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Demolishing The Myths About Back Pain

The truth about low-back pain

We demolish some of the myths about the condition that plagues athletes as well as ordinary mortals

As spinal expert Richard Deyo points out, there are three certainties in life: death, taxes, and low-back pain. After all, up to 80% of all adults experience back problems, and back pain is a leading cause of doctors'-office visits, hospitalisation, surgery, and work disability. In the United States alone, the annual combined cost of back-pain-related medical care and disability compensation is estimated at 50 billion dollars, or about 35 billion pounds (1).

Athletes are not exempt from such back worries; in fact, low back pain is one of the most common maladies which sports active people have to face. So – you would think that with all those troubled backs hanging around out there, both in the regular and sports worlds, sports-medicine experts should know just about everything there is to know about healing athletes' backs, right?

Think again! In fact, many of the most popular beliefs about caring for athletes' backs have little support from scientific research. In this article, we discuss several of these myths about back care for athletes. You will probably recognise the myths. In fact, it is highly likely that up to this very moment you have been treating the myths as 'gospel' – as valid ways to keep your back out of trouble.

The first myth

Ready? Here's myth number one: to protect your back, you should strengthen your torso muscles, ie, your abs and low-back muscles.

Recognise it? This myth will definitely die hard, partially because it makes so much intuitive sense. After all, if your abs and low-back muscles are incredibly strong, won't they stabilise your torso and keep you from engaging in those sudden, uncontrolled, perhaps twisting motions which could throw your back out of kilter? Plus, can all those physical therapists, the ones who have athletes and back-malady patients doing strengthening exercises for their low-back muscles and abs, be wrong?

Well ... in fact they could be wrong. Intuition and logic are great things, but several scientific studies have actually shown that muscle strength does not predict which persons will have future back troubles. For example, in research carried out by venerable Danish spine expert, Fin Biering-Sorensen, M.D., 82% of the inhabitants (male and female) of Glostrup, a Copenhagen suburb, were surveyed to determine potential relationships between anthropometric measurements, flexibility/elasticity of the low back and hamstrings, back-muscle strength, and back muscle endurance with the probability of low-back troubles during a one-year period(1). The main finding in this study, which received the prestigious

1983 Volvo Award in Clinical Science, was that good isometric endurance, not strength, of the back muscles (in other words, an ability of the low-back muscles to maintain moderate levels of force for prolonged periods of time without significant fatigue) was the best apparent preventer of low-back trouble in men and women.

How isometric endurance was evaluated

Isometric endurance of the back muscles was evaluated by determining how many seconds a subject was able to keep the unsupported upper part of the body (from the superior border of the hip bones) horizontal while the subject was lying prone (tummy down) with arms folded across the chest and the buttocks and legs fastened to a table with wide canvas straps (in other words, the upper body, cantilevered into open space, had to be kept level via continuous actions of the low-back muscles).

This simple test was a great predictor of an individual's ability to stay away from back problems, and this relationship has an intuitive appeal of its own. After all, isn't it reasonable to think that the back muscles protect the spine – but that such protection might begin to wear thin as the back muscles begin to become fatigued, and thus produce less protective force? It makes sense to think that huge amounts of force are not necessary to support the spine under normal conditions, but that the spine may be more easily injured if force application dips below a certain level.

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In a subsequent investigation carried out in Helsinki, Finland, which reinforced such notions(2), spinal physical capacity and static back endurance were again studied for their ability to predict the first-time occurrence of back injury. Of a total of 126 individuals who were completely free from back problems at the beginning of the research, 33 subjects developed low-back maladies over a one-year period. As it turned out, the results of a static back endurance test (again, a test of the ability of the back muscles to generate moderate force for extended periods) were the only measurements which indicated an increased risk of low-back injury. In fact, individuals with poor back-muscle endurance were more than three times more likely to develop back troubles, compared with subjects with regular, medium endurance!

More than 58 seconds

Of course, you are thinking: how did this static back endurance test actually work? Naturally, you are also curious about the prospects that a good performance on this test might keep you free and clear of back difficulties during the coming year (of course, you are less likely to be thinking that a poor performance will necessitate the undertaking of a serious, seven-day-a week effort to overhaul the endurance of your spinal force applicators). Well, the test was a simple one. In fact, it was simply Fin Biering-Sorensen's-

Volvo-Award-Winning exam, with the trunk in thin air, extended out ñ from the tops of the hips up – from a table upon which subjects lay prone ñ and fastened to the table with nice straps.

In this Finnish study, age, sex, occupation, and muscular-strength tests (repetitive sit-ups, arch-ups, squats, and lifts) were all reviewed as possible candidates for low-back-pain prediction, but only the Volvo exam fitted the bill. As it turned out, both men and women who were unable to maintain Volvo for more than 58 seconds were the most likely to have agonising spinal problems during the one-year period (please test yourself now). That dashed Fin (who was actually a Dane) had it right!

