



ACSM Information On...

## Delayed Onset Muscle Soreness (DOMS)

Any type of activity that places unaccustomed loads on muscle may lead to delayed onset muscle soreness (DOMS). This type of soreness is different from acute soreness, which is pain that develops during the actual activity. Delayed soreness typically begins to develop 12-24 hours after the exercise has been performed and may produce the greatest pain between 24-72 hours after the exercise has been performed.

### A COMPLETE PHYSICAL ACTIVITY PROGRAM

A well-rounded physical activity program includes aerobic exercise and strength training exercise, but not necessarily in the same session. This blend helps maintain or improve cardiorespiratory and muscular fitness and overall health and function. Regular physical activity will provide more health benefits than sporadic, high intensity workouts, so choose exercises you are likely to enjoy and that you can incorporate into your schedule.

ACSM's physical activity recommendations for healthy adults, updated in 2011, recommend at least 30 minutes of moderate-intensity physical activity (working hard enough to break a sweat, but still able to carry on a conversation) five days per week, or 20 minutes of more vigorous activity three days per week. Combinations of moderate- and vigorous-intensity activity can be performed to meet this recommendation.

Examples of typical aerobic exercises are:

- Walking
- Running
- Stair climbing
- Cycling
- Rowing
- Cross country skiing
- Swimming.

In addition, strength training should be performed a minimum of two days each week, with 8-12 repetitions of 8-10 different exercises that target all major muscle groups. This type of training can be accomplished using body weight, resistance bands, free weights, medicine balls or weight machines.

While origins of the soreness and accompanying symptoms are complex, it is well-established that many types of physical activity can cause delayed soreness. Most believe soreness develops as a result of microscopic damage to muscle fibers involved the exercise. This type of damage likely results from novel stresses that were experienced during the exercise. One common misconception about DOMS is that it is due to lactic acid accumulation, but lactic acid is not a component of this process. DOMS appears to be a side effect of the repair process that develops in response to microscopic muscle damage.

Examples of activities that are known to cause DOMS include:

- Strength training exercise
- Walking down hills
- Jogging
- Step aerobics
- Jumping

Activities which cause DOMS all cause muscles to lengthen while force is applied. This is eccentric muscle action. Examples of eccentric muscle actions include the lowering phase of a bicep curl exercise or the lengthening of the thigh muscles while the limb brakes against your body's momentum as it walks or jogs down a hill. Jogging or running on a flat surface can



also elicit DOMS symptoms for those who are unaccustomed to this type of activity.

The severity of soreness depends on the types of forces placed on the muscle. Running down a hill will place greater force on the muscle than walking down the same hill. The soreness that develops will likely be greater after running down a hill. A high number of repetitions will cause

more damage and soreness than a low number of repetitions. As a result, work your way gradually into a new exercise program.

All people are susceptible to DOMS, even those who have been exercising for years. However, the severity of soreness normally becomes less as your body becomes adapted to work it regularly performs. Just one bout of soreness-producing exercise actually develops a partial protective effect that reduces the chance of developing soreness in that same activity for weeks or months into the future.

### **DOES DOMS ONLY CAUSE SORENESS?**

There are numerous characteristics of DOMS beyond local muscle pain. Some of the most common symptoms include:

- Swelling of the affected limbs;
- Stiffness of the joint accompanied by temporary reduction in a joint's range of motion;
- Tenderness to the touch;
- Temporary reduction in strength of the affected muscles (lasting days);
- In rare and severe cases, muscle breakdown to the extent that the kidneys may be placed at risk; and
- Elevated creatine kinase (CK) enzyme in the blood, signaling muscle tissue damage.

### **SEEKING MEDICAL TREATMENT**

DOMS symptoms do not typically necessitate the need for medical intervention. If the pain level becomes debilitating, if limbs experience heavy swelling or if urine becomes dark, then medical consultation is advisable.

