How to be Back Strong and Beltless — Part 2
Belts, are they as good as people say they are?
by Paul Chek

In Part I of this three-part series, I briefly discussed the history of the weight belt and went into detail about the three proposed mechanisms our bodies utilize to help create stability of our spine. Here in Part II of the article, I demonstrate how the supposed benefits of belt use, along with the reasons people choose to use a belt, are unfounded, particularly when one looks at some basic scientific principles of how the body works.

Belts, Are They as Good as People Say They Are?

Certainly, if you could come up with a product that supposedly reduced pain at the same time that it improved performance, *or at least appeared to,* you could make A LOT OF MONEY! Just take a look around you next time you are at the lumberyard, warehouse, or office supply store. Chances are you will see employees wearing belts. As I eluded to in the introduction, many furniture moving companies, chain store organizations and package delivery companies have made it *mandatory* for employees to wear belts.

Have the decisions made by companies, corporations, workers and gym members been based on sound research? Perhaps. But maybe it has been the scare tactics and strong marketing techniques of belt companies that have helped people make their decision.

There is certainly no shortage of claims being made by belt manufacturers. For example, here are two claims I pulled directly from the "Valeo" belt company's web site

· The support helps workers perform their duties while helping to protect their back from stress and strain damage.

· Reduces the likelihood of pain or injury for a variety of activities.

If you can market a product based on *fear* and emotion (both of which are highly correlated with the back pain experience), chances are you will sell that product *and lots of it!* Famous speaker, Zig Ziglar, states that F-E-A-R is really False Evidence Appearing Real.(25) This, in my opinion, is the case with weight belts in general.

Apparently, the evidence supporting the use of back belts did not even *appear* real to Lahad et al,(26) who identified 190 articles from 1966 to 1993 that focused on various interventions for the prevention of low back pain. Lahad et al (26) concluded that sufficient evidence was unavailable to recommend the use of mechanical back supports for the prevention of back pain.(27) In another study conducted by the National Institute for Occupational Safety and Health, prophylactic use of back belts for healthy workers was not recommended because of a lack of scientific evidence promoting their benefit.(27,28) There are also many other studies indicating belt use provides no significant improvement in performance or reduction in the user's chance of injury.(29-34)

Getting to the Bottom of the Elusive Obvious

To make this review of belt use complete, it must be stated that there are numerous studies indicating the use of back belts, weight belts and lumbar corsets improves performance, endurance, and reduce chances of injury. I have sited these studies in the reference list.(35-40) Even though there are studies demonstrating a supposed increase in performance while using weight belts, there are many, if not more, studies indicating weight belts are damaging and even worse, create dysfunction in their users.

As most of you reading this article are aware, many gyms have racks of weight belts, *as a service to their members.* I have already mentioned their widespread use in the industrial workplace. So then, if as stated above, a government agency devoted to occupational health and safety doesn't support belt use due to lack of scientific evidence,(27,28) then what are the belts providing that lead people to believe they help reduce pain, prevent injury or improve performance?

The Weightlifting Encyclopedia — A Guide To World Class Performance, a respected book among weightlifters, sites four reasons for a competitive weightlifter to wear a belt:(41)

1.The belt itself can offer some support (i.e. to the extent it resists bending, it can provide an external physical force against which the body can exert a force).

2.The lifter can exert some outward force against the belt with the muscles of the torso (primarily the abdominal muscles), helping achieve rigidity in the torso.

3.The pressure of the belt can help to remind the lifter to maintain the correct position of the spine and the proper degree of tension in the lower back muscles.

4.The belt can help to keep the area it covers warm.

In an attempt to assist the reader with a more comprehensive understanding of how workers and weightlifters have developed unfounded security in supportive back belts, I will analyze each of these four benefits.

Alleged Belt Benefit No. 1

The belt itself can offer some support (i.e. to the extent it resists bending, it can provide some physical force against which the body can exert a force).

This is true . . . the belt can offer the body some support. The support a belt offers is deceiving, though. To appreciate how the support offered by a weight belt can improve performance, we must first analyze the concept of *hoop tension.*

Hoop tension is created anytime you create tension around a joint or joints. For example, if you were to grasp a snake in your hand, you would be applying *hoop tension* to the snake's body with your hand, in effect immobilizing the vertebral joints of the snake's spine that were in your hand.(Figure 11) The snake would still have movement above and below the region of hoop tension. Powerlifters have been capitalizing on hoop tension for years through the use of knee wraps, wrist wraps, weight belts and body suits which all create hoop tension around one or more joints.

