Stability of the knee depends on a system of support from its ligaments and capsular structures (Anderson & Hall, 1997). The anterior cruciate ligament (ACL) accounts for significant stability in the knee because it prevents the femur from moving posteriorly during weight-bearing activities. It can also stabilize the tibia against excessive internal rotation during running and cutting activities (Amheim & Prentice, 1999).

Knee injuries occurring to athletes can result in surgery and extensive rehabilitation. Injuries to the ACL are among the more common ligament injuries to the knee in sports (DeLee & Farney, 1992). ACL injuries have been shown to occur more often in female than in male volleyball players (Ferretti, Papandreou, Conteduca, & Mariani, 1992). ACL injury rates are significantly higher for women participating in intercollegiate basketball and soccer than for male athletes, and suggested reasons for this include muscle strength, skill level, joint laxity, limb alignment, and size of the ligament (Arendt & Dick, 1995). Gymnastics and martial arts are other activities with a high rate of ACL injury (Backx, Beijer, & Bol, 1991). The most frequent mechanism of injury in volleyball is landing from a jump in an attack zone (Ferretti et al.). This can include both spiking and blocking (Schafle, Requa, & Patton, 1990). Most ACL injuries occurring during athletic participation are noncontact in nature (Daniel, Stone, & Dobson, 1994). Athletes with smaller intercondylar-notch dimensions are at greater risk of ACL injury (Anderson, Lipscomb, & Liudahl, 1987), and notch indexes can be smaller in women than in men (Souryal & Freeman, 1993).

Rehabilitation after orthopedic injury is vital to successful return to competition. Detraining is characterized, among other changes, by marked alterations in the cardiorespiratory system and the metabolic patterns during exercise. Mujika and Padilla (2001) indicated that in highly trained athletes, insufficient training induces a rapid decline in maximal aerobic capacity and athletic performance. Furthermore, these changes might start to occur within 10 days of training cessation. Among the mechanisms responsible for this detraining is reduced blood volume (Coyle, Hemmert, & Coggan, 1986).

A wide variety of rehabilitation protocols and equipment are used in the management of ACL injuries. Athletic trainers and therapists have numerous therapeutic modalities and exercise equipment available for their use. Isokinetics, plyometrics, closed kinetic chain exercise, and aquatic therapies can all serve a purpose in rehabilitation. Maintaining cardiorespiratory fitness during orthopedic rehabilitation using traditional stationary cycles, steppers, or unloading devices is often difficult or impossible because of associated orthopedic pain.
To date, no documents are found that report the use of the Psycle™ ergometer in the rehabilitation of orthopedic injuries, although numerous reports exist regarding its use in training individuals with spinal-cord injuries (Priest, Hagan, Simpson, & Jennings, 1995; Welsh & Priest, 2000; Willoughby, Priest, & Jennings, 2000; Willoughby, Priest, & Nelson, 2000). Therefore, the purpose of this article is to report the use of the Psycle in the orthopedic rehabilitation and cardiorespiratory training of an athlete after she had ACL-reconstructive surgery.

Subject
An 18-year-old freshman volleyball player reported to fall camp to begin her college career. During her initial preparticipation physical examination, the team physician noted significant left-knee-joint laxity as a result of an injury sustained in high school. She was disqualified from participation and underwent reconstructive ACL surgery using a patellar-tendon graft.

Methods
A leg cycle ergometer (Psycle, Intellifit®, Wichita Falls, TX), unique to our university, was used for the rehabilitation of the injury (Figure 1). Normally used to meet the rehabilitative and reconditioning needs of the severely disabled, it had not been used for college athletes. The recumbent-design ergometer is controlled by a microcomputer. It provides precise control of power outputs from 2 to 450 W and pedal forces from < 1 to 90 lb (Figure 2).

Several mechanical and ergonomic developments allow for accommodations based on the limitations of the injured athlete. Adjustable crank arms (77–177 mm) provide appropriate range of motion for the hip and knee, and pedal adjustments provide control of plantar and dorsiflexion (Figure 3). A bidirectional flywheel allows both forward and backward pedaling. Heart rate is monitored by telemetry. Real-time exercise-performance measures (pedal rate, power output, and heart rate) are monitored while cumulative exercise variables are tallied and summarized on printouts. Graded exercise tests are preprogrammed. Modes of operation for training include interval training, constant power, and speed-independent workloads. Although many conventional pieces of equipment are used in the rehabilitation of athletic injuries, few have features to provide concise monitoring of the cardiorespiratory impact of training. The Psycle software monitors heart-rate response to orthopedic training.