

SAFETY CONSIDERATIONS IN EXERCISE

Exercise, when properly performed, can stimulate the body to produce dramatic improvements in muscular strength and endurance, bone strength, cardiovascular efficiency, flexibility, and body composition. However, when improperly performed, exercise can produce injury. There are several general safety considerations which must be observed to reduce the risk of serious injury during exercise. These include:

1. Slow Movement Speed
2. Proper Breathing
3. Head and Neck Stabilization
4. Relaxation of Grip, Neck and Facial Muscles
5. Understanding How To Avoid Exercise Induced Headache (EIH)
6. Understanding the Distinction Between Muscular Stress And Pain

While many of these things might seem like common sense, it would appear that common sense regarding exercise is hardly common. If you don't believe me, take a good look around next time you're at the gym, or read any of the so-called fitness magazines. In any case, I feel that these are extremely important points which should be known and understood by anyone who trains themselves or others if they are concerned with safety.

Slow Movement Speed

Damage results when a material is exposed to a force which exceeds its structural strength. Slower repetition speeds expose the body to less force, decreasing the risk of injury. The following is excerpted from the Super Slow Exercise Guild's web site, "It is a misconception that excessive weight causes injury during exercise. Many well-meaning physicians recommend reduced weight for patients without realizing the real danger; force. Many injuries sustained through activities pursued as exercise were caused when little or no additional weight was involved - the acceleration of the subjects own limbs often causes the injury (for example: the impact on a jogger's knees, tennis elbow, a baseball pitcher's shoulder, a lower back injury sustained while picking up a golf ball, even weight-training injuries sustained with "light weight, low reps" often cause injury). The key to minimizing injury is minimizing force. Force equals mass times acceleration. In physics, this is known as the acceleration law:

$$F=ma$$

While it is natural to beware the amount of weight (mass); acceleration, the

greater danger, is almost universally ignored. If you limit the speed of movement (don't heave, explode or use any other ballistic movement) you significantly reduce the probability of injury. This also enables people rehabilitating injuries to work them directly by significantly reducing the possibility of exacerbating them. Strengthening the damaged structure directly will speed rehabilitation."

To minimize the amount of force the body is exposed to during an exercise, one should attempt to barely move as they begin each repetition. When beginning the first repetition, only apply a very slight amount of force against the resistance. Slowly, gradually increase the amount of force you are applying until you feel the movement begin. Then, apply only enough force to keep it moving slowly. Concentrate on contracting the target muscles as intensely as possible continuously throughout the exercise.

As you approach the end of the positive or negative movement, gradually decrease speed until you are barely moving so that you will be able to perform the turnaround in a slow and controlled manner, with no jerking, bouncing, or sudden acceleration. On compound pushing movements (leg press, chest press, overhead press, dips, etc.) turnaround prior to full extension of the arms or legs to avoid unloading. On compound pulling movements (compound row, pull down, chin ups, etc.) and simple movements (rotary movements such as arm and leg curls and extensions) pause briefly in the most contracted position. Do not pause at the lower turnaround (end of the negative). If you can bottom-out the weight stack, only allow the weights to very lightly touch. Then immediately, but slowly, begin the next repetition.

When it seems almost impossible to produce any further movement against the resistance, concentrate on contracting the target muscles as hard as you can, attempting to keep the resistance moving, even if it seems to barely move at all. Once positive movement ceases, continue to contract the target muscles for a few more seconds to fatigue them as deeply as possible. When you have achieved momentary muscular failure, do not accelerate or in any way sacrifice proper form for the sake of finishing the repetition. The purpose of performing an exercise is to invade the strength levels of the target muscles to stimulate a growth mechanism, and not to simply lift the weight for the sake of lifting the weight.

Proper Breathing

During exercise, it is extremely important not to hold or force your breath. Holding or forcing your breath, known as Valsalva's maneuver, increases pressure in the thorax and abdomen which causes blood pressure (BP) to rise dangerously high, very quickly. This can cause dizziness, fainting, painful exercise induced headaches (EIH), and in those susceptible to it, even stroke.

