AMERICAN COLLEGE of SPORTS MEDICINE
LEADING THE WAY

A Road Map to Effective Muscle Recovery

As a physically active individual, recovery is key to preventing injuries and allowing the body to rebuild itself after the stress of exercise. Our muscles, tendons, ligaments and energy stores require recovery, repair and replenishment to perform at our best during the next exercise bout. For new or more intense exercise our muscles can often become sore within 24 to 48 hours after exercise, but soreness is not vital for an adequate recovery routine. Muscle soreness can occur when cellular waste products accumulate in muscle cells leading to inflammation or by micro-tears that occur in the muscle fibers. There are many different strategies to maximize recovery and minimize the amount of muscle soreness experienced after exercise. From good nutrition, sleep, regular days off, to different methods and tools, use this exercise recovery road map to find the best strategy to recover quickly and effectively.

Dynamic Warm-up: A dynamic warm-up is a great way to prime the body for activity. Lingering soreness can be alleviated by a dynamic warm-up by encouraging blood flow and movement through a large range of motion[1]. A dynamic warm-up consists of a few minutes of an activity that will elevate heart rate (such as jogging, jumping jacks, or cycling) followed by dynamic movements (such as lunges, leg swings, or arm circles). These movements should move joints through a large range of motion, coming in and out of the movement without stopping for too long.

Active Cooldown: By performing a few minutes of low-intensity aerobic exercise after a workout, the body is able to gradually decrease blood pressure and heart rate, while preventing blood pooling in the limbs. During intense exercise, the body breaks down chemicals that can cause fatigue and muscle soreness. Incorporating an active cooldown is a great way to circulate the cellular waste products so that they do not accumulate in the muscles. It is important to note that even if you don't feel sore after your workout, the waste products that build up in the muscle can cause fatigue during your next workout, ultimately affecting performance.

A great way to accomplish an active cooldown is by walking on a treadmill or pedaling a stationary bike at an easy pace for 5 to 10 minutes at the end of your workout[2].

Stretching and Mobility: After your heart rate has returned to resting levels, the next step is to begin focusing on the muscles that you worked out. Muscles can become tight and fatigued from exercise and stretching can alleviate sensations of tightness and restriction. In our daily lives, our posture can also become altered due to our day-to-day working positions.

In order to keep the tendons and muscles mobile, it is recommended to stretch each muscle group for at least 60 seconds. This can be accumulated into sets of 10-30 seconds at a time or all at once[3].While stretching, a mild discomfort may occur, but sharp or intense pain should be avoided.

The idea is to let the muscle relax into the stretch, where forcing a position can cause the muscle to tighten up or even cause injury. All stretching and mobility exercises should be completed in a slow and controlled manner, while breathing throughout each exercise.

Myofascial Release: Myofascia is the connective tissue that surrounds the entire body. Normally, the myofascial system moves seamlessly as the body moves. However, restrictions in the fascia can lead to pain, stiffness, and loss of function. Myofascial release techniques aim to restore mobility, improve blood circulation, and decrease areas of pain and tenderness[4]. There are several tools on the market. See the ACSM brochure on self-myofascial release tools!

Foam Rolling: Gently roll the affected body part over the foam roller, about one inch per second for about 30 to 60 seconds total. For specific areas that feel tight, you can isolate 10 to 15 seconds on that area[5], but then make sure to move on. As with stretching, a mild discomfort is acceptable, but pain should not be excessive. Slowly increase the pressure as tolerated and work on the areas that feel tight or sore. Avoid rolling directly on bones and joints or spending too much time on one area. It is also important to work around the muscle area that might be sore or painful, rather than directly on the area itself. There are many different types of foam rollers available with varying firmness and textures. A soft, smooth foam roller will result in less pressure, which may be more suitable for beginners.

Massage: Post-workout massage therapy can also be a recovery strategy. Current research indicates that it is effective in reducing muscle soreness and perceived fatigue after exercise[6]. Massage can increase blood flow to the area and has been shown to decrease pain and inflammation caused by metabolic products that have built up during exercise. Massage therapy should be performed after exercise and include sessions of at least 20 to 30 minutes to produce best recovery results.

Hydration: Hydrating prior to exercise, during, and post-exercise plays an important role in how you recover. While it is common to remember to hydrate during exercise, many times we forget the importance of starting exercise well hydrated. It's important to ensure proper hydration prior to exercise because it will adversely affect how you perform during your exercise session, especially if you are exercising in a hot, humid environment. As a general recommendation prior to exercise, you should drink about 5 to 10 ml/kg of your body weight (~2 to 4 ml/lb) in fluid in the 2-4 hours before exercise[7]. For example, a 150 lb person should drink between 300 and 600 milliliters (~0.5-2.5 cups) of fluid prior to exercise. During exercise, it is important to drink enough water to replenish fluid lost through sweating. It is recommended to drink small amounts of fluid throughout the duration of exercise. This ranges from 0.3 to 2.4 liters per hour of activity depending on the intensity, duration, fitness level, and other environmental factors. This will not only help you exercise longer, harder, faster, but will support your body into recovery. Lastly, post-exercise hydration is critical to accelerate recovery. To get a more accurate idea of how much fluid should be replenished, you should weigh yourself before and after your workout and make sure that you at least drink enough fluids to restore bodyweight to pre-workout weight. As a rule of thumb, try to limit a decrease in your body weight of greater than two percent[7]. Here's an example! You're getting ready to exercise and record a pre-workout weight at 200 pounds. Your post-workout weight was 198 pounds. This means you lost two pounds during your session. This is approximately a one percent of body weight loss. In this example you should target a little over one liter to ensure proper hydration recovery.

Nutrition: Nutrition is another key step to recovering quickly and adequately. According to the joint position paper released from the Academy of Nutrition and Dietetics and ACSM in 2016, the nutritional principles for recovery include adequate energy (caloric) intake and macronutrient distribution (carbohydrates, proteins and fats)[7]. Although energy and macronutrient requirements are different based on activity type and individual differences, the basics for including adequate energy, carbohydrates, fats and protein is to help facilitate performance and recovery. Sufficient energy intake supports overall body functions, body composition and how we use our fuel (carbohydrates, fats, protein sources) during exercise. Adequate energy is key before moving on to specific macronutrients. Post-exercise carbohydrates are important to replenish the fast-acting energy stores (glycogen) while protein is required for muscle repair (muscle protein synthesis). Although not often in the spotlight of exercise nutrition, fat is a necessary macronutrient for a healthy diet and can support your body's ability to provide energy, maintain cell membrane integrity, and enable fat-soluble vitamin absorption— all important factors in recovery.

Cold Therapy: Cryotherapy chambers and cold-water immersion are two common forms of cold therapy that have been shown to aid in muscle recovery and decrease muscle soreness. This is especially beneficial for those with injuries, swelling, or those engaging in contact sports[8].

Ice baths are relatively easy to set up and effective; however, most people find them very uncomfortable. Even so, spending 15 minutes in an ice bath or submerging the affected area has been shown to aid in muscle recovery by reducing inflammation.

Cryotherapy involves a chamber filled with liquid nitrogen that gets extremely cold and usually people spend only two to three minutes inside of it. While it is very cold, most people do not mind the sensation and it is over very quickly. Although cryotherapy is often expensive (at least in comparison to a homemade ice bath), it can be effective and is a great tool to aid in the recovery process.