

ABSTRAKTA - Lumbar: Anatomical physiological studies (v anglickém jazyce)

Abstract Title:	An evaluation of the McKenzie regimen - validity of the disc model.
Summary:	This paper reviews the disc as a source of pain, the role of annular fissuring and displacement as a mechanism of pain production, and the relationship between the degree of disc pathology and the extent of symptoms.
Abstract Content:	Proceedings 10th Biennial Conference of Manipulative Physiotherapists Association of Australia. November 26-29, Melbourne, Australia
Abstract Author:	Reddeck T
Journal:	
Biblio:	
Year Published:	1997
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	The influence of slouching and lumbar support on iliolumbar ligaments, intervertebral discs and sacroiliac joints.
Summary:	Cadaveric study of mechanical effect of slouched posture identifying stress on intervertebral discs and ligaments that is almost eliminated with use of lumbar backrest.
Abstract Author:	Snijders CJ, Hermans PFG, Niesing R, Spoor CW, Stoeckart R
Journal:	Clin Biomech
Biblio:	19:323-329
Year Published:	2004
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Recent advances in lumbar spinal mechanics and their clinical significance.
Summary:	Comprehensive review of how spinal structures fail (over 200 refs) with emphasis on importance of mechanical loading in back pain. Discs particularly prone to fatigue failure.
Abstract Content:	Of the many problems associated with low back pain, those which are most amenable to biomechanical investigation are identified. Recent advances in lumbar spinal mechanics are then reviewed in five sections dealing with mechanical function, mechanisms of failure, movements in vivo, loading in vivo, and the biological consequences of mechanical loading. The discussion suggests that mechanical fatigue damage may frequently be the underlying cause of low back pain, even when degenerative changes are evident in the tissues, and the review ends by suggesting some priority areas for future research.
Abstract Author:	Adams MA, Dolan P.
Journal:	Clin Biomech (Bristol, Avon)
Biblio:	Jan;10(1):3-19
Year Published:	1995
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	The effect of fatigue on the lumbar intervertebral disc.
Summary:	Cadaveric experiment simulating a vigorous day's activity in flexion led to fatigue failure of annulus, with distortion of the lamellae and fissures in 23 out of 41 motion segments tested.
Abstract Content:	Forty-one cadaveric lumbar intervertebral joints from 18 spines were flexed and fatigue loaded to simulate a vigorous day's activity. The joints were then bisected and the discs examined. Twenty-three out of 41 of the discs showed distortions in the lamellae of the annulus fibrosus and, in a few of these, complete radial fissures were found in the posterior annulus.
Abstract Author:	Adams MA, Hutton WC
Journal:	J Bone Joint Surg [Br]
Biblio:	Mar;65(2):199-203
Year Published:	1983
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Sitting biomechanics, part 1: Review of the literature / Sitting biomechanics, part 2: Optimal car driver's seat and optimal driver's spinal model.
Summary:	Extensive literature review on the biomechanical effects and comfort of different sitting postures to identify optimal seating and driving posture. Concludes that maintenance of lumbar lordosis, seat-back inclination, freedom to move, and minimal anterior head translation have been shown to reduce sitting stress and be associated with higher comfort ratings.
Abstract Author:	Harrison DD, Harrison SO, Croft AC, Harrison DE, Troyanovich SJ
Journal:	J Manip & Physio Therapeutics

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Biblio:	22:594-609; 23:37-47 2000
Year Published:	1999
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Pain profile of patients with low back pain referred to physical therapy.
Summary:	98 patients with chronic back pain surveyed about aggravating and relieving factors etc. Pain was worse in morning and evening, and commonest aggravating factors were sitting, driving, bending, and lifting. Commonest alleviating postures were recumbency, changing positions, and walking. Non-serious night pain was common.