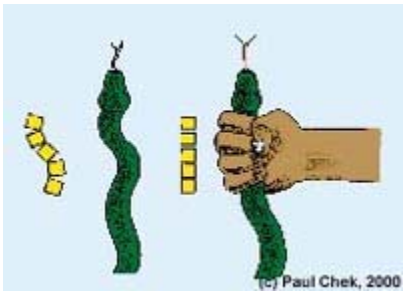

Figure 11. Hoop Tension Demonstrated

Left: Without external influence from hoop tension, the snake's spine (like the lifter's) is free to move, under direct influence of the snake's muscles.

Right: When you grasp a snake, you create hoop tension around the snake's body with your hand, immobilizing the snake's vertebra. Although the snake will continue to try and wiggle out of your hand, it will be unable to produce gross movements of its spine in the region of hoop tension as produced by your hand. If filmed with motion X-ray, you would see that the vertebra are demonstrating small segmental movements (compression, torsion, sheer) as a result of muscle actions.

With regard to the human spine, we cannot ignore the anatomical fact that the TVA and IO are optimally designed and situated to create hoop tension through the thoracolumbar fascia (see Figures 2 & 3 from Part 1). Through its middle layer, the TLF communicates directly with the spinous processes of the lumbar spine.(6,7,8,21) Therefore, any increased hoop tension created by the TVA and IO would serve to not only increase IAP, but it would also increase segmental joint stiffness and serve to stabilize the spine in all planes of motion (6 p. 55-58).(Figure 12-A)

This is not the case when creating hoop tension with a weight lifting belt. First, hoop tension is created manually when the user tightens the belt. Second, hoop tension, as measured against the belt, will rise as the lifter pushes his or her abdominal wall into the belt. When pushing the abdominal wall outward into the belt, the umbilicus moves away from the spine which can only decrease hoop tension created by the TVA and IO. This *action of pushing out* decreases segmental joint stiffness, which means that gross recruitment of the rectus abdominis and obliquus externus pushing against the belt can only create gross spinal stabilization and compression of the relevant joints.(Figure 12-B.)

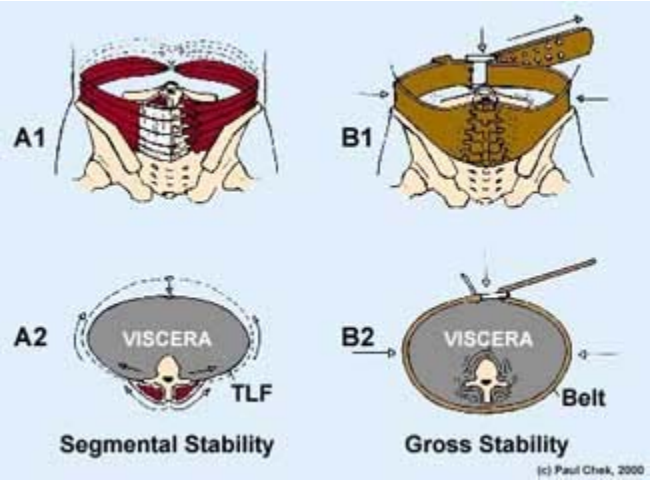

Figure 12 A & B. Intrinsic Hoop Tension vs. Extrinsic Hoop Tension and Spine Stabilization

A1) Because the transversus abdominis and internal oblique muscles place lateral tension on the thoracolumbar fascia, which is intimate with the transverse processes and spinous processes of the lower lumbar segments (A2), intrinsically generated hoop tension actually provides segmental stability.

B1) Tightening a weight belt around the waistline compresses the abdominal viscera, but there is no direct connection to the spine itself. B2) Although the belt provides gross stability/immobility through increased intra-abdominal pressure (much like the snake in Figure 11), the compressive loading and faulty recruitment patterns often associated with lifting with belts may continue to produce aberrant motions at segmental levels of spinal joint structures. Once the belt is removed, the same faulty recruitment patterns, unaided by the gross stability of the belt often result in joint derangement, particularly in the L4/5 and L5/S1 motion segments.

If you look back at Figure 9, you can easily imagine what would happen to the mast of the pirate ship if a large wind were to hit the sails, loading the large stabilizing guy wires in absence of a corresponding increase in segmental stiffness.

In fact, research backs my point. Axelsson et al. studied the effects of lumbar orthosis on intervertebral mobility using a sterophotogrammetric x-ray analysis.(42) In this study, they used two types of back supports: the first, a molded, rigid orthosis and the second, a canvas corset with molded, plastic posterior support, each of which is far more comprehensive in design than a traditional weight belt.

