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JANUARY 17, 2004

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Sport & Fitness Vol 1.3• March 2004

Sport & Fitness is published 12 times per year by StrengthPro Inc.

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Sport & Fitness is a peer reviewed journal for strength and conditioning professionals, personal trainers, fitness instructors and serious athletes. The journals mission is to publish articles that link scientific information with practical applications; including research reviews, application articles, and original research.

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Treating Delayed Onset Muscle Soreness

Rebecca M. Lopez, ATC

Just about every physically active individual has experienced the pain and uncomfortable symptoms associated with delayed onset muscle soreness. Delayed onset muscle soreness, or DOMS, is the sensation of muscular pain and discomfort that usually peaks 24 to 48 hours after strenuous exercise.¹ The symptoms, however, can last up to 5 to 7 days after the activity. Other symptoms of DOMS include inflammation, strength loss, stiffness and a decreased range of motion. DOMS usually occurs after completing strenuous, unaccustomed exercise or exercises eccentric in nature.

Symptoms of DOMS can range from mild soreness and stiffness to severe and debilitating pain and loss of function. The severity of these symptoms is dependent on the type, duration, and

intensity of the exercise. DOMS can sometimes impede on simple activities of daily living, not to mention the possible damper it can place on your training regimen. Therefore, it is imperative for coaches, trainers, athletes, and any individual involved in strenuous exercise to be aware of how to treat the symptoms of DOMS and prevent further injury.

Various researchers have examined different methods of treating DOMS. Some have looked into possible prophylactic, or preventative, methods of treating DOMS, while others have examined ways to treat the symptoms of DOMS once they are present. Although there have been varying findings in terms of effective ways of treating DOMS, there are many strategies that can be utilized to alleviate the symptoms and restore muscular

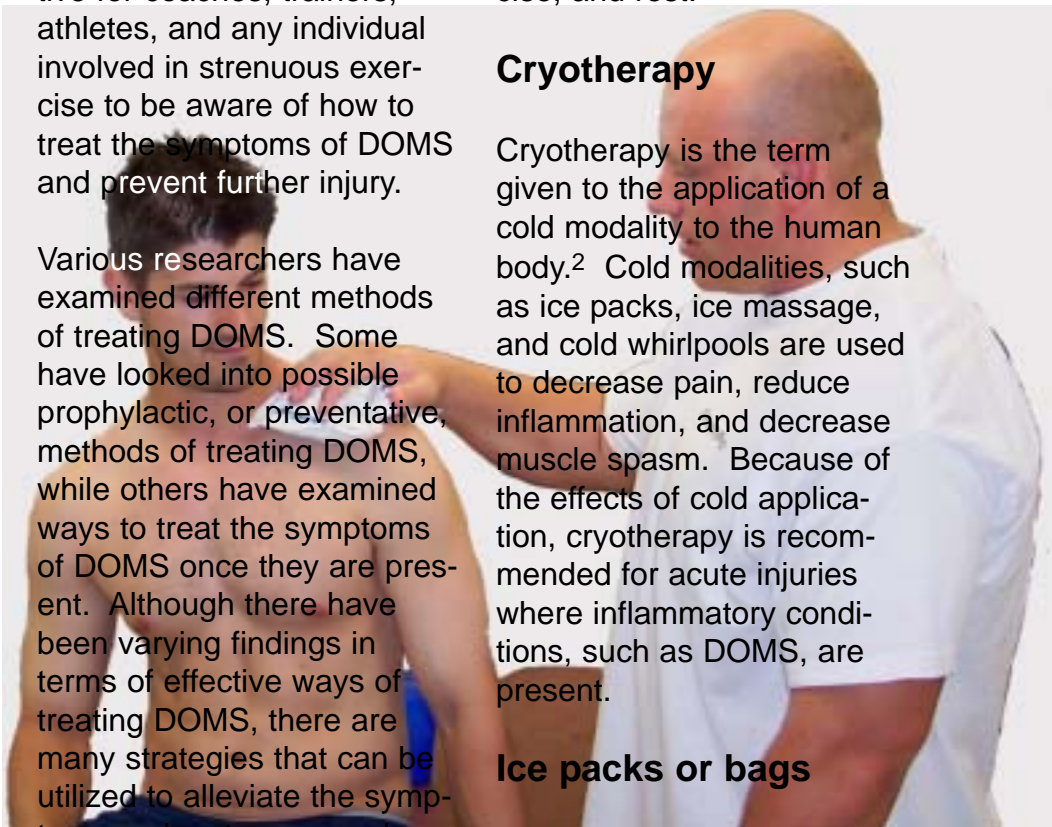
function. Treatment and management strategies for DOMS have included cryotherapy, nonsteroidal anti-inflammatory drugs, electrotherapy, warm-up and stretching, massage, exercise, and rest.

Cryotherapy

Cryotherapy is the term given to the application of a cold modality to the human body.² Cold modalities, such as ice packs, ice massage, and cold whirlpools are used to decrease pain, reduce inflammation, and decrease muscle spasm. Because of the effects of cold application, cryotherapy is recommended for acute injuries where inflammatory conditions, such as DOMS, are present.

