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Osteopathic Research

Evidence to support osteopathic treatment of low back pain – a summary table of osteopathic and osteopathic-relevant evidence

(May, 2016)

- Research relevant to osteopathic treatment of musculoskeletal pain comes from a number of healthcare professions, including osteopathy, chiropractic, physiotherapy, and medicine. Much of the research has focused on spinal manipulation and mobilization;
- In the management of low back pain (LBP), a range of studies are presented looking at different symptom presentations. Studies looking at acute and subacute low back pain are included in entries 1-8; and mixed studies are included in studies 9-16; and chronic low back pain studies are included in studies 17-29. Studies examining low back pain associated with pregnancy and post-partum are described in entries 30-37;
- In the summary of findings, the authors' conclusions are reported verbatim from the study. However, it is important to read the full text of the studies and critically review the findings to decide if you agree or challenge the authors' conclusions. Useful tools to help with critical appraisal can be found at http://www.casp-uk.net/#!casp-tools-checklists/c18f8;
- Summaries of the individual studies are presented in the table below, and appear in descending date order;
- All abbreviations are presented at the end of the table.

	Citation	Study characteristics	Study conclusions
1.	von Heymann WJ, Schloemer P, Timm J, Muehlbauer B. Spinal high velocity l ow amplitude manipulation in acute non-specific low back pain. Spine. 2013;38(7):540-548 http://www.ncbi.nlm.nih.gov/pubmed/23026869	**Study design:** RCT **Study population**: Patients with low back pain; **Duration of symptoms**: Acute; **Sample size**: N= 101; **Intervention**: OMT and sham OMT; **Comparator/Control**: NSAID (Diclofenac), and placebo; **Outcome measures:** RMDQ, VAS, and SF-12; **Outcome measurement interval:** Baseline and 12 weeks.	The authors concluded "in a subgroup of patients with acute nonspecific LBP, spinal manipulation was significantly better than nonsteroidal anti-inflammatory drug diclofenac and clinically superior to placebo".
2	Rubinstein SM, Terwee CB, Assendelft WJ, et al. Spinal manipulative therapy for acute low back pain. *Cochrane Database of Systematic Reviews.* 2013;38(3):E158-77. doi: 10.1097/BRS.0b013e31827dd89d. http://www.ncbi.nlm.nih.gov/pubmed/23169072	**Study design:** Systematic review; **Study population**: Patients with low back pain; **Duration of symptoms**: Acute; **Sample size**: N= 2674; **Intervention**: Spinal manipulative therapy; **Comparator/Control:** Various among the studies reviewed; **Outcome measures:** Various among the studies reviewed; **Outcome measurement interval:** Various among the studies reviewed.	The authors concluded that "SMT is no more effective for acute low back pain than inert interventions, sham SMT or as adjunct therapy. SMT also seems to be no better than other recommended therapies. Our evaluation is limited by the few numbers of studies; therefore, future research is likely to have an important impact on these estimates. Future RCTs should examine specific subgroups and include an economic evaluation".

3	Cruser dA, Maurer D, Hensel K, Brown SK, White K, Stoll ST. A randomized, controlled trial of osteopathic manipulative treatment for acute low back pain in active duty military personnel. J Man Manip Ther. 2012;20(1):5-15. http://www.ncbi.nlm.nih.gov/pubmed/23372389	**Study design:** RCT **Study population**: Military personnel with low back pain; **Duration of symptoms**: Acute **Sample size**: N-109; **Intervention**: OMT + usual care; **Comparator/Control:** Usual care; **Outcome measures:** Pain **(**VAS); Disability (RMDQ); General health (SF-36); Patient expectation questionnaire; **Outcome measurement interval:** Baseline, and after each treatment visit.	The authors concluded that "this study supports the effectiveness of OMT in reducing ALBP pain in active duty military personnel".
4	UK BEAM Trial Team. United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. BMJ. 2004;329(7479). http://www.ncbi.nlm.nih.gov/pubmed/15556955	**Study design:** RCT; **Study population**: Patients with low back pain; **Duration of symptoms**: Patients had experienced pain every day for 28 days prior to randomisation, or for 21 out of 28 days prior to randomisation, and 21 out of the 28 days before that. **Sample size**: N=1334 **Intervention**: Best care alone, exercise classes; SMT, or usual care + SMT + exercise; **Outcome measures:** RMDQ, modified	The authors concluded that "relative to "best care" in general practice, manipulation followed by exercise achieved a moderate benefit at three months and a small benefit at 12 months; spinal manipulation achieved a small to moderate benefit at three months and a small benefit at 12 months; and exercise achieved a small benefit at three months but not 12 months".

