

Core Stabilization

The term “Core” has become all the rage in the fitness industry; both athlete and fitness enthusiasts alike are aware of the need to maintain a solid foundation. However, the meaning of the word may be very different depending on the person. For instance, at the collegiate and clinical levels, the term represents the more than 30 muscles that act on the motion segments of the hip and spine. But in a gym, a core class may be comprised primarily of crunches and multiple variations of supine trunk flexion. Arguably, the core concept is appropriately applied in the relationship of stability and energy transfer, where the inner unit functions with the global stabilizers and movers of the outer unit. But for the fitness enthusiast, it is difficult to properly and safely challenge the musculature, especially in the face of imbalance around the lower back and abdominal regions. Because most people are familiar with a traditional, bodybuilding model, they generally select old-school, floor-based exercises such as the crunch or sit-up to strengthen the body’s midsection. They select these types of exercise because “that’s what everyone else is doing,” it’s commonly seen on infomercials, or because the activities are familiar. Crunches and sit-ups, though, have limitations, and for many people, full sit-ups are contraindicated. These exercises only work the muscles in one plane and may put excessive stress on the lower back. Additionally, the literature does not support the use of such activities for improvements in function or sports performance beyond basic muscle activation. Studies have shown that hip flexors often dominate the movement, particularly when the person anchors his or her feet; plus, activation during the performance of the movements is based on several factors, including momentum, range, and movement speed. And despite

attempts to clarify it, the myth of spot reduction continues to pervade the gym culture; exercisers attempt hundreds of repetitions of floor-based crunches because they believe it will reduce their waist size and potentially produce the coveted six-pack abs. Basic exercise science laughs at the notion, particularly with such an exaggerated rep scheme that is more likely to stress the person’s lower back or neck than improve their waistline. Ultimately, achieving a lean abdominal midsection requires genetics and proper eating habits.

The concept of the core should really be based in function, suggesting range of motion, muscle strength balance, and stability. The musculoskeletal system is designed for upright posture and locomotion; therefore, isolating segments rather than coordinating actions is somewhat counterintuitive. When these muscles get weak and tight or have poor communication pathways, the risk for the development of injury exists. Low back pain is likely to occur in over 75% of the population and increases with age, so it is imperative that trainers be able to identify exercises that will best strengthen their clients’ core muscle systems while teaching them to appropriately stabilize during everyday activities. In rehabilitative and functional settings, clients are encouraged to perform closed-chain exercises, because they tend to be more effective and put less stress on a joint than similar open-chain exercises. Closed-chain work often encourages greater kinetic chain efficiency and better central stabilization, assuming the technique is correct. Examples of closed-chain exercises include standing trunk rotation, push-ups, pull-ups and squats, while comparable open-chain exercises might include the torso rotation machine, chest presses, lat pulldowns, and leg extensions. Such isolative, single-joint

exercises primarily benefit bodybuilding because of their focus on specific muscle groups.

With all the confusion surrounding core exercises, researchers have sought to find the holy grail of ab workouts. A study performed at the Andrews-Paulos Research and Education Institute in Gulf Breeze, Florida attempted to identify which exercises most effectively activated the core stabilizers. The researchers defined the core stabilizers as the lumbopelvic hip complex and selected eight Swiss ball exercises to compare against two traditional movements. They enlisted 18 subjects who performed five repetitions of each of the eight exercises while connected to EMG equipment that recorded data for upper and lower rectus abdominis, external and internal obliques, latissimus dorsi, lumbar paraspinals and rectus femoris. EMG signals were significantly higher in the rectus abdominis and obliques during the performance of the physioball roll-out and pike compared to the other traditional abdominal exercises (keep in mind that the deep muscles of the spine are difficult to assess using EMG). However, the pike and roll-out are relatively challenging exercises that may not be appropriate for beginning exercisers. A similar study, published in the *Arch Phys Med Rehabilitation* (Vol 86), found that of four exercises selected to be performed both on and off a physioball, the upward position of the physioball press-up and the single-leg hold caused the most activation in the rectus abdominis muscle, but the addition of the stability ball did little to further engage the muscles of the core. The quadruped, in which the client begins on his or her hands and knees and proceeds to lift contralateral limbs, alternating sides, is a core stability exercise that is best suited for individuals who are newer to exercise or are working to improve their balance

and coordination. Most commonly it is the pectoralis major, hip flexors, and erector spinae that dominate stability exercises such as the quadruped, rather than the pelvic floor, transverse abdominis, and posterior obliques. Performance of the exercise on the physioball demonstrates an increase in activation of these local stabilizers under proper instruction. As a side benefit, use of the physioball limits the contraction of the rectus abdominis, which often “unintentionally” dominates stability rather than serving its phasic role.

In a study that focused more on specific styles of training, researchers at the School of Human Kinetics and Recreation in Newfoundland reviewed the effectiveness of instability resistance training for athletes, recreational athletes, and individuals requiring rehabilitation or other therapeutic measures. Training athletes tends to require the incorporation of movements that teach acceleration and deceleration in a manner that safely and effectively respond to destabilizing forces; while core stabilization exercises can decrease the incidence of low back pain and increase the sensory efficiency of soft tissues, athletes are generally best served by incorporating forces in free-living conditions and at varied velocities. In many cases, free-weight exercises that are ground-based and employ moderate instability (e.g., chops) or hanging closed-chain exercises (e.g., hanging pike) best serve this population. Recall that because their prime purpose is postural, abdominals tend to be primarily made up of type I fibers. This suggests an endurance plan would best train the groups, but for human performance that is not the case. Rather, the idea of specificity suggests performing movements in whole or in part that resemble free-living conditions. Additionally, the loads and velocities should be similar to the demands of the target activity, and individuals are generally better

served by selecting exercises that place higher demands on the body through moderate repetition ranges. Unstable resistance exercises such as the single-leg medicine ball rotation are excellent alternatives for individuals who train for recreational purposes or who may not have access to the equipment necessary for challenging closed-chain exercises.

There are many ways to skin a cat, but the reality is some abdominal exercises work more effectively than others. While crunches, machine trunk flexion, and sit-ups recruit tissues that act on the trunk are popular, they can be considered

narrow in scope. Certainly a bodybuilder would benefit from repeated weighted abdominal flexion, but most other populations can find more return by using closed-chain exercises that promote multi-plane involvement. For the average fitness enthusiast, focusing on muscle balance between trunk flexion and extension (1:1 ratio) challenging the trunk in multiple planes (split stance trunk rotation) while adding in closed chain actions (medicine ball chops) and reducing isolation on the low back and hip flexors will serve as a good start. Ultimately, the key is identifying safe and effective exercises and performing only quality movements.