Ice packs or bags

An ice bag can easily be



applied to a specific area by using a plastic bag or reusable rubber bag filled with ice. The treatment time for an ice bag is between 15 and 30 minutes. This treatment can be repeated several times a day, with a minimum of 2 hours in between treatments. When using commercial ice packs, be sure to place a wet cloth or wrap on the skin before applying the cold pack to prevent frostbite or burns from the chemicals used in some cold packs.

Ice massage

Ice massage is a simple and inexpensive method whose purpose is to produce numbness in a specific area. Ice massage can be applied by filling a paper cup with water and freezing. Once frozen, peel away the edge of the paper cup until the ice is exposed. Place a towel underneath the body part and use the ice cup to slowly massage the area in circles or overlapping strokes. Continue ice massaging the area for about 10 to 15 minutes or until the area is numb. You may need to continue to peel away the edge of the cup as the ice melts. Ice massage can also be used several times a day, as long as treatments are not within 2 hours of each other.

Cold Whirlpool

Whirlpools are an effective means of applying cold or heat to a body part or full body by means of water and a turbine or jet. The water and turbine provide a means of massage as well as the ability to perform range of motion exercises. A study examining the effects of whirlpool treatments in alleviating the symptoms of DOMS concluded that cold whirlpool application was the best method in the treatment of DOMS when compared to warm whirlpool treatment or no treatment at all.³ Treatments may be given once or twice a day, and

treatment times are initially given for 5 to 10 minutes. One disadvantage of this treatment is that you must have access to a whirlpool. In addition, whirlpool treatments should be administered by a therapist or athletic trainer that is knowledgeable on how to operate a whirlpool, as the combination of water and electricity can be extremely dangerous if not operated properly.

Warm-up/ Stretching

Warming up and stretching exercises have often been used before exercising to prevent muscular strains or muscle pulls. Many believe,



however, that warming up and pre- and post-exercise stretching can be used in preventing DOMS. The stretching of sore muscles has also been recommended as a treatment method for alleviating the symptoms of DOMS once they are present. Although not many studies have proven the efficacy of a warm up and stretching in the prevention or treatment of DOMS, there is a strong body of anecdotal, or subjective, evidence that has supported these techniques. In order to prevent any type of muscular injury, it is always best to begin every workout with an adequate warm up and stretching of the muscles being used.

Massage

Massage is one of the oldest healing techniques still used quite frequently. The use of massage in sport has been seen as a means of improving performance as well as in treating injuries and muscular soreness. Various studies have examined the effects of massage in the treatment of DOMS. Although there have been conflicting findings in these studies, there is a growing body of evidence suggesting massage lowers the intensity of the soreness associated with DOMS.⁴

Massage can be effective at controlling pain for various reasons. Massage can be used to reduce muscle spasm and reduce swelling, which can, in turn, alleviate pain.² Because massage increases blood flow to the area, oxygen delivery to the injured muscle tissue would increase and therefore enhance the healing process. Massage can also reduce pain by activating sensory receptors on the skin which would inhibit the pain receptors via the gate mechanism; this means you would feel the pressure of the massage rather than the pain.^{2,4} Lastly, there is also the possibility that the effects of massage may be due to psychological rather than physiological factors.⁴

Anti-Inflammatory Medication

The use of nonsteroidal anti-inflammatory drugs, or NSAIDs, is frequently used in the treatment of sports-related injuries. Several researches have examined the use of NSAIDs in preventing and treating the symptoms of DOMS. The use of NSAIDs for DOMS is based on the assumption that DOMS is caused by inflammation and edema within the muscle. However, many of these studies have

had conflicting results. In a study examining the effects of Ibuprofen and Acetaminophen on muscle inflammation caused by DOMS, the researchers concluded that therapeutic doses of these NSAIDs did not blunt muscle inflammatory responses after eccentric exercise.⁵ On the other hand, a study that examined the use of Diclofenac (Voltaren) on treating exercise-induced muscle damage found that the NSAID reduced muscle damage when given before and after the injury producing exercise.⁶ The conflicting evidence in studies examining the effects of NSAIDs on DOMS can be attributed to differences in the dosages, time of administration, as well as exercise protocols used in the studies. Due to the lack of evidence on the effectiveness of NSAIDs on DOMS, always use caution when taking anti-inflammatory drugs and remember to follow the directions and read all warning labels.

Exercise, Rest, and Immobilization

Light exercise is often used to treat the symptoms of DOMS. Simple, light intensity exercises can improve muscle blood flow, which can produce an analgesic effect

and temporarily reduce muscular soreness.^{7,8} There have also been studies which have investigated the "repeated bout effect" as a means of preventing DOMS.^{7,9,10} The repeated bout effect can be defined as an adaptive response to one or more bouts of eccentric exercise and is known as an effective means of preventing DOMS.⁹ The repeated bout effect would suggest that performing an eccentric exercise produces an adaptation that reduces muscle damage in subsequent bouts of exercise. This protective effect can last from 6 to 9 months, but has been shown to be most effective when the second bout is performed within 2 weeks of the initial exercise bout.¹⁰ This finding is important because it can assist trainers and strength coaches in planning preseason conditioning and exercise programs efficiently so that symptoms of DOMS do not interfere with games or the competitive season. The effects of immobilization on DOMS after eccentric exercise have also been investigated.¹¹ When compared to resting alone, immobilization was found to improve the recovery of muscle function after DOMS. Therefore, a short period of immobilization allowed the muscle to regain strength and prevent re-

injury.