		Von Korff scale, SF-26, FABQ, and EQ5D; **Outcome measurement interval:** 3 months and 12 months.	
5	UK BEAM Trial Team. United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: cost effectiveness of physical treatments for back pain in primary care. BMJ. 2004;329(7479):1381. http://www.ncbi.nlm.nih.gov/pubmed/15556954	**Study design:** RCT; **Study population**: Patients with low back pain; **Duration of symptoms**: Patients had experienced pain every day for 28 days prior to randomisation, or for 21 out of 28 days prior to randomisation, and 21 out of the 28 days before that. **Sample size**: N=1334 **Intervention**: Best care alone, exercise classes; SMT, or usual care + SMT + exercise; **Outcome measures:** RMDQ, modified Von Korff scale, SF-36, FABQ, and EQ5D; **Outcome measurement interval:** 3 months and 12 months.	The authors concluded that "spinal manipulation is a cost effective addition to "best care" for back pain in general practice. Manipulation alone probably gives better value for money than manipulation followed by exercise".
6	Williams NH, Edwards RT, Linck P, Muntz R, Hibbs R, Wilkinson C, Russell I, Russell D, Hounsome B. Cost-utility analysis of osteopathy in primary care: results from a pragmatic randomized controlled trial. Fam Pract. 2004;21(6):643-50. http://www.ncbi.nlm.nih.gov/pubmed/15531626	**Study design:** Cost utility analysis of RCT; **Study population**: Patients with spinal pain; **Duration of symptoms**: 2-12 weeks; **Sample size**: N=201; **Intervention**: Usual GP care + 3 or 4 sessions of OMT; **Comparator/Control:** Usual GP care;	The authors concluded that "a primary care osteopathy clinic may be a cost-effective addition to usual GP care, but this conclusion was subject to considerable random error. Rigorous multi-centre studies are needed to assess the

		Outcome measures: EASPS, SF-12, EQ5D. and SFMQ; **Outcome measurement interval:** 2 and 6 months.	generalizability of this approach".
7	Williams NH, Wilkinson C, Russell I, Edwards RT, Hibbs R, Linck P, Muntz R. Randomized osteopathic manipulation study (ROMANS): pragmatic trial for spinal pain in primary care. Fam Pract. 2003;20(6):662-9. http://www.ncbi.nlm.nih.gov/pubmed/14701889	**Study design:** RCT; **Study population**: Patients with spinal pain; **Duration of symptoms**: 2-12 weeks; **Sample size**: N=201; **Intervention**: Usual GP care + 3 or 4 sessions of OMT; **Comparator/Control:** Usual GP care; **Outcome measures:** EASPS, SF-12, EQ5D. and SFMQ; **Outcome measurement interval:** 2 and 6 months.	The authors concluded that "a primary care osteopathy clinic may be a cost-effective addition to usual GP care, but this conclusion was subject to considerable random error. Rigorous multi-centre studies are needed to assess the generalizability of this approach".
8	Gibson T, Grahame R, Harkness J, Woo P, Blagrave P, Hills R. Controlled comparison of short-wave diathermy treatment with osteopathic treatment in non-specific low back pain. Lancet 1985;i:1258-61. http://www.ncbi.nlm.nih.gov/pubmed/2860453	**Study design:** RCT; **Study population**: Patients with non-specific low back pain; **Duration of symptoms**: Subacute low back pain; **Sample size**: N=109; **Intervention**: OMT; **Comparator/Control:** Short-wave diathermy; **Outcome measures:** Pain (VAS); Spinal flexion; return to work; recovery; and	The authors concluded that "the outcome of treatment was unrelated to the initial severity or duration of pain or to the trend of pain towards deterioration or improvement. It is, therefore, unlikely that the results simply reflect the natural history of low back pain. Benefits obtained with osteopathy and SWD in this study may have been achieved

