



**Physiotherapy
Association of
British Columbia**

PHYSIOTHERAPY LOW BACK STRAIN MODEL OF CARE

Literature Levels of Evidence Review

Therapeutic Exercise

Level of Evidence	Paper	Strength of Evidence (power calculation; randomization; concealed allocation; blinding; dropouts reported & data included in analysis; CIs, NNT, RR, OR not just p value)	Outcome measures (ROM, RTW etc)	Comments
Level 1: Meta-Analysis	Machado et al. 2006	Power-NA Random-NA Con. Alloc.-NA Blind.-NA Drop-outs-NA Stats-WMD and -4.16 points; 95% C.I. for decreased pain 3.85 points; 95% CI, for decreased disability	Pain disability, quality of life, RTW, recurrence	1-suggests McKenzie method more effective than passive therapies albeit with a small magnitude of difference. 2-not better than passive therapy and advice to stay active for acute low back pain
Level 2: Systematic reviews	Hayden et. al 2006 "Exercise treatment for non-specific low back Pain" Up-date from Cochrane Review	Power-NA Random-NA Conc. Allocation-NA Blinding-NA Drop-Outs NA Stats C.I 95%		1-for acute low back pain exercise is as effective as either no treatment or other conservative treatments. 2-for sub-acute low back pain there is some evidence that a graded activity program improves absenteeism outcomes
	Rackwitz et.al 2006	Power-NA Random-NA Conc. Alloc.-NA Blind.-NA Drop-outs-NA Stats-NA		1-mod. evidence that segmental stabilizing exs. more effective than GP to decrease recurrence 2-Mod. evidence that seg. stab. exs/with man. th./GP more effective at decreasing pain and disability than GP alone @4 weeks 3-strong evidence that seg. stab. exs/man.th./GP more effective at decreasing pain and disability than GP alone @12 mos. 4-lack of evidence re: RTW and recurrence
	Pengel et al. 2002	Power-NA Random-NA Conc. Alloc.-NA Blind.-NA Drop-outs-NA Stats-Effect Sizes with 95%C.I.	Pain, disability, risk ratios for return to work	Looked at subacute LBP (6-12/52) and found that exercise is an effective treatment for subacute low back pain and suggest acute and subacute phases of low back pain are different and that effective treatments should be identified specifically for each phase.
Level 3: Evidence-based Clinical guidelines	New Zealand ALBP 2002			1-advice to stay active improved clinical outcome 2-no evidence of improvement of clin. out. for "specific back exs"

	Dutch Physiotherapy guidelines for LBP			"Ex th. has no added value in acute pts (<6/52) but is useful in Rx of chronic pts(>12/52) but is not clear which exs are best". doesn't talk about sub-acute pain.
	Holohan et al. 2006 Physiotherapy Canada			1-at initial contact strong evidence to stay active for ALBP (and provide printed material) 2-subsequent Rx moderately strong to strong evidence for manipulation (& referral to "specialist"). 3-moderate evidence for physical activity or training, stability training and McKenzie exs.
Level 4: RCT's	Hides et al 2001	Power-no Random-yes Conc. alloc.-? Blinding-yes Drop-outs reported and included-yes Stats-C.I.95% P=<0.01 year 1 P=0.015 year 2/3	Recurrence of LPB as reported in telephone questionnaire	1 st episode, acute, LBP who received Multif/TrAb ex therapy+ medical manage. experienced fewer recurrences compared to N activity and medical manage.
	Wand et al. 2004	Power-yes Random-yes Conc.alloc.-no Blind- assessor only Drop-outs reported and included-yes Stats P<0.05	-VAS-pain -RMDQ- func.disability -Mod.Zung-self rated depression. -Gen health -Quality of life	1-Early physio intervention improves short term outcome better than advice to stay active 2-no long term diff. in pain and disability between early and late interven. 3-timing of interven. affects progression of psychosocial features- better earlier
	KlabinMoffet et al. 2004	Power-yes Random-yes Con.alloc.-to clinical researchers Blind-single Drop-outs reported & inc.-yes Stats-5%OR with their corresponding 95% C.I.	-RMDQ -Fear avoidance questionnaire	1-most benefit was for pts. who were afraid physical activity would damage their back 2-pts with high fear avoidance beliefs in the Back to Fitness program were 3 times more likely to be functioning well at 1 year compared to those in GP care.
	Fritz et al 2003	Power-yes Random-yes Conc.Alloc. Blind-single Drop-outs reported & included-yes	-Impairment index -Oswestry scale (P=0.023) RTW(P=0.017) -medical costs -satisfaction (P=0.006) -SF-36 (P=0.029)	Patients with acute, work related low back pain had improved disability and RTW status after 4/52 with classification based therapy as compared with therapy based on clinical practice guidelines.

Manual and Manipulative Therapy

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 1: Meta-Analysis	Low Back Pain and Manual Medicine, A look at the Literature, 1996 Mein, Eric A Medicine & Rehabilitation Clinics of North America, 7(4), 715 - 729	Reviews scored out of 100 points for 17 items looking at study population, interventions, measurement of effect, and data presentation and analysis.	Various including: VAS, Oswestry, Modified Zung Depression Index	Existing literature strongly suggests that manipulative therapies are helpful in the treatment of acute and chronic low back pain. Notes that all trials of manipulative therapy score poorly when assessed for scientific quality.
	Efficacy of Spinal Manipulative Therapy for low back pain of less than three months duration, Manuela L. Ferreira et al, Journal of Manipulative and Physiological Therapeutics, Nov/Dec 2003, Vol 26, No. 9, pp 593 – 600	Power – ?, Total sample size 3817 patients, 27 trials Randomization- yes Concealed Alloc. – Most No, 19 trials Blinding – most No, 26 trials (difficult to do) Dropouts –not reported Stats: PEDro of > 2 points for inclusion, Method. Quality scores range 3 – 8 points/10 (Max) with MEAN 5.7, SD 1.6. No P values cited. CI of 95% Various figures cited according to studies	Disability, Pain, Quality of life, adverse events, RTW, global perceived effect, patient satisfaction	Spinal Manipulative therapy produces slightly better outcomes than placebo, no treatment, massage and short wave diathermy for non-specific low back pain of < 3 months. (although confidence limits indicate that the difference may not be clinically important) Manipulative therapy, exercise, usual physio and medical care produce similar outcomes in the first 4 weeks. Findings of this review were limited by study heterogeneity and failure of many studies to report key data. Also limited by methodological quality of RCTs. Failure to conceal allocation was common and failure to adequately blind patients & therapists even though this is nearly impossible to do.
Level 2: Systematic reviews	<i>Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis, G Bronfort et al, The Spine Journal 4 (2004) 335-356</i>	Power – yes Randomization- yes Concealed Alloc. – yes Blinding – yes Dropouts –not reported Stats: Alpha level 0.05, 80% power to detect a grp difference. No P values or CI s cited.	<i>Not clearly defined but general description was:</i> Pain scales, disability questionnaires, loss of work, recovery time, medication use, global improvement, functional health status	<i>Moderate evidence that manipulation provides more short term pain relief than controls.</i> No evidence in long term follow-up. Article complicated by including neck pain as area of study. ALBP defined as < 6 wks, Chronic > 6 wks. Short term follow up < 3 mths, long term follow up > 6 mths. 15 RCTs studied for ALBP, 6 accepted, 9 rejected.
	A review of the evidence for the effectiveness, safety, and cost of acupuncture, massage therapy, and spinal manipulation for back pain, Daniel C. Cherkin et al, Ann Intern Med. 2003;138: 898-906	Power – not mentioned Randomization- yes Concealed Alloc. – n/a Blinding – assumed Dropouts –not reported Stats: No P value stated, CI 95%.	VAS, RMQ	LBP short term < 6 weeks Long Term > 3 months Conclusion: Manipulation no more effective than other conventional therapies. Only demonstrated effectiveness when compared to sham or ineffective treatments. Problems: Mixed chronic and acute popl'ns, identified that patient expectations and preferences will affect outcomes.