Additional Treatments

Other treatment methods that have been used to prevent and/or treat the symptoms of DOMS include electrotherapy, ultrasound, acupuncture, and vitamin supplements.¹²⁻¹⁶ A study investigating the use of electro-membrane microcurrent therapy on DOMS found that the treatment reduced the severity of the symptoms when compared to a placebo.¹² There have also been studies investigating the use of ultrasound on DOMS, but the findings have not been conclusive. Many of these electrical modalities are often used to treat muscular injuries; however, their use in the treatment of DOMS has not been thoroughly investigated.

Acupuncture has also been utilized as a means to treat DOMS. Despite increases in the use of acupuncture as an alternative method of treating muscular pain, its efficacy in the use of treating the symptoms of DOMS has not been confirmed. A study that focused on determining the effects of acupuncture on DOMS concluded that acupuncture had little effect on alleviating the symptoms.¹⁴

The use of nutritional supplementation has also been observed as a possible treatment of DOMS. Most of these supplements have been used as a preventative measure and have been taken prior to exercising. The most commonly used antioxidant supplements are vitamin C and E. Research findings on the effect of vitamin supplementation on DOMS have also been inconclusive as studies have had conflicting results.^{15,16} Although there have been various studies investigating the effects of these additional modalities on the symptoms of DOMS, there is no conclusive evidence indicative of their effectiveness.

Conclusion

Despite the growing number of studies on the treatment of DOMS, not one specific method can be recognized as the most effective. The most efficient method of treating delayed onset muscle soreness may vary from person to person, depending on the degree of exercise-induced damage and personal responses to the treatment modalities.

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Fun Nutrition Facts

Fresh apples float because 25 percent of their volume is air.

More than 1,130,000 packages of Jell-O gelatin are purchased or eaten every day.

The cashew nut is a member of the poison ivy family.

More than one-fourth of U.S. households consume turkey deli meat at least once every two weeks.

Green tea has 50 percent more vitamin C than black tea.

Research Reviews: the Science of Training



Acute Effects of Plyometric Exercise on Maximal Squat Performance in Male Athletes

Masamoto, Larson, Gates, Faigenbaum. Journal of Strength and Conditioning Research, 17 (1): pg 68-71. Feb 2003

Athletes are frequently instructed to perform some type of physical activity or warm-up as a preparation for strength testing and strength training. Traditionally these recommendations have advocated several minutes of light to moderate aerobic activity followed by various stretching techniques. While this type of warm up has been the subject of many studies since the 1950's, recently the value of pre-event static stretching has been questioned and there is a growing body of evidence suggesting that the performance of high-intensity contractions during the pre-event warm-up may create an optimal environment for subsequent training or testing.

This study examined the acute effects of explosive exercise, plyometrics, on 1RM strength performance. Twelve male athletes with an average age of 20 years volunteered to participate in this study. Eleven of the twelve subjects played collegiate basketball and all had five years of strength training experience and at least one year of prior plyometric training. None of the subjects performed strength training or plyometric exercise for the lower body during the testing period.

Three different protocols and their relationship to 1RM squat performance were examined in this study. Subjects were tested on squat performance on three separate occasions at least six days apart. During the first session subjects performed a traditional warm-up protocol before 1RM testing. During the subsequent second and third sessions, subjects performed either tuck jumps (TJ) or depth jumps (DJ) prior to their 1RM attempts.

Testing was conducted over a three week period. The warm-up procedure was the same in all three tests; a general warm-up of 5 minutes of low to moderate intensity stationary cycling, followed by 6 lower body static stretches, each held for 20 seconds and performed twice. Before attempting a 1RM lift subjects performed a series of sub-maximal sets consisting of 8,

5, 2, and 1 repetitions, each with increasing loads. All testing took place in a university strength and conditioning center with a 1:1 instructor to subject ratio. Uniform verbal encouragement was offered to all subjects.

During the first testing period subjects performed the general warm-up and rested for at least 4 minutes between 1RM attempts. If the weight was lifted with correct form thru the prescribed range of motion, thighs parallel to the floor, the weight was increased 1-10kg depending on the difficulty of exertion with increments becoming smaller as 1RM was approached. On the average 1RM was reached within 6 trials. 1RM was defined as a lift falling short of the full range of motion in two consecutive attempts with at least 4 minutes rest between attempts.

During the second and third testing sessions subjects performed either three double-leg TJ or two DJ's 30 seconds before each 1RM attempt. The order of the plyometric intervention was counterbalanced for the second and third testing sessions with half the subjects performing the TJ or DJ first then rotating this order on the third session. For the purpose of this study a 43.2cm box was used for all DJ's.