Abstract Content:	Detailed pain descriptions for patients with low back pain referred to physical therapy have not been adequately summarized in the literature. The purpose of this study was to present a detailed pain characteristic profile for patients who were referred to physical therapy for treatment of low back pain. One hundred patients (52 males and 48 females) completed portions of the McGill Pain Questionnaire and were interviewed to obtain additional descriptions of pain using a comprehensive pain questionnaire developed for this study. The scores on the McGill Pain Questionnaire demonstrated variability from those previously reported in other populations of patients with low back pain. The comprehensive pain questionnaire revealed that the most intense pain was distributed across the waking hours. Seventy-seven of the 98 subjects (79%) noted that lifting and forward flexed postures increased the pain intensity. In contrast, only 27 of 98 subjects (28%) reported an increase in symptoms with backward bending. Seventy-four of the 98 subjects reported that sitting made their pain worse, and 17 of 84 subjects (20%) reported that sitting resulted in their worst pain. Fifty-nine of 84 subjects stated a recumbent position was the most effective means of relieving the pain. Fifty-two subjects (53%) reported that they experienced pain severe enough to wake them from sleep (night pain). Only three of these patients (6%) stated they were unable to fall back asleep once they were awakened. It was concluded that the detailed pain profile was consistent with symptoms associated with activity-related spinal disorders.
Abstract Author:	Boissonnault W, Fabio RP.
Journal:	J Orth & Sports Phys Ther
Biblio:	Oct;24(4):180-91
Year Published:	1996
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Influence of daily life activities on pain in patients with low back pain
Summary:	4 GPs questioned 100 patients about back pain during 9 different postures / activities, to which patients could answer <input checked="" type="checkbox"/> yes <input checked="" type="checkbox"/> or <input checked="" type="checkbox"/> no <input checked="" type="checkbox"/> . Pain was reported as follows: sitting 85%, partly bent 78%, standing 73%, sit-to-stand 70%, sauntering 66%, fully bent 60%, lying 47%, walking 23%, cycling 15%.
Abstract Author:	Van Deursen LLJM, Snijders CJ, Patijn J:
Journal:	J Orthopaedic Med
Biblio:	24(3) 74-76
Year Published:	2002
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	In vitro study of segmental motion in the lumbar spine.
Summary:	Intradiscal material generally moved anteriorly on extension and posteriorly in flexion, but amount varied amongst the specimens.
Abstract Author:	Shepherd J
Journal:	JBJS
Biblio:	77B: S2,161
Year Published:	1995
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	MRI evaluation of lumbar spine flexion and extension in asymptomatic individuals.
Summary:	Between flexion and extension there was anterior displacement of the nucleus pulposus of 6.7%, this was significant at L1/2, L2/3 and L5/S1. Displacement did not occur in 30% of discs.

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Abstract Content:	<p>Flexion and extension movements or positions have been advocated in the treatment of various forms of low back dysfunction due to the potential pain relieving effects attributed to displacements of the intervertebral disc (IVD). Objective in vivo determination of the segmental behaviour of the disc to contrasting positions has until recently been difficult. Magnetic resonance imaging (MRI) was used in this study to evaluate the influence of sagittal plane positions on lumbar IVD height and nucleus displacement in a small asymptomatic population. T2-weighted sagittal plane images from L1 to S1 were obtained from 10 subjects (mean age: 30+/-5 years) positioned supine in lumbar flexion, followed by extension. Changes in disc height and localization of nucleus position (determined by peak MRI signal intensity) between the two positions were calculated. Discs were classified for degenerative changes using a semi-quantitative grading scale. The mean range of lumbar sagittal movement achieved in the MRI was 44 degrees (range: 22-77 degrees). Between flexion and extension, a significant increase in measured anterior disc height of 1.1 mm (<math>P &lt; 0.0001</math>) and anterior displacement of the nucleus of 6.7% (<math>P &lt; 0.0001</math>) was observed. Despite the anterior displacement of the nucleus in extension observed in the pooled analysis, 30% of discs did not follow this trend. Nucleus degeneration was observed in at least one disc in nine subjects and in 26% of all discs examined. Lumbar spine position was found to be associated with small measured changes in anterior disc height and nucleus position, however, this response was variable within and between individuals. The theoretical concept of a stereotypical effect of spinal position on the lumbar IVD is challenged by these initial data. Since the health of the disc is often unknown in clinical practice, manual therapy treatment for lumbar spine pain should be based on the symptomatic response to movement and position rather than biomechanical theory. Copyright 2000 Harcourt Publishers Ltd.</p>
Abstract Author:	Edmondston SJ, Song S, Bricknell RV, Davies PA, Fersum K, Humphries P, Wickenden D, Singer KP.