	<p>A systematic review of systematic reviews of spinal manipulation, E. Ernst & P. H. Canter, J R Soc Med 2006;99: 192-196</p> <hr/> <p>Evidence-Based Physiotherapy for Acute Low Back Pain: A Composite Clinical Algorithm Synthesized from Seven Recent Clinical Guidelines Holoan, Deenadayalan and Grimmer, Physio Canada, Vol 58, No. 4, 2006: pp 280-292</p>	<p>Power – not mentioned Randomization- assumed Concealed Alloc. – n/a Blinding – assumed Dropouts –not reported Stats - No P value stated, CI - not stated</p> <hr/> <p>Power – not mentioned Randomization- assumed Concealed Alloc. – n/a Blinding – assumed Dropouts – n/a Stats - No P value stated, CI - not stated AGREE instrument applied for Data extraction and synthesis Relative strength of evidence discussed.</p>	<p>N/A</p> <hr/> <p>N/A</p>	<p>Search restricted to reviews or meta-analyses b/w 2000 and May 2005. Conclusion: Data does not demonstrate that spinal manipulation is an effective intervention for any condition. Given the possibility of adverse effects, this review does not suggest that spinal manipulation is a recommendable treatment. Specifically no benefit in use of spinal manipulation in acute or chronic low back pain.</p> <hr/> <p>Manipulation at 1 – 2 weeks post injury there was strong and moderately strong evidence to support its use as treatment.</p> <p>Authors note that in most guidelines treatment options are not clearly defined and at times poorly described.</p> <p>Identifies the need for future studies with better statistical design.</p>
Level 3: Evidence-based Clinical guidelines	<p>New Zealand Acute Low Back Pain Guide, October 2004</p> <hr/> <p>EUROPEAN GUIDELINES FOR THE MANAGEMENT OF ACUTE NONSPECIFIC LOW BACK PAIN IN PRIMARY CARE, Maurits van Tulder et al</p>	<p>Systematic Review of best evidence from Jan 1999 – Feb 2002</p> <hr/>	<p>N/A</p> <hr/>	<p>Acute LBP defined as less than 3 months, defines red and yellow flags, aims to exclude red flags. Grade A (meta-analysis, systematic review or RCTs) evidence of improved clinical outcomes for manipulation in the 1st 4 – 6 weeks only.</p> <hr/> <p>We do not know for which subgroup of patients spinal manipulation is most effective. Future studies should focus on identifying these subgroups. Spinal manipulation should be provided by professionals with competent skills. Consider (referral for) spinal manipulation for patients who are failing to return to normal activities. Current guidelines contraindicate manipulation in people with severe or progressive neurological deficit.</p>
	<p>UK Clinical Guidelines for management of acute LBP (1996).</p>	<p>Review of literature and consensus information</p>	<p>N/A</p>	<p>Supports the use of manipulation as a treatment in the management of acute low back pain.</p>

	<p>APA Low Back Pain Position Statement, Executive Summary</p> <hr/> <p>Dutch Physiotherapy Guidelines for Low Back Pain</p> <hr/> <p>The Philadelphia Panel Guideline</p> <hr/> <p>The Australian Guidelines - Evidence-based Clinical Guidelines for the Management of Acute Low Back Pain (1999). Professor Nikolai Bogduk</p>	<p>Systematic Reviews</p> <hr/> <p>Systematic Reviews and meta analyses</p> <hr/> <p>Systematic Reviews and meta analyses</p> <hr/> <p>Grade Definition I Evidence obtained from a systematic review of all relevant randomized controlled trials. II Evidence obtained from at least one properly designed randomized controlled trial. III - 1 Evidence obtained from well-designed pseudo-randomized controlled trials (alternate allocation or some other method). III - 2 Evidence obtained from comparative studies with concurrent controls and allocation not randomized (cohort studies), case-control analytic studies, or interrupted time series with a control group. III-3 Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group. IV Evidence obtained from case series, either post-test or pre-test and post-test.</p>	<p>N/A</p> <hr/> <p>N/A</p> <hr/> <p>Various</p> <hr/> <p>N/A</p>	<p>Summary only but reports evidence to support manipulation as treatment in acute LBP.</p> <hr/> <p>Acute 0 – 6 weeks, Sub-Acute 7 -12 weeks, Chronic > 12 weeks Effectiveness of manual therapy/manipulation not discussed because these techniques demand specific knowledge and training. A future study is proposed on manual therap guidelines.</p> <hr/> <p>Manipulation not examined</p> <hr/> <p>Although manual therapy appears to be more effective than placebo (weak Level I evidence), there are no grounds to prefer manual therapy over other conservative therapy options (Level I evidence).</p>
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Level 4: RCT's	<p>Early Intervention for the mngmt of ALBP, B. M. Wand et al, Spine Vol 29, No. 21, pp 2350-2356</p>	<p>Power – yes Randomisn- Yes Concealed Allocn- yes Blinding-Yes Dropouts reported & included – yes Stats – p=0.05, power 0.90, CI, N/A, Chi squared done.</p>	<p>RMQ, VAS, MZSRDS, MSPQ, STAIS, QTF, ALBP screening questionnaire</p>	<p>No difference b/w grps at baseline At 6 wks treatment grp better on RMQ than control, no difference for VAS No difference b/w grps at 3 & 6 mths using RMQ & VAS but treat grp better outcomes in gen health, social functioning, mental and emotional health. Concludes early intervention does not affect long term pain & disability. More study needed.</p> <p>74% of referred back pts fell outside criteria for simple ALBP. ALBP not clearly defined. Manipulation and rehab exercise were combined (difficult to sort out which has influence)</p>
	<p><i>Stabilizing training compared with manual treatment in sub-acute and chronic low back pain, E. Rasmussen-Barr et al, Manual Therapy(2003) 8 (4), 233-241</i></p>	<p>Power – yes Randomisn- Yes Concealed Allocn- No Blinding-Yes Dropouts reported & included – yes Stats – p=0.05, Chi squared, ANOVA & Mann-Whitney U-test done, Power - No, C. I. – not mentioned</p>	<p>VAS, Health assessment (using VAS), Oswestry LBP questionnaire, Disability Rating Index, Satisfaction Rating (using VAS).</p>	<p>Dropout rate precludes any definite conclusions, more study needed. Preliminary findings: No difference b/w groups in short-term and better outcomes in stabilization group compared to manip therapy for long term follow-up. Problems: 74% of patients had previously seen other physios or chiros before study, high dropout rate and lack of control group i.e. no intervention.</p>

	<p>A perspective for considering the risks and benefits of spinal manipulation in patients with low back pain, John D. Childs et al, Manual Therapy 11 (2006), 316-320</p> <hr/> <p>Comparison of the effectiveness of three manual physical therapy techniques in a subgroup of patients with low back pain who satisfy a clinical prediction rule: Study protocol of a randomized clinical trial, Cleland et al BMC Musculoskeletal Disorders 2006, 7:11</p>	<p>Power – No Randomisn- Yes Concealed Allocn- No Blinding- No Dropouts reported & included – yes Stats – p=0.007 Chi squared done Power - No, C. I. – 95%, RR 1 week 8.0 (95% CI: 1.1, 63, 5). APR 1 week 10% (95% CI< 2-21%), NNT 1 week 9.9 (95% CI: 4.9, 65.3)</p> <hr/> <p>Power – yes Randomisn- Yes Concealed Allocn- No Blinding-Yes Dropouts reported & included – yes Stats – alpha=0.05, ANOVA, C. I. – to be determined</p>	<p>Oswestry Disability Quest.</p> <hr/> <p>NPRS, Oswestry Disability Questionnaire, Fear avoidance beliefs qest., Patient Global rating of change</p>	<p>Conclusion: When patients were screened for red flags to increase likelihood of benefit from manipulation, those who received only exercise without manipulation were 8 times more likely to experience a worsening in disability after 1 week than those who received manipulation with exercise. Results explained to a popl'n of 100 patients: Manip + ex 1-2 pts will experience worsening disability, Ex only 11-12 patients will experience worsening disability. Problems: Sample size was small, LBP not clearly defined (acute vs. Chronic) 4 week follow up comparison not stat sig P<0.052 but claim ex only still 4 times more likely to have worsening disability.</p> <hr/> <p>Lists protocols of future study with aim to have sample size of 240 patients. Will use the Clinical Prediction Rule (CPR) for inclusion in study. CPR shown statistically to identify improvement with manipulation in 97% of patients whose satisfy the criteria.</p>
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EDUCATION