The 1RM scores were 139.6 ± 29.3 kg following the traditional warm up, 140.5 ± 25.6 kg following the TJ and 144.5 ± 30.2 kg. The 3.5% increase in 1RM following the DJ trials was significantly higher than the 1 RM following the traditional warm up. It appears high intensity contractions performed during a pre-event warm-up may positively impact muscular performance. While the mechanisms behind the performance improvement were not examined several have been proposed including increased motor neuron excitability and reflex potentiation, enhanced recruitment patterns and increased activation of synergists. It is interesting to note that only the highest intensity protocol yielded significant changes in 1RM performance. Warm ups that wish to include power activities to improve strength performance need to take this into consideration and ensure that the power activities are of very high intensity.

Bill Hebson

Preventing heart disease and heart attack in women

John C. Ashworth, MA, CSCS

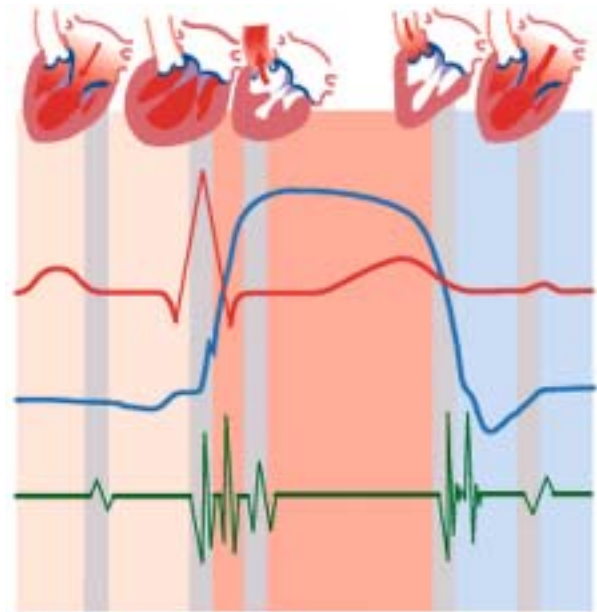
Inactivity is a major risk factor for heart disease with 60% of both men and women in America being inactive. This is literally a deadly combination. The problem is no longer just a concern; it has become an epidemic.

Approximately one third of women (34 million) in America are obese (classified as a BMI > 30). Obesity, especially abdominal obesity, is an especially important risk factor for women. Women are at an increased risk of developing the metabolic syndrome, which is characterized by at least three of the following: excess body fat stored in the abdomen (waist circumference > 35 inches), hypertension (SBP > 140/90), increased levels of tryglycerides (>150 mg/dL), elevated fasting blood sugar (>110 mg/dL), and a low HDL (good) cholesterol level.

The presence of these risk factors can lead to the body's decreased sensitivity to insulin, or insulin resistance, and ultimately to Type II diabetes.

For women, the development of Type II diabetes is associated with a 3-7-fold increased risk of heart disease, compared to only a 2 to 3-fold increase seen in men. This may be due in part to the fact that diabetes in women more adversely affects their blood pressure and cholesterol metabolism. To put it in perspective, half of all deaths in women with Type II diabetes are from heart disease.

The importance of exercise and regular physical activity



It is well established that regular physical activity prevents the development of coronary artery disease (CAD) and reduces symptoms in patients with established cardiovascular disease. Research conducted over the last 50 years that includes prospective epidemiological studies of occupational and leisure time activity have consistently demonstrated a reduced rate of CAD in more physically active and fit subjects. The relationship is graded in that the more

active the individual the less their risk for developing CAD, with the most active individuals showing a reduction in risk of 50%. In many studies, the decrease in risk is independent of the other traditional risk factors for CAD such as blood pressure and cholesterol levels.

The independent benefit of regular exercise is likely a result of its effect on the traditional risk factors for heart disease. These include blood pressure, insulin resistance and glucose intolerance, elevated triglyceride concentrations, low HDL (Good) cholesterol, high levels of LDL (Bad) cholesterol, and obesity. The magnitude of the exercise effect is also directly related to the amount of exercise and weight loss that occurs, along with individual variation.

As mentioned earlier, the development of Type II diabetes is a significant risk factor for heart disease, especially in women. Of course, exercise and lifestyle change including diet are powerful agents in offsetting this trend. In the Diabetes Prevention Program a 58% reduction in the development of Type II diabetes in patients at high risk for developing the disease was observed in patients receiving the lifestyle intervention, which included both regular exercise (>593 kcals of energy expenditure per week or ~6 miles of walking for a 70kg individual) and dietary counseling.

Yes, something is always better than nothing...