		analgesia consumption. **Outcome measurement interval:** Baseline, 4 weeks, and 12 weeks.	through a placebo effect".
9	Franke H, J-D Franke, Fryer G. Osteopathic manipulative treatment for nonspecific low back pain: a systematic review and meta-analysis. BMC Musculoskeletal Disorders 2014;15:286. http://www.ncbi.nlm.nih.gov/pubmed/25175885	**Study design:** SR and MA **Study population**: Patients with non-specific low back pain, and women experiencing non-specific low back pain during pregnancy and post-partum. **Duration of symptoms**: Acute and chronic; **Sample size**: N=1502 for all studies included **Intervention**: OMT **Comparator/Control:** various among the studies reviewed; **Outcome measures:** various among the studies reviewed; **Outcome measurement interval:** various among the studies reviewed.	The researchers concluded that "clinically relevant effects of OMT were found for pain reduction and improvement in functional status in patients with acute and chronic nonspecific LBP, and for LBP in patients while pregnant and postpartum at 3 months posttreatment. However, larger, high-quality randomized controlled trials with robust comparison groups are recommended".
10	Furlan AD, Yazdi F, Tsertsvadze A, et al. A systematic review and meta-analysis of efficacy, cost-effectiveness, and safety of selected complementary and alternative medicine for neck and low back pain. Evidence-Based	**Study design:** Systematic review and meta-analysis; **Study population**: Patients with neck and low back pain; **Duration of symptoms**: Various among	The authors concluded that "CAM treatments were significantly more efficacious than no treatment, placebo, physical therapy, or usual care in reducing

	Complementary and Alternative Medicine. 2012; 2012:953139. http://www.ncbi.nlm.nih.gov/pubmed/22203884	included studies; **Sample size**: N= 162 (low back pain patients) and N= 104 (neck pain patients); **Intervention**: Techniques used in CAM treatments; **Comparator/Control:** Various among included studies; **Outcome measures:** VAS, MPQ, RMDQ, NPQ, PDI, and ODI; **Outcome measurement interval:** immediate, short term (<3 months), intermediate (3-12 months) and long term (> 12 months).	pain immediately or at short-term after treatment. CAM therapies did not significantly reduce disability compared to sham. None of the CAM treatments was shown systematically as superior to one another. More efforts are needed to improve the conduct and reporting of studies of CAM treatments".
11	Posadzki P, Ernst E. Osteopathy for musculoskeletal pain patients: a systematic review of randomized controlled trials. Clinical Rheumatology. 2011;30(2):285-91. http://www.ncbi.nlm.nih.gov/pubmed/21053038	**Study design:** Systematic review; **Study population**: Patients with low back pain; **Duration of symptoms**: Acute and chronic; **Intervention**: Osteopathic manipulation or mobilisation; **Comparator/Control:** Various among the studies reviewed; **Outcome measures:** Various among the studies reviewed;	The authors concluded that "a total of five of the 16 RCTs showed that OMT is effective for musculoskeletal pain (MSP) and 11 showed no difference between OMT and controls. These controls included sham ultrasound, placebo sham manipulation, no intervention, drugs, moist heat, chemonucleolysis, sham

		Outcome measurement interval: Various among the studies reviewed.	treatment + standard care, chiropractic techniques, antiphlogistics, and cortisone injections, exercises or manipulative physiotherapy, manual mobilization, short-wave diathermy and a placebo, or standard care. The evidence is therefore inconclusive".
12	Chou R, Huffman LH. Non-pharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/American College of Physicians clinical practice guideline Annals of Internal Medicine. 2007;147(7):492-504.	**Study design:** Review of RCTs; **Study population**: Patients with low back pain; **Duration of symptoms**: Acute and chronic; **Sample size**: The review identified 38 trials for management of acute low back pain, and 237 trials for the management of subacute and chronic low back pain; **Interventions**: Various interventions were included for example exercise, spinal manipulation, yoga, massage, and acupuncture; **Comparator/Control:** Various among the studies reviewed; **Outcome measures:** Various among the studies reviewed; **Outcome measurement interval:**	The authors concluded that "therapies with good evidence of moderate efficacy for chronic or sub-acute low back pain are cognitive behavioural therapy (CBT), exercise, spinal manipulation, and interdisciplinary rehabilitation. For acute low back pain, the only therapy with good evidence of efficacy is superficial heat".