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 2: Systematic reviews	Henrotin, Y., Cedraschi, C., Duplan, B., Bazin, T., & Duquesnoy, B. (2006). Information and low back pain management – A systematic review. <i>Spine</i> , 31(11), E326-334.		The authors considered as primary outcomes at least one of the following variables: pain, disability, RTW, use of health care resources or patient's knowledge, beliefs, or attitudes about back pain.	The authors' objectives were to evaluate, via a systematic review, the effectiveness of information (i.e., booklet, video program, multimedia campaign, internet-based information) as a preventive action and/or treatment for low back pain and to determine which type of information is most effective. The studies in this review included patients with non-specific low back pain, whether acute or chronic.
	Waddell, G., Feder, G., & Lewis, M. (1997). Systematic review of bed rest and advice to stay active for acute low back pain. <i>British Journal of General Practice</i> , 47, 647-652.		Studies included needed to measure at least one of the following outcomes to be included in the systematic review: Rate of recovery from acute attack Pain relief Restoration of function Satisfaction with treatment Days off work and return to work Development of chronic pain and disability Recurrent attacks Further health care use	The authors' aim, with this systematic review, was to review all randomized controlled trials of bed rest and medical advice to stay active for acute low back pain.
	Cohen, J., Goel, V., Frank, J.W., Bombardier, C., Peloso, P., & Gullemin, F. (1994). Group education interventions for people with low back pain, an overview of the literature. <i>Spine</i> , 19(11), 1214-1222.		The studies included in the review looked at a variety of outcomes, such as: pain intensity, pain duration, sick leave duration, functional status, knowledge, spinal mobility, contacts with health care providers.	The authors' objective was to determine the effectiveness of group education as an intervention for persons with low back pain. Note that this systematic review only included two studies with acute cases which the authors considered sufficiently well designed for their findings to be considered.
Level 3: Clinical guidelines	UK Clinical Guidelines for the management of acute LBP. September 1996. Royal College of General Practitioners, London.			These guidelines were one of the first developed with the purpose of having a more consistent and systematic approach to low back pain across different disciplines. Note that these guidelines also included recommendations based on consensus-based views in addition to evidence-based information.
	NZ Acute LBP guidelines. http://www.nzgg.org.nz/guidelines/0072/acc1038_col.pdf			These guidelines were first developed in 1997. Further evidence reviews in 1998, 2000 and 2001/2002 led to the current edition of the NZ Acute LBP Guide.

<p>The Australian Guidelines - Evidence-based Clinical Guidelines for the Management of Acute Low Back Pain (1999).</p> <p>http://www.emia.com.au/MedicalProviders/EvidenceBasedMedicine/NHMRC_Bogduk_A_LBP_Guidelines.pdf</p>			<p>This document was prepared by Professor Nikolai Bogduk on behalf of The Australasian faculty of musculoskeletal Medicine in response to the belief that back pain was poorly managed in Australia and New Zealand. In contrast to the recommendations in the UK guidelines, which also include consensus views, the recommendations in these guidelines are, according to the author, exclusively evidence-based.</p> <p>The purpose of the guidelines was to provide Australian medical practitioners and other interested groups with a summary of evidence-based best practice for low back pain.</p>
<p>Royal Dutch Association of Physical Therapy – Guideline: Manual Therapy on Low Back Pain.</p> <p>http://www.nvmt.nl/</p>			<p>Although the recommendations from these guidelines are directed to manual therapists, they apply to all clinicians interacting with patients with acute low back pain.</p>
<p>van Tulder, M., Becker, A., Bekkering, T. et al. (2004) European guidelines for the management of acute nonspecific low back pain in primary care. European Commission, Research Directorate General.</p> <p>http://www.backpaineurope.org/web/files/WG1_Guidelines.pdf</p>			<p>These guidelines were developed with the intention of improving the primary care management of acute non-specific low back pain for adult patients. The target populations are individuals as well as professional associations that disseminate and implement guidelines.</p> <p>The recommendations in these guidelines were based on Cochrane reviews and other systematic reviews if Cochrane review was not available.</p>

Level 4: RCT's	Wand, B. M., Bird, C., McAuley, J. H., MacDowell, M., & De Souza, L. H. (2004). Early Intervention for the management of acute LBP: A single-blind randomized controlled trial of biopsychosocial education, manual therapy, and exercise. <i>Spine</i> , 29(21), 2350 – 2356.	Power calculation – Yes Randomization – Yes Concealed allocation - Yes Blinding – yes; single-blinded. Dropouts - Yes; At 6 weeks 64% and at long-term follow-up 62% of patients returned for their assessments. Note, however, that there was no significant difference found between follow-up responders and non-responders in terms of baseline characteristics. Stats – $p < 0.05$;	Roland and Morris Disability Questionnaire (RMDQ); Visual Analogue Scale (VAS); 6 items from the State-Trait Anxiety Inventory (STAI); Modified Zung Self Rated Depression Score (MZRDS); Modified Somatic Perception Questionnaire (MSPQ); EuroQol health transition and health thermometer; and Short-term Form 36 (SF-36).	The purpose of this study was to compare two types of interventions (assess/advice/treat versus assess/advice/wait) for acute low back pain and assess the effect of timing of physical intervention.
	Roberts, L., Little, P., Chapman, J., Cantrell, T., Pickering, R., & Langridge, J. (2002). The back home trial: General practitioner-supported leaflets may change back pain behavior. <i>Spine</i> , 27(17), 1821-1828.	Power calculation – Not reported Randomization – Yes; At the level of the GP, but not at the level of the patient Concealed allocation - No Blinding – Yes Dropouts – Yes; 2 GP's dropped out Stats – $p < 0.05$;	Outcomes studied included: Knowledge and attitude (based on quiz and questionnaire respectively) Observed behaviour Function as measured by way of the Aberdeen LBP scale (a functional self-report functional questionnaire)	The purpose of the study was to test the effectiveness of a simple patient information leaflet on knowledge, attitude, behavior, and function.
	Hagen, E. M., Eriksen, H. R., & Ursin, H. (2000). Does early intervention with a light mobilization program reduce long-term sick leave for low back pain? <i>Spine</i> , 25(15), 1973-1976.	Power calculation – Not reported Randomization – Yes Concealed allocation - Yes Blinding – Yes; single-blinded Dropouts - Not provided Stats – P value < 0.05	Return to full duty work.	Patients included in this study had been off work 8 to 12 weeks for low back pain. Note that persons diagnosed with sciatica were also included in the study. Purpose of the study was to investigate the effect of a 'light mobilization program', essentially consisting of an examination, information, and recommendations to remain active, on the duration of "sick leave" for patients with sub-acute low back pain (as defined as off work with back pain for 8-12 weeks)

	<p>Hazard, R., Reid, S., Haugh, L., & McFarlane, G. (2000). A controlled trial of an educational pamphlet to prevent disability after occupational low back injury. <i>Spine</i>, 25(11), 1419-1423.</p>	<p>Power calculation – Yes Randomization – Yes Concealed allocation - Yes Blinding – Yes at 3 months; not at 6 months Dropouts - Yes, i.e., 12 persons in the pamphlet group and 19 in the no-pamphlet group could not be contacted for follow-up (analysis of people lost to follow-up revealed some statistical differences for age, median hourly wage and median employment history) Stats – p value < 0.05;</p>	<p>Back pain; work status and health care use</p>	<p>The purpose of the study was to determine the effectiveness of a mailed pamphlet stressing psychosocial recovery issues on the recovery of recently injured workers with low back pain.</p>
	<p>Burton, K. A., Waddell, G., Tillotson, M., & Summerton, N. (1999). Information and advice to patients with back pain can have a positive effect: A randomized controlled trial of a novel educational booklet in primary care.</p>	<p>Power calculation – not reported Randomization – Yes Concealed allocation - not provided Blinding – Yes, double-blinded Dropouts - Yes (loss to follow-up; similar follow-up proportions between intervention and control groups, but no discussion provided re: possible difference between those who were not followed up and those that were (was there a significant difference?)) Stats – p value < 0.05; RR: yes; CI = 95%</p>	<p>Fear-avoidance beliefs about physical activity; beliefs about the inevitable consequences of back trouble; the Roland and Morris disability questionnaire; and visual analogue scale for pain intensity.</p>	<p>The purpose of this study was to evaluate the effectiveness of this booklet (versus a traditional booklet imparting factual information) in changing beliefs and behaviour.</p>

