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Low Back Pain and Core Stability Exercise

By Ya-Ting Hsu, B.S. P.T., M. A.

Core stability training has become a popular component for fitness programs. Look at the advertisement claims for all kinds of training, such as Pilates, Yoga, even martial arts. They always address how exercise can work on your core and help swipe out the “extras” on your tummy. For those with low back pain, your doctor or physical therapist may have recommended working on your core to help stabilize the back. In this article, you will learn more about trunk stabilizers (muscles), core stability exercise and the relationship between chronic low back pain and lumbar stabilization.

What and where is the core?

As the word “core” suggests, it is a muscular box in the center of the body. The abdominals are in the front, paraspinals (trunk extensors) and gluteals in the back. The top of the box is the diaphragm and the bottom is the pelvic floor and muscles of the hip girdle. The core offers proximal stability for distal mobility. Here is an extreme example: suppose the core does not have the strength to support you sitting steadily. You would not be able to keep from moving back and forth (no proximal stability), when reaching forward to take a glass off a desk (no distal mobility). So, a strong core helps increase the trunk stability.

How does the core work?

The core muscles connect with the thoracolumbar fascia and work as a “natural corset” to increase stability and protect the lower



back. Take a deep breath, hollow in your stomach and tighten your pelvic floor muscles. You can start activating your natural back belt and help relieve your back discomfort.

Sit-ups + Back extensions = Core Stability?

If you have an on-and-off low back problem, you’ve probably been told that you need to increase your trunk stabilization. But how? Most people think the solution is sit-ups plus a trunk extension exercise. Actually, that is not quite right. There are two types of muscle fibers that comprise the core muscles: slow-twitch fibers (deep and local muscles close to the bones) and fast-twitch fibers (superficial and global muscles). The slow-twitch muscle fibers are short in length and control interspinal motion. Therefore, they act like a radar to detect small changes of spinal movement and respond to changes in posture and external load. We will call them “postural muscles.”

Important postural muscles include transverse abdominus, multifidus, internal obliques, and the pelvic floor muscles. Studies have shown that in individuals with low back pain, the postural muscles are very dysfunctional. Therefore, core stability training should emphasize the local postural muscles. The fast-twitch muscle fibers are the superficial muscles with a large lever arm. The main function is to produce force and movement. Important “movement muscles” include erector spinae, external oblique, rectus abdominis, and quadratus lumborum. Most of you are more familiar with these “movement muscles” since the traditional weight training program only stresses these muscles. Thus, only doing sit-ups and back extensions will not fully improve trunk stabilization.

What is spinal stability?

In 1992, Panjabi first described a spinal stability model with three components: passive components (bone and ligament), active components (muscles) and neuromuscular components (neural control). Among these, muscles and neuromuscular controls take key roles as spinal stabilizers in neutral and functional positions. We can apply this idea to training. A more advanced core movement combines proper sensory inputs with exercise. For example, during training use a ball, mat or pulley, or just decrease the contact area of the body/limbs.

Core Stability Exercise: Part I.

Actually, you don't need to work “super hard” to train these postural muscles. Typically, only around 10% of maximal contraction is needed to provide spinal segmental stability. Therefore, endurance is much more important when dealing with your low back pain. This makes sense, since you need the postural muscles to contract for a long period of time (i.e. endurance) to sustain a good posture and respond to external loads. This is not to say that core strength is not important. Core strength is also needed for unpredictable activities, like a fall or quick movements. But strength is not necessarily the only solution, especially when you have back problems.

Core Stability Exercise: Part II.

An evidence-based core stability program will suggest that you work on the key postural muscles, including transverse abdominus, multifidus, and pelvic floor muscles. It's difficult to illustrate the exercises here, since the first step you need is to learn how to isolate these local muscles. (That's why you usually need a professional if you have back problems.) But I've already given you the rule of thumb---use 10%-20% of your maximal strength when tightening the postural muscles. We need endurance, not strength. So, let's go back to the “natural corset” idea and practice again. Take a deep breath, hollow in your stomach and tighten your pelvic floor muscles.

Try to do the above instructions with different positions and activities. You will probably find that it is not easy to tighten your core all the time when sitting, standing and even walking up stairs. Gradually increasing the core's endurance can help you wear a supportive “natural corset” and deal with the back pain.