Journal:	Man Ther
Biblio:	Aug;5(3):158-64
Year Published:	2000
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Low -back stiffness is altered with warm-up and bench rest: implications for athletes.
Summary:	9 varsity level volleyball players had their lumbar spine stiffness measured before, after 30 minutes warm-up, and after 30 minutes bench rest in slumped sitting. Though there was no decrease in stiffness following the warm-up, but in general sitting led to an increase in spinal stiffness.
Abstract Content:	<p>INTRODUCTION: General practice in many team sports is to have the athletes who do not start in a game sit on a bench while waiting to play. The purpose of this study was to examine the effect of a warm-up followed by bench rest on the stiffness of the lumbar spine in athletes. METHODS: Nine varsity-level volleyball players volunteered to have their lumbar-spine stiffness measured. The protocol consisted of an initial stiffness measurement followed by a 30-min warm-up, then another stiffness measurement, then 30 min of bench rest, and finally a third stiffness measurement. RESULTS: In general, lumbar spine stiffness increased as a result of bench rest after a warm-up. This effect was seen in both the spine extension and lateral bend axes but not in the flexion or axial twist axes. However, there was no decrease in stiffness associated with the active warm-up portion of the task. CONCLUSIONS: It was concluded that a warm-up followed by bench rest does lead to an increase in stiffness of the lumbar spine, suggesting this practice is not in the best interest of reducing the risk of back injury or optimal performance.</p>
Abstract Author:	Green JP, Grenier SG, McGill SM:
Journal:	Med Sci Sports Exerc
Biblio:	34: 1076-1081
Year Published:	2002
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	The tissue origin of low back pain and sciatica: a report of pain response to tissue stimulation during operations on the lumbar spine using local anesthesia.
Summary:	When mechanically stimulated during an operation the outer annulus, posterior longitudinal ligament, vertebral end plate, anterior dura and previously traumatised nerve roots, were all pain sensitive.

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Abstract Content:	In an effort to define the origin of low back pain and sciatica, 193 patients were carefully studied using progressive local anesthesia. These patients had surgery for herniated discs, spinal stenoses, or both. Various tissues were stimulated during the performance of these lumbar spinal operations. This article discusses our observations and the results of that study.
Abstract Author:	Kuslich SD, Ulstrom CL, Michael CJ.
Journal:	Orthop Clin North Am
Biblio:	Apr;22(2):181-7
Year Published:	1991
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Effect of Repeated Trunk Extension and Flexion Movements as seen by CT/Discography.
Summary:	No change observed in position of nucleus pulposus after flexion or extension.
Abstract Author:	Vanharanta H, Ohnmeiss D, Rashbaum R et al:
Journal:	Orthopaedic Transactions
Biblio:	12:3;650-651
Year Published:	1988
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Cardiovascular responses to repetitive McKenzie lumbar spine exercises
Summary:	Blood pressure and heart rate goes up in normal individuals when they perform repeated exercises as described by McKenzie.
