# Back Belts


Few types of safety equipment have generated controversy to the degree that back belts have. Vendors of back belts extol their virtues, and some safety directors praise their role in reducing back claims. But many researchers question their effectiveness in preventing low back injury in the workplace. This Reference Note briefly reviews some of the more notable back belt scientific studies and offers unbiased explanation to often cited "pros" and "cons" of back belt use. This information will help you make an educated decision about whether back belts might become part of your back injury control program.

Liberty Mutual is convinced that the primary strategy for the control of low back pain is through the ergonomic design of jobs. Back belts and other approaches should always be considered only secondarily, as possible supplements to ergonomic controls. Back belts are not a quick fix to your back injury problems.

## Commercial vs. Prescribed

The use of back braces dates back to the Middle Ages, when they were custom made by armorers to correct spinal deformities. Today, there are a number of back-support devices on the market, ranging from contoured back braces to the relatively simple rigid leather belt. Some back belts are fairly stiff, others flexible; some have no elasticity, others stretch in all directions; some have a quick Velcro™ closure, others have buckles. There are many different sizes to choose from.

Most of the back braces prescribed by physicians differ substantially from commonly available back belts. Physician-prescribed back braces or orthoses are configured to apply forces to the patient's spine to restrict motion or to substitute for or assist muscle activity. Back braces are prescribed to provide support, immobilization, protection, and correction.

Commercially available back belts, on the other hand, are manufactured for relatively universal application. They are not individually prescribed by a clinician or sized for a specific individual. They are often provided to workers with little or no formal training in correct usage.

## Do Back Belts Work?

Virtually all commercially available back supports are advertised as being helpful in preventing low back injuries. But do back belts really work? The answer depends on whom you talk to. A number of organizations report substantial reductions in low back claims and lost time, but with no published data, the results are considered anecdotal. Weight lifters and body builders frequently wear back belts, but athletic or recreational use is very different from use in a commercial setting.

## Scientific Studies

The following are brief summaries of studies that are often cited either in support of or against use of back belts.

**Amendola** (1989): Twelve students participated in a psychophysical experiment which tested two types of back belts. There was no significant difference in maximum acceptable weight chosen, subjective preference, or body part discomfort.

**Harman et al.** (1989): This study measured intra-abdominal pressure (IAP) in one female and eight male subjects, all physically active and with varying degrees of noncompetitive weight lifting experience. The belt used was a 6" rigid belt. Results indicate that using a lifting belt during a dead lifting (floor to knuckle height) movement at 90% of one repetition maximum (RM) increases IAP, which may reduce compressive force and improve lifting safety.

**Hunter et al.** (1989): Five healthy males and one healthy female ages 23 to 43 participated in a study to determine the effect of a weight lifting belt on heart rate and blood pressure during aerobic bicycle ergometer, one-arm bench press, and isometric lift exercise. A "standard" weight lifting belt was used in this study. All activities were performed in random sequence with and without the belt. Study concluded that wearing the weight belt increased systolic blood pressure significantly with aerobic bicycle exercise and isometric exercise. Heart rate also increased with weight belt use for aerobic exercise.

**Kraus et al.** (1996): Researchers at the UCLA School of Public Health studied work history records of nearly 36,000 workers in 77 warehouse-style home renovation supply stores in California from 1989 to 1994. Between 1990 and 1992, each store phased in a mandatory back support policy that required employees to wear flexible Lycra™ back belts. OSHA logs were used to identify 2,152 workers with an acute low back injury over the six-year study period. According to the study results, workers sustained about 31 back injuries per one million work hours during the time period when back belts were not mandated or being phased in. These results compare to about 20 back injuries per one million work hours after the back support use policy was implemented. While these results prove interesting, because the study was not controlled, we are uncertain whether the reduction was a result of back belt use or other factors not accounted for in the published results.