References:

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Recipe: Pumpkin Polenta with Grilled Vegetables and Sausage

By Brandon Rhines

Serves 4

If pumpkin polenta doesn't remind you of autumn, we don't know what will! This recipe tops polenta with grilled sausages and veggies, but you can get creative and substitute pork tenderloin or grilled chicken breasts instead of the Italian sausages. Enjoy!

INGREDIENTS

- 3 tablespoons extra virgin olive oil (EVOO)
- 1 eggplant, sliced into 1/2-inch thick slices
- 1 head radicchio, cored and cut in quarters
- 2 pieces hot Italian sausage
- 2 pieces sweet Italian sausage
- 2 cups chicken stock, regular *or* low sodium
- 2 cups skim milk
- 1 cup quick-cooking polenta
- 1 can pumpkin puree (15 ounces) *or* frozen butternut squash puree, defrosted
- 1 tablespoon honey
- 2 tablespoons rosemary, chopped
- Salt and freshly ground black pepper

PREPARATION

Heat a grill or grill pan to medium-high heat. Drizzle the EVOO over the eggplant and radicchio. Grill the sausage, eggplant and radicchio until cooked through, about 10-12 minutes.

While the sausage and vegetables are cooking, bring the chicken stock and milk to a boil in a saucepan. Once the liquid comes to a boil, stir in the polenta with a wooden spoon until it all comes together. Stir in the pumpkin puree and then add the honey. Finish with the rosemary, salt and plenty of black pepper.

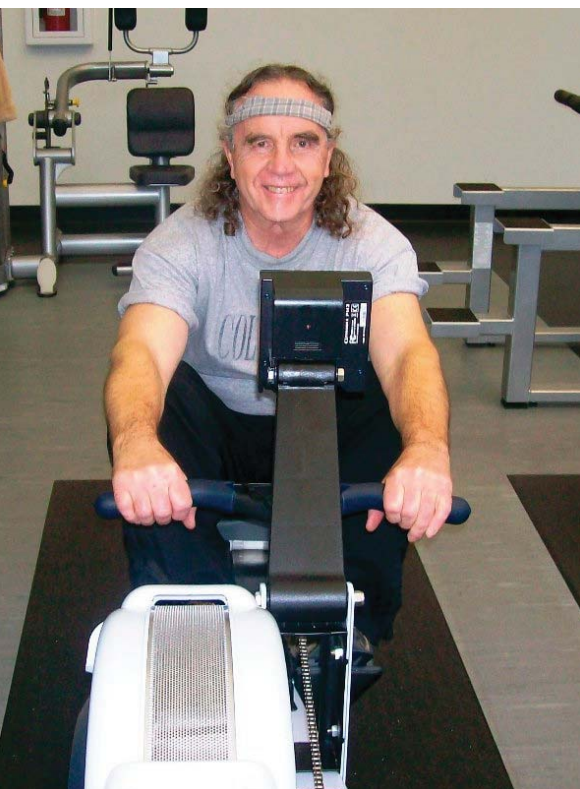
When the sausage and vegetables finish cooking, slice the sausage on a bias and serve over the polenta mixture with the vegetables.

UP CLOSE AND PERSONAL WITH BOB MERRITT

By Justin Dials

Bob is University staff member working as a research associate in physics. Since joining our program in September of last year, Bob's consistency with his training has resulted in significant improvements in multiple areas of health and fitness. All of you are familiar with the treadmill tests included in your annual assessments; that are used in part to determine your cardiovascular fitness level. At Bob's follow up visit just a few weeks ago, he achieved a value representing a 20% improvement. In addition, the muscular strength component of his testing corresponds with a 30% improvement. Further, and as a result of his hard work and dietary changes, Bob's weight decreased by 20 pounds.

Aside from the physiological and clinical benefits of exercise training, perhaps the most important aspect of one's health, and one that is consistently overlooked, relates to the influence of exercise on quality of life. As seen in the figure below, a large emphasis is placed on the psychological benefits through exercise training. A simple method to measure the component is simply through the 'feel-good test'. While discussing this integral component of health with Bob, he stated, "I feel significantly better since beginning my exercise program. The weight I've lost in addition to the condition that I've attained allows me to feel so much better about myself and I feel that my emotional well-being has improved dramatically."