Abstract Content:	BACKGROUND AND PURPOSE: Repetitive exercises of the type recommended by McKenzie for the lumbar spine, such as flexion and extension exercises in standing (FIS and EIS) and lying positions (FIL and EIL), have been used in the management of low back pain for over 20 years. The cardiovascular effects of exercises that involve postural stabilization and the arms and of exercises performed in a lying position are well known. Therefore, the purpose of this study was to examine the cardiovascular effects of 4 exercises used in the McKenzie system. SUBJECTS AND METHODS: One hundred subjects without cardiovascular or cardiopulmonary disease (mean age=31 years, SD=6.1, range=22-44) and who were representative of people susceptible to low back pain were studied. Subjects were randomly assigned to 1 of 4 exercise groups (ie, FIS, EIS, FIL, and EIL). Subjects performed sets of 10, 15, and 20 repetitions of the assigned exercise, with a 15-minute rest between sets. Heart rate, blood pressure, and rate-pressure product (an index of myocardial work) were recorded before and after each set of repetitions. RESULTS: After 10 repetitions, flexion and extension in lying were more hemodynamically demanding than in standing. This trend persisted for 15 and 20 repetitions; however, at 20 repetitions, the hemodynamic demands were different across exercise groups (ie, FIL>EIL>FIS>EIS). DISCUSSION AND CONCLUSION: Repetitive exercises of the type suggested by McKenzie for the lumbar spine can have cardiovascular effects in people with no cardiovascular or cardiopulmonary conditions. These effects may be important with respect to cardiac work, and patients for whom these exercises are indicated should have a cardiac and pulmonary risk factor assessment to determine whether heart rate and blood pressure should be monitored.
Abstract Author:	Al-Obaidi S, Anthony J, Dean E, Al-Shuwai N.
Journal:	Phys Ther
Biblio:	Sep;81(9):1524-1533
Year Published:	2001
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Seeking the optimal posture of the seated lumbar spine.
Summary:	A review of the literature on the optimal sitting posture for spinal health, based mostly on cadaveric studies, but some clinical studies. They conclude that the arguments in favour of a kyphotic sitting position are not substantiated by research; and that a lordotic position, interspersed with regular movement, is the optimal sitting posture and assists in preventing back pain.
Abstract Author:	Pynt J, Higgs J, Mackey M
Journal:	Physio Theory & Practice
Biblio:	17;5-21
Year Published:	2001

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Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Migration of the Nucleus Pulposus Within the Intervertebral Disc During Flexion and Extension of the Spine
Summary:	In vivo flexion tends to cause posterior displacement of the nucleus pulposus and extension anterior displacement using MRI.
Abstract Content:	<p>Study design. Magnetic resonance images were obtained of the lumbar spines of three volunteers in neutral, flexed, and extended postures. Objectives. To measure migration of the nucleus pulposus within the intervertebral disc during flexion and extension of the spine in living people. Summary of Background Data. Results of experiments on bisected cadaveric spines have indicated that the nucleus migrates posteriorly during flexion and anteriorly during extension in nondegenerate discs. Degenerate discs may have faults or fissures that result in abnormal motion of the nucleus. Methods. Proton density weighted, sagittal, magnetic resonance images were obtained from the lumbar spines of three volunteers. Measurements of the positions of the anterior and posterior margins of the nucleus and of flexion and extension angles were made on tracings of the images corresponding to neutral, flexed, and extended postures. Results. The observed frequency (22 of 24 measurements) at which the margins of the nucleus migrated in the directions predicted by results of cadaveric studies was significantly greater than the frequency that would be expected by chance (<math>P &lt; 0.001</math>). The two exceptions may be a result of disc degeneration. There was a significant (<math>P &lt; 0.05</math>) linear correlation between the migration of the anterior margin and the flexion-extension angle and a highly significant (<math>P &lt; 0.001</math>) correlation for the posterior margin and the flexion-extension angle. Conclusions. Flexion of an intervertebral disc in a living person tends to be accompanied by posteriorly directed migration of the nucleus pulposus within the disc. Extension tends to be accompanied by an anteriorly directed migration. [Key words: flexion-extension of the spine, intervertebral disc, magnetic resonance imaging, nucleus pulposus]</p>
Abstract Author:	Fennell A.J.; Jones, A.P.; Hukins, D.W.L.
Journal:	Spine
Biblio:	21:2753-2757
Year Published:	1996
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Hyperextension and Spine Height Changes
Summary:	Hyperextension was demonstrated to be a beneficial movement to unload the spine after loading, aiding rehydration and concomitant improvement of disc nutrition.