Why, then, do so many ostensibly therapeutic back programmes emphasise upgrading the strength of the back muscles, rather than their endurance? As spinal maestro Stuart

McGill of the University of Waterloo in Ontario, Canada, points out, the emphasis on strength may well be a result of a popular paradigm in which the goal of training is always to enhance performance(4). It is also possible that the coronation of strength may result from the pervasive utilisation of bodybuilding approaches in the field of rehabilitation. At any rate, the real research indicates that the thrust toward strength as a back-pain prophylactic may well be misdirected.

And the second myth

At this point, you are no doubt ready for low-back myth number two, which simply states: to protect your back, you should always perform your situps with bent knees. If you have not heard this recommendation, you evidently have been frequenting the gyms of upper North Dakota to carry out your workouts, because the myth is as common as soap in a shower room. We call the statement a myth because there is absolutely nothing in the scientific literature to support the proposition. In fact, a fine study carried out in the Department of Kinesiology at the University of Waterloo in Ontario demonstrated that there was little advantage (for the back) associated with one knee position over another(5).

In this investigation, in which bent-knee sit-ups surely met their Waterloo, nine men performed 12 different ‘abdominal’ exercises, representing a wide range of different techniques, in random order. The subjects recovered for four to six minutes between exercises, during which any necessary equipment was readjusted and the subsequent exercise was explained. Of the 12 exercises, ten were dynamic and two were isometric. As the exercises were performed for five to 12 seconds, EMG signals were obtained from all of the key muscles of the abdomen and back.

The 12 exercises were:

(1) Straight-leg sit-ups. Lying supine with legs straight and feet anchored under a strap, with arms positioned so that fingers touched the cheeks, subjects raised their torsos to a vertical position and then completely lowered their torsos back down to a mat.

(2) Bent-leg sit-ups (ie, the sit-ups which are 'optimal' for low-back health). These were exactly like the straight-leg sit-ups, except that knees were bent to a 90-degree angle.

(3) Curl-ups with feet fixed. These were like the bent-leg sit-ups, but subjects kept their arms straight at the sides of their torsos with their hands flat on a mat. The exercise involved sliding the hands forward about five inches, a movement which lifted the head, shoulders, and upper torso off the supporting bench.

(4) Curl-ups with feet free. Just like the curl-ups with feet fixed – but there was no strap to anchor the feet.

(5) Quarter sit-ups. Almost like the curl-ups with feet free, but both the hips and knees were flexed to 90 degrees (which lifted the feet off the ground), and the arms were positioned so that the fingers touched the cheeks.

(6) Straight-leg raises. Lying supine with hands under the lumbar region, subjects raised their straight legs to 30 degrees from the horizontal.

(7) Bent-leg raises. These were similar to straight-leg raises, but knees were bent to 90 degrees,

and the bent legs were raised until the hips achieved 90 degrees of flexion.

(8) Dynamic cross-knee curl-ups.

Now we're getting serious. These exercises were very similar to the quarter sit-ups, with one exception: subjects twisted their torsos to bring one elbow toward the opposite knee.

(9) Static cross-knee curl-ups.

These were similar to dynamic cross-knee curl-ups, but hands were brought up to contact contralateral knees (one at a time), and hands were pushed against knees (one at a time) for resistance for three seconds at a time.

(10) Hanging straight-leg raises.

As subjects hung from a chinning bar (holding the bar with their hands), they lifted straight legs to a horizontal position, without pelvic rotation.

(11) Hanging bent-leg raises. Just like the hanging straight-leg raises, but with knees bent to 90

degrees.

(12) Isometric side supports. Torso and legs were lifted off a sit-up bench, with body supported only by the side of the right foot, the right elbow, and the right forearm.

Whew! Can you think of any more abdominal exercises? The Waterloo investigators had things well covered, and they were interested in a unique variable associated with each of the 12 exercises – the maximum abdominal muscle EMG value divided by the maximum compression value of the spine. As you can see, those exercises which stressed the abs to the greatest extent and compressed the spine to the least extent would have the highest scores (as a result of the lofty numerator and depressed denominator) – and could be assumed to provide the best ab-building and smallest spine-crunching effects. However, the Waterloo explorations revealed that no single exercise optimally trained the abdominal muscles while simultaneously minimising the loads and forces applied between vertebrae of the back.

As it turned out, there was absolutely no statistically significant difference in the compressive force applied between the fourth and fifth lumbar vertebrae for the straight-leg versus bent-leg sit-ups! In fact, bent-leg sit-ups tended to produce the highest amount of lumbar compression, while curl-ups generally produced the least compressive force. No single exercise was able to appreciably stimulate all of the abdominal muscles simultaneously. For example, simple straight-leg sit-ups provided a good challenge for the rectus abdominis muscles but not for the external obliques. Meanwhile, isometric side supports did a great job with the external-oblique muscles but failed their rectus-abdominis test.

On to the third myth…

Now that you know that strengthening your torso and maintaining a predilection for bent-leg sit-ups won't save your back, we are ready to move on to our third myth: a leg-length discrepancy increases the risk of low back troubles. Again, this is one of those ideas which makes perfect sense. After all, if you have unequal legs, won't your pelvis be tipped in an accommodating way, and won't such tipping produce lateral curling of your lower spine ('lumbar scoliosis') – and thus pressure, nerve irritation, and pain?