Interesting to note is that

some of the benefit of physical activity and exercise on CAD risk factors is an acute effect of recent exercise, and is not dependent on prolonged exercise training or improvement. Hence, the current recommendation from the American College of Sports Medicine (ACSM) and the Center for Disease Control (CDC) to get at least 30 minutes of physical activity and/or exercise on most days of the week. These benefits include: a reduction in blood levels of triglycerides for up to 72 hours following vigorous exercise, a temporary increase in HDL cholesterol, a reduction in systolic blood pressure that can last for up to 12 hours following an exercise session, and of course, an improvement in the regulation of blood sugar levels. Physical activity does not

Table 1. Daily Physical Activities that Can Help Reduce CAD Risk Factors

- walking to and from work
- taking the stairs instead of the elevator
- playing with your kids at the park - a great way for a busy parent to get a workout in
- mowing the lawn
- parking farther away than normal
- walking to the store
- walking your dog
- taking a short walk/kids with your safe before or after dinner
- washing your car
- shoveling snow
- moderate to heavy yard work or gardening

need to be part of a structured program simple daily activities like those in table 1 done for at least 30 minutes will help reduce risk factors.

"For Women, a heart attack doesn't always mean chest pain"

Unfortunately, heart attacks still happen, and for women, it is important to recognize that their symptoms may, and often do, differ from those experienced by men. And though the onset of heart disease is usually about 10 years later in women than it is in men, women still experi-

ence a greater proportion of sudden cardiac death than men, and heart disease remains the leading cause of death in American women. Heart disease has killed more women than men every year since 1984.

When it comes to heart attack and heart disease, women are different. Unfortunately, much of the research on heart disease and sudden cardiac death has historically focused on men. This trend is so prominent that the current description of "typical" cardiac symp-

toms is based primarily on the experience of white, middle-aged men, with deviations from this norm labeled "atypical." The result of this gender bias has limited the ability of a physician to diagnose heart attack and heart disease in women because most times, their symptoms are different than those experienced by men. Even more unfortunate, is the case where a woman does report her symptoms and is mistreated, misdiagnosed, or ignored because clinicians have a tendency to minimize, or even ignore a woman's reported symptoms. This problem is so significant that 35 percent of heart attacks in women go unnoticed. Research has also demonstrated that women are less likely than men to undergo treatments such as cardiac catheterizations, thrombolytic therapy, and bypass surgery.

Failure to recognize the early symptoms of a heart attack and heart disease in women may in fact be one of the main reasons women experience a greater proportion of sudden cardiac death than men. And it may also explain why heart disease remains the primary cause of



Walking with your kids or grandchildren is a great form of exercises

death for women in the United States.

What are the early warning signs in women?

A recent investigation, published in the American Heart Association journal, *Circulation*, identified the most frequent prodromal or early symptoms of an acute myocardial infarction (AMI) and how they related to comorbidities and risk factors, as well as whether or not these symptoms were predictive of symptomology consistent with an acute heart attack. (*Circulation*: 2003 (108) 2619-2623. In this study, these symptoms became a more powerful predictor of a heart attack than hypertension, hyperlipidemia, and diabetes.

Chest pain, a hallmark symptom of ischemia in men, is often not of significant prognostic value in women. In fact the most common early warning symptoms reported by women are fatigue and sleep disturbances rated as severe in intensity. Not only is this hard to quantify, but also very easy to ignore or minimize, especially for a

physician looking for the classic signs and symptoms of chest, jaw, or left arm pain or pressure.

The remaining three most frequent symptoms reported by women include shortness of breath, indigestion, and anxiety, anxiety being another easily misinterpreted or minimized condition. In the aforementioned study, most women reported these symptoms at least one month prior to their event, and previous research has shown that women may experience symptoms for up to 4-6 months prior to their event. One could speculate that if these symptoms were recognized and treated at the time of onset, many events could be prevented. Women who do experience chest related symptoms often experience them as pressure, aching, or tightness in the chest and NOT pain.

Summary

Exercise is an important line of defense in heart disease prevention in both men and women. For women, exercise represents a valuable tool in fighting their increased risk for developing obesity,

the metabolic syndrome and Type II diabetes, which increases their risk for the development of heart disease significantly more than men.

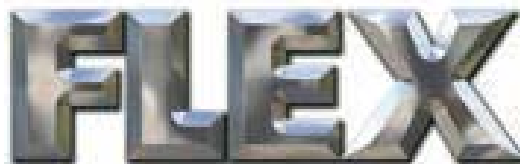
When attempting to diagnose the risk and/or presence of heart disease in women, it is important to consider that their symptoms for heart disease are often different than those experienced by men. And for women, fatigue and sleep disturbances are important symptoms to explore and evaluate thoroughly, as they may represent the early signs that a woman has heart disease or is having a heart attack.

As clinicians continue to assess for "chest pain" as the primary symptom of a heart attack, women and men alike will continue to be misdiagnosed and mistakenly discharged from emergency departments. More importantly, there is a practice that may be confounding the misconception. Failure by clinicians to assess for and differentiate between chest pain and other sensations or symptoms may lead some clinicians to indicate on medical records that there is a

presence of chest pain when an individual is in fact reporting no pain or is describing other sensations. Some providers record all chest sensations as pain, and as a result, retrospective studies auditing medical records may not be able to discern whether pain was actually present.