Abstract Content:	<p>Study Design. The effect on spine height changes from different combinations of time and angle of static prone hyperextension, and one intervention of dynamic hyperextension was explored. Objectives. To explore whether controlled hyperextension would cause an height increase with greater duration than previously shown, and to find an optimal combination of hyperextension angle and duration of the intervention. Summary of Background Data. Hyperextension is a commonly used treatment of low back pain. Previous studies have shown a positive effect of passive and dynamic hyperextension as measured as spine height changes using the stadiometer. Overhead work, i.e. with the spine in an increased lordosis was shown to relieve the load on the disc because it did not cause spinal height loss, which was attributed to the hyperextended posture. The height recovery that was found in previous studies was significant but temporary. Methods. Ten subjects were exposed to hyperextension in the prone position for different time periods and with different amounts of hyperextension. The effect was measured using the stadiometer for measurement of spine height changes. Results. The study showed that time was the most important variable, and also that for a given time, there was an increased recovery with increased angle. Conclusions. The results indicate that hyperextension can be a beneficial maneuver to unload temporarily the spine after loading and to rehydrate the discs, providing enough time is given for the procedure. The optimal time and angle combination was 20 minutes for 20 minutes because this intervention resulted in the largest recovery that lasted for a relatively long period of time. [Key words: height change, hyperextension, spine, stadiometer]</p>
Abstract Author:	Magnusson, M.L.; Aleksiev, A.S.; Spratt, K.F.; Lakes, R.S.; Pope, M.H.
Journal:	Spine
Biblio:	21:2670-2675
Year Published:	1996
Category:	Lumbar: Anatomical & physiological studies

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Abstract Title:	Effects of backward bending on lumbar intervertebral discs. Relevance to physical therapy treatments for low back pain.
Summary:	Cadaveric experiment in which the distribution of compressive stresses within ♦degenerated♦ discs were measured by dragging a stress transducer through it. Extension caused an average increase in localised stress peaks in the posterior annulus, however in 7/19 discs extension caused a decrease in stress peaks by up to 40%. It was hypothesised that this reduction was due to stress shielding by the neural arch in more degenerated discs.
Abstract Content:	STUDY DESIGN: Mechanical testing of cadaveric motion segments. OBJECTIVES: To test the hypothesis that backward bending of the lumbar spine can reduce compressive stresses within lumbar intervertebral discs. SUMMARY OF BACKGROUND DATA: Lumbar extension affects the distribution of compressive stress inside normal cadaveric discs, but little is known about its effect on mechanically disrupted and degenerated discs. METHODS: Nineteen lumbar motion segments (mean donor age, 48 years) were subjected to complex mechanical loading to simulate the following postures: moderate lumbar flexion, 2 degrees of extension, 4 degrees of extension, and the neutral position (no bending). The distribution of compressive stress within the disc matrix was measured in each posture by pulling a miniature pressure transducer along the midsagittal diameter of the disc. Stress profiles were repeated after a mechanical treatment that was intended to simulate severe disc degeneration in vivo. RESULTS: The "degeneration" treatment reduced pressure in the nucleus pulposus and generated stress concentrations within the annulus, in a manner similar to that found in severely degenerated discs in vivo. When all discs were considered together, 2 degrees of extension increased the maximum compressive stress within the posterior annulus by an average of 16%, compared with the neutral posture. The size of localized stress peaks within the posterior annulus was increased by 43% (P = 0.02). In 4 degrees of extension, changes observed between 0 degree and 2 degrees were usually exaggerated. In contrast, moderate flexion tended to equalize the distribution of compressive stress. In 7 of the 19 discs, 2 degrees of lumbar extension decreased maximum compressive stress in the posterior annulus relative to the neutral posture by up to 40%. Linear regression showed that lumbar extension tended to reduce stresses in the posterior annulus in those discs that exhibited the lowest compressive stresses in the neutral posture (P = 0.003; R2 = 41%). CONCLUSIONS: The posterior annulus can be stress shielded by the neural arch in extended postures, but the effect is variable. This may explain why extension exercises can relieve low back pain in some patients. Department of Anatomy, University of Bristol, United Kingdom. M.A.Adams@Bristol.ac.uk
Abstract Author:	Adams MA, May S, Freeman BJ, Morrison HP, Dolan P
Journal:	Spine
Biblio:	Feb 15;25(4):431-7
Year Published:	2000
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Gradual disc prolapse
Summary:	Cadaveric experiment loading motion segments in compression and bending caused 6 out of 52 to gradual prolapse, starting with distortion of the lamellae and progressing to nuclear herniation. The most common mechanism of failure was end-plate fracture.
