

# THE REHABILITATION PROCESS

## THE INDIVIDUAL WITH AMPUTATION

The development of temporary prosthetic function has been one of the most significant advances in rehabilitation over the past two decades. Automated fabrication using computer-aided design/computer-aided manufacturing (CAD/CAM) promises to provide inexpensive, functional early-fit prostheses, as well as improved definitive limbs, at an acceptable cost. These new prostheses are designed to be lightweight, energy-storing, and adjustable at the socket interface in order to maintain socket fit as the residual limb matures. Their early and routine use leading up to definitive prosthetic fit is becoming standard accepted practice.

When the first temporary prosthesis is fitted, physical activities are gradually begun. A temporary prosthesis is usually started after the wound is healed and a degree of residual limb shrinkage has occurred. Timing is important. If a prosthesis is made before the major portion of the shrinkage occurs, a new limb will be required within a few weeks. During the first year after surgery, the temporary prosthesis will require regular adjustments and often several replacements as the size and shape of the residual limb become stable.

Physical conditioning may begin without wearing the prosthesis. Stretching and flexibility exercises, Nautilus™ or similar seated weight-training machines, and sports such as swimming, stationary bicycling or rowing, water aerobics, and crutch soccer may be performed without a prosthesis. As the resid-

ual limb stabilizes in size, more time can be spent in activities that require wearing the prosthesis.

The prosthesis should be viewed as an assistive device. Prostheses permit better performance, fit more comfortably, are lighter in weight, and look more realistic than ever before, but they do not replace a real leg in function. They do not automatically adjust to changes in weight or other causes of increased interface pressure.

Many people who are getting their first prosthesis tend to start doing too much too quickly. This can often lead to pain and irritation of the residual limb or other parts of the body that are compensating for the amputation. It can result in the temporary inability to wear the prosthesis. Such setbacks are discouraging. The entire body, as well as the residual limb, needs to adjust to the new stresses. Until the individual is fully adapted to walking comfortably with the prosthesis, movements that produce increased stress (such as running) should not be attempted.

Most healthy people with a unilateral lower limb amputation will be able to run or jog as they wish, and some may become successful competitors in sports events that require endurance running. In more limited circumstances, these activities are possible for those with bilateral amputations. For individuals who are subject to residual limb soft-tissue breakdown as a result of scarring—or for other reasons—as well as those with high-level amputations, it may be better to choose activities that do not require the use of a prosthesis.



ELAINE NAISMITH

Elaine Naismith continues her work as a flight attendant and enjoys playing tennis.

Exercise is effective only if it is done on a regular basis; sporadic exercise is not much better than no exercise at all. Ideally, one should start with an activity participated in prior to the amputation. Most people will be able to get back into shape. Many individuals who were not physically active before losing a limb have improved their physical condition. They have understood that being fit provides them with the energy they need to overcome their disability.

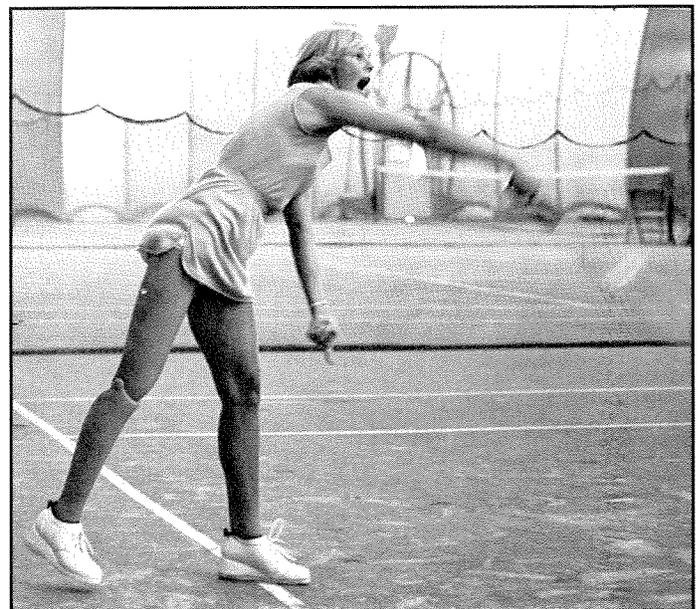
### Considerations for Older People

Most amputations performed today result from peripheral vascular disease, diabetes, and related con-

ditions; a majority involve the lower limb and are related to the general health of the individual. Many of the individuals who require amputation are 60 years of age or older. This population poses a new challenge for health care and rehabilitation professionals. Accidents and other trauma-related causes account for a modest percentage, as do tumors. A small segment of the amputee population results from congenital limb loss and congenital limb deficiencies, while war-related and natural disaster amputations remain a factor in many areas of the world.