John Ashworth, MA, CSCS is Founder/CEO of www.ExerciseCareers.com He is also a clinical exercise physiologist in Preventive Cardiology at the University of Wisconsin Hospital. He has over 10 years experience as a personal trainer, exercise physiologist, and coach. You can reach him via email at john@exercisecareers.com or through his website at www.ExerciseCareers.com

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The logo for GNC Pro Performance, featuring the letters "GNC" in a bold, red, sans-serif font above the words "PRO PERFORMANCE" in a bold, black, sans-serif font.The logo for FLEX, featuring the word "FLEX" in a bold, metallic, 3D-style font with a silver and grey gradient.The logo for Muscle & Fitness, featuring the words "MUSCLE" and "FITNESS" in a bold, red, sans-serif font, with an ampersand "&" between them.



Exercise of the Month:

Stand holding a Power Grip Ball with straight arms near your waist. Feet shoulder width apart. Rapidly squat down to a quarter squat position, reversing direction as the ball gets below your knees. Jump explosively upwards and backwards, driving with the legs and completely extending the trunk while accelerating the arms and ball upwards to toss the ball as far as possible behind you. Your momentum should carry you backwards and you will need to take a short hop or step to catch yourself. If this drill is done near a high jump landing mat you can focus more of your power into a backward jump and land safely on the mat. It will take some time and practice to find the optimal release point and timing for this drill. Avoid rapidly flexing the arms as you release the ball as this will cause a low trajectory and limit your throw distance. Again the majority of the power comes from the explosive jumping action not the arms. This drill can be done with one or two balls.



SPEED AND POWER CERTIFICATION

The quickness to break through the line and accelerate past tacklers, grabbing a rebound out of the hands of your opponent, ripping off a 130 mph tennis serve or driving a golf ball 300 yards all have one thing in common. They all require incredible power.

Power, the optimal combination of speed and strength is essential for sport performance and is the difference between good and great athletes. Not every sport has the same power requirement, being able to determine the ideal relationship between speed and strength for a sport, test an individual athlete for their strengths and weaknesses and teach proper exercise progressions will allow you to develop more effective training programs and separate yourself from other trainers in the field of athlete development.

With this in mind StrengthPro has created a certification that covers every aspect of power and



speed development, from the science, to the exercises, to the development programs to maximize your clients results.

This four session lecture-workshop will provide each participant the skills and knowledge needed to develop explosive power programs. Examining both historical perspectives and the newest, scientific approaches for developing power the workshop will consist of approximately 50% of the time being devoted to lecture and 50% to practical application hands on applications, allowing participants to bridge the gap between science and practice.



Session 1: The Strength-Speed-Power Continuum

This lecture session will introduce participants to the physiological basis of power development and the Strength-Speed Power continuum. To develop optimal power one must first know whether that power is strength based or speed based. The continuum allows the participant to analyze the power demands of a sport or activity and determine the proportions of strength and speed needed to excel. Other topics covered include:

- Muscle and Nervous system physiology

- Force-velocity curve
- The length-tension curve
- Acceleration, Torque and Impulse
- Elastic energy, the stretch reflex and momentum
- Dynamic Power Expression
- The trade – off between strength and speed
- Where does optimal sport specific power lie?
- Sport and position specific power analysis

Session 2: Developing a Power Profile

During this practical workshop participants will be lead through a series of specific and general strength, speed, and power tests. They will learn to administer the test protocols, interpret the results and set training priorities and goals based on the testing and how the results match the strength-speed-power continuum analysis.

Session 3: The 5 Step Power Program

This lecture session provides the program variables and theoretical framework for designing specific power programs. The 5 step model provides participants with a simple, effective means of ensuring that they are covering ever aspect of power development. Topics covered include:



- Training muscles vs. training movements
- Replication and skill transfer
- The weight training paradox
- Power periodization cycling
- Antagonistic power combinations
- Volume-intensity relationships
- Overload
- Acceleration and deceleration



Session 4: Power Techniques

Building on the previous session, this hands on session features the drills, exercises and training methods discussed in the previous lecture. The group will be broken into smaller groups and cycle through four different stations where participants will learn and learn to teach ten different exercises and drills for a total of 40 new exercises ranging from releases and throws to plyometrics and Olympic lifts.

**For information on a
certification course in your area call 1-800-255-1017
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Strength Training Technique: The Dumbbell Push Press

Ed McNeely



The dumbbell push press is an excellent exercise for developing explosive leg power, core strength and strength and stability in the shoulders.

Set Up

Stand with feet shoulder width apart and clean a pair of dumbbells to shoulder height, palms facing forward, elbows point towards the floor, weight is distributed evenly on your feet (figure 1). For some people getting the weight to the shoulders will be the most difficult part of the exercise, it may be necessary to have a training partner hand you the dumbbell if you cannot clean it effectively. If you can curl the weight to shoulder height it probably isn't heavy enough. You should choose a weight that you cannot curl or press overhead.

Dip

Once you are set up take a deep breath and hold it, expanding your chest and raising your shoulders while contracting your abs and lower back to keep your trunk tight. Keeping the trunk tight is crucial to the performance of this exercise, a tight trunk will allow the force developed by the legs to be transferred effectively to the dumbbell so that the weight can be driven overhead.