Abstract Content:	Fifty-two cadaveric lumbar motion segments were subjected to fatigue loading in compression and bending to determine if the intervertebral discs could prolapse in a gradual manner. Prior to testing, the nucleus pulposus of each disc was stained with a small quantity of blue dye and radiopaque solution. This enabled the progress of any gradual prolapse to be monitored by direct observation and by discogram. Six discs developed a gradual prolapse during the testing period. The injury starts with the lamellae of the annulus being distorted to form radial fissures and then nuclear pulp is extruded from the disc and leaks into the spinal canal. Discs most commonly affected were from the lower lumbar spine of young cadavers. Tests on ten older discs with pre-existing ruptures showed that such discs are stable and do not leak nuclear pulp.
Abstract Author:	Adams MA, Hutton WC.
Journal:	Spine
Biblio:	Jul-Aug;10(6):524-31
Year Published:	1985
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Effect of lordosis on the position of the nucleus pulposus in supine subjects. A study using magnetic resonance imaging (MRI).

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Summary:	In vivo some anterior displacement of the nucleus pulposus with extension movements was observed. Degenerated discs appear to behave differently from non-degenerated discs.
Abstract Content:	STUDY DESIGN. Healthy young women (N = 20) underwent magnetic resonance imaging while supine with their hips and knees flexed (flexed position) and supine with a lumbar roll under the low back (extended position). The posterior and anterior margins of the nucleus pulposus (NP) relative to posterior and anterior margins of the adjacent vertebral bodies were calculated from mid-sagittal T2-weighted images to determine the position change of the NP as a function of two supine postures. OBJECTIVES. This study describes the effect of two commonly used supine postures on the position of the NP. SUMMARY OF BACKGROUND DATA. Management of patients with low back pain is often based on theorized positional changes of the NP during spinal extension and flexion. Data describing NP positional changes have not been reported for noninvasive measurements. RESULTS. The distance of the posterior margin of the NP to the posterior margins of the adjacent vertebral bodies was greater in the extended compared with the flexed position. There was no difference in the anterior distance. Eight of the 20 subjects had at least one degenerative disc in the lower lumbar spine. The NPs of the degenerative discs did not move the same as normal discs. CONCLUSIONS. The use of a lumbar roll under the low back when supine causes an increase in the distance from the posterior margin of the NP to the posterior portions of the vertebral bodies in normal discs of healthy young females. Degenerative discs deform differently from nondegenerative discs.
Abstract Author:	Beattie PF, Brooks WM, Rothstein JM, Sibbitt WL Jr, Robergs RA, MacLean T, Hart BL.
Journal:	Spine
Biblio:	Sep 15;19(18):2096-2102
Year Published:	1994
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	A digitizing technique for the study of movement of intradiscal dye in response to flexion and extension of the lumbar spine.
Summary:	Nuclear material in normal discs moves anteriorly with extension and posteriorly with flexion, however movements in degenerated discs were less predictable.
Abstract Content:	The effects of flexion and extension exercises on lumbar discs and low-back pain are controversial. Our goals were to develop a technique and program for digitizing and analyzing discograms and to study the motion of intradiscal dye in response to flexion and extension. Thirty-five patients following awake discography were evaluated with lateral radiographs obtained in an extension position and a flexion position. Fifty-three segments with normal morphology and 47 segments with abnormal morphology were studied. Discograms with normal morphology showed numerically significant change in position with a more anterior position occurring during extension. Changes in the position of intradiscal dye in discs with abnormal morphology were less predictable. Digitizing was an advantageous technique.