**Lander et al.** (1990, 1992): Maximum intra-abdominal pressure (IAP) was increased by using a 4" rigid weight belt while performing a squat-lifting exercise at 75-90% of the lifter's one repetition maximum (RM) effort or between 250-300 lbs. Five to six skilled male subjects, all engaged in intensive weight training programs, were used in these studies. Based on mean electromyographic voltages for the erector spinae and external oblique muscles, IAP data and biomechanical modeling, the authors concluded that wearing a belt provides a degree of protection during submaximal lifting.

**Lavender and Kenyeri** (1995): Eleven male and five female subjects participated in one session with a lifting belt and one session without a belt. It has been hypothesized that lifting belts provide a biomechanical or motivational advantage and, if true, subjects in a psychophysical lift test should select a higher maximum weight of lift (MAWL) with the belt than without. Study results did not support this hypothesis.

**McGill et al.** (1990): Six subjects (mean age 25.7 years) performed dead lifts of loads ranging from 150-200 lbs. Wearing a weightlifting belt during a squat lift produced a significant increase in IAP. Breath-held conditions also resulted in a significant increase in IAP but not as great as with a belt. Extensor activity was lowered with the breath-held condition; wearing a belt did not augment this reduction.

**Mitchell et al.** (1994): A retrospective survey of 1,316 workers who performed lifting activities at a local Air Force base. Various types of back belts (rigid to flexible) were used in this study. Study concluded back belts are effective in preventing first time occurrence of low back pain but they are not cost effective. A cost analysis showed less intensive treatment and lower cost per injury for workers injured without a belt than those injured while wearing a belt. Belted workers had a higher rate of limited activity days and higher rate of back injuries than the no-belted group.

**Penrose et al.** (1991): Thirty subjects were randomly selected from a pool of individuals diagnosed with muscular sprain/strain of the lower back. An "air" belt or pneumatic lumbar support was used in this study. Study duration was a six-week rehabilitation program with 15 subjects belted and 15 subjects not belted. Belt group showed a significant improvement in strength, flexibility, and pain index as compared to non-belt group during recovery of low back pain.

**Reddell et al.** (1992): Comprehensive study of 642 fleet service clerks of a major airline showed no significant difference in incidence or lost days due to low back pain in four groups: control; back belts only; training only; and back belts and training. Fifty-eight percent of belt users discontinued their use before the end of the eight-month study.

**Ciriello and Snook** (1995): A study by the Liberty Mutual Research Center for Safety & Health investigated whether wearing a 5" rigid belt preserves the endurance characteristics of the back extensors thus indirectly indicating decreased loading of the spine. Thirteen healthy male industrial workers recruited from local businesses were used in this study. This study concluded there were no significant differences in maximum isokinetic endurance and EMG spectral parameters of the back extensor muscles as a result of wearing a back belt during four hours of heavy lifting and lowering.

**Walsh and Schwartz** (1990): Ninety male grocery distribution center workers were divided into three groups: control; back school and no back support; and back school and back orthosis. This six-month study showed no decrease in strength and a decrease in lost time in the back school and back orthosis group, which supports the concept of back bracing and education to prevent back injury and lost time. Other studies (Lantz & Schultz, 1986) have investigated use of lumbar braces and corsets similar to those prescribed by physicians with similar results.

**Wassell et al.** (2000): A large prospective cohort study by NIOSH researchers found no evidence back belts reduce back injury or back pain for retail workers who lift or move merchandise. Workers wore a flexible nylon belt with Velcro fasteners without shoulder straps. The study, conducted over a two-year period, found no statistically significant difference between the incidence rate of workers compensation claims for job-related back injuries among employees who reported using back belts every

day versus employees who reported never using back belts or using them no more than once a month.

**van Poppel et al.** (1998): Cargo department workers of a major Dutch airline at Schiphol Airport in the Netherlands consisting of thirty-six work groups, totaling 312 subjects, were randomized to receive education plus lumbar support, education alone, lumbar support alone, or no intervention (control group). Main outcomes, as well as compliance with wearing the lumbar support, were based on responses to monthly questionnaires completed by subjects and aggregated over a 6-month period. An elastic belt with Velcro fasteners and flexible stays kept in place with an anchor belt was used in the study. The study concluded no statistically significant differences in low back pain incidence or in sick leave for subjects with lumbar support and those without. However, in a subgroup of subjects with low back pain at baseline, lumbar supports reduced the number of days with low pack pain per month (median 1.2 vs. 6.5 per month; p=.03).