Dip straight down bending from the knees until they bend to about 120° , keeping your trunk upright and elbows pointed down (figure 2). Dip depth should feel natural, and is similar to the dip depth you would use if asked to jump as high as possible. Make sure that the trunk is

kept upright during the dip. If your rear end sticks out and trunk bends forward it becomes difficult to hold onto the weight and drive the dumbbell straight overhead. During the dip your weight will shift towards the front half of your foot, putting you in a good position for a strong leg drive.

Drive and Press

The drive is initiated by an explosive extension of the hips and knees, similar to a vertical jump. The drive should be as explosive as possible providing enough momentum to drive the dumbbells almost to the top position. As soon as the leg drive is completed press the weight overhead using the arms (figure 3). The weight should travel straight up from the shoulders, finishing overhead with your arms beside your ears. Don't let the weights travel forward or you will not be able to hold them overhead. Keep your abs and back tight while the weight is overhead. Lower the weight back to the shoulders and repeat the process for the required number of repetitions. Take your time and make sure that you reset your starting position at the end of each repetition. This is not the sort of exercise where you can quickly do rep after rep if you want to do them right.

An alternative to the dumbbell push press is the dumbbell push jerk. The push jerk is identical to the push press except that the arms are not used to press the weight overhead, the leg drive accelerates the weight upward and you dip down to catch the weight overhead with



Figure 1.



Figure 2.



Figure 3.

straight arms. The push jerk requires more leg drive than the push press and relies less on shoulder and arm strength to press the weight overhead.

Common Errors

Bending Backwards

Some people will bend backwards when the weight is overhead, placing stress on their lower back. This occurs when the abdominals are relaxed or are not strong enough to maintain an upright trunk posture. Front squats, military press and lots of abdominal work will help correct this problem.

Unstable Lock out

Many people will have difficulty locking the weight out when it gets overhead. Any number of things could cause this to occur including having the weight too far forward, weak triceps and weak shoulders. Review your technique and make sure that your dip is straight down. A dip that shifts your body weight too far forward will cause the dumbbells to be locked out in front of your face, where they cannot be locked out. In some instances the triceps muscles are not strong enough to press the weight out the last couple of inches. Increasing tricep strength with tricep pushdowns or extensions will help take care of this.

If the weight wavers overhead and doesn't feel like it is locked in place strengthening the shoulders may be necessary before you can effectively use the dumbbell push press. Military press, side and bent lateral raises and rotator cuff exercises will strengthen and stabilize the shoulder allowing you to use an appropriate weight in the push press or push jerk.

The dumbbell push press is an athletic lift that is a great addition to an athlete's program, training them to activate their muscles explosively, increasing core strength, balance, and shoulder strength.



Eccentric Training

Marlon Gomez

You've heard it all before, how much can you lift? Just about everyone goes to the gym to "lift" weights, never putting much thought into lowering them. You've seen it before: the person doing barbell curls, allowing the barbell to drop rapidly from the top of the lift back to the bottom with no control during the lowering portion. The lowering part of the repetition is just as important if not more than just lifting it, by allowing the weight to drop you are cheating yourself out of half of the lift. Unless you're training specifically just to "lift" weights, you should be concerned with lowering it as well. The lowering portion contributes to size and strength gains.

In order to understand how Negative Training or Eccentric Training can benefit your current program, we must first classify the various types of muscle contractions. We must also have a fundamental understanding of the anatomy of a repetition. The human body is capable of three types of muscle actions concentric, isometric, and eccentric muscle actions. Lifting a weight is termed the positive portion, or concentric action, of the lift. This is the part of the movement that everyone in the gym seems to put their focus on. Holding a weight at a given point in the range of motion is an isometric action, meaning that no movement is occurring in the body part being trained. This type of muscle action is not typically seen during your usual work out but can become important in some sports training programs. The major muscle action we will be looking at is the lowering of a weight. It is also known as the negative portion or eccentric action.

A Closer Look

Let's take a closer look at what's happening during an eccentric muscle action. As you lower the weight, you are typically much stronger than during the lifting phase. There are two main reasons for the increase in strength; first, you are no longer attempting to overcome the force of gravity by lifting upwards and second, eccentric contractions result in greater force developed in the working muscles because the actin and myosin cross bridges that allow a muscle to contract are stretched apart. What

this means is that regardless of how much weight you can lift, you will be able to lower much more. In fact, you are 20-40% stronger in the eccentric phase. Therefore, the weight you use to train is too light to tax your eccentric strength. This does not mean you should simply ignore your eccentric strength and continue to drop the weight. Instead, you should lower the weight with control to eliminate momentum and focus on the muscle being trained, by moving slower the tension is increased in the working muscles. By incorporating eccentric training schemes, you can get greater increase in size and strength from your workouts.

As with every training method, eccentric emphasized training has advantages and disadvantages. The major advantage of eccentric training is that it allows you to pick up more weight, causing the body to adapt to the increases in weight, which over time will cause increased size and strength. The disadvantage is that the extra weight increases the risk of injury, and depending on the type of eccentric training utilized will require a spotter. There are several types of eccentric emphasized training, using different modalities including free-weights, machines, manual resistance and body weight.

