Enhancing Low-back Health through Stabilization Exercise

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Background Perspective

Appropriate exercise design for the low back cannot be achieved with pamphlets showing suggested exercises. Some people with a history of back troubles desire pain relief and spine stability (a health objective) while others may seek a performance objective (which may be counterproductive to optimal back health). Some people need more stability while others may need more mobility. Some exercises will exacerbate the back troubles of some people but may help others. Because each individual has different needs, various assessment approaches should be utilized to aid in subsequent decisions for exercise design. Further, proficient exercise professionals will need an understanding of the issues, and of the myths and realities pertaining to each issue, to form a foundation for the decision process. The focus here is to briefly introduce a few selected issues, followed by an example of a quantified and evidence-based exercise program.

Rather than provide thin background material that will not be robust enough to assist the exercise design process (the book is necessary to serve that purpose), I have decided to offer some initial food for thought. There is no shortage of manuals and books offering wisdom on the topic of low-back health written by authors with a wide spectrum of backgrounds, ranging from formal medical or rehabilitation training to lay people who found an approach to alleviate their own back troubles and have become self-proclaimed prophets "believing" that others will benefit. Their intentions are honorable, but their advice is rarely based on a sound scientific foundation. In my opinion, too many of these books offer inappropriate recommendations or even harmful suggestions. Years ago, as I began to develop scientific investigations into various aspects of understanding low-back problems, I would ask my graduate students to find the scientific foundation for many of the "common sense" recommendations I was hearing both in the clinic and in industrial settings. To my surprise, they would report that the literature yielded no, or very thin, evidence.

Examples of such "common sense" recommendations include the following:

- Bend your knees when performing sit-ups.
- When performing a lift, bend your knees and keep your back straight.
- Reducing the load throughout the workday will reduce the risk of back troubles.

In fact, the benefit of each of these has been shown to be highly questionable.

It is widely believed that stretching the back and increasing the range of motion is beneficial and reduces back problems—however, the scientific evidence shows that, on average, those who have more range of motion in their backs have a greater risk of future troubles. Clearly there is a tradeoff between mobility and stability; the optimal balance is a very personal and individual variable. Indeed, the "stability/mobility balance" may shift during a progressive exercise program as symptoms resolve, with advancing age, or as rehab/training objectives change. Another generally perceived goal of training the back is to increase strength. Strength has little association with low-back health. In fact, many people hurt their backs in an attempt to increase strength. It could be argued that this is an artifact, in that some exercise programs intended to enhance strength contained poorly chosen exercises such as sit-ups. Performing sit-ups both replicates a potent injury mechanism (specifically posterior disc herniation) and results in high loads on the spine. On the other hand, muscle endurance, as opposed to strength, has been shown to be protective against future back troubles. Further, for many people, it is better to train for stability rather than stretching to increase range of motion.

Recent investigations into injury mechanisms have revealed that many back-training practices actually replicate the loads and motions that cause parts of the low back to become injured. For example, disc herniations need not have excessive loading on the back to occur; rather, repeated forward flexion motion of the spine is a more potent mechanism. Thus, if full flexion or deviation is avoided in the spine, the risk of herniation is remote. But for most fitness professionals the link between injury and exercise needs to be better developed.

Injury is caused by damage to supporting

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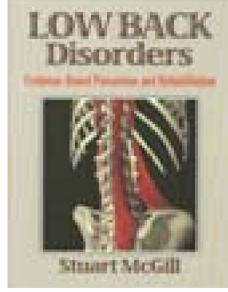

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tissues. This damage reduces the normal stiffness in the spine, resulting in unstable joints. Thus, while injury results in joint instability, an event characterized by improper muscle activation can cause the spine to buckle or become unstable. There is no question that excessive loading can lead to back injury, but instability at low loads is also possible and problematic. For example, it is possible to damage the passive tissues of the back while bending down and picking up a pencil, or sneezing, if sufficient stability is not maintained. Some people recommend that when training, one should exhale upon exertion (when weight training, for example, exhaling upon the lifting phase and inhaling on the lowering). In terms of grooving stabilizing motor patterns for all tasks, this is a mistake. Breathing in and out should occur continuously, and not be trained to a specific exertion effort—this helps to maintain constant abdominal muscle activation and ensure spine stability during all possible situations. (The opposite is true for maximal effort competitive lifting where a Valsalva maneuver with the breath held is necessary, but performance training is not the emphasis here.)

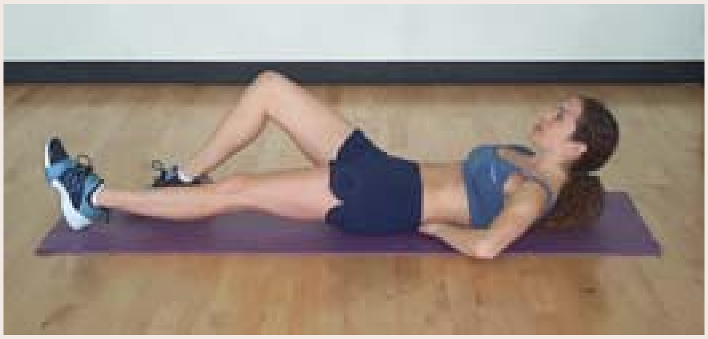
Further, specific muscle activation patterns are essential to avoid injury but have also been documented to become perturbed following injury. Pain is a powerful instigator in the deprogramming of normal/healthy

A Daily Routine for Enhancing Low-back Health

The following exercises have been chosen to spare the spine, enhance the muscle challenge and enhance the motor control system to ensure that spine stability is maintained in all other activities. Having stated this, they are only examples of well-designed exercises and may not be for everyone—the initial challenge may or may not be appropriate for every individual nor will the graded progression be the same for all clients. These are simply examples to challenge the muscles of the torso.