Abstract Author:	Schnebel BE, Simmons JW, Chowning J, Davidson R.
Journal:	Spine
Biblio:	Mar;13(3):309-12
Year Published:	1988
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	The role of spinal flexion and extension in changing nerve root compression in disc herniations.
Summary:	Using cadaver models of herniated discs, Schnebel demonstrated that flexion increases tension and that extension decreases tension on the L5 nerve root.
Abstract Content:	Changes in nerve root compression forces with spinal motion were measured on six freshly frozen adult cadaver spine specimens. A model was devised to represent a herniated disc at the L4-5 level. This was done using an anterior approach placing a compression-measuring device through the disc at the L4-5 level and against the L5 root. An accelerometer was used to monitor the range of motion of the spine. Because the compression device was held in a static position, the only variable was the tautness of the nerve root across the tip of the device. By simultaneously monitoring motion and force delivered at the tip of the compression meter placed at the nerve root, we were able to quantitate nerve root tension forces across the tip of the measuring device in relation to spinal motion. The force was measured with controls as well as in flexion and extension. In addition, the force was measured as traction was applied to the L5 root. The amount of compressive force and tension in the nerve root increased with flexion of the spine and decreased with extension of the spine. In conclusion, flexion of the lumbar spine increased the compressive force on the L5 root and extension decreased the compressive force on the L5 root.

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Abstract Author:	Schnebel BE, Watkins RG, Dillin W.
Journal:	Spine
Biblio:	Aug;14(8):835-7
Year Published:	1989
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	The effect of different standing and sitting postures on trunk muscle activity in a pain-free population.
Summary:	Compared to erect sitting and standing most trunk muscle activity is significantly less in slumped sitting or standing.
Abstract Content:	<p>STUDY DESIGN: A normative, single-group study was conducted. OBJECTIVE: To determine whether there is a difference in electromyographic activation of specific lumbopelvic muscles with the adoption of common postures in a pain-free population. SUMMARY OF BACKGROUND DATA: Clinical observations indicate that adopting passive postures such as sway standing and slump sitting can exacerbate pain in individuals with low back pain. These individuals often present with poor activation of the lumbopelvic stabilizing musculature. At this writing, little empirical evidence exists to document that function of the trunk and lumbopelvic musculature are related to the adoption of standardized standing and sitting postures. METHODS: This study included 20 healthy adults, with equal representation of the genders. Surface electromyography was used to measure activity in the superficial lumbar multifidus, internal oblique, rectus abdominis, external oblique, and thoracic erector spinae muscles for four standardized standing and sitting postures. RESULTS: The internal oblique, superficial lumbar multifidus, and thoracic erector spinae muscles showed a significant decrease in activity during sway standing (<math>P = 0.027</math>, <math>P = 0.002</math>, and <math>P = 0.003</math>, respectively) and slump sitting (<math>P = 0.007</math>, <math>P = 0.012</math>, and <math>P = 0.003</math>, respectively), as compared with erect postures. Rectus abdominis activity increased significantly in sway standing, as compared with erect standing (<math>P = 0.005</math>). CONCLUSIONS: The findings show that the lumbopelvic stabilizing musculature is active in maintaining optimally aligned, erect postures, and that these muscles are less active during the adoption of passive postures. The results of this study lend credence to the practice of postural retraining when facilitation of the lumbopelvic stabilizing musculature is indicated in the management of specific spinal pain conditions.</p>
Abstract Author:	O♦Sullivan PB, Grahamslaw KM, Kendell M, Lapenskie SC, Moller NE, Richards KV.
Journal:	Spine
Biblio:	Jun 1;27(11):1238-44
Year Published:	2002
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Historical perspective milestones in the evolution of lumbar spinal postural health in seating.
Summary:	Historical review of seating postures in the past, with analysis of what is deemed good posture from a recent evidence-based approach ♦ favouring lordosis and interruption of sustained static sitting.