<p>Cherkin, D. C., Deyo, R. A., Battie, M., Street, J., & Barlow, W. (1998). A comparison of physical therapy, chiropractic manipulation, and provision of an educational booklet for the treatment of patients with low back pain.[see comment]. <i>New England Journal of Medicine</i>, 339(15), 1021-1029.</p>	<p>Power calculation – Yes Randomization – Yes Concealed allocation - Yes Blinding – No Dropouts - Not discussed Stats – P value < 0.05</p>	<p>Outcomes measured: Pain levels on an 11-point scale Level of function using the 24-point Roland Disability Scale Recurrences of low back pain Use of back-related health care</p>	<p>The purpose of this study was to investigate the effect of the McKenzie method of physical therapy versus chiropractic manipulation versus minimal intervention (consisting of an educational booklet) on patients with acute low back pain lasting longer than 7 days (patients with sciatica were excluded). Patients were followed for a total of 2 years.</p>
<p>Indahl, A., Haldorsen, E. H., Holm, S., Reikeras, O., & Ursin, H. (1998). Five-year follow-up study of a controlled clinical trial using light mobilization and an informative approach to low back pain. <i>Spine</i>, 23(23), 2625-2630.</p>	<p>Power calculation – Yes Randomization – Yes Concealed allocation - Yes Blinding – not discussed Dropouts - Not discussed Stats – p value < 0.05</p>	<p>Primarily length of sick leave, return to work, recurrent sick leaves.</p>	<p>The purpose of this study was to examine the long-term effect of a minimal approach, consisting of an assessment, information and recommendations to stay active, on acute low back pain.</p> <p>Persons included in the study had LBP between 4-12 weeks at the time of the original intervention.</p>
<p>Friedrich, M., Cermak, T., & Maderbacher, P. (1996). The effect of brochure use versus therapist teaching on patients performing therapeutic exercise and on changes in impairment status. <i>Physical Therapy</i>, 76(10), 1082-1088.</p>	<p>Power calculation – not reported Randomization – Yes Concealed allocation - not reported Blinding – Yes Dropouts - not reported Stats – p value < 0.01</p>	<p>Visual analogue scale. Rating to assess correctness of exercise performance and impairment measures (as per Janda).</p>	<p>The purpose of the study was to evaluate whether the mode of teaching exercises (brochure versus therapist teaching) impacts the patients' ability to perform exercises correctly and whether it affects changes in impairment.</p> <p>Persons with neck and low back pain were included. Duration of pain was not provided.</p>
<p>Indahl, A., Velund, L., & Reikeraas, O. (1995). Good prognosis for low back pain when left untampered. A randomized clinical trial. <i>Spine</i>; <i>Spine</i>, 20(4), 473-477.</p>	<p>Power – Yes Randomization – Yes Concealed allocation - Yes Blinding – not discussed Dropouts - not discussed Stats – p value < 0.05</p>	<p>Outcome was measured by return or failure to return to work (= still on "sickness leave").</p>	<p>This randomized clinical trial was designed to determine the effect of treating low back pain as a benign, self limiting condition by light normal activity versus normal medical intervention. Note that patients included in this study had been off work (= sick leave) for more than 8 weeks.</p>

	<p>Stankovic, R., & Johnell, O. (1990). Conservative treatment of acute low-back pain. A prospective randomized trial: McKenzie method of treatment versus patient education in "mini back school". <i>Spine</i>, 15(2), 120-123.</p>	<p>Power calculation – Not provided Randomization – Yes Concealed allocation - No Blinding – not provided Dropouts - not provided Stats – p value < 0.05</p>	<p>Following variables were studied: Return to work Sick-leave during the initial episode Sick-leave during recurrences Recurrences of pain during the year of observation Patients' ability to self-help, Pain and movement</p>	<p>The purpose of the study was to compare McKenzie method of intervention with patient education only in the form of a one 45 minutes back school session based on the biomedical approach for patients with acute low back pain.</p>
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ELECTROPHYSICAL AGENTS

ELECTRICAL STIMULATION

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 1: Meta-Analysis	Bjordal, JM et al (2003). TENS can reduce postoperative analgesic consumption. A meta-analysis with assessment of optimal parameters for post-op pain. European Journal of Pain, 7(2): 181-188.	<ul style="list-style-type: none"> - 1966-2001 from MEDLINE, EMBASE, CINAHL, PEDro, Cochrane Controlled trials - Conventional TENS or Acupuncture-like TENS (ALTENS) 	<ul style="list-style-type: none"> - Consumption of analgesics after surgery - Mean reduction in analgesic use after TENS/ALTENS was 26.5% (-6% to 51%) better than placebo - For trials with sufficient intensity of TENS, the mean weighted reduction in analgesic consumption was 35.5% (14-51%) > placebo - For trials without confirmation of sufficient intensity the mean weighted reduction was 4.1% (-10% to 29%) in favor of active Rx p=0.0002 in favor of adequate stim 	<ul style="list-style-type: none"> - Thus evidence to support efficacy > placebo in acute pain (post-op) if stimulation parameters are adequate.
Level 2: Systematic reviews	Pengel, HM et al. (2002). Systematic review of conservative interventions for subacute LBP. Clinical Rehabilitation, 16: 811-820.	<ul style="list-style-type: none"> - RCTs only; 19 databases; methodological quality assessed as per Cochrane Collaboration Back Review 	<ul style="list-style-type: none"> - If the definition of subacute LBP was 6 wks to 3 months there was no evidence of high internal validity found; if the definition was 7 days to 6 months then TENS may be effective - When quality was represented by internal validity criteria only, then no high quality evidence was found for the efficacy of <i>any</i> intervention. 	<ul style="list-style-type: none"> - Highlighted the important effect of definition of subacute LBP in determining the efficacy of interventions for LBP.
	Kroeling P. et al (2006). Cochrane Systematic Reviews Electrotherapy for Neck Disorders.	<ul style="list-style-type: none"> - Cochrane Central, MEDLINE, EMBASE, CINAHL, ICL, MANTIS with no language restrictions from their beginning to 2003 - RCTs or quasi-randomization trials included - 11 publications; total n=525 	<ul style="list-style-type: none"> - Relative risk - Standardized mean difference with 95% CI - Limited benefit: PEMF vs placebo for immediate pain relief in chronic MND and acute whiplash - Unclear or conflicting evidence: galvanic vs other Rx for pain in acute, subacute or chronic occipital headache; iontophoresis vs other Rx for pain, RTW & self-assessment of overall outcome in acute and subacute WAD; TENS vs placebo in acute WAD, chronic MND; PEMF vs placebo for medium of LT effect in pain, patient assessment of improvement, ADL in acute WAD, and chronic MND - Ltd evidence of no benefit: diadynamic current, magnets for chronic MND or EMS vs sham for pain in MND 	<ul style="list-style-type: none"> - Unclear or conflicting evidence to support estim for acute and subacute <u>cervical</u> spinal dysfunction.

Level 3: Evidence-based Clinical guidelines	Bekkering et al (2003). Dutch Physiotherapy Guidelines for LBP: National Practice Guidelines for Physical Therapy with LBP. Physiotherapy, 89(2), 82—188	(English, German, French and Dutch) - Acute = 0-6 wks; Subacute = 7-12 wks	- Electrotherapy and TENS: effectiveness unclear for acute or subacute LBP.	- *Included 5 papers for electrotherapy in MSK conditions because none specifically for LBP were identified
	Philadelphia Panel EBCPGs for management of LBP (2001) Physical Therapy 81: 1641-1674.	TENS: Acute: Level C, I Subacute: nd (no data) Estim: Acute: nd Subacute: nd - Acute = <4 wks; Subacute= 4-12 wks	- Poor evidence to include or exclude these modalities alone as an intervention for acute LBP; insufficient or no data for subacute LBP.	- Separated TENS from Estim; no rationale provided -
	New Zealand Acute LBP Guide (1997, 2003).	TENS – Grade A evidence for no improvement. - Acute =< 3 months	- Insufficient evidence for physical agents and passive modalities	- Unclear as to what modalities are included in the recommendations
	Australian Physiotherapy Association LBP Position Statement		- Did not include a statement on Estim modalities.	
Level 4: RCT's	Herman et al (1994). A randomized controlled trial of TENS (CODETRON) to determine its benefits in a rehabilitation program for acute occupational LBP. Spine, 19(5), 561-568.	- 58 industrial workers with Estim and exercise or placebo and exercise -- Acute = 3-10 wks - 200 Hz X 15 min at 'tingling' intensity then 4 Hz for 15 min to 'twitch' intensity - Power calculation YES - Randomization YES - Blinding: YES for evaluator - Concealed allocation YES - Drop outs: reported and data analyzed YES	- Roland Morris Disability Questionnaire - Sickness Impact profile - VAS 3X/day - Fitness test - U/E & L/E strength tests - Schoeber test - RTW at 5 wks & 6 months - No significant difference between groups in any of the outcome measures.	Internal validity jeopardized by: - Disproportionate drop-out rate especially from TENS group ie. 49.3% TENS grp vs 11.3% of placebo group - No control group - Rx parameters were not individually adjusted