		Various among the studies reviewed.	
13	Ernst E, Canter PH. A systematic review of systematic reviews of spinal manipulation. Journal of the Royal Society of Medicine. 2006;99(4):192L6.	**Study design:** A systematic review of systematic reviews; **Study population**: Patients with low back pain; **Duration of symptoms**: Various among the studies reviewed; **Sample size**: N=239; **Intervention**: Spinal manipulation **Comparator/Control:** Various among the studies reviewed; **Outcome measures:** Various among the studies reviewed; **Outcome measurement interval:** Various among the studies reviewed.	The authors concluded that "collectively these data do 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" but the review was strongly criticised by experienced researchers with special interests in OMT concerning their views on the many flaws in the review.
14	Heinze G. The Effectiveness of a Holistic Osteopathic Treatment in Subacute Low Back Pain. A Randomized Controlled Trial. 2006. Unpublished D.O. Thesis.	**Study design:** RCT; **Study population**: **Duration of symptoms**: Acute and Chronic (4 weeks to 6 months); **Sample size**: N=60; **Intervention**: OMT + PT + heat; **Comparator/Control:** Heat and PT; **Outcome measures:** Current and average level of pain (NRS); disability (RMDQ). **Outcome measurement interval:** Not disclosed.	The authors concluded that 'in the area of pain, as well as in the area of the disabilities a clinically relevant improvement could be achieved.' (Franke et al, 2014)

15	Koes BW, Assendelft WJ, van der Heijden GJ, Bouter LM, Knipschild PG. Spinal manipulation and mobilisation for back and neck pain: a blinded review. BMJ. 1991;303(6813):1298-303. http://www.ncbi.nlm.nih.gov/pubmed/1836153	**Study design:** A blinded review **Study population**: Patients with neck and low back pain; **Duration of symptoms**: Acute and chronic **Sample size**: N=1421; **Intervention**: SMT **Comparator/Control:** Various **Outcome measures:** Various among the different studies reviewed; **Outcome measurement interval:** Various among the different studies reviewed.	The researchers concluded that "although some results are promising, the efficacy of manipulation has not been convincingly shown. Further trials are needed, but much more attention should be paid to the methods of study".
16	MacDonald RS; Bell CM. An open controlled assessment of osteopathic manipulation in nonspecific low-back pain. Spine (Phila Pa 1976). 1990;15(5):364-70. http://www.ncbi.nlm.nih.gov/pubmed/2141951	**Study design:** Controlled clinical trial; **Study population**: Patients with low back pain; **Duration of symptoms**: Acute and chronic; **Sample size**: N=49; **Intervention**: OMT **Comparator/Control**: Exercise and advice on posture; **Outcome measures:** Information not available; **Outcome measurement interval:**	The researchers found that the advantage to manipulated patients was maximal between 1 and 2 weeks after commencing treatment, but was not discernable after 4 weeks.

		Information not available.	
17	Orrock PJ, Myers SP. Osteopathic intervention in chronic non-specific low back pain: a systematic review. BMC Musculoskelet Disord. 2013;14:129. http://www.ncbi.nlm.nih.gov/pubmed/23570655	**Study design:** Systematic review; **Study population**: Patients with low back pain; **Duration of symptoms**: chronic; **Sample size**: N=330; **Intervention**: OMT; **Comparator/Control:** various among the studies reviewed; **Outcome measures:** various among the studies reviewed; **Outcome measurement interval:** various among the studies reviewed.	The study's authors concluded that "there are only two studies assessing the effect of the manual therapy intervention applied by osteopathic clinicians in adults with CNSLBP. One trial concluded that the osteopathic intervention was similar in effect to a sham intervention, and the other suggests similarity of effect between osteopathic intervention, exercise and physiotherapy. Further clinical trials into this subject are required that have consistent and rigorous methods. These trials need to include an appropriate control and utilise an intervention that reflects actual practice".
18	Licciardone JC, Minotti DE, Gatchel RJ, Kearns CM, Singh KP. Osteopathic manual treatment and ultrasound therapy for chronic low back pain: a randomized controlled trial. Ann Fam Med. 2013;11(2):122-9.	**Study design:** RCT; **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: N=455;	The authors concluded that "the OMT regimen met or exceeded the Cochrane Back Review Group criterion for a medium effect size in relieving chronic low back

