Open–Versus Closed–Kinetic Chain Exercise

OPEN–KINETIC CHAIN (OKC) exercise is often an overlooked and underrated method of training athletes. Exercising muscle groups through a single joint movement with resistance applied distally in a nonweightbearing mode is a staple of resistance training, yielding hypertrophic changes. Although closed–kinetic chain (CKC) exercises are believed to be more functional and more safe by many strength and conditioning professionals, the evidence to support these opinions is based on very limited available data. The benefit of training in the OKC is isolation of involved muscle groups through a full range of motion. In addition, OKC exercise may minimize shear forces at the joint, thereby minimizing the chance of injury.

Biomechanical analysis reveals that both OKC and CKC movements are inherent in most athletic endeavors in varying degrees, and therefore, each is suitable for mimicking functional activity. For example, a greater amount of time may be spent during the hip swing phase (OKC) in running than in the landing and pushing phase (CKC). A complete needs analysis of the athlete would indicate a need to design a program utilizing both forms of training.

The goal of every strength and conditioning professional should be to provide the athlete with an optimal combination of exercises. Including one form of exercise with the total exclusion of another form is shortsighted and a disservice to the athlete.

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STRICT CLOSED–KINETIC CHAIN exercise (CKC) is defined as exercise in which the distal segment is fixed against an external, unmoving resistance. Put simply, these are exercises in which the feet or hands are fixed from moving. CKC exercises offer a variety of benefits over open–kinetic chain exercises (OKC).

The most important benefit is that CKCs are functional with respect to both life and sport. Examples are the push-off phase of the gait cycle, jumping actions, and the push-up. With respect to sport performance, few sports involve exclusive OKC movement patterns. More often, these open-chain activities occur in conjunction with CKC activity. For example, baseball pitching involves OKC movement of the throwing arm. However, the forces contributing to the speed of the pitch were initiated with the legs. Keeping the concept of specificity of training in mind, a CKC exercise would better condition a pitcher for throwing activities than would an OKC exercise. From a time management standpoint, CKC exercises are more practical.

Because of its multijoint nature, CKC exercise stimulates multiple muscles in their proper sequential recruitment patterns, thus conditioning the central nervous system as well. OKC knee extensions may strengthen the quadriceps, but CKC squats condition the quads, hamstrings, gluteals, adductors, and core with 1 exercise. In short, CKC exercises can condition the athlete to perform in a functional manner that more specifically correlates to his or her sport.

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