Abstract Content:	<p>The best knowledge on seated posture before the Enlightenment was not scientific, but influenced by sociocultural, economic, and manufacturing factors. Although the pursuit of knowledge related to spinal postural health was advanced with the advent of empirico-analytic research, academic opinion continued to be influenced by unsubstantiated information, often resulting in incorrect advice to the public. Only in the past decade has advice on "correct" seated posture, spanning the time from the Hippocratic texts to the present, been brought into question by evidence-based research. By exploring seating from 3100 B.C to the present, this article discusses key influences that have an impact on seating functional to spinal postural health. Emphasis is placed on the role of medical opinion.</p>
Abstract Author:	Pynt J, Higgs J, Mackey M.
Journal:	Spine
Biblio:	Oct 1;27(19):2180-9
Year Published:	2002
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Disc stimulation and patterns of referred pain.



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Summary:	25 patients who met inclusion criteria and who received intradiscal electrothermal annuloplasty (IDET) treatment for chronic discogenic back pain were studied for pain response to procedure. All pain provoked by procedure was familiar to patients ♦ 16 had back pain only, 6 back and thigh, 3 radiated into calf. The distance pain was referred correlated to intensity of stimulus as measured by heat and duration, and always preceded in order back, thigh, then calf.
Abstract Content:	STUDY DESIGN Prospective, within-subjects, observational experimental design.OBJECTIVES To determine the pattern of pain response to noxious stimulation of the intervertebral disc.SUMMARY OF BACKGROUND DATA Experimental studies have demonstrated that noxious stimulation of interspinous ligaments, facet joints, and paravertebral muscles causes referred pain into the extremity, with the distal extent of radiation dependent on the intensity of stimulation. Analogous studies have not been performed on the lumbar intervertebral disc.METHODS A total of 25 consecutive patients meeting inclusion criteria completed a pain diagram before undergoing the intradiscal electrothermal annuloplasty procedure. The location, intensity, and familiarity of any pain provoked during disc heating were correlated with presenting symptoms and duration of heating.RESULTS During disc heating, 68% of patients reported exact reproduction of their presenting pain, in both pain quality and location. None of the patients experienced unfamiliar pain during the procedure. The pattern of pain reproduction was consistent; pain originated proximally and progressed distally as stimulus intensity increased.CONCLUSION Noxious stimulation of the intervertebral disc may result in low back and referred extremity in patients presenting with these symptoms. The distal extent of pain produced depends on the intensity of stimulation. Disc stimulation may reproduce pain that extends to below the knee.
Abstract Author:	O♦Neill CW, Kurgansky ME, Derby R, Ryan DP.
Journal:	Spine
Biblio:	Dec 15;27(24):2776-81
Year Published:	2002
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Prolapsed intervertebral disc. A hyperflexion injury.
Summary:	Cadaveric experiment simulating hyperflexion led to disc failure by posterior prolapse in 26 out of 61 motion segments tested.
Abstract Author:	Adams MA, Hutton WC.
Journal:	Spine
Biblio:	10.184-191
Year Published:	1982
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Pain immediately upon sitting down and relieved by standing up is often associated with radiologic lumbar instability or marked anterior loss of disc space.
Summary:	Comparison of 42 patients with pain immediately on sitting and relieved on standing compared to 32 LBP patients who did not show this pattern - 86% were female and there were higher rates of radiological signs of instability.
Abstract Author:	Maigne JY, LapeyreE, Morvan G, Chatellier G
Journal:	Spine
Biblio:	28:1327-1334
Year Published:	2003
Category:	Lumbar: Anatomical & physiological studies
Abstract Title:	Changes in posterior disc bulging and intervertebral foraminal size associated with flexion-extension movement: a comparison between L4-5 and L5-S1 levels in normal subjects.
Summary:	MRI of 3 volunteers with no history of back pain; clear trend for flexion to cause greater posterior bulging and extension to reduce posterior bulging. Intervertebral foramina increased in flexion and decreased with extension.
Abstract Author:	Fredericson M, Lee SU, Welsh J, Butts K, Norbash A, Carragee EJ
Journal:	Spine Journal
Biblio:	1:10-17
Year Published:	2001
Category:	Lumbar: Anatomical & physiological studies