	http://www.ncbi.nlm.nih.gov/pubmed/23508598	**Intervention**: OMT or ultrasound therapy; **Comparator/Control:** sham OMT or sham ultrasound respectively; **Outcome measures:** VAS; RMDQ; SF-36; Days lost from work; Satisfaction with care; Co-treatments. **Outcome measurement interval:** Baseline, 4, 8, and 12 weeks.	pain. It was safe, parsimonious, and well accepted by patients".
19	Vismara L, Cimolin V, Menegoni F, Zaina F, Galli M, Negrini S, Villa V, Capodaglio P. Osteopathic manipulative treatment in obese patients with chronic low back pain: a pilot study. Man Ther. 2012;17(5):451-5.	**Study design:** RCT **Study population**: Chronic; **Duration of symptoms**: **Sample size**: N=21; **Intervention**: OMT + SE; **Comparator/Control**: Specific exercises (SE); **Outcome measures:** Pain (VAS); Disability (RMDQ); LBP-DQ; Kinematics of thoracic spine/pelvis during forward flexion. **Outcome measurement interval:** Information not available.	The authors concluded that "combined rehabilitation treatment including Osteopathic Manipulative Treatment (OMT + SE) showed to be effective in improving biomechanical parameters of the thoracic spine in obese patients with cLBP. Such results are to be attributed to OMT, since they were not evident in the SE group. We also observed a reduction of disability and pain. The clinical results should be considered preliminary due to the small sample size".
20	Rubinstein SM, van Middelkoop M, Assendelft WJ, et al. Spinal manipulative therapy for	**Study design:** Systematic review; **Study population**: Patients with low	A total of 26 RCTs representing 6070 participants

	chronic low back pain. *Cochrane Database of Systematic Reviews.* 2011;2: CD008112. http://www.ncbi.nlm.nih.gov/pubmed/21328304	back pain; **Duration of symptoms**: Chronic; **Sample size**: N=6070; **Intervention**: Manipulative therapy delivered by various professional groups; **Comparator/Control:** Various among the studies reviewed; **Outcome measures:** Various among the studies reviewed; **Outcome measurement interval:** Various among the studies reviewed.	were included, of which 9 had a low risk of bias. The authors concluded that "there is high quality evidence that spinal manipulative therapy (SMT) has a small, statistically significant but not clinically relevant, short-term effect on pain relief and functional status compared to other interventions. The robustness of the findings was confirmed by sensitivity analyses. There is varying quality of evidence that SMT has a statistically significant effect on the above outcomes when added to another intervention. There is low quality evidence that SMT is not statistically significantly more effective than inert interventions or sham SMT for the previously-mentioned outcomes".
21	van Middelkoop M, Rubinstein SM, Kuijpers T, et al. A systematic review on the effectiveness of	**Study design:** Systematic review; **Study population**: Patients with low	Based on the heterogeneity of the populations, interventions,

	physical and rehabilitation interventions for chronic non-specific low back pain. European Spine Journal. 2011; 20(1):19-39. http://www.ncbi.nlm.nih.gov/pubmed/20640863	back pain; **Duration of symptoms**: Chronic; **Sample size**: N=8816; **Intervention**: Various including exercise therapy, back school, TENS, LLLT, massage, behavioural interventions, lumbar supports, traction, and multidisciplinary treatments; **Comparator/Control:** Various among included studies; **Outcome measures:** Various among included studies; **Outcome measurement interval:** Various among included studies.	and comparison groups, the researchers concluded that "there are insufficient data to draw firm conclusion on the clinical effect of back schools, low-level laser therapy, patient education, massage, traction, superficial heat/cold, and lumbar supports for chronic LBP management".
22	Chown M, Whittamore L, Rush M, Allan S, Scott D, Archer M. A prospective study of patients with chronic back pain randomised to group exercise, physiotherapy or osteopathy. Physiother. 2008;94:21–28. doi: 10.1016/j.physio.2007.04.014 http://www.physiotherapyjournal.com/article/S0031-9406(07)00126-5/abstract	**Study design:** RCT **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: N=239; **Intervention**: Group exercise classes led by physiotherapists; **Comparator/Control:** One to one predominantly manipulative physiotherapy, or osteopathy; **Outcome measures:** Disability (ODI); general health (EQ5D); pain (VAS); mobility (Shuttle Walk Test).	The authors concluded that "the study supports the use of a variety of approaches for the treatment of chronic low back pain. Particular attention needs to be given to the problems of attracting enough participants for group sessions, as these can be difficult to schedule in ways that are convenient for different participants".