<p>Ghonaime EA et al (1999). Percutaneous Electrical Nerve Stimulation for LBP. A randomized crossover study. JAMA 281(9), 818-823.</p>	<ul style="list-style-type: none"> - n=60; LBP \geq 3 months secondary to DDD - 4 interventions: PENS vs TENS vs ex VS sham PENS - X-over study thus all pts received all 4 Rx (each Rx for 30 min 3X/wk for 3 wks) - PENS at 4 Hz 0.5 millisecc at intensity to 'tapping' without visible muscle contraction - Sham: needles only - TENS; 4 Hz 0.1 millisecc - Power calculation: YES - Blinding: not stated - Drop outs – none reported 	<ul style="list-style-type: none"> - Pre/post VAS for pain, activity and quality of sleep; daily analgesic use; global patient assessment questionnaire; SF 36 - PENS sig more effective than sham PENS < TENS & Ex in decreasing pain scores (3.4 +/- 1.4; 5.5 +/- 1.9; 5.6 +/- 1.9; 6.4 +/- 1.9 respectively), reducing consumption of analgesic (1.3 +/- 1.0; 2.5 +/- 1.1; 2.2 +/- 1.0; 2.6 +/- 1.2 respectively) and in increasing activity, quality of sleep and sense of well being. 	<ul style="list-style-type: none"> - Included both subacute and chronic LBP - TENS parameters selected were atypical for either Conventional TENS or Acupuncture-like TENS application. - PENS relatively uncommon in clinical practice in BC.
<p>Hamza M. et al (1999). Effect of the duration of electrical stimulation on the analgesic response in patients with LBP. Anaesthesiology, 91: 1622-7.</p>	<ul style="list-style-type: none"> - Sham controlled cross-over trial - LBP \geq 3 months - n=75 - 4 time intervals of percutaneous estim (0, 15, 30 and 45 minutes – random sequence) - Alternating freq of 15 Hz & 30 Hz 3X/wk for 2 consec wks - Power calculation YES - Randomized YES - Blinding SINGLE - Drop outs: none reported 	<ul style="list-style-type: none"> - SF36 - VAS for pain, physical activity & quality of sleep at 10 min and 24 hrs after each session - Total amount of oral analgesics - All Estim regimes caused short term improvement in VAS for pain, activity, sleep & reduction in oral analgesics - 30 & 45 in produced similar level of effect and sig more effective than 15 or 0 minutes 	<ul style="list-style-type: none"> - Included both subacute and chronic LBP - Estim produced short-term favorable outcomes more so than sham - PENS relatively uncommon in clinical practice in BC.
<p>Glaser JA et al (2001). Electrical muscle stimulation as an adjunct to exercise therapy in the treatment of nonacute LBP. A randomized trial. The Journal of Pain 2(5) 295-300.</p>	<ul style="list-style-type: none"> - RCT, placebo controlled - LBP \geq 6wks 18 to 80 years of age +/- radicular pain - n=80 - Ex & FES vs ex & placebo FES (ex for 6 months; FES for 2 months) - Power calculation YES - Randomized YES - Blinding SINGLE - * Tested for normalcy of data - Dropouts = yes, 42 out of 80, data included in analysis. 	<ul style="list-style-type: none"> - At baseline, 2 m & 6 m with (1) North American LBP Outcome Instrument [LBPOI]; function with Progressive Isoinertial Lifting Evaluation [PILE] which is an incremental in weight lifted in a basket from floor to waist level - PILE Rx grp vs placebo p = 0.0049 at 2m and p=0.0341 at 6 months - Estim at a motor level had lasting therapeutic effects at 6 months even though stopped at 2 months. 	<ul style="list-style-type: none"> - Strong methodology - Sig. number of drop outs but original power calculation assumed normalcy of data & changing to nonparametric statistical calculations improved the statistical power - Placebo was intensity of estim to 'TENS' level ie sensory rather than motor thus actually compared motor level Estim to sensory level Estim.

<p>Hurley, D et al (2001). Interferential Therapy electrode placement technique in acute LBP: A preliminary investigation. Arch Phys Med Rehabil 82: 485-93</p>	<ul style="list-style-type: none"> - RCT - N=60; 19-62 years old; referral from GP or self referral - Acute=<3 months - 3 grps: (1) IFT painful area plus Back Book (2) IFT at spinal nn + Back Book (3) control Back Book only - 3.8 KHz; 140 Hz constant; 130 microsec pulse width, 30 min - Randomized - Yes - Blinded: single blinded - Power calculation – No, this study stated that it would provide data for power calculation for a subsequent study - Drop outs: (1) reported; included in intention to treat analysis 	<ul style="list-style-type: none"> - At D/C and at 3 months (1) Pain Rating Index (Pain Severity with McGill Pain Questionnaire); (2) Roland Morris Disability Questionnaire; (3) EuroQol - At 3 m follow up the grp who received the IFT at the spinal nn & the Back Book had sig improvement in Roland Morris than the other grps p=0.030 	<ul style="list-style-type: none"> - Included both acute and subacute - Quite a powerful finding given the fact that the IFT at the spinal nn grp actually had the highest risk of LBP chronicity on entry to the study (eg. % smoking hx, % employed, % analgesic use; % aerobic exercise).
<p>Johnson MI & Tabasam G (2003). An investigation into the analgesic effects of interferential currents and TENS on the experimentally induced ischemic pain in otherwise pain free volunteers. Phys Ther 23:208-223.</p>	<ul style="list-style-type: none"> - N = 30 21-54 years of age with <u>no pathology</u> - Induced ischemic pain then 3 grps: (1) IFT (2) TENS (3) sham; - 100 Hz, 200 microsec - Blinding: single blinded - Power calculation: YES - Drop outs: none reported 	<ul style="list-style-type: none"> - Outcome: change in self-report of Pain intensity with VAS; McGill Pain Questionnaire - IFC=TENS >sham p=0.03 	<ul style="list-style-type: none"> - Applicability limited by experimentally induced ischemic pain.
<p>Cheing, GL et al (2003). Analgesic effects of TENS and IFT on heat pain in healthy subjects. J Rehabil Med 35:15-19.</p>	<ul style="list-style-type: none"> - N= 48 normals - TENS vs IFC vs no stim - RCT – stratified by gender to 16 in each group - IFT: 100 Hz, 3X sensory threshold; TENS: 120 microsec, 100 Hz, 3X sensory threshold; increased intensity by 10% every 15 min; total 30 min; controls: no electrodes - Power calculation: NO - Blinding: not reported - Drop outs: none reported 	<ul style="list-style-type: none"> - Outcome; threshold to heat pain - TENS (p=0.003) & IFT (p= 0.004) sig increased threshold to heat pain but no stim did not; maintained for 30 min after; no sig diff btwn TENS & IFT 	<ul style="list-style-type: none"> - Strength of findings limited by no power calculation - Applicability limited by experimentally induced heat pain.

