant MTS.\textsuperscript{16} Nonetheless, MTS is a clinically relevant neuromechanical characteristic that affects joint health.
Stiffness properties of the musculoskeletal system are predictors for performance and injury risk. A stiffer musculotendinous unit crossing a joint may enhance muscle efficiency by transmitting tension developed by the contractile component to the skeletal system. Muscle efficiency is manifested by a rapid rate of force production in response to joint displacement, which facilitates maintenance of dynamic joint stability. Thus, insufficient MTS may predispose the knee to instability. A gender difference in quadriceps and hamstrings MTS has been proposed to account for the gender difference in ACL injury incidence. Rittweger et al. have suggested that a reduction in patellar tendon stiffness following BPTB ACL-R surgery may contribute to development of knee OA. Muscle dysfunction has replaced “wear and tear” as the primary factor believed to influence development of degenerative joint disease at the knee. Thus, a documented difference in knee OA incidence between BPTB and STG ACL-R cases may be attributable to the propensity for the hamstrings tendons to maintain greater donor-site MTS compared to that of the patellar tendon after autograft harvest.

**Figure 1** Abbreviated paradigm depicting factors contributing to musculotendinous stiffness, a key constituent of functional knee joint stability and performance capacity.

**ACL Injury, Reconstruction, and Musculotendinous Stiffness Responses**

Anterior cruciate ligament rupture is a common sports injury that can substantially reduce a patient’s quality of life. Approximately 200,000 ACL ruptures occur annually in the United States. Anterior cruciate ligament deficiency is often associated with recurrent subluxation episodes, which increase susceptibility to secondary structural lesions and OA. To restore