Physical fitness for the older adult is important. Muscles lose their elasticity with passing years. Changes in the arteries and the pumping action of the heart may cause a decrease in blood delivery to exercising muscles. Moderate physical activity can slow the aging process and provide the benefits of better health.

In beginning an exercise program, each aspect of muscle conditioning must be gradual and carefully monitored because, for some older individuals, even a gentle exercise routine can involve risk. As strength is developed, walking and light jogging can become part of the routine. Consistency in performing the exercise program is especially important. The aging process is accompanied by diminishing muscle flexibility, strength, and endurance. A consistent



ELAINE NAISMITH

Elaine Naismith added lifts to tennis shoes so that the same prosthetic foot can be used with dress shoes.

physical fitness program has shown to slow these aging effects.

### Considerations for Children

In children with congenital limb deficiencies, residual lower limbs often will allow partial or full end weightbearing. This is particularly true when no surgery has been necessary and the soft tissues at the distal end of the residual limb possess weightbearing capacity. Prosthetic components available to children and small adolescents are limited compared with the choices available to the adult population. Prosthetic fittings for children must be maintained and checked on a regular basis to accommodate for growth.

### THE REHABILITATION TEAM

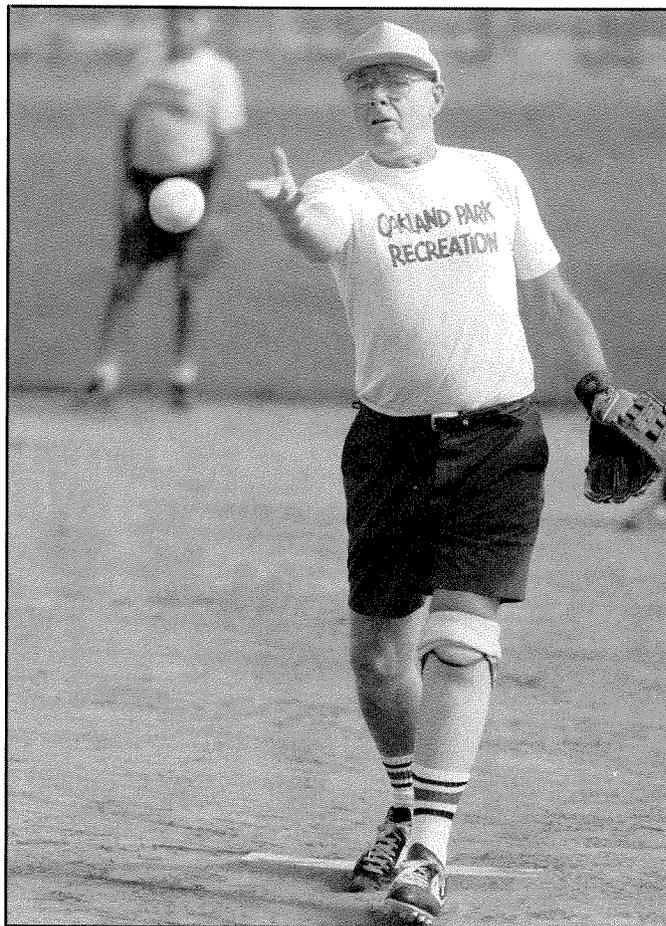
Rehabilitation of a person who has had an amputation requires a special care-giver team. No single health care discipline can provide all of the services needed. The patient is an active participant in each step of the recovery process. Along with the patient, the primary members of the rehabilitation team are the surgeon, physical therapist, nurse, and prosthetist.

The initial purpose of this team is to monitor the healing process in preparation for fitting a prosthesis. Physical therapy begins in the hospital; a program for physical conditioning is usually discussed later in the rehabilitation process.

### Preoperative Considerations

When the amputation is elective, the physical part of the recovery process can actually begin prior to surgery. It consists of stretches to improve range of motion of joints and weight resistance exercises to increase strength and endurance. Rehabilitation goals may be discussed at that time to help the individual understand what he or she can expect in the way of return of function.

