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Core Training: Designing a Program for Anyone

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summary

This article provides strategies for strength and conditioning professionals to assist in developing a complete and thorough core-training program for any client.

Core training may be defined as training designed specifically to address a core muscle or muscle action, whether performed individually or coactively to create a stable spine and torso. In general terms, core muscles include the musculature of the abdominal and low-back regions. This “core” of your body is responsible for the transmission of force between upper and lower halves of your body. With respect to low-back health, core muscles play a very important role in stabilizing the spine during lifting exercises as well as everyday activities. The core muscle’s role in spinal stabilization is of particular importance to anyone who has had lumbar disk surgery or is currently experiencing any spine instability. Even healthy

clients need to create a strong and stable core to help prevent injury and increase athletic performance.

To develop a strong and stable spine, core training should incorporate multiple training strategies. Two different training strategies address core training and agree it should incorporate stability, flexibility, and strength-training components. However, the strategies differ with respect to which component should be emphasized (1, 2, 3).

Stability and Flexibility Training for Core Muscles

McGill (3) contends that stability and flexibility training should take precedence over strength training for the core muscles. They describe a situation in which during normal daily tasks, as well as strenuous exercise, the spine can buckle or rotate at a segmental level. Stability and flexibility training must be incorporated so that the muscles controlling spinal stability are trained to adapt to the stress associated with spinal instability. In addition, because vertebral joints allow the spine to move in multiple planes, a program designed to develop a stable spine should be performed in all 3 rotational planes.

Spinal flexibility must be addressed with core training because spinal stiffness will occur at the joint after the removal of a herniated disk. The scar tissue that fills inside the disk causes a natural decrease in flexibility at that joint. The spine compensates with an increased reliance on the neighboring spinal joints; therefore, the neighboring joints must become more flexible to compensate for this added stress. In addition, most low-back pain is caused by inflammation at a given vertebral joint that can result from an unexpected force applied to the spine and the inability of the spinal muscles to maintain a neutral spine. To prevent this damage to the spinal joint, the flexibility of the lumbar spine must be able to compensate for any unexpected force. The ability to maintain a stable spine depends, in part, on the flexibility of the deep spinal muscles.

Flexibility of the core muscles may be addressed by stretching the abdominal and low-back muscles, hip extensors, and hip flexors. A good way to begin any workout is by stretching the hip extensors and back extensors in a progression performed in a supine position as outlined in Table 1. This progression allows for a gradually increasing stretch applied to hip and low-back extensors.

To balance the stretches performed for the hip extensors, the hip flexors and abdominal muscles should then be stretched by using the stretches outlined in Table 1. The other stretches outlined in Table 1 allow for a thorough flexibility program in which every major muscle group that controls core movement is stretched. This program is designed to increase flexibility of the core musculature, which, according to McGill (3), is necessary to allow the incorporation of stability training into core training. To prevent spinal injury, each spinal segment must be able to adjust to a strenuous situation. Thus, the first step in effective core training should be to increase flexibility of the core muscles to compensate for certain stresses.

With this basic flexibility, a client will now be able to progress to exercises performed in an unstable environment, which may be defined as any situation where the pelvis and low back are not supported by a stable surface, such as a floor. This freedom for the pelvis and spine to move requires stabilizing muscles to be activated synergistically to

Table 1 Flexibility Stretches
Supine knee flex with 1 leg straight and 1 leg flexed (low-back and hip extensor) <ul style="list-style-type: none"> • Alternate legs
Supine knee drop side-to-side (oblique) <ul style="list-style-type: none"> • Right side • Left side
Prone push-up with hips to the ground (abdominals and hip flexors)
"Cat-camel" stretch (intervertebral muscles)
Hamstring stretch

maintain proper pelvic and spinal position. Many everyday movements are carried out in unstable environments. A slip, fall, or missed step by someone with a back injury can be extremely painful. These incidences of instability can often trigger back pain in previously healthy backs. If the vertebral column and pelvis are not able to adjust and stabilize, the spine becomes susceptible to injury. Thus, training the spine and pelvis to handle unstable environments is an important component of core training.

Various benches and other pieces of equipment allow a client to train the core in an unstable environment. According to the progression of this program, the first piece of equipment presented is the stability ball. The other pieces of equipment will be discussed when the concept of strength development in an unstable environment is addressed. The isometric exercises in Table 2 are designed to recruit the stabilizing muscles of the spine. The body must balance itself on the ball while holding these various isometric positions, thus causing the low-back muscles to develop tension and stabilize movement of the spine. Stabilizer muscles refer not only to deep vertebral muscles that control segmental movement, but also to the abdominal muscles and hip flexors, low-back extensors, and hip extensors. These muscles all play a role in either moving or stabilizing the spine during any given movement.

As stated earlier, the exercises in Table 2 are provided as a guide for beginning a stability program. More advanced stability training should be introduced in time, particularly with healthy clients and athletes. In fact, a client without a history of back pain potentially could omit the exercises in Table 2 and move to the more advanced stability exercises presented below. However, clients with a history of low-back pain or current pain should first progress through the beginning stabi-

Table 2 Stability Exercises
Prone exercises (balance ball under lower abdominals) <ul style="list-style-type: none"> • One-leg raises (alternate legs) • Opposite arm/leg raise (alternate sides) • Double-leg raises • Back extension hold
Bridges (feet or knees on ball) <ul style="list-style-type: none"> • Prone • Supine (shoulders on ground) • Side (both sides)

ty exercises in Table 2 and then introduce the more advanced exercises as tolerated.