	<p>Hurley, D. et al (2004). A randomized clinical trial of manipulative therapy & interferential therapy for acute LBP. Spine, 29(20), 2207-2216.</p>	<ul style="list-style-type: none"> - RCT; n=240 LBP < 12 wks (*4-12 wks); 18-65 years of age; referred by GPs - 3 grps: (1) Manipulative therapy - MT (2) IFT (3) CT= MT & IFT - IFT: 3.85 KHz; 140 Hz; 130 microsec, 30 min; spinal nn placement - Randomization – YES; ensured baseline comparability - Concealed allocation - YES - Blinding: single - Power analysis: YES - Drop outs: 15%, data included in analysis as “intention to treat”. 	<ul style="list-style-type: none"> - Roland Morris at D/C, 6 m & 12 m: MT = -4.5 95% CI -5.7 to -3.3; IFT = -3.56 95%CI -4.8 to -2.4; CT= -4.65 95%CI -5.8 to -3.5 - McGill pain Questionnaire: MT = -5.12 95% CI -7.7 to -2.5; IFT= -5.87 95% CI -8.5 to -3.5; CT= -6.64 95% CI -9.2 to -4.1 - SF 36: MT 28.6 95% 18.3 to 58.9; IFT 31.4 95% CI 21.1 to 41.5; CT 30 95% CI 19.9 to 40 - No sig diff btwn grps for recurrence, work absenteeism, medication consumption; ex participation or healthcare use at 12 months. 	<ul style="list-style-type: none"> - Moderately strong study design - Acute 4-12 wks; This is more appropriately described as subacute - Estim was not used <i>in conjunction with</i> activity to enhance activity - Wide confidence intervals reduce strength of findings.
	<p>Werners, R et al (1999). Randomized trial comparing Interferential therapy with motorized lumbar traction and massage in the management of LBP in a primary care setting. Spine 24(15) 1579-1584.</p>	<ul style="list-style-type: none"> - N = 152 with no radiation of pain; 20-60 years of age - 6 sessions over 2-3 wks; IFT= 30-60 Hz para-vertebrally X 10 min - Randomization: YES - Power analysis: YES - Drop outs: Yes 16%; but did not report if this data was included in the analysis - Blinding: not reported. 	<ul style="list-style-type: none"> - Oswestry and pain VAS post Rx and at 3 months - Reduction in ODI and VAS for pain with IFT or traction and massage but no diff between groups. 	<ul style="list-style-type: none"> - No placebo - No reporting of whether data from drop outs was included in the analysis - Treatment duration of 10 minutes is approximately 1/2 to 1/3 of the recommended treatment duration

<p>Pope MH et al (1994). A prospective randomized 3 week trial of spinal manipulation, transcutaneous muscle stimulation, massage & corset in the treatment of subacute LBP. Spine 19(22), 2571-77.</p>	<ul style="list-style-type: none"> - LBP btwn 3-6 months; no radicular signs - 18-55 years old - Manipulation: 5 chiropractors, 3X/wk X 3 wks - Massage: soft tissue effleurage 15 min 3X/wk for 3 wks - TMS – 37 Hz; biphasis; 2 sec ramp up, 6 sec on; 2 sec ramp down; off 6 sec; 225 microsec; electrode placement around the pain on either side of spine; amplitude as high as possible while still comfortable; at least 8 hrs per day at a min of 1 hr at a time - Corset; only off 10 min for no more than 3X day -Power analysis: YES - Randomization: YES - Concealed allocation: YES - Blinding: Single - Drop outs: 19% drop out rate; highest drop out in corset, TMS & massage, lowest in manipulation grp 	<ul style="list-style-type: none"> - VAS for pain - ROM with Schoeber test - Max Volunatry extension effort (MVEE) - Sorenson Fatigue Test - Median frequency EMG from Sorenson Test - TMS: no sign reduction in pain; did not fatigue less than other groups; didn't have greater strength than other groups - No sig diff btwn Rx methods in the objective scores of spinal function and pain score. 	<ul style="list-style-type: none"> - Parameters for TMS (especially duration at ~ 8 hrs/day) is extremely atypical; location of electrodes appropriate for pain but parameters more typical for motor recruitment. The combination of these prescription parameters is questionable as they are conflicting in terms of sensory and motor nerve recruitment. - Prolonged stimulation such as this have subsequently been shown to be associated with muscle damage *INSERT REF - THUS, the parameters selected are not clinically relevant eg. designed for failure for pain relief, failure for muscle strengthening and failure for improving endurance.
<p>Hseih, GY et al. (1992). Functional Outcomes of LBP; Comparison of four treatment groups in a randomized controlled trial. J of Manip & Physiolog Therapeutics. 15(1) 4-9.</p>	<ul style="list-style-type: none"> - LBP duration 3 wks to 6 month - N = 85; 18-55 years of age - Corset: fitting, 8 hrs/day & weekly follow up for 3 wks - Massage; hotpack for 10 min; massage 3 X/wk for 3 wks - Manipulation; hot pack &"diversified" manipulation of Lsp and SIJ 3 X/wk for 3 wks - TMS; 4 electrodes positioned around the pain; 225 microsec; 37 Hz, 2 sec ramp up, 6 sec hold, 2 sec ramp down and 6 sec off for 8 hrs - Power analysis: No - Randomization: Yes - Blinding: single blinded - Drop outs: 63 out of 85 pts finished study; NO INCLUSION OF DATA OF DROP OUTS in analysis. 	<ul style="list-style-type: none"> - Revised Oswestry - Roland-Morris - Both Oswestry and Roland-Morris showed sig diff bt manipulation and massage p=0.05 - Roland Morris: sig diff btwn manip and TMS and btwn corset & massage. 	<ul style="list-style-type: none"> - As per Pope et al study the location and parameters for TMS would result in failure for improvements in pain, strength or endurance - No power analysis; no inclusion of drop outs in data analysis thus internal validity severely jeopardized.

<p>Tsukayama H et al (2002). Randomized controlled trial comparing the effectiveness of electroacupuncture and TENS in LBP: a preliminary study for a pragmatic trial. <i>Acupuncture in Medicine</i> 20(4), 175-180.</p>	<ul style="list-style-type: none"> - N= 20; LBP without sciatica; > 2 wks of LBP; > 20 years of age - Rx: 2 X per wk for 2 wks - electroacupuncture: 1 Hz for 15 min at 4 points bilaterally with intensity to muscle stimulation - TENS; 8 electrodes; no skin prep; intensity to max comfortable without muscle action; 1 Hz ? pulse width - Power calculation: NO - Randomization: YES - Concealed allocation: YES - Drop out; 1 reported; included in analysis 	<ul style="list-style-type: none"> - VAS for pain relief - LBP score form Japanese Orthopaedic Assoc (JOA) - Occurrence of adverse events - Mean VAS of electroacp less than TENS p<0.01 CI 4.126 to 37.953 - JOA in electroacp improved sig & TNS did not change 	<ul style="list-style-type: none"> - Included acute, subacute and chronic LBP pts - Very wide Confidence intervals thus questionable accuracy - Small sample size with no power calculation thus high probability of type 11 error.
<p>Jarzem, PF et al (2005). TENS for short-term treatment of lowback pain – a randomized double blind crossover study of sham vs conventional TENS. <i>J of MSK Pain.</i> 13(2), 11-17.</p>	<ul style="list-style-type: none"> - N = 50; LBP > 3 month (mean duration 8.8 yrs – no SD); no leg symptoms, 18-70 years of age, from 1 GP's practice - randomized crossover to 2 Rxs TENS, 2 Rxs shams TENS, 2 Rxs conventional therapy for 20 min each Rx - Power calculation: NO - Randomized: YES - Blinding: triple blinded - Drop outs: None reported 	<ul style="list-style-type: none"> - VAS – pain tolerance - <i>Physical measurements: ROM Flex, Extn, SLR, isolift, # of back extension & sit-ups & oblique sit-ups and # side flexions in 1 minute</i> - Sig improvement for TENS in both objective and functional measurements with sig carryover effect p<0.05 conv TENS vs sham; Flex p=0.0001; Extn p=0.00093; SLR p=0.008, isolift p=0.0001; # extensions p=0.0001, # side flexions p=0.0001 # situps p=0.0001 	<ul style="list-style-type: none"> - Mixture of subacute & chronic - No power calculation - No statistical calculation of level of accuracy eg. confidence intervals - Referral bias
<p>Mustafa O et al (2002). TENS for pain management in patients with uncomplicated minor rib fractures. <i>European Journal of Cardiothoracic Surgery.</i> 22(1) 13-17.</p>	<ul style="list-style-type: none"> - 100 consecutive pts - 4 grps: NSAIDS, TENS, NSAID & inactive TENS, or placebo tablet - NSAIDS & placebo 4X/day - TENS 2X/day for 3 days; 80 Hz, 50 microsec, 20 milliamps - Power calculation: NO - Randomized: YES - Blinded: clinicians, pts - Dropouts: reported; not clear if data included in analysis 	<ul style="list-style-type: none"> - Pain score on days 0, 1, 3 - TENS more effective on days 1 & 3 (p<0.05) than NSAIDS or placebo. 	<ul style="list-style-type: none"> - Although not specific to LBP, these findings may be extended to a limited degree to the management of acute musculoskeletal pain.