Eccentric Safety and Effectiveness

Before getting into the specifics of eccentrics, safety guidelines must be addressed. The rep speed is of utmost importance when performing eccentric work and will vary depending on the type of method being used. For eccentric training to be effective and maintain safety, you should follow a 3-10 second count per repetition. Any faster and you won't have control of the weight. Always apply maximal effort throughout the entire eccentric portion of the lift. Proper weight selection must be determined. You are 20-40% stronger on the lowering portion of an exercise than the lifting. However, this does not mean



that you add 40% to your max the first time you undertake an eccentric training session, build to this over time by following the eccentric methods below that don't require added weight.

Eccentric Applications

The most common methods of eccentric training are eccentric only, eccentric finishes, emphasized eccentric, accentuated eccentrics and manual eccentrics.

Attentive Spotters are crucial when using eccentric training methods

Eccentric only

This method requires the use of attentive spotters. They allow for the maximum amount of weight to be used safely. The weight used will be approximately 130-140% of the lifters 3RM, the maximum amount of weight you can lift three times. If the load is too heavy risk of injury is increased and the weight will descend too quickly to get a benefit from the movement. You should not push the weight during the concentric portion of the lift; the spotters lift the weight to the starting position and then

when you are ready they release the weight. You then push against the weight as it slowly lowers on its own. If the weight selected is correct, you will push be pushing as hard as possible even when the weight continues to descend. If the weight is too heavy, you will not be able to push up against it long enough to provide an effective eccentric overload, an eccentric should take at least two seconds to complete. If you are able to stop the movement at any point during the lowering portion, then the weight is too light.

Eccentric finishes

These require the use of spotters at the end of your set. After you complete the set by taking it to the point of momentary muscular failure, the spotter will then lift the weight back to the top. Then you will lower the weight under control. This will be repeated until you are not able to control the weight. This method will allow you to reach momentary muscular failure not just concentrically but eccentrically as well.

Emphasized eccentrics

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The advertisement features a central yellow starburst containing the main text. Surrounding the starburst are several images: a male athlete in a white shirt and black shorts running with a blue and white parachute-like device; a female athlete in a red tank top and black shorts holding a blue ball; a male athlete in a white t-shirt with 'POWER SYSTEMS' on it holding a red ball; a male athlete in a white shirt and black shorts performing a hurdle drill on a track; and a male athlete in a white shirt and black shorts running on a track. The background is dark blue with a red border.

This method allows eccentric to be done without the aid of spotters. These are the safest form of eccentrics as they use the lightest weight and are completely controlled by the lifter. The goal of emphasized eccentrics is to increase the length of time it takes to lower the weight. Initially the weight will be lowered to a three second count and gradually increased to a ten second count when the resistance is increased and the weight is again lowered for a three second count. This type of training eliminates momentum from the movement, which keeps tension throughout the range of motion constant and increases the total time under tension for the muscle.

Accentuated eccentrics

These are typically done on a machine but can be performed with dumbbells as well and without the use of spotters. The machine should have a movement arm that allows you to use one or both limbs. The weight will typically be decreased from your regular concentric-eccentric loads. The concentric portion is performed with both limbs while the eccentric phase is executed with one limb at a slow speed. You perform all eccentric reps on the same limb for a set or alternate between reps. If using dumbbells, use both arms to get the weight into the top position then remove one arm and lower slowly.

Manual eccentrics

Manual eccentrics are my personal favorite to perform. They allow the lifter to perform maximally both concentrically and eccentrically without waiting until the end of a set, or just doing eccentric only sets to tax the eccentric strength. Manual eccentrics require a spotter who applies resistance to the bar or weight stack while you are performing the eccentric portion. The major advantage is that the muscle will fatigue both concentrically and eccentrically at about the same time.

Positive results

These eccentric methods all provide a different challenge and add variety to your current training program. Keep in mind they will all result in some serious soreness if applied properly. The delayed on set muscle soreness (DOMS) produced by eccentric training is much greater than in traditional training. The severity of muscle damage that they induce means that they can only be performed for a week or two at a time and only 3-4 times during the year. You may choose to include a few eccentric sets at the end of your regular sets or for the highly motivated an eccentric emphasized workout session. Regardless of which method you decide to use, the result will be greater development in size and strength.

An eccentric training program is not advisable for the beginner that has less than 6 months of proper progressive training under their belt.

Do not go beyond failure during your eccentric sets. An eccentric set should be terminated when you can no longer resist the lowering of the weight for at least a two second lowering phase.

Recovery is paramount. Since, eccentric training causes more muscle breakdown than other types of lifting, it often requires more recovery time. So when you begin doing eccentric workouts, you may well need to alter your weekly schedule

Reps should be kept to no more than 3-5 maximal reps per set
1-2 sets of maximal eccentrics should be executed
They should be incorporated only during heavy phases of training and should be performed sparingly

Guidelines for Incorporating Eccentric Training

1. An eccentric training program is not advisable for the beginner that has less than 6 months of proper progressive training under their belt.
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