A visit by one whose circumstances compare to those of the patient awaiting amputation is one of the best forms of preoperative counseling. An elderly person may view the upcoming amputation as the end of life: immobilized, confined to a wheelchair or bed, and totally dependent on others for care. A visit from an active person of the same age who has had an amputation can often overcome these fears. A young person is almost always responsive to a



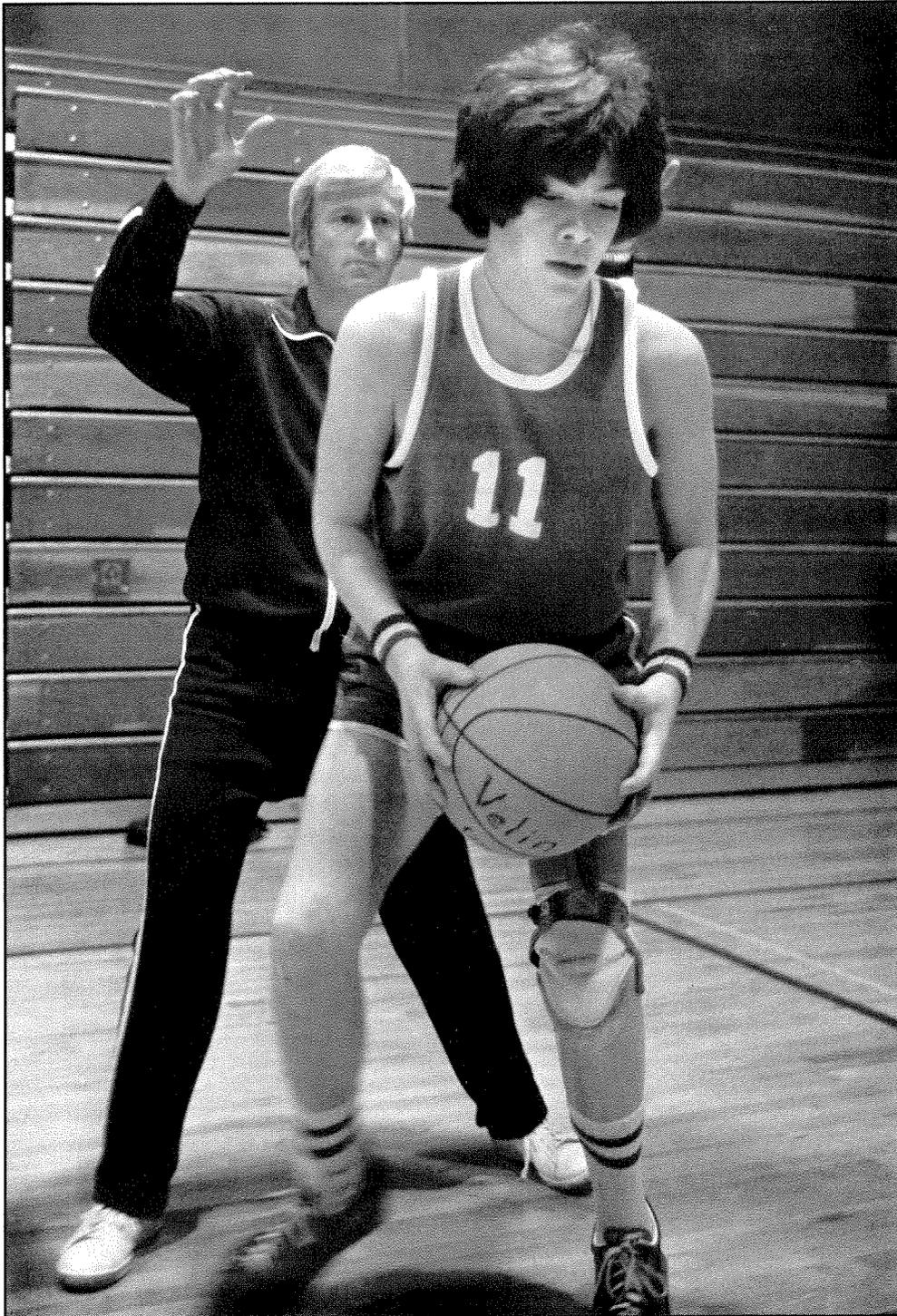
KEITH HADLEY/NEWS-SENTINEL  
World War II veteran Ed McCausland plays recreational softball on a nondisabled league.

visit from a young amputee who has recently been snow skiing or bicycling or playing tennis.

Apprehension about pain is a serious concern. The patient should know that pain will be properly controlled following surgery and that adequate medication can even allow for early movement and physical activity.