	Jorge et al (2006). Interferential Therapy produces antinociception during application in various models of inflammatory pain. Phys Ther 86(6), 800-8.	- Rat model - 140 Hz, 125 microsec, 5 mA for 1 hour - 11 grps (including sham control) to investigate the effect of IFT on nociceptor behavior tests and edema.	- Formalin-induced nociceptive behaviors and carrageenan-induced mechanical hyperalgesia - IFC was effective in producing effective short duration reduction in inflammatory pain.	- Animal model support for the use of IFT in the control of acute inflammatory pain.
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LASER

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 1: Meta-Analysis	Enwemeka CS. et al. (2004). The efficacy of low-power lasers in tissue repair and pain control: A meta-analysis study. Photomedicine and Laser Surgery. Vol. 22(4), pp 323-329.	- Included 34 peer-reviewed papers	- Positive effect on tissue repair (d = +1.81; n = 46) & pain control (d = +1.11; n = 9) as follows: collagen formation (d = +2.78), rate of healing (d = +1.57), tensile strength (d = +2.13), time needed for wound closure (d = +0.76), tensile stress (d = +2.65), number and rate of degranulation of mast cells (d = +1.87), and flap survival (d = +1.95); positive effects of various wavelengths on tissue repair, with 632.8 nm having the highest treatment effect (d = +2.44.) and 780 nm the least (d = 0.60); overall treatment effect for pain control was positive as well (d = +1.11). Fail-safe number = 370 for tissue repair and = 41 for pain control.	- Strong evidence for efficacy of LASER on tissue repair and somewhat less for pain control.
	Gam, AN et al. (1993). The effect of low-level laser therapy on musculoskeletal pain – A meta-analysis. Pain, 52(1), 63-66.	- 23 trials; 17 controlled trials, 10 blinded (7 insufficiently blinded)	- Mean difference in pain between LLLT and placebo was 0.3 % (CIs -10.3 to -10.9%) in adequately blinded trials but 9.5% difference (CIs -2.9 to -21.8%) for insufficiently blinded trials; concluded that LLLT has no effect on pain in musculoskeletal syndromes	- Included 1 paper on chronic LBP and none on acute LBP - Lit review covered yrs 1980-1990
Level 2: Systematic reviews				

Level 3: Evidence-based Clinical guidelines	Bekkering et al (2003). Dutch Physiotherapy Guidelines for LBP: Physiotherapy 89(2), 82		- Effectiveness of LLLT unclear for subacute LBP.	Acute = 0-6 wks Subacute = 7-12 wks - Included the Gam et al (23 RCTs but only 1 with LBP) and DeBie et al (25 RCTs but only 2 with LBP) papers
	Australian Physiotherapy Association LBP Position Statement.		- No mention of LLLT for acute or subacute LBP.	- Did not include a position on LLLT for acute or subacute LBP
	New Zealand Acute LBP Guide (1997, 2003).		- Insufficient evidence for physical agents and passive modalities.	- Unclear as to whether LLLT was included in the designation of "physical agents and passive modalities"
Level 4: RCT's	Basford, JR. et al. (1999). Laser Therapy: A randomized controlled trial of the effects of low-intensity Nd:YAG LASER Irradiation on musculoskeletal back pain. Arch Phys Med Rehabil, 80: 647-652.	-N= 63; 18-70 yrs of age; nonradiating LBP > 30 days duration Median 4.5 month (active grp) vs 6.5 (sham grp) * not stat sig diff - IR LASER (542 mW/cm2) on 8 points for 90 sec each 3X/wk for 4 wks - Power calculation done - Randomized - Double blinded - Dropouts (reported 59/63 completed).	- 1. Subjects' perception of benefit - 2. Oswestry Disability Questionnaire - 3. Lumbar mobility Schober test - LLLT group better outcome at both midpoint (6 th session p<0.005) and at end of Rx (12 th session p<0.017) and 1 month follow-up (p<0.10); no change in lumbar mobility; thus function increased and pain decreased modestly and lessened with time	- Heterogenous population of subacute and chronic LBP - Strong methodological design - Supportive of short term effectiveness of LASER on subacute/chronic LBP in terms of increased function and decreased pain

ULTRASOUND

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 1: Meta-Analysis	Van der Windt et al. (2004). Ultrasound Therapy for Acute Ankle Sprains. Cochrane Review	Pooled RR 1.04 (CI 0.92 to 1.17) in favour of US over sham US for acute MSK injury		- Possible limited degree of generalizability of findings to other acute soft tissue injury
	Gam A & Johannsen F (1995). Ultrasound therapy in Musculoskeletal Disorders: A meta-analysis. Pain (63), 85-91.	-Lit review 1950-1995 (English, German, French, Swedish, Norwegian, Danish) - 22 papers compared US with sham US, non-US or no Rx	- Pooled data on 13 trials comparing US vs sham US: Difference in effect 0.64% CI -6.7 to 7.5% thus no evidence that pain relief could be achieved - Significant influence of degree of blinding - RCTs lacking in description of drop-outs, randomization methods, US apparatus, mode of delivery, size of sound head, treatment area and follow-up time.	- Significant heterogeneity of population typically dilutes possible efficacy in more homogenous subpopulations

Level 2: Systematic reviews	- Robertson, VJ & Baker, KG (2001). <i>A review of therapeutic ultrasound: Effectiveness studies. Physical Therapy, 81(7), 1339-1350.</i>	- 35 RCTs published btwn 1975-1999. 10 with sufficient methodological adequacy	- Stated little evidence that active US is more effective than placebo US	- Grouped a wide range of musculoskeletal conditions together with various methodologies/ parameters thus diluting potential efficacy for subpopulations. - More appropriately classified as a narrative review as it does not meet the rigorous methodologically rigorous requirements of a systematic review.
Level 3: Evidence-based Clinical guidelines	Bekkering et al (2003). Dutch Physiotherapy Guidelines for LBP: National Practice Guidelines for Physical Therapy with LBP. <i>Physiotherapy, 89(2), 82</i>		- Effectiveness of Ultrasound unclear for subacute LBP	
	Philadelphia Panel (2001). Philadelphia panel evidence based Clinical practice guidelines on selected rehabilitation interventions for low back pain. <i>Physical Therapy, 81(10), 1641-1674.</i>		- Acute: Level C II (nonrandomized trials with clinically important effects of < 15%) Subacute: nd (no data)	
	Australian Physiotherapy Association LBP Position Statement		- No mention of US for management of acute or subacute LBP.	
	New Zealand Acute LBP Guide (1997, 2003)		- Insufficient evidence for efficacy of US.	- With the definition of < 3 months, this likely reflects both acute and subacute populations.
Level 4: RCT's	Ansari, NN et al (2006). A Randomized, single blind placebo controlled clinical trial on the effect of continuous US for LBP. <i>Electromyogr Clin Neurophysiol, 46:329-336.</i>	- N = 10 (58 consecutive pts screened by orthopaedic surgeon), 18-65 years of age with non-radiating NSLBP of > 3 months - US or sham US for 10 sessions, 3X/wk, every other day - Randomized, single-blind, placebo-controlled - Drop outs – 5 of 15; no report re inclusion of data - Power analysis: No	- Functional Rating Index, Hmax/IMmax ratio (EMG) and ROM at baseline, after 5 Rxs and end of Rx - US grp had sig better Functional Rating Index than placebo p=0.016 and p=0.032 respectively - No sig diff in EMG - US grp had sig increased ROM moreso than placebo p=0.016 vs p = 0.032	- Avg duration in months of LBP: US grp 13.8 (SD=9.8); Placebo 14.8 (SD=10.7) thus include, subacute and chronic LBP - No exercise program - No power calculation and with an N of 10 and a 25% drop out rate thus the internal validity of the study is markedly suspect

Other: Narrative Reviews

Baker, KG, Robertson, VJ & Duck, FA (2001). A review of therapeutic ultrasound: Biophysical Effects. *Physical Therapy; 81(7), 1351-1358.*