		Outcome measurement interval: Information not available.	
23	Mandara A, Fusaro A, Musicco M, Bado F. A randomised controlled trial on the effectiveness of osteopathic manipulative treatment of chronic low back pain (abstract) International Journal of Osteopathic Medicine. 2008;11:156. doi: 10.1016/j.ijosm.2008.08.011. http://www.journalofosteopathicmedicine.com/article/S1746-0689(08)00102-8/abstract	**Study design:** RCT; **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic **Sample size**: Information not available; **Intervention**: OMT + usual care; **Comparator/Control**: sham OMT + usual care; **Outcome measures:** Pain **(**VAS); Disability (ODI). **Outcome measurement interval:** Not disclosed.	The authors concluded that '…OMT appears to provide benefits over and above usual care for the treatment of CLBP. The improvement in the OMT compared to the SMT demonstrated that placebo effects… do not justify per se the results of this study.' (Franke et al, 2014).
24	Snelling NJ. Spinal manipulation in patients with disc herniation: A critical review of risk and benefit. International Journal of Osteopathic Medicine. 2006;9(3):77L 84 http://www.journalofosteopathicmedicine.com/article/S1746-0689(06)00096-4/abstract	**Study design**: literature review; **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: Four RCTs were located; **Intervention**: Spinal manipulation; **Comparator/Control:** Various among the different studies reviewed; **Outcome measures:** Various among the different studies reviewed; **Outcome measurement interval:**	The authors conclude that "the early benefits of manipulation for the management of disc herniation is based on weak evidence and since the estimate of risk, which is believed to be rare with appropriately trained practitioners, is difficult to ascertain, care should be taken in choosing this approach to treatment and it seems prudent

		Various among the different studies reviewed.	to advise patients of the potential risk".
25	Licciardone JC, Brimhall AK, King LN. Osteopathic manipulative treatment (OMT) for low back pain: a systematic review and meta-analysis of randomized controlled trials. *BMC Musculoskeletal Disorders.* 2005;6:43. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1208896/	**Study design:** SR and MA; **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: N= 525; **Intervention**: OMT **Comparator/Control:** Various among the different studies reviewed; **Outcome measures:** General health (SF36); pain (VAS); disability (RMDQ); Work disability; Satisfaction with back care **Outcome measurement interval:** Various among the different studies reviewed;	The reviewers concluded that "OMT significantly reduces low back pain. The level of pain reduction is greater than expected from placebo effects alone, and persists for at least three months. Additional research is warranted to elucidate mechanistically how OMT exerts its effects, to determine if OMT benefits are long-lasting, and to assess the cost-effectiveness of OMT as a complementary treatment for low back pain".
26	Licciardone JC, Stoll ST, Fulda KG, Russo DP, Siu J, Winn W, Swift J Jr. Osteopathic manipulative treatment for chronic low back pain: a randomized controlled trial. Spine (Phila Pa 1976). 2003;28(13):1355-62. http://www.ncbi.nlm.nih.gov/pubmed/12838090	**Study design:** RCT; **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: N= 91; **Intervention**: OMT; **Comparator/Control:** sham manipulation or no intervention;	The authors concluded that Osteopathic manipulative treatment and sham manipulation both appear to provide some benefits when used in addition to usual care for the treatment of chronic nonspecific low back pain. It remains unclear

		Outcome measures: General health (SF36); pain (VAS); disability (RMDQ); work disability; satisfaction with back care; **Outcome measurement interval:** Baseline, one month, and six months.	whether the benefits of osteopathic manipulative treatment can be attributed to the manipulative techniques themselves or whether they are related to other aspects of osteopathic manipulative treatment, such as range of motion activities or time spent interacting with patients, which may represent placebo effects".
27	Adorjàn-Schaumann K, Höhrhan G, Wille H, Wolff A. Osteopathic Treatment of Chronic Low Back Pain. A Randomized Controlled Trial. 1999. Unpublished D.O. Thesis.	**Study design:** RCT **Study population**: Patients with low back pain; **Duration of symptoms**: Chronic; **Sample size**: N=57 **Intervention**: OMT; **Comparator/Control:** Sham treatment; **Outcome measures:** Disability (RMDQ); pain (VAS); general health (SF-36); and side effects of treatment; **Outcome measurement interval:** Not disclosed.	The authors concluded that 'OMT – in comparison to the sham treatment - shows statistically significant and clinically important improvements regarding primary and secondary outcome measures.'
28	Andersson GB, Lucente T, Davis AM, Kappler RE, Lipton JA, Leurgans S. A comparison of osteopathic spinal manipulative treatment with	**Study design:** RCT **Study population**: Patients with low back pain;	The authors concluded that "osteopathic manual care and standard medical care have