Like many of our members, Bob participated in the recent aerobic exercise and strength training contests and finished near the top of the pack in both. His motivation and commitment to improved health is evident in the duration and intensity of his training. Upon speaking with Bob a few months ago, he posed a question involving the modalities of exercise that impact weight loss and more importantly 'waist loss' the most. After sharing with him the impact of aerobic exercise training on caloric expenditure, he decided to devote additional time on the treadmill and rowing ergometer. The work has paid off for Bob. As stated earlier, he has decreased his weight by 20 pounds and has noticed the dramatic reduction in waist circumference of over two inches.

Bob understands that he is not alone in his exercise training. Many of you have experienced similar benefits while exercising in our facility and as staff; we appreciate your time and devotion to health and wellness. My time spent with Bob, as well as other numerous members, reinforces my passion for 'doing what I do' which is helping others help themselves. Thank you Bob, for allowing me to work with you and to be involved in your health and well-being.

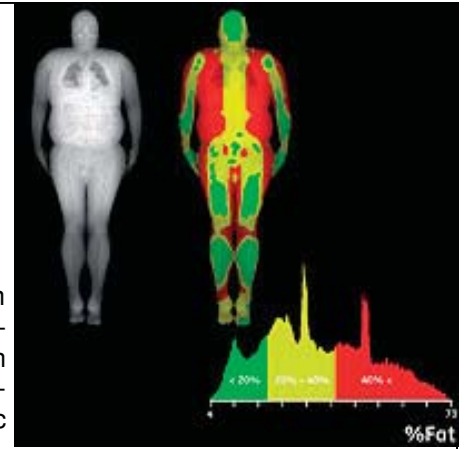
Benefits of Exercise

- Lowers "bad" LDL cholesterol
- Raises levels of "good" HDL cholesterol
- Decreases body fat and increases muscle strength
- Reduces blood pressure
- Decreases risk for diabetes and improves body's regulation of blood sugar
- Improves overall quality of life and ability to function independently
- Enhances performance of work, recreational, and sport activities
- Decreases risk for future adverse cardiac events
- Reduces risk of some cancers
- Improves body's ability to use oxygen and body's blood circulation
- Decreases fatigue and increases energy level
- Enhances mental health by reducing anxiety and depression

Spotlight on Technology

Labs in Life and the iDXA

By Matthew Garver

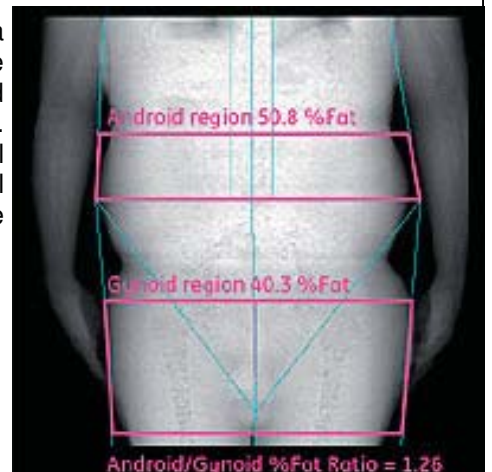


As an exercise scientist, I often hear the following, “Oh, so you want to be a gym teacher” or “Is that like sports medicine or athletic training?” My response is usually something like this, “Actually, my degree is an interdisciplinary study which focuses on anatomical and physiological adaptations in conjunction with pathophysiological and nutritional consideration related with both acute and chronic movement.” For some reason, that answer is usually a conversation killer. Overall, I think that exercise science is rather misunderstood. To help straighten out the matter a little, I am starting a new series of articles entitled, “Spotlight on technology.” Over the course of the next few newsletters, you will see selected articles on equipment which is used within our facilities. If you know more about what we do, maybe you understand us more.

Labs in Life and the iDXA: Earlier this summer, COSI ® and OSU initiated a research collaboration called “Labs in Life” which is on site at COSI under the eye of Dr. Swain (formerly Babcock) and Dr. Buell from the nutrition department. The facilities are phenomenal and have drawn audiences locally and from around the nation and world. One local company held their international research symposium at COSI and requested lab tours for their guests. In another tour, the VP and other highly-esteemed members of the Boston Science Center came to COSI to view the labs in hopes of setting up a similar project with Boston University, Boston College, Harvard, and MIT among others. The main draw of the lab is the glass-enclosed rooms (like large pods) which allows live audiences to watch events occurring during actual research collection periods. There are a total of 4 large glass-pods which contain various pieces of equipment. One room houses all of the body composition equipment while another is stocked with a treadmill, Biodex and Micro fit system (read later newsletter issues for highlights of these pieces of equipment).