ACUPUNCTURE

Level of Evidence	Paper	Strength of Evidence	Outcome measures	Comments
Level 1: Meta-Analysis	Ernst E, White A R (1998) Acupuncture for back pain: a meta analysis of RCT's	Power – NA Randomization – NA Concealed allocation – NA Blinding – NA Dropouts – NA Stats: eg. NNT + 57	Quality assessed points 2 randomis'n 2 pts blinding 1 pt dropouts reported Outcome Measures: VAS, RTW, objective ROM etc by 2 examiners, subjective imp.	Only 2 studies with acute LBP. Results showed acupuncture to be superior to various control interventions. 12 studies incl however in results only 9 were included. Caution with results, as the studies were heterogeneous in population, type of acupuncture outcome measures. Inadequate follow up period also.
	Manheimer et al 2005 Acupuncture for low back pain	Power - NA Radomisation NA Concealed allocat'n NA Blinding NA Dropouts NA Stats: No of RCT's = 33 QA defined according to Cocherane group protocol.		1. Acupuncture is effective in providing short term relief of chronic LBP. 2. More research required to evaluate acute LBP. 3. No evidence that acupuncture is more effective than other active therapies. 4. Acupuncture seems less effective than spinal manipulation (2 studies)
Level 2: Systematic reviews	Van Tulder et al 1999 "The effectiveness of acupuncture in the management of acute and chronic LBP"	Power – NA Randomization – NA Concealed allocation – NA Blinding – NA Dropouts – NA Stats: NA Methodological quality assessment defined according to Cochrane guidelines.	11 trials used heterogenous data Outcome M's: VAS, functional status, subjective imp, RTW, obj physiol measures, use of meds.	1. No study clearly evaluated acupuncture for acute LBP 2. Results showed no evidence that acupuncture is more effective than no treatment. 3. No evidence that acupuncture is effective in treating LBP, however poor methodology highlight a need for higher quality RCT's to firmly evaluate.
	Furlan et al 2005 "Acupuncture and dry needling for LBP": updated syst review within the Cocherane framework	Power- NA Randomisation- NA Concealed allocat'n NA Blinding NA Dropouts- NA Stats Method QA assessed by 2 reviewers, point scale high/low quality. 35 RCT's reviewed only 3 for acute LBP.		1. no firm conclusions regarding effectiveness acupuncture for acute LBP, however only 3 trials were included. Small sample size and low quality of methodology. 2. Insufficient evidence to make any recommendations about acupuncture/dry needling in acute LBP 3. For chronic LPB acupuncture not more effective than other treatments. 4. Data suggest that acupuncture and dry needling are useful adjuncts to other therapies for chronic LBP 5. Most studies of low methodological quality, so need for more research in this area.
Level 3: Evidence-based Clinical Guidelines				

Level 4: RCT's	Vas et al 2006 "Efficacy& safety of acupuncture for treatment of non-specific acute LBP: a randomized controlled multicentre trial protocol"	4 groups N=70 pts per group. Power – Yes Randomization – Yes Concealed allocation – Yes Blinding – Yes Dropouts – reported & included – Yes Stats: alpha =0.05 CI 95%	RMQ, pain VAS, EQ-5D, Consumption of analgesics, time off work.	Study currently being undertaken, results and followup pending January 2008 Methodology looks stronger for this study.
	Araki et al 2001 40 patients Acute LBP (Japan) acupuncture Vs sham acupuncture	Power- yes Randomisation Yes Concealed allocation Yes Blinding-yes Dropouts report- yes CI 95%		1. No difference between acupuncture and sham acupuncture
	Garvey et al 1989 "A prospective randomized doubleblind evaluation of trigger point injection for LBP" Dryneedling vs injection of various substances into trigger points	Randomisation Yes Concealed allocation-Yes Blinding-Yes Dropouts reported-No CI 95% N=63 patients with acute LBP into 3 groups	Global improvement, % of not imp/improved Complications	Groups very different in size Conclude that the substance injected is not important and it is the mechanical stimulus to the trigger point that provides symptomatic relief equal to that of any medication injected.

PREDICTIVE FACTORS

Level of Evidence	Paper	Strength of Evidence	Predictive factors	Comments
Level 2: Systematic reviews	Steenstra et al 2005	Reviewed 18 research papers, following Cochrane review strategies Began with 1063 titles, screened 70, found 14 fulfilled all inclusion criteria	<p>Positive</p> <ul style="list-style-type: none"> -specific LBP -high disability -older age -female -social dysfunction/social isolation - radiating pain - heavier work - recurring compensation <p>Not predictive</p> <ul style="list-style-type: none"> -Hx of LBP -job satisfaction -educational level -marital status -# of dependents -smoking ->8 hour shifts - occupation type -size of company 	Inception cohort studies with outcome of RTW of workers with low back pain less than 6 weeks, up to 2003
	George et al 2006	Power NA Randomization – yes Blinding – yes Concealed allocation NA Drop-outs – reported&included Stats – $p < .001$, CI 95%	Differences in men and women Predictive for men – baseline pain related disability, fear-avoidance beliefs, leg pain and performing stabilization exercises Predictive for women – baseline pain intensity, duration of symptoms and baseline pain related disability Did not predict – gender, flexion ROM, and SLR range,	Pooled data from three RCT's
	Lacroix et al 1990	Randomization – yes Blinding – not stated Drop-outs reported Stats – p values, no CI	In subacute stage Predictors -overall understanding of the medical condition - number of no-organic signs -MMPI scales 1&3, hypochondriasis and hysteria	Prospective Cohort study N= 110
	Schultz et al	Randomization- yes Blinding NA Drop outs- not reported Stats – sensitivity and specificity	-expectation for recovery accurately predicted 72%	Studying the predictive ability of the PRODS
	Hansson et al 2006	Randomization NA Blinding NA Drop outs reported Stats – prevalence models and ROC curves	Predictive power of the tool varied over time, diagnosis and gender -found that the intensity of the pain was of greatest importance	Prospective cohort study of the EQ-5D

Dionne et al 2005	Randomization NA Blinding NA Dropouts – reported, not included Stats – sensitivity and specificity, positive and negative predictive values	Best model of predictors included -patient's recovery expectations -radiating pain -previous back surgery -intense pain -Frequent position change due to pain -Irritability and bad temper -Difficulty sleeping	Studied a unique algorithm of prediction Prospective cohort study
Wernecke and Hart 2001	Randomization NA Blinding NA Drop outs reported and included Stats – logistic regression, likelihood ratios, odds ratios and CI 95%	Predictors of delayed RTW- -non-centralizers - presence of leg pain -	Prospective cohort study Reported that able to better predict who would not return to work than the characteristics of those who will
Dunn and Croft 2005	Randomization NA Blinding yes Drop outs – reported Stats – risk ratios	Pain bothersomeness predicted work absence, perceived disability and pain intensity at 6 months	Lost about ½ of subjects by followup. Bothersomeness was grouped into scores of very/extremely and moderately/slightly/not at all
Pransky et al 2006	Randomization NA Blinding NA Dropouts NA Stats – Wilcoxon test, p values and CI 95%, Cox proportional hazard model,	Predictors within their model of increased length of disability Included -older age -short work tenure -female -language barrier -comorbidity -prior work absence - delayed referral to nurse case manager -nonsupportive attorney approach to RTW -low motivation for RTW	Retrospective cohort study Their model could accurately classify high and low risk, but not moderate risk Model only explained 12% of the variance in RTW
Storheim et al 2005	Randomization yes Blinding yes Control group Dropouts – not reported Stats – relative risk, CI95%, stepwise backwards Cox regression model	Predictors – fear-avoidance beliefs - perceived disability (SF36), and cardiovascular fitness	Three-armed RCT
Hagen et al 2005	Randomization – yes Blinding yes Drop outs reported (few) Stats – logistic regression Odds ratios, CI 95%	Interacting prognostic factors -high psychological work load -perceived large reduction in ability to work -belief that work would aggravate the condition -over 40 years -other illnesses -pain during daily activities	Retrospective cohort study of prognostic factors

	Krause et al 2001	Randomization NA Blinding NA Drop outs NA Stats – Cox regression model, relative ratio and P value, CI 95%	In acute phase – less severe injury diagnosis→ 5x higher RTW rates Job satisfaction had no significant impact on RTW Job control, job strain, work-schedule flexibility and history of previous injury are determinants of RTW in subacute phase (not acute).	Retrospective cohort study
	Long A 1995	Randomization – NA Blinding NA Drop-outs reported Stats – p values	Centralization – predictive of RTW at 9 months, and predictive of greater increase in pain intensity	Prospective comparative study N= 223 Subjects in chronic phase