They concluded that neither of the two types of lumbar support had any stabilizing effect on the sagittal, vertical, or transverse intervertebral translations. Additionally, they stated that lumbosacral orthosis illicit their effect by restricting gross motions of the trunk rather than the intervertebral mobility in the lumbar spine.(42)

Furthermore, Miller et al., studied three types of lumbosacral corsets, concluding *that* "no brace could adequately immobilize the L5-S1 level, and some people demonstrated increased motion at this level while wearing the orthotics".(43) The disturbing aspect of this is that all of the forms of support in these studies are far more comprehensive in design than a weight belt, and if *they* don't provide intervertebral stability, then what good will a weight belt do?

Alleged Belt Benefit #2

The lifter can exert some outward force against the belt with the muscles of the torso (primarily the abdominal muscles), helping achieve rigidity in the torso.

Recruitment of trunk stabilizers via EMG with and without a weight belt has been studied. These studies concluded there was increased recruitment of the erector spinae and rectus abdominis when wearing a belt.(40,44) Now that you understand the workings of the inner unit, it should be evident that by recruiting the larger, *gross stabilizers* without proportionate recruitment of the inner unit musculature responsible for regulating joint stiffness, the result could certainly lead to spinal joint dysfunction or exacerbate an existing condition. It is also likely that prolonged use of weight belts will result in coordination problems within the inner unit muscles and among the inner and outer unit systems.

Clinically, when treating injured weightlifters and workers, I find it common that belt users suffer from what I call "*rectus abdominis dominance"*.(Figure 10A & B in Part 1) It is also rare, extremely rare in fact, to find someone who uses a weight belt and has normal TVA function according to tests outlined by Richardson, Jull, Hodges and Hydes.(6) (Figure 13) My clinical findings also correlate with current

research, which indicates that those individuals with a reduced ability to draw in the abdominal wall have inconsistencies in the coordination of the TVA and related inner unit musculature.(45)

Figure 13. Transversus Abdominis Testing

To begin, place the bladder of the Blood Pressure Cuff (BPC) placed directly under the client's umbilicus. Pump the BPC to read 70 mmHg after exhalation; if 70 mmHg is uncomfortable, any even number between 40-70 mmHg will work. Instruct the patient/client to completely relax, exhale and draw their umbilicus off the BPC. Watch carefully to make sure they are not pressing downward with their arms, flexing their hips or activating their gluteus maximus muscles. An indicator of normal TVA activation is demonstrated by the ability to reduce the pressure reading by 10 mmHg. Those with faulty recruitment patterns commonly increase the pressure registered on the BPC, which is an indicator of rectus abdominis dominance; a common finding among belt users.

Many of these patients suffer form chronic back pain, intermittently disrupting their training. They also commonly state that there is a significant difference in lifting performances with and without their belt, being much stronger with the belt. This common finding among most belt users is an indication of what I call a "*stabilization deficit*". In other words, the greater the difference in load lifted, with, versus without, a lifting belt, the greater the indication that the CNS is down-regulating motor unit recruitment to protect unstable, inflamed and/or painful articular structures. Adding a weight belt, which creates hoop tension, increases *gross stability* in a body that is likely suffering from reduced ability to stiffen joints segmentally and has coordination deficits within the core.

Research by Cholewicki et al.(46) indicates that "inappropriate coordination of trunk muscle recruitment patterns to stabilize the lumbar spine through antagonistic co-activation and IAP, may predispose an individual to sustain a low back injury during a physical activity." The faulty recruitment patterns that result from belt use are logical when considering that the body's motor system is organized as a "sensory-motor system."

When strapping a belt tightly around your waist, surface receptors in the skin are stimulated. The sensory nerves serving the cutaneous tissue beneath the belt have a sensory-motor relationship with the muscles under the skin. This relationship is well explained by Hilton's Law, which states, "The nerves which supplied the muscles and controlled the movements of the part (joint) also served the skin and other sensory surfaces which were connected with that part".(47)

Davis' Law is demonstrated and well known by physical therapists who treat neurological injuries; stimulating the surface of the body produces stimulation of the muscles served by the same nerve root.

(48 p.137) Therefore, repeatedly "pushing outward" against the belt, which is encouraged by the belt through sensory-motor stimulus, is likely to develop and perpetuate faulty recruitment patterns.