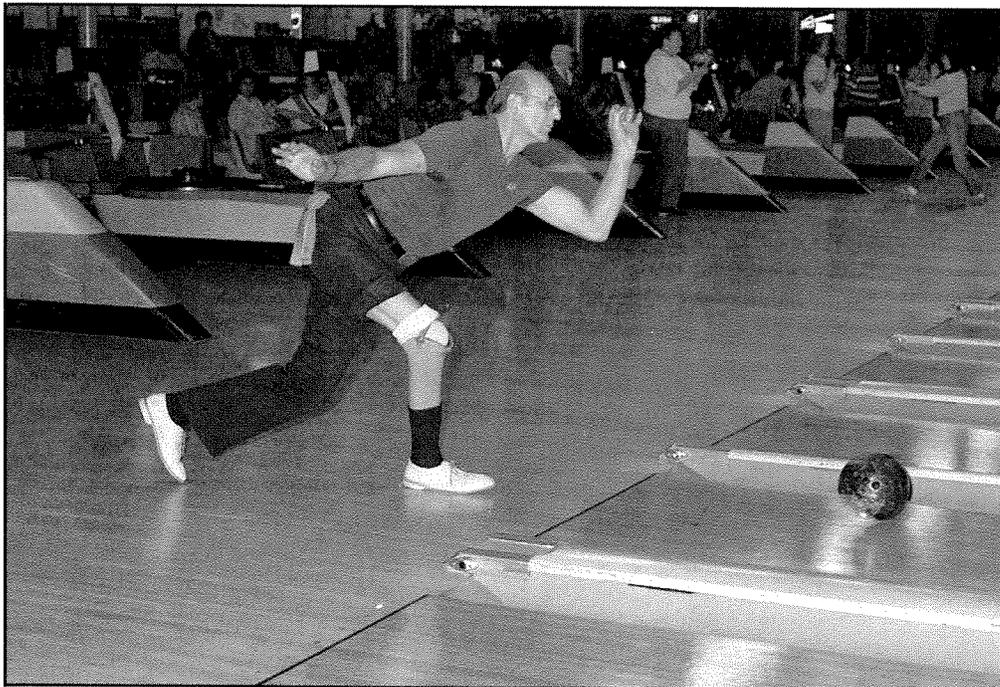
### Surgical Procedures

The surgeon who performs the amputation is responsible for selecting the level of limb removal and for reconstructing the residual soft tissues and bone. Technical details of amputation surgery (conservation of length, muscle stabilization, treatment of bone, nerves, blood vessels, and subcutaneous tissues) are critical to residual limb function. The muscles and remaining joints of the residual limb act to control the prosthesis. Muscle action through the tendon and aponeurosis attachments to bone also



PETE LIDDELL/SEATTLE TIMES

Mike Day practices basketball moves with coaching from his high school athletic director, Rich Gustafson.



JOHN WOODMANSEE/DVAMC, SEATTLE, WA

Joe Demkovic, a World War II veteran, bowls three times a week.

provide a sense of proprioception (position and movement) and are very important to prosthetic control.

The degree and extent to which an individual with an amputation can engage in normal physical activities and sports will often be determined during surgery. Modern surgical techniques are described in medical textbooks, and new applications can be found in state-of-the-art monographs.