	standard care for patients with low back pain. New England Journal of Medicine. 1999;341(19):1426L1431. http://www.nejm.org/doi/full/10.1056/NEJM199911043411903	**Duration of symptoms**: Between 3 weeks and six months; **Sample size**: N=155 **Intervention**: OMT (N=83); **Comparator/Control:** standard medical treatment (N=72); **Outcome measures:** Pain (VAS); disability (RMDQ); Oswestry Questionnaire, selected questions from NASS; ROM; a pain drawing, and SLRT; **Outcome measurement interval:** information not available.	similar clinical results in patients with subacute low back pain. However, the use of medication was greater with standard care".
29	Siehl D, Olson DR, Ross HE, Rockwood EE. Manipulation of the lumbar spine with the patient under general anesthesia: Evaluation by electromyography and clinical-neurologic examination of its use for lumbar nerve root compression syndrome. Journal of the American Osteopath Association 1971;70:433-40. http://www.ncbi.nlm.nih.gov/pubmed/5203536	**Study design:** Pre- and post-evaluation study; **Study population**: Patients with nerve root compression secondary to lumbar disc herniation; **Duration of symptoms**: 12 months **Sample size**: N=47; **Intervention**: OMT under anaesthesia; **Comparator/Control:** Conservative treatment or surgery; **Outcome measures:** Electromyographic readings, and "clinical improvement"; **Outcome measurement interval:** Baseline**,** 6 and 12 months	The study's authors reported that "the results thus far tend to suggest that manipulation under anaesthesia will produce only temporary clinical improvement in cases with electromyographic evidence of nerve root compression, and an operation eventually will be needed. With no evidence of nerve root compression, manipulation will probably bring lasting relief".

30	Schwerla F, Rother K, Rother D, et al. Osteopathic Manipulative Therapy in women with postpartum low back pain and disability: a pragmatic randomized controlled trial. J Am Osteopath Assoc. 2015;115(7):416-25. http://www.ncbi.nlm.nih.gov/pubmed/26111129	**Study design:** RCT; **Study population**: Women post-partum; **Duration of symptoms**: ≥ 3 months; **Sample size**: N=80; **Intervention**: OMT; **Comparator/Control:** Waiting list control; **Outcome measures:** 10-point Visual Analogue Scale; Oswestry Disability Index (German version); **Outcome measurement interval:** information not available	OMT was applied four times at 2 weekly intervals. The study team reported "treatment led to clinically relevant and positive changes in pain and functional disability".
31	Majchrzycki M, Wolski H, Seremak-Mrozikiewicz A, et al. Application of osteopathic manipulative technique in the treatment of back pain during pregnancy. Ginekol Pol. 2015;86(3):224-8. http://www.ncbi.nlm.nih.gov/pubmed/25920314	**Study design:** Literature review; **Study population**: Women during pregnancy; **Duration of symptoms**: ≥ 3 months; **Sample size**: Not applicable; **Intervention**: OMT; **Comparator/Control:** various among the studies reviewed; **Outcome measures:** various among the studies reviewed; **Outcome measurement interval:** various among the studies reviewed.	The review concluded that "OMT procedures appear to be effective and safe for pelvic and spinal pain management in the lumbosacral area in pregnant women".

32	Pennick V, Liddle D. Interventions for preventing and treating pelvic and back pain in pregnancy. *Cochrane Database of Systematic Reviews.* 2015;9:CD001139..http://www.ncbi.nlm.nih.gov/pubmed/26422811	**Study design:** Systematic Review of RCTs; **Study population**: Patients with low back and/or pelvic pain during pregnancy; **Duration of symptoms**: various durations; **Sample size**: N=5121 **Intervention**: Various interventions including exercise in different forms; manual therapy, and education. **Comparator/Control:** Various among the 15 RCTs examined; **Outcome measures:** various among the studies reviewed; **Outcome measurement interval:** various among the studies reviewed.	The authors concluded that "evidence from single studies suggests that acupuncture or craniosacral therapy improves pregnancy-related pelvic pain, and osteomanipulative therapy or a multi-modal intervention (manual therapy, exercise and education) may also be of benefit".
33	Gundermann S. Effectiveness of Osteopathic Treatment in Pregnant Women Suffering From Low Back Pain. A Randomized Controlled Trial. 2013. Unpublished D.O. Thesis.	**Study design:** RCT **Study population**: N/S pregnancy **Duration of symptoms**: At least one week; **Sample size**: N=41; **Intervention**: OMT; **Comparator/Control:** No treatment; **Outcome measures:** VAS; Frequency of pain; RMDQ; Questionnaire postpartum;	The study's authors concluded that 'Four osteopathic treatments over a period of 8 weeks led to statistically significant and clinically relevant positive changes of pain intensity and frequency in pregnant women suffering from low back pain.'

