

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Exercise for the Management of Back Pain: Clinical Effectiveness

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Research Question

What is the clinical effectiveness of exercise for the management of back pain?

Key Findings

Forty-six systematic reviews (12 with meta-analysis) were identified regarding the clinical benefits and harms of exercise for adults with back pain.

Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD), Canadian and major international health technology agencies, as well as a focused Internet search. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews and meta-analyses. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and July 21, 2017. Internet links were provided where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Adults with acute or chronic back pain
Intervention	Exercise (including hydrotherapy and aquatic exercise)
Comparators	Opioids; No treatment; Wait-list Placebo
Outcomes	Clinical benefits and harms (