Lifters may go uninjured for years under these conditions, yet research and clinical experience show it is likely they are setting themselves up for injury! If belts really did improve trunk stability, then the lifter would be able to use them for a given period of time, remove the belt and experience improved performance when lifting; THIS IS NOT THE CASE!

Sensory-Motor Amnesia

The concept of sensory-motor amnesia was popularized by Thomas Hanna in 1988.(53) Hanna used the term to describe a motor deficit resulting from lack of sensory stimuli. Clinically, sensory-motor amnesia is a common finding among people that do not use their body adequately to keep the motor system stimulated and by people that stopped moving part of their body secondary to pain avoidance.

In my 16 years of clinical practice, I have had adequate experience rehabilitating injured athletes and workers that were belt users prior to seeking my assistance. Due to my experience, I can assure you a high rate of sensory-motor amnesia exists in many belt users' deep abdominal wall. I've found this is due to the fact that belt users, using extroceptive stimuli from the belt, learn to push their abdominal wall *outward*,into the belt. The result is that they not only go for extended periods without using their deep abdominal wall (TVA and IO), the deep abdominal wall becomes weak, and the brain can often no longer recruit those muscles.

The only way to restore function of the deep abdominal wall is to use various forms of biofeedback (described below). Additionally, injured clients must be taught how to lift and move correctly while learning how to sequence the inner and outer units for synergistic action and injury prevention. A big part of this rehabilitative process is weaning them off the belt! (See below for instructions on how to do this.)

Alleged Belt Benefit #3

The pressure of the belt can help to remind the lifter to maintain the correct position of the spine and the proper degree of tension in the lower back muscles.

The benefit stated above is one of the reasons lifters commonly give to justify their use of belts. Improved proprioception is cited as an additional benefit of belt use in medical literature.(49) Reduced lumbar proprioception after back injury has been recognized by physical therapists (50) and proven to exist among back pain patients in a controlled study.(51) It is very likely that many belt users recovering from a back injury began using a belt because of instruction to do so by a doctor or therapist in an attempt to re-establish proprioception. It may also have been prescribed to reduce the fear of re-injury.

Proprioceptive deficits in the lumbopelvic region are common among back pain patients. Such deficits are often demonstrated by the patient as an inability to differentiate anterior pelvic tilt from posterior pelvic tilt when positioned by the therapist. Proprioceptive deficits in the lumbopelvic region are also recognized by the patient's inability to actively return to a target position or to recognize the position when placed there passively.

Although wearing a back belt or weight belt may be of some benefit to the individual who has a

proprioception deficit, my clinical experience dictates that it is not because the belts enhance proprioception. Exteroceptors are classified as "One of the peripheral end organs of the afferent nerves in the skin or mucous membrane, which respond to stimulation by external agents".(52) Therefore, belts are a source of *exteroception.*

This is an important distinction to make because exteroception (touch, heat and pressure (48 p. 145)) from the belt only improves one's sense of position *whenworn.* This means that if the worker or athlete forgets their belt and is faced with having to perform lifting tasks, they are faced with greater risk of injury because they have not learned anything from using a belt. Many of the back injuries among belt users I have treated over the years came when they forgot their belt, or did not have it secured adequately to produce the needed exteroception.

If indeed belts did improve proprioception, the user would be able to take the belt off after a period of use and have improved proprioceptive sense or "position sense" while lifting. This would constitute a *learning effect;* I have never experienced this to be the case! Belt users become *dependent* upon their belt, making the belt more of a crutch than a training device.

Improving proprioception requires special exercises that are usually taught by a skilled physical therapist, movement therapist or corrective exercise specialist. As the patient progresses, they are able to better detect their body position in space, demonstrating increased kinesthetic awareness, and thereby demonstrating a belt is not necessary.

It is very valuable to use other extroceptive stimuli, such as athletic tape to improve kinesthetic awareness. As the patient learns, the need for tape is reduced, and eventually the tape is eliminated. String is also used as a form of biofeedback during movement training and is particularly useful in restoration of deep abdominal wall function during functional movement training.(23, 54) The use of string as a biofeedback mechanism will be discussed below.

Alleged Belt Benefit #4

The belt can help to keep the area it covers warm.

The use of a weight lifting or back belt to keep the area warm can easily be accomplished by any insulating material; wet-suit material is commonly used for this purpose. In light of the many concerns regarding the use of weight belts discussed in this article, it is apparent that performing a proper warm-up and using other materials to keep heat in the tissues is advantageous and superior to weight belt use.

In the final installment of Back Strong and Beltless, I will tell you how you can stop using a weight belt, restore the function of your inner unit *and* how to do it all safely!

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