Of all the equipment, the baby of the lab is the iDXA. iDXA stands for: The Incredible, Innovative, Intuitive, Integrated, Intelligent Dual-energy x-ray absorptionometry (DEXA). How does this machine work and what does it do? I have attached a couple of pictures to make this easier to understand. With use of low dose x-rays (very low – 1/60th that of a normal front and back chest x-ray!) the arm of the machine slides from the subjects head down the body. The x-rays which come from the lower arm pass through the body and are interfered with by various tissues of the body in relation to the amount of tissue and type of tissue in a given area. By knowing the amount of x-rays leaving the lower arm and the amount being “sensed” by the upper arm, a picture of the body can be generated. Amazingly, the machine can scan the body in less than 7 minutes and produce pictures of the skeleton, the muscle mass and the fat mass. What is even more amazing is that the machine will quantify the amount of calcium and the bone density and bone content of all the parts of the body. If you want to find out how dense your lumbar spine is....we got you covered. Same thing with the bone content of the right humerus vs. the left humerus. If you need to see the calcium content in the left tibia you know where to go. This machine will do the same thing for muscle mass and fat mass. Not only can we look at the amount of muscle on the right upper leg vs. the left upper leg, I can tell how much fat tissue is in these same areas. This machine will be of great assistance as we dig deeper into the idea that fat content location (and not just total fat content) is related to various health issues.

From left to right the pictures are: 1) the iDXA 2) a bone/body comp display 3) a body comp scan showing fat distribution and breakdown of fat content in the android and gynoid regions (ever heard of “apple” and “pear-shaped” people?). I could say so much more but I will leave you with this...for a cool \$190,000 you could have one of these machines too.





Up Close and Personal with Brian Unverferth

By Nate Saunders

Brian will be graduating this summer with a MA in Sport and Exercise Science from OSU. He first came to us from Kalida High School in Northwest Ohio. His personal passion for athletics inspired him to pursue Exercise Science, both as an undergraduate and graduate student. While not an integral part of his future success as a Strength and Conditioning Coach, Brian very much enjoys his role as a graduate teaching associate (teaching exercise testing laboratories, and guiding FSFP members toward their fitness goals). In addition to his duties as a graduate associate, he has focused his studies toward strength and conditioning. Since January, he has played a major role in the success of the OSU football team by personally attending to the development of our athletes as an intern. He also interned with the Columbus Crew this past summer and found it to be quite a rewarding experience. Upon graduation, he will likely have two important certifications, Certified Strength

and Conditioning Specialist (CSCS) and Health and Fitness Instructor (HFI). Brian would like to find work locally, but would entertain the idea of moving elsewhere if it would enhance his career. Hopefully OSU will continue to benefit from his expertise for many years to come.

Altitude Training Study:

Current Research in OSU Exercise Science

By Alisa Blazek

Altitude training has been shown to increase athletic endurance performance and is used frequently by elite athletes, such as Olympians. “Live high-train low” training means the athlete lives or sleeps at a high or moderate altitude but trains at sea level. Alternatively, some athletes use apartments, chambers, or other devices that simulate living at altitude by lowering the pressure of oxygen to less than the pressure found in the air they would normally breathe at sea level. It is believed that over time, live high-train low altitude training causes the body to adapt to a lower oxygen pressure by increasing EPO release from the kidneys. EPO is a chemical that increases production of new red blood cells in the body. Since red blood cells carry oxygen, the oxygen carrying capacity of the blood is increased. This increased oxygen carrying capacity may allow an athlete to use more physical energy for a longer period of time, and performance improvements in endurance running, swimming, and/or biking may result.

Although there are positive benefits, live high-train low training has been shown to lead to decreases in immune system function. The immune system is a collection of cells and chemicals in the human body that function to fight bacterial or viral infection. Research has shown that athletes training at high altitude may be more likely to get upper respiratory infections, such as a “cold” or “flu.” Researchers can measure the immune system by collecting proteins called antibodies found in saliva.



Dr. Swain, an OSU Exercise Science Instructor and COSI researcher, has shown previously that a simple device worn an hour each day for fifteen days in the lab has the same performance enhancing effects as live high-train low. The purpose of the present study is to determine whether this device will impact the immune system in the same manner as live high-train low. Preliminary data suggests that the device is effective in improving running performance, while having no detrimental effects on antibodies in the saliva. This research may reveal a safe, cost-effective, simple, and non-cumbersome method to simulate altitude that could prove useful to many competitive endurance athletes.