∂ *Cat-Camel*

The routine should begin with the cat-camel motion exercise (spine flexion-extension cycles) to reduce spine viscosity (internal resistance and friction) and "floss" the nerve roots as they outlet at each lumbar level. Note that the cat-camel is intended as a motion exercise—not a stretch—so the emphasis is on motion rather than "pushing" at the end ranges of flexion and extension. Five to eight cycles have shown to be sufficient to reduce most viscous-frictional stresses.



∑ *Curl-up*

The cat-camel motion exercise is followed by anterior abdominal exercises, in this case the curl-up. The hands or a rolled towel are placed under the lumbar spine to preserve a neutral spine posture. Do not flatten the back to the floor. Flattening the back flexes the lumbar spine, violates the neutral spine principle and increases the loads on the disc and ligaments. One knee is flexed but the other leg is straight to lock the pelvis-lumbar spine and minimize the loss of a neutral lumbar posture. Alternate the bent leg (right to left) midway through the repetitions.

π *Birddog*

The extensor program consists of leg extensions and the "birddog." In general, these isometric holds should last no longer than seven to eight seconds given recent evidence from near infrared spectroscopy indicating rapid loss of available oxygen in the torso muscles when contracting at these levels; short relaxation of the muscle restores oxygen. The evidence supports building endurance with increased repetitions rather than extending "hold time."

motor patterns and the creating of perturbed patterns. The exercises and programs described here are based on the latest scientific knowledge of how the spine works and how it becomes injured. In addition, they have been quantified for spine load, resultant spine stability and muscle oxygenation, to name a few. These are only a few examples to begin a program. The goals are to enhance spine stability by grooving motion and muscle activation patterns to prepare for all types of challenges. Of course, other exercises may be required subsequently to enhance daily functioning, but once again, these will depend upon the characteristics and objectives of the individual.

Two other concepts must be emphasized at this point. First, training approaches intended to enhance athletic performance are often counterproductive to the approaches used when training for health. Too many patients are rehabilitated using athletic philosophies or, worse yet, "body-building" approaches designed primarily to isolate and hypertrophy specific muscles, and progress is thwarted. Many bad backs are created from using inappropriate performance philosophies.

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Side Bridge

The lateral muscles of the torso (called quadratus lumborum and the abdominal obliques) are important for optimal stability, and are targeted with the side bridge exercise. The beginner level of this exercise involves bridging the torso between the elbow and the knees. Once this is mastered and tolerated, the challenge is increased by bridging using the elbow and the feet. Advanced variations involve placing the upper leg and foot in front of the lower leg and foot to facilitate longitudinal "rolling" of the torso, which challenges both the anterior and posterior portions of the wall and further grooves stabilizing patterns that are transferable to upright tasks. This is a superior exercise in terms of muscle activation, low spine load and stabilizing patterns compared to exercises such as performing a sit-up with a twist, which produce lower muscle activity levels and higher tissue loads.

Caveats for Exercise

1. While there is a common belief that exercise sessions should be performed at least three times per week, it appears low-back exercises have the most beneficial effect when performed daily.

2. The "no pain, no gain" axiom does not apply when exercising the low back in pained individuals, particularly when applied to weight training.

3. General exercise programs that combine cardiovascular components (like walking) with specific low-back exercises have been shown to be more effective in both rehabilitation and for injury prevention. The exercises shown here only comprise a component of the total program.

4. Diurnal variation in the fluid level of the intervertebral discs (discs are more hydrated early in the morning after rising from bed) changes the stresses on the discs throughout the day. Specifically, they are highest following bed rest and diminish over the subsequent few hours. It would be very unwise to perform full range spine motion while under load shortly after rising from bed.

5. Low-back exercises performed for maintenance of health need not emphasize strength; rather, more repetitions of less demanding exercises will assist in the enhancement of endurance and strength. There is no doubt that back injury can occur during seemingly low-level demands (such as picking up a pencil) and that the risk of injury from motor control error can occur. While it appears that the chance of motor control errors, which can result in inappropriate muscle forces, increases with fatigue, there is also evidence documenting the changes in passive tissue loading with fatiguing lifting. Given that endurance has more protective value than strength, strength gains should not be overemphasized at the expense of endurance.

6. There is no such thing as an ideal set of exercises for all individuals. An individual's training objectives must be identified (be they rehabilitation specifically to reduce the risk of injury, optimize general health and fitness, or maximize athletic performance), and the most appropriate exercises chosen. While science cannot evaluate the optimal exercises for each situation, the combination of science and clinical experiential "wisdom" must be utilized to enhance low-back health.

7. Be patient and stick with the program. Increased function and pain reduction may not occur for three months.

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Identifying the training objectives is paramount. The emphasis here is on enhancing spine health—training for performance is another topic. Second, many of the training approaches that are used at joints such as the knee, hip, shoulder, etc., are mistakenly applied to the back. The back is a very different and complex structure, involving a flexible column, with complex muscle and ligamentous support. The spine contains the spinal cord and lateral nerve roots, and musculature intimately involved in several other functions, including breathing mechanics, to give just one example. Many of the traditional approaches for training other joints in the body are not appropriate for the back—either they do not produce the desired result or they create new patients.

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