### **DOMS PREVENTION**

One of the best ways to reduce the severity of DOMS is to progress slowly in a new program. Allowing the muscle time to adapt to new stress should help to minimize the severity of symptoms, but it is unlikely that soreness can be avoided altogether. It is also important to allow the muscle time to recover from work that produces soreness, and participating in the same exercises on subsequent days should to be done judiciously.

Proper warmup is also important in preparing the muscle for the types of forces that may cause damage, but there

is little evidence that warm-up will be effective in preventing DOMS symptoms. Stretching is sometimes done before exercise, but it is better to stretch after the body is warmed up and after exercise. Stretching has not been shown to reduce or prevent symptoms of DOMS, but DOMS should last only a few days (usually 3-5 days) and the involved muscles will be better prepared for future bouts of the same type of exercise.

### **DISCONTINUING EXERCISE**

Often, symptoms diminish during activity, but they will return after recovery. Performing exercise while experiencing severe symptoms may make matters worse. On the other hand, light activity should not impair your recovery. However, there is also not much evidence that this will hasten your recovery. If you find that your symptoms make it difficult or too painful to perform the activity, then it is advisable to refrain from the activity for a few days and return to the activity as symptoms subside.

### **EASING DOMS SYMPTOMS**

There is little evidence that such treatment strategies will hasten recovery and return to normal function. If the primary goal is to reduce symptoms, then treatments such as ice pack application, massage, tender-point acupressure, and oral pain relief agents may be useful in easing pain. It is important to be aware that pain reduction does not represent recovery. Rather, these treatments may only be effective in reducing symptoms of pain, but underlying muscle damage and reduced function may persist.

### **NO PAIN, NO GAIN?**

It is unlikely that you will avoid soreness altogether when beginning a new exercise program. However, pain does not need to be present to achieve gains in fitness status, and pain may indicate a need to reduce or refrain from an activity. While eccentric loading of muscle to achieve gains in muscle size appears to be important, gains in strength will occur without overemphasizing the eccentric component of a weightlifting exercise. Pain that occurs during exercise (i.e., acute) signals a problem with the exercise (too intense, bad form, etc.) and should be halted before muscle or joint damage occurs.

### **STAYING ACTIVE PAYS OFF!**

Those who are physically active tend to live longer, healthier lives. Research shows that moderate physical activity – such as 30 minutes a day of brisk walking – significantly contributes to longevity. Even a person with risk factors like high blood pressure, diabetes or even a smoking habit can gain real benefits from incorporating regular physical activity into their daily life.

As many dieters have found, exercise can help you stay on a diet and lose weight. What's more – regular exercise can help lower blood pressure, control blood sugar, improve cholesterol levels and build stronger, denser bones.

### **THE FIRST STEP**

Before you begin an exercise program, take a fitness test, or substantially increase your level of activity, make sure to answer the following questions. This physical activity readiness questionnaire (PAR-Q) will help determine if you're ready to begin an exercise routine or program.

- Has your doctor ever said that you have a heart condition or that you should participate in physical activity only as recommended by a doctor?
- Do you feel pain in your chest during physical activity?
- In the past month, have you had chest pain when you were not doing physical activity?
- Do you lose your balance from dizziness? Do you ever lose consciousness?
- Do you have a bone or joint problem that could be made worse by a change in your physical activity?
- Is your doctor currently prescribing drugs for your blood pressure or a heart condition?
- Do you know of any reason you should not participate in physical activity?

If you answered yes to one or more questions, if you are over 40 years of age and have recently been inactive, or if you are concerned about your health, consult a physician before taking a fitness test or substantially increasing your physical activity. If you answered no to each question, then it's likely that you can safely begin exercising.

### **PRIOR TO EXERCISE**

Prior to beginning any exercise program, including the activities depicted in this brochure, individuals should seek medical evaluation and clearance to engage in activity. Not all exercise programs are suitable for everyone, and some programs may result in injury. Activities should be carried out at a pace that is comfortable for the user. Users should discontinue participation in any exercise activity that causes pain or discomfort. In such event, medical consultation should be immediately obtained.



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