## Summary

The most effective approach to the control of low back pain and disability is the ergonomic design of jobs. Consider using back belt supports only for jobs where ergonomic task design improvements are impractical or difficult to implement, and only after a safety process is in place.

Workers must be trained in proper use and adjustment of back belts. Supplement this training program with wellness instruction or training that encourages proper lifting biomechanics and care of a healthy back.

Perhaps the greatest danger in back belts is that resources which could be better channeled into ergonomic job and task design might instead be expended on the selection, purchase, and administration of back belts.

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## Pros and Cons of Back Belt Use

PROs

- **Back belts increase intra-abdominal pressure (IAP), providing additional support to decompress the spine during manual lifting**

  Studies that concluded slight IAP increases used leather rigid supports. Most supports sold to industry are flexible designs. Flexible belts provide limited biomechanical benefit either in restricted torso mobility or increased IAP. Heavy weights used in several studies are not typical of industry, and are difficult to compare to actual industry exposures.

- **Wearing back belts may remind users to practice good body mechanics when lifting**

  Many studies have cited that wearing a back belt provides constant awareness of proper lifting techniques, however Reddell's study did not show this to be true.

- **Back belts may reduce some sensation of pain**

  Injured workers seemed to respond well to back belt support as evidenced in the Penrose and the Walsh & Schwartz studies. The duration of these studies and the use of formed or custom-molded belts make the results questionable, however, those with back pain experienced fewer symptoms when using "air" belts or therapeutic-type lumbar orthoses.

- **Some employees seem to like them**

  As evidenced by Reddell's study, employees who like back belts wear them and those who dislike them usually don't wear them. Training has an impact on compliance. Penrose and Walsh & Schwartz concluded that workers with back pain seem to respond well when wearing a support device. Over half of the working population is estimated to have low back pain. Therefore, whether injured workers benefit from commercially available back support devices is not known.

**CONs**

- **Back belts take the focus off the real problem – poor job design**

  Back belts are not a substitute for an ergonomics program. If a safety program does not include management support and direction, worksite analysis, hazard control, training programs, and employee participation, then it's best to start there first. Back belts may have some value for difficult-to-control jobs (e.g., healthcare workers) but only in the right organization with the right safety culture.

- **Users may attempt to lift more weight because of a sense of being protected**

  According to the Lavender & Kenyeri study, there is no evidence to support the "Superman theory" that workers perceive they can lift more than they are able when wearing a back belt. However, there might indeed be individual abuses.

- **Back belts may increase cardiovascular stress when lifting**

  The Hunter study supporting this theory used aerobic and isometric exercises which are not typical of industry workloads. It would be difficult to make this comparison to actual industrial lifting tasks. However this is not to say that IAP does not adversely affect blood flow back to the heart. Further study is necessary. Reddell's study noted shortness of breath complaints from one participant.

- **Back belts can be hot and uncomfortable**

  This was the most frequently recorded complaint in the Reddell study. A subjective questionnaire administered by Reddell concluded belted groups without training rated the belts hotter than those issued a belt with training. Compliance with wearing the belt in the no training group was also lower. The training group received instructions mentioning that warming the lumbar muscles may have a beneficial effect, which might explain the perceived differences.

- **Regular users may become more susceptible to injury when not wearing their belts**

  There is no known harm to workers from wearing back belts. Ciriello and Snook determined no significant difference in extensor muscle endurance from wearing vs. not wearing a back belt during lifting, thus dispelling concerns that wearing a belt might contribute to back muscle atrophy over time. Other studies have reached the same conclusion (e.g., Walsh and Schwartz and a study by Holstrom et al.). Whether workers could become dependent on back belts is unknown but thought unlikely from these studies.