



Walking and Running

The following is taken from Physical Fitness:
A Guide for Individuals with Lower Limb Loss.
By Ernest M. Burgess, M.D. and Albert Rappoport,
C.P.

Walking

Walking is the most natural form of aerobic exercise. It is also the most gentle. It does not place undue stress on the musculoskeletal system because one foot is always in contact with the ground. It does not require any special training, skills, or equipment.

Although walking is basic to almost everyone, there are certain techniques that will enhance its aerobic benefit.

- Maintain an upright posture with shoulders back and head held up.
- Let the upper body do some of the work by swinging the arms in coordination with the legs.
- Land on the heels of the foot and push off with the toes.
- Establish a comfortable, consistent rhythm.

The aerobic benefits of walking will be further improved by increased pace, length of stride, and distance walked.



Photo: Ottobock HealthCare

The only equipment needed for walking as an exercise is good shoes. This is especially important for a person with a unilateral amputation, since much stress is placed on the sound limb. Two important features to look for in walking shoes are firm heel support and a flexible forefoot. Walking shoes should fit comfortably even when new.

The prosthetic components selected for everyday use will generally be suitable for walking as an aerobic exercise. On occasion, some modifications or separate prosthetic components may be needed. Energy-storing feet are an advantage for most individuals – a single-axis foot or the combination of a multi-axis ankle with an energy-storing foot is good for walking down hills and provides for increased knee stability. Additional suspension may be needed.

A person with lower limb loss who is comfortable standing and moving about with a prosthesis will find that walking is excellent for beginning and maintaining an aerobic conditioning program. However, if you are experiencing difficulties as the result of surgical, prosthetic, or musculoskeletal problems, consult with your physician, prosthetist, and therapist.



Designing a Walking Routine

Walking for exercise should be approached in a manner similar to other types of aerobic sports.

Walkers should start slowly and gradually build up time, distance, and speed over a predetermined number of weeks of training. Sports medicine experts recommend that the minimum amount of exercise needed to maintain good aerobic health is 20 minutes, three to four times per week. Walkers should work up to a combined total of about three hours a week, walking at a pace that maintains the heart rate in the targeted zone of 70-85 percent of 220 minus their age.

Some individuals cannot maintain their heart rate at 70-85 percent of maximum for as long as 20-30 minutes. Similar fitness levels can be achieved by exercising at a lower intensity level for a longer period of time.

Three hours of walking per week is generally adequate for most individuals to maintain good aerobic fitness. Certainly one can gain additional benefits by training for more than three hours a week, but it is not necessary unless one is interested in competitive activities. It is best for beginning walkers to train every other day with a rest day in between. This allows the muscles to relax and recover. In the beginning, it is more important for the walker to concentrate on the length of time he or she is able to maintain the target heart rate than to be concerned with distance covered.

Walking for aerobic fitness is more demanding than ordinary walking; warm-up and stretching exercises before and after walking will help prevent muscle soreness.

Running

Running is one of the most efficient ways to achieve aerobic conditioning. It can also be one of the most difficult activities for a person with lower limb

amputation. Running requires foot-over-foot movement and causes musculoskeletal stress from the impact of landing. Many individuals wearing prostheses can comfortably sprint and run short distances; however, running long distances presents an entirely different situation. Long-distance running requires a high degree of personal motivation. For those with lower limb amputation, it also requires a properly designed prosthesis and a residual limb that is able to withstand the substantial forces generated by the impact of landing.

Running is Not for Everyone

Running is a strenuous form of exercise. It can sometimes cause debilitating problems with regard to skin, muscle, ligaments, and tendons in the legs. Therefore, running as exercise should be carefully considered by those with lower limb loss. Factors that affect the ability to run are the nature of the surgery, the prosthetic fitting, the general state of physical fitness, personal motivation and the level of amputation and the condition of the residual limb.

It is recommended that everyone, particularly those over age 35, consult a physician before starting a running or jogging program for fitness and conditioning.

Once medical approval has been obtained, individuals who have not previously exercised should proceed with moderation. Before a new prosthetic leg is built, anyone with lower limb amputation considering running should inform the prosthetist so that he or she can design it with that in mind. If running or jogging causes any pain or irritation, the prosthetist should be consulted immediately.



Most individuals will not be able to run or jog for extended distances and time without periodic irritation to the residual limb. Alternative aerobic activities may be better for those who experience persistent residual limb irritation. Activities such as walking, swimming, or bicycling are less traumatizing to the residual limb.

Running Surface



The running surface substantially affects the ability to run. Running on grass does not cause stress to the body as much as running on a concrete or asphalt surface. For the runner with lower limb loss, however, grass may be more

difficult. The surface is not always even; rocks and holes can throw a runner off balance, causing irritation to the residual limb. Running on grass also tends to dampen the push-off built into energy-storing feet. Even with these problems, some runners prefer grass because it lessens the shock to the body. Alternatively, a hard, even surface can be preferable to grass because it is a consistent surface, permitting the runner to land the same way each time.

Energy-Storing Foot Design

Energy-storing feet provide comfort as well as improved performance. They are particularly well suited to running because of their responsiveness, light weight, and adaptability to many conventional prostheses. You should talk with your prosthetist about the amount and type of running you will be doing as he/she can then determine which foot would work best for you.

Foot-over-Foot versus Hop-Skip Running

Individuals with above knee (AK) amputations have had great difficulty running in a normal foot-over-foot fashion because the impact at heel strike must be absorbed by knee flexion. Conventional AK prosthetic components do not provide a great deal of knee flexion. Without knee flexion, one must use a hop-skip method of running. In the hop-skip method, both legs cannot be off the ground simultaneously. A double-stance phase takes place when the sound leg makes the second hop.

The extra second hop gives the time needed to get the prosthesis out in front. The hop-skip method causes the legs to be close together at heel strike, which lessens the impact when landing on the prosthesis and increases the knee flexion moment. The hip is also in a better position to extend the residual limb to further control the tendency for increased flexion of the knee.

New designs in feet and pylons include “shock absorbers” which compress and cushion the impact to the residual limb. From heel strike through mid-stance the spring is compressed to shorten the prosthesis slightly and lower the center of gravity. As the runner rolls over the toe, the spring is released at toe-off, which moves the prosthesis forward into swing phase.

No matter what you chose – walking or running – it is important to talk to all members of your clinic team about an exercise routine. Each member of the team has expertise and will have noticed different things about your amputation and current physical condition.