### Postoperative Rehabilitation

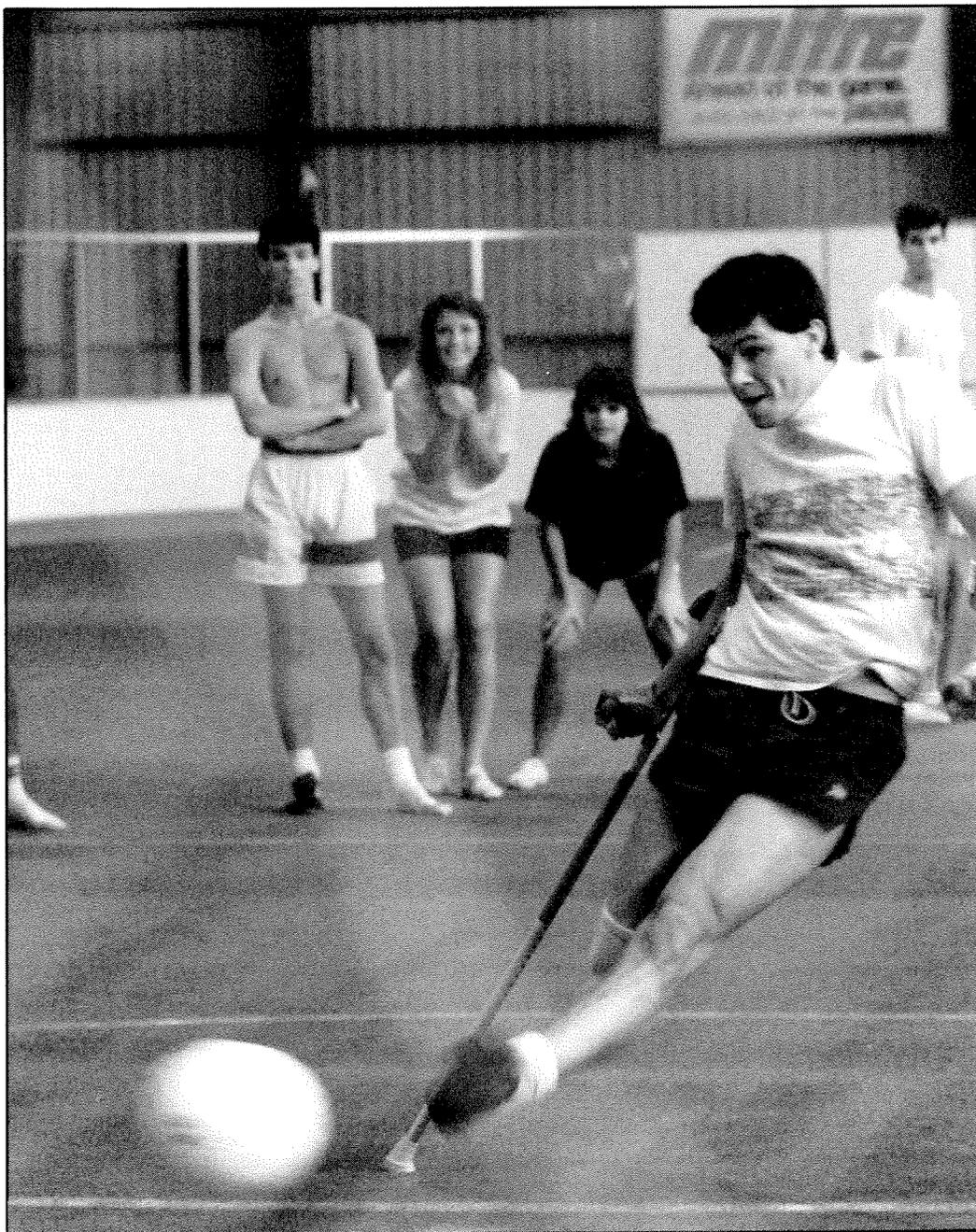
Emphasis upon immediate and progressive physical movement and prosthetic applications has accelerated the rehabilitation period for people of all ages. Two goals direct rehabilitation management. The first is to obtain uneventful wound healing. The second is to begin the rehabilitation process immediately.

These objectives are best accomplished by rigid dressing management which provides support, protection and rest for the tissues, a clean wound-healing environment, and pain control. Because of these features, rigid dressings allow the patient to move about comfortably early in the postoperative

period. The rigid dressing actually forms a receptacle which can serve as a socket for an immediate or early postoperative prosthesis. Limited weight-bearing using crutches or a walker may begin as soon after surgery as the patient is able, with moderated increases in the amount of weight as wound healing progresses. Full weightbearing is not allowed until the use of a temporary socket can be tolerated.

In other postoperative methods, elastic bandages (e.g., Ace® Brand™ Athletic Bandage) or an elastic stockinette are used to wrap the residual limb to prepare it for prosthetic fitting. The pylon and foot, which can be attached to a plaster cast, allow for early limited weightbearing. Soft dressings are easy to apply, but are not usually as effective as a rigid dressing.

Progressive rehabilitation is the key to recovery. A carefully planned and well-timed recovery process that encourages optimum physical activity is basic to regaining a sense of “wholeness.” The rehabilitation team will recommend community organizations that are involved in physical fitness and provide support services, such as National Handicapped Sports (NHS), which offers specialized instruction in adapting physical activities to individual disabilities.



STEVE WILBER, SEATTLE, WA

Kevin Wilson goes for the ball in a game of crutch soccer.



J. CONRAD WILLIAMS, JR./NEWSDAY

Recent advancements in prosthetic technology have made active physical pursuits, such as competitive running, possible and rewarding for many people with lower limb amputation. Pictured is Dennis Oehler, who set a world record of 11.73 seconds in the 100 meter dash event for BK amputee athletes at the 1988 Olympics in Seoul, Korea.