To stress the importance of proper breathing during exercise to new clients, Ken Hutchins often points out that elderly people are commonly found dead of a stroke on the commode as a result of the increase in BP which occurs as they Val Salva while straining against a bowel movement. Not a very graceful way to go. You do not want this to happen to you during an exercise.

To prevent Val Salva, it is necessary to breathe continuously during exercise, in a relaxed and natural manner. It is preferable to breathe through the mouth, with the mouth wide open. Do not purse your lips as you exhale, as this increases the amount of force required to expel the air from the lungs, increasing intra-abdominal and thoracic pressure, and thus BP.

There is often a strong association between performing intense muscular contractions, and holding or forcing the breath. This association can be difficult to break in some people, but it is essential to do so. If during an exercise you feel the urge to hold or force your breath, or notice yourself doing so, try to breathe more. It is preferable to experience some slight dizziness from over-breathing than to faint and possibly drop a weight on yourself, suffer a painful exercise induced headache, or die of a stroke as a result of holding your breath.

It is also important to have nothing in your mouth during exercise. If you are eating something or chewing gum and it becomes lodged in your throat, you may choke and die.

Head and Neck Stabilization

Your head and neck musculature are under load, either directly or indirectly, during the performance of most exercises. To decrease the risk of neck strain or headache, it is necessary to minimize tension in this area when performing exercises for other areas of the body. To do this, it is important to keep the head and neck in a neutral position. The ideal head and neck position relative to the body differs slightly from exercise to exercise, but it is generally head facing straight forward, with the neck slightly flexed (chin about fist distance from the sternum).

During exercises where the back of the head is resting on a seat, bench, or head support, it is essential that you do not push back against this with the head, as this will greatly increase tension in the neck. During prone leg curls, the head should be positioned so that the forehead is resting on the bed of the machine with the neck slightly flexed, and not resting on the chin or side of the head. To rest the head on the chin forces the neck into an extremely extended position, and to rest the head on either side forces the neck onto an extremely rotated position, both of which increase the risk of straining muscles in that area, and tend to irritate the necks of most subjects.

Relaxation of Grip, Neck and Facial Muscles

Many lower body exercise machines possess handles that exist for no other purpose than to provide the user with a place to put their hands, or play a minor role in maintaining proper positioning or alignment during exercise. In this case, it is important to keep the grip relaxed. Tension in the forearm muscles tends to cause a significant increase in BP. When one grips tightly, they also tend to tense up the shoulder and neck muscles, which should be avoided.

Excessive gripping or contraction of muscles not directly involved in the performance of an exercise can interfere with concentration on the target muscles. If one finds it difficult to break the habit of gripping tightly and tensing up the forearms during these exercises, placing the thumbs on the same side of the handles as the fingers often decreases the tendency to do so.

In exercises for the upper body which require a strong grip, such as compound pulling exercises, tension in the forearm muscles is unavoidable. This is also the case with most barbell and dumbbell exercises, where a secure grip is required to control the weight. The performance of compound pushing exercises on machines do not usually require a strong grip though. In the case of a chest press or overhead press machine, the application of pressure against the handles with the palms is all that is required, and excessive gripping should be avoided.

It is common to witness people grimace, clench their teeth, and tense up their facial muscles while grunting or yelling along with gripping excessively during the performance of those last few hardest reps of an exercise. This type of behavior is counterproductive, and should be avoided. It is necessary that the muscles of the face, neck, forearms and hands remain completely relaxed not only to prevent unnecessary increases in BP and to minimize neck tension, but also to allow better concentration during the exercise, and greater intensity of contraction in the target muscles.

The majority of the neurons in the primary motor cortex (the area of the brain responsible for voluntary control of skeletal muscles) control the muscles in body areas requiring the most precise motor control such as the face, tongue and hands. In comparison, the sections of the primary motor cortex controlling the larger muscle groups which do not require such precise motor control, such as the muscles of the hips and thighs, are very small.