Strength Training (Stable Environment)

Whether clients are individuals with low-back pain or are elite athletes, they need to develop strength in the core musculature. The first step in this program for developing strength is to perform exercises in a stable environment. Strength training for the abdominal muscles can be performed doing exercises on the floor, whereas low-back strength can be developed either on a hyperextension bench or a low-back extension machine. Graves et al. (1, 2) evaluated the effectiveness of developing low-back strength with a low-back extension machine. When performed with an isolated pelvis, the subjects in these studies were able to dramatically increase strength as well as low-back health.

Functionally, core muscles are designed to resist fatigue. If fatigue occurs in these muscles during an action, the risk of injury increases. For this reason, the exercises in Table 3 should initially be performed with only body weight as resistance, except for the low-back extension machine, and the repetitions should be kept high and equally distrib-

Table 3
Strength Exercises
(Stable Environment)

Crunches (progress from body weight to additional weight)

- Bent knee
- Straight leg
- Raised legs
- V-ups (modified or full)

Low-back extension (hyperextension bench)

Low-back extension (weighted machine)

uted for each exercise. In the case of a healthy low back, the principles of progressive overload and specificity apply. Once body-weight exercises are not sufficiently challenging, clients should use additional weights. Only when the client can perform 100 repetitions on each of the strength exercises with body weight can additional weight be added. The additional weight can be held in different positions, such as at the chest or over the head, and contributes to the principle of progressive overload. Table 3 outlines an example of strength exercises that can be used. The given types of crunches can be changed if desired, but it is recommended that the program include a crunch that targets each muscle in the abdominal region. The effectiveness of the low-back extension machine has been evaluated (1, 2); however, a combination of the 2 low-back extension exercises can be performed throughout the training week to maximize benefits.

Strength Training (Unstable Environment)

Both stability and strength training have their place in a core-training program, but they should not be trained in isolation. The incorporation of strength training in an unstable environment may provide the most favorable results

when training for core-muscle stability. The most dangerous situation in which low-back pain may occur is an unstable environment. Stability training deals only with developing isometric strength in the spinal stabilizers that may not be sufficient to address all situations. Strength is gained by performing isotonic strength movements in an unstable environment and is the final aspect of the proposed core training.

Strength training in an unstable environment is easily achieved with the current equipment. Although strength can be developed with isometric training, isotonic exercises allow clients to develop more functional strength that can benefit them in their everyday activities and athletic movements.

Although a basic level of core strength should be achieved with the exercises in Table 3, strength should also be achieved through more complex exercises. People spend the majority of their waking hours with their core muscles in an unstable environment; therefore, why should strength exercises be done only in a stable environment? Stability strength is necessary, but the exercises in Table 4 give some of the methods in which core strength can be developed in unstable environments. With these exercises the development of strength should follow the same principles of progressive overload, periodization, and specificity. Clients should begin with body weight and then progress to additional weights, like dumbbells, weight plates, or medicine balls. Additional weight will allow progressive overload of these core muscles and stabilizers, which will help develop total core strength. Focus should be placed on the standing exercise in Table 4. Although there are many more examples of core exercises that can be done in a standing position, incorporating this type of exercise will greatly benefit every client. By addressing core training functionally, training for strength in an unstable environment can produce excellent results.

Table 4
Strength Exercises
(Unstable Environment)

Stability ball (ball under hips or low back)

- Crunch
- Twist crunch
- Prone reverse crunch (feet on ball, roll knees to chest)
- Reverse crunch (ball under low back)

Decline bench

- Crunch
- Twist crunch

Incline bench

- Reverse crunch (straight leg)
- Reverse crunch (bent knee)

Hanging leg raises/knee raises

Standing (on 2 feet, then move to 1 foot)

- Crunch
- Twist crunch
- Lateral flexion
- Trunk rotation

Program Design and Precautions

Table 5 gives a summary of the components of the recommended training program. The program should be developed based on the medical and training history of the client. The same program may not be recommended for everyone because of varying fitness levels and medical issues. The basis of this program is the inclusion of the 4 training aspects of core muscles: flexibility, stability, strength, and strength with stability. Clients should follow the order of exercises in Table 5 because each exercise builds on the previous one. If a client can address each of these aspects in a progressive manner, then increases in the overall health of the core muscles may result.

Table 5
Overall Program

Flexibility stretches

Strength exercises

Stability exercises

Strength with stability exercises

- Stability ball and standing exercises (2 times per week)
- Decline bench, incline bench, and hanging exercises (2 times per week)

With the number of exercises available, some aspect of core-musculature training can be performed every workout day. Use variety when training, especially with the “strength with stability” exercises. Experiment and find what works best for your client to adequately train all 4 aspects of the core muscles without overtraining or causing injury. Repetitions for both types of strength movements should be kept high. When fatigue begins to set in, do not push too much longer, for injury could follow. Balance the number of repetitions between exercises so that all the core mus-

cles are trained in an equal volume; for example, 3 sets of 30 for all core exercises. These guidelines are general, but they allow trainers to develop a program that will give each client the best results.

As with any program, the exercises should be conducted under proper supervision with special attention to proper form. If at any point pain begins or is exacerbated by any particular exercise, find an alternative exercise to address the movement. Delayed onset muscle soreness may occur because of the nature of conditioning these muscles, but be very careful not to progress too quickly and risk injury, prolonged pain, or discomfort. Anyone with a history of low-back pain should consult a physician to determine what kind of training is safe. ♦

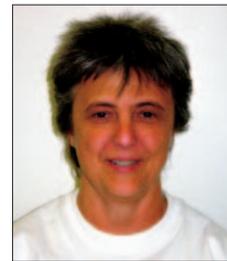
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