		Outcome measurement interval: information not available.	
34	Schwerla F, Rother K, Rother D, Ruetz M. Vol Proceedings of the 9th International Symposium of Osteopathy 2012. Nantes, France: Akademie für Osteopathie; 2012. Osteopathic treatment of women with persistent low back/pelvic girdle pain postpartum.	**Study design: RCT** **Study population**: Women suffering persistent low back pain after childbirth; **Duration of symptoms**: Chronic **Sample size**: N= 80 **Intervention**: OMT **Comparator/Control:** No treatment; **Outcomes measured: Pain (**VAS); OPQ; Different specific health problems. **Outcome measurement interval:** information not available.	The authors concluded that 'four osteopathic treatments over a period of eight weeks led to statistically significant and clinically relevant positive changes of pain intensity and effects of low back pain on everyday activities in women suffering from low back pain after childbirth'
35	Licciardone JC, Buchanan S, Hensel KL, King HH, Fulda KG, Stoll ST. Osteopathic manipulative treatment of back pain and related symptoms during pregnancy: a randomized controlled trial. Am J Obstet Gynecol. 2010;202(1):43.e1-8 http://www.ncbi.nlm.nih.gov/pubmed/19766977	**Study design: RCT**; **Study population**: Patients with low back pain; **Duration of symptoms**: Not specified; **Sample size**: N=144; **Intervention**: usual obstetrical care and OMT ; **Comparator/Control:** usual obstetrical care and sham ultrasound treatment or usual obstetrical care only; **Outcome measures:** RMDQ; pain 11-point NRS;	The authors conclude that "osteopathic manipulative treatment slows or halts the deterioration of back-specific functioning during the third trimester of pregnancy".

		Outcome measurement interval: after each visit.	
36	Recknagel C, Roá J. Study on the Effectiveness of Osteopathic Treatment for Women with Persistent Post Partum Back Pain. A Randomized Controlled Trial. 2007. Unpublished D.O. Thesis.	**Study design:** RCT; **Study population**: Patients with pots-partum low back pain; **Duration of symptoms**: Chronic (3-24 months); **Sample size**: N=40 **Intervention**: OMT; **Comparator/Control:** No treatment; **Outcome measures:** Pain (VAS); OPQ; Regions of dysfunction; **Outcome measurement interval:** baseline and 4 weeks.	The authors concluded that OMT 'for women with persistent, unspecific backache post-partum brings about a clinically relevant improvement of the pain symptoms and a reduction of the impediment on daily life'. (Franke et al, 2014)
37	Peters R, Van Der Linde M. Osteopathic Treatment of Women with Low Back Pain during Pregnancy. A Randomized Controlled Trial. 2006. Unpublished D.O. Thesis.	**Study design:** RCT; **Study population**: N/S pregnancy; **Duration of symptoms:** Acute (at least one week); **Sample size**: N=60; **Intervention**: OMT; **Comparator/Control:** No treatment; **Outcome measures:** Pain (VAS); and disability (QBPDS); **Outcome measurement interval:** Not disclosed.	The authors concluded that 'four osteopathic treatments… could cause a clinically relevant influence on the pain-symptomatology and on the interference of daily life of pregnant women with pain in the pelvic and/or lumbar area'. (Franke et al, 2014)

Abbreviations:

CAM: Complementary and Alternative Medicine

CLBP: Chronic low back pain
EASPS: Extended Aberdeen Spinal Pain Score
EQ5D: Euroquol 5D

FABQ: Fear Avoidance Beliefs Questionnaire
LBP-DQ: Low Back Pain Disability Questionnaire
LLLT: Low level laser therapy

MPQ: McGill Pain Questionnaire
NASS: North American Spinal Surgeons Questionnaire

NPQ: Northwick Park Pain Questionnaire

NRS: Numerical Rating Scale
N/S: Non-specific

OMT: Osteopathic Manipulative Therapy

OPQ: Orebro Pain Questionnaire

ODI: Oswestry Disability Index

PDI: Pain Disability Index

QBPDS: Quebec Back Pain Disability Scale
RCT: Randomised Controlled Trial

RMDQ: Roland Morris Disability Questionnaire

RoM: Range of Motion
SE: Specific exercise

SF36: Short Form-36

SFMQ: Short Form McGill Pain Questionnaire
SMT: Spinal Manipulative Therapy

TENS: Transcutaneous Electrical Nerve Stimulation
VAS: Visual Analogue Scale