Use of Functional Knee Braces After ACL Reconstruction

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FUNCTIONAL KNEE BRACES have been used to prevent and manage knee injuries for many years. In the anterior-cruciate-ligament-reconstructed (ACL-R) population, knee braces are often prescribed to protect the ligament graft during functional activities, thereby facilitating an earlier and safer return to sports participation. Their effectiveness in this regard, however, remains controversial.

One of the most common causes of ACL injury is a noncontact mechanism associated with landing from a jump (Noyes, Mooar, Matthews, & Butler, 1983). Therefore, jump landings should be a concern when a reconstructed individual returns to functional activities. Peak ground-reaction force (PGRF), the maximum force of the ground exerted on the body, represents the magnitude of impact associated with landing from a jump. Although many researchers have evaluated the kinetics of landing from a jump, a question remains concerning the role of PGRF magnitude in relation to knee-injury susceptibility.

The Research

Studies on plyometric training have suggested that decreasing PGRF on landing is important to reduce forces experienced at the hip, knee, and ankle (Hewett, Stroupe, Nance, & Noyes, 1996), thereby, theoretically, decreasing the risk of lower extremity injuries. A paradox exists, however, between injury rates and PGRF magnitude. It is well established that men generate greater PGRFs than women do (Hewett et al.). Why then, do they experience far fewer ACL injuries? Some researchers attribute this to the ability of men to generate greater knee-extension moments than women do (Hewett et al.).

Other studies suggest that increasing PGRF is advantageous. Kuster, Grob, Kuster, Wood, and Gachter (1999) evaluated ACL-R individuals landing from a jump with and without an elastic-compression knee sleeve. The increase in PGRF while wearing the sleeve was attributed to an increase in patient confidence, improved muscle coordination, and an increase in tolerance of shear forces.

In our research at the University of Tennessee at Chattanooga, we have found that jump-landing PGRF increases in ACL-R individuals when they are wearing a functional knee brace (Figure 1). This finding might be attributed to some combination of the following interrelated factors: improved neuromuscular control, a stiffer landing pattern (decreased knee flexion), and a psychological effect that decreases apprehension. In addition, weaker participants (<60% peak-hamstrings-to-peak-quadriceps ratio or <80% peak-quadriceps-to-body-weight ratio) produced greater PGRF when wearing a brace than when landing in an unbraced condition. These results suggest that weaker athletes rely on the brace to a greater extent than do stronger ones.

A review of the literature suggests that the increased PGRF produced by bracing is not necessarily problematic. Hoffman, Liebermann, and Gusis (1997) found that experienced parachute jumpers landed with a greater PGRF than did novice jumpers. They attributed this to a stiffer landing strategy being used by the experienced jumpers. The novice jumpers dis-
played greater amplitudes of lower extremity joint displacements immediately on landing, which might increase the likelihood of injury (Hoffman et al.).

**Conclusion**

Adequate strength seems to be a key consideration. PGRF is likely to increase while one is wearing a knee brace, and quadriceps strength is important to dampen the impact of these forces on the articular surfaces of the knee joint. Athletic trainers and therapists should not consider 80% strength of the noninvolved extremity an acceptable level for discontinuation of strengthening exercises; restoring optimal strength should be the goal of rehabilitation.

When managing ACL injuries with functional knee braces, clinicians should consider their effect on PGRF. Landing from a jump is a very common element of many athletic activities. Although PGRF tends to increase when one is wearing a knee brace during jump landings, the athlete’s ACL graft is not necessarily at greater risk. Optimal quadriceps strength should be restored to dampen the effect of ground-reaction forces on the articular surfaces of the knee, and an optimal hamstrings-to-quadriceps strength ratio should be attained to maximize dynamic control of knee displacement. If optimal strength has been restored in the lower extremity, a functional knee brace can provide additional protective benefit, and its effect on PGRF might be associated with improved athletic performance.

**References**


Hoffman, J.R., Liebermann, D., & Guisis, A. (1997). Relationship of leg strength and power to ground-reaction forces in both experienced and novice jump trained personnel. Aviation, Space, and Environmental Medicine, 68, 710-714.


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