It has been suggested by Doug McGuff, MD, that the greater amount of neural activity in the section of the primary motor cortex involved in contraction of the facial muscles, may somehow override or inhibit neural activity in the sections

which control the muscles one is working during a particular exercise, reducing the intensity of the contraction in those muscles (the number of motor units one is able to recruit), and decreasing the effectiveness of the exercise.

Understanding How To Avoid Exercise Induced Headache (EIH)

If, during an exercise, you ever feel as though you are beginning to get a headache, stop the exercise immediately. Relax for a few minutes, close your eyes and breathe deeply. Then, if you can no longer sense any trace of the headache, continue. If, however, you still feel even a slight head pain, then do not finish the workout. Take a few days off before attempting to train again. If you attempt to work through this head pain, it may develop into an exercise induced headache (EIH).

EIH can be twice as severe as a migraine, and can last anywhere from a few days to two weeks. It was previously believed that EIH was related to tension in the muscles of the neck, similar to tension headaches, and was often addressed by performing a neck extension and/or flexion exercise at the beginning of the workout, to produce fatigue induced relaxation of the neck muscles. This was done to minimize tension in the neck muscles during the more intense exercises involving greater body masses, such as the leg press.

Recent observations by Doug McGuff, MD suggest that EIH may be caused by stretching of the dura mater (outermost of the three membranes covering the brain and spinal cord) as a result of increased BP in the cerebral veins caused by retrograde venous flow towards the brain. The onset of EIH is usually experienced during intense exercises for the legs, hips, and trunk, during which there is a large amount of venous congestion in the pelvis and abdomen. In an article entitled The Mystery of Exercise Induced Headache, in Vol. 5, Issue 3 of The Super Slow Exercise Standard, Dr. McGuff writes,

"This congestion is a result of soft tissue compression, Val Salva and massive venous return from the legs stimulated by intense muscular contraction. This massive venous congestion can create a strong enough force to drive venous flow in a cephalad direction (towards the head). Perhaps, in some subjects, the force is great enough to reverse the gradient of cerebral venous drainage so that venous blood is pushed up through the jugular veins into the confluence of sinuses...

...Theoretically, a threshold level of venodilation and pressure transmission would have to occur before the dura could be stimulated. Once this threshold is reached, look out! Dural stimulation produces severe, sudden onset pain that can persist for days."

In other words, during exercises for the lower body, increased pressure in the abdomen may cause venous blood to be forced back into the cerebral veins, increasing BP in the brain to the point where the dura mater is stretched. If

this happens, it's going to feel like a bolt of lightening shot through the back of your skull, cracked it wide open, and exited through one or both of your eyes.

If this theory is correct, the reason that performing exercises for the neck at the beginning of a workout tends to reduce or prevent the onset of EIH would not be due to fatigue induced relaxation of those muscles, and the resulting decrease in tension. Instead, it appears that the increased pressure exerted on the jugular veins caused by edema (the "pump") in the surrounding neck muscles decreases retrograde blood flow. This would reduce BP in the cerebral veins, which would reduce the pressure exerted on the dura mater.

It is best not to develop EIH in the first place, but if you do there are measures which can be taken to minimize the possibility of it recurring.

1. Do not hold or force your breath during an exercise. As previously stated, this causes BP to quickly increase to dangerously high levels.
2. Perform neck extension and flexion exercises at the beginning of the workout. Always move extremely slowly when performing neck exercises. A 10/10 movement speed is recommended.
3. If you are performing a full body workout, perform it in reverse order, with exercises for the trunk and lower body last.

Understanding the Distinction Between Muscular Stress And Pain When properly performed, exercise should produce an intense burning, fatiguing sensation in the muscles, labored breathing, elevated heart rate, and sometimes even nausea and dizziness. These are all natural responses to intense muscular stress, and should not be considered cause for alarm within the context of a high intensity workout. Exercise should not produce any sharp, sudden pain or discomfort in the joints, or any type of pain in areas of the body not being directly worked during an exercise.

If you do feel anything you suspect might be an injury, stop immediately, slowly lower the weight, and check with a medical doctor. If you feel something that may be an injury and ignore it or attempt to work through it, you may cause even further damage to the injured structure.