Yes, it should, but it doesn't – or at least it doesn't in any systematic way. The athlete with perfectly equal legs is just as likely to suffer the pains of low back distress as the fellow who hops around with unequal stems. In a comprehensive study carried out with 100 subjects, Finnish researchers were able to show that leg-length discrepancy was only mildly

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associated with sacral tilt – and not at all correlated with lumbar scoliosis(6). Other studies have also failed to find a link between leg-length disparity and low-back pain(7).

…and number four

Without further ado, myth number four: tight hamstrings predispose athletes to a heightened risk of low back pain. Again, this hypothesis is as reasonable as an end-of-the day martini. After all, the hamstrings attach to low, posterior points (the ischial tuberosities) on each side of the hips, and as a result the 'strings', when tight, can generate posterior pelvic tilt. Now, posterior pelvic tilt decreases lumbar lordosis (an exaggerated forward curvature of the lumbar region of the spine), and decreases in lumbar lordosis have been hypothesised to cause low-back pain. There's just one problem, though: in a nice study carried out with 600 young men, no association at all was detected between hamstring tightness and low-back pain(8). Many experts now believe that hamstring tightness in athletes with low-back pain may be a compensatory – not causative – mechanism which results from some form of pelvic instability(9).

As mentioned, one concept about low-back pain which has not taken on mythical dimensions is the assertion that low-back-muscle endurance is the critical factor in preventing low-back troubles. If you still don't buy this idea, consider one last study – a beauty carried out in Teheran, Iran, with a grand total of 600 subjects (10). These 600 individuals were subdivided into four groups: 150 asymptomatic men, 150 asymptomatic women, 150 men with low-back pain, and 150 women with the same. 17 physical characteristics (extent of lumbar lordosis, angle of pelvic tilt, length of abdominal muscles, length of low-back extensor muscles, length of hip-flexor muscles, length of hamstring muscles, length of hip-adductor muscles, endurance of erector-spinae muscles, length of the gastrocnemius muscles, length of the iliotibial band, leg-length discrepancy, foot-arch structure, and strength of the hip flexors, hip extensors, hip abductors, hip adductors, and abdominal muscles) were measured in each subject.

As it turned out, among all of the physical characteristics measured, the endurance of the back-extensor (erector-spinae) muscles had the highest (negative) association with low back pain. The Iranian researchers suggested that low-back-muscle endurance could be used as a screening tool to predict which individuals would be likely to develop low-back disorders.

Action to take

So what might you do to increase your low-back-muscle endurance? There are a number of things you could try, but one safe bet would simply be to carry out the Volvo test (described above) on a nearly daily basis. To complete this exercise, simply lie prone (face down) on a table with the tops of your hips at the very edge of the table. Keep your hands at your sides, have someone hold your feet so that you don't go flying through the air, and then simply maintain your torso in a horizontal position, parallel with the ground and on the same level

as the table top, for as long as possible. Rest for a few minutes, repeat, and you will be done for the day (as far as low-back pain preventatives are concerned).

“Many experts now believe that hamstring tightness in athletes with low-back pain may be a compensatory mechanism which results from some form of pelvic instability”

If you don’t like the thought of having your trunk unsupported and three or four feet off the ground, you can also use the ‘Iranian endurance exercise’ described in the Teheran research. To do this one, lie prone again on a table or bench, with your hands lying at your sides. Then, simply lift your upper trunk approximately 30 degrees from the table, and hold this position for as long as possible (for more details, see reference no. 11). The length of time (in seconds) that you can maintain the desired angle is the measure of your erector-spinae endurance. Men who steered clear of low-back pain could sustain the posture for about 80 seconds or longer (women only had to hang in there for 57 seconds).

Incidentally, in case you are thinking that this test was a poor tool, since low-back-pain individuals might experience pain during the exam and thus quit sustaining the posture prematurely (not because of lack of endurance but because of riveting pain), you should know that individuals who experienced pain during the procedure were excluded from the study. **The question is, why?**

Of course, you might be curious about why isometric tests of low back-muscle endurance, in which muscles did not change their length or produce real movement, were the key factors associated with low-back torture. After all, the back is a dynamic structure, and athletes produce all kinds of twists, turns, flexions, and extensions of their backs during sporting activity – movements which contort the spine and force the spinal muscles to lengthen and shorten. Why, then, is staid, stable, isometric spinal muscle endurance such a great predictor?

Well, there probably is a link between isometric endurance and endurance of the concentric and eccentric kinds. In addition, for much sporting activity the function of the spinal muscles is to keep the torso stable (think of long distance runners, Michael Johnson sprinting, Tour de France cyclists, footballers surging toward the ball, basketball players getting ready to get off a shot, etc.). All of these actions are isometric in nature and certainly require the spinal muscles to ‘hold their positions’ for extended periods of time. An inability to maintain a safe position for the spine – as a result of spinal-muscle fatigue – may in fact predispose the back to small-scale injuries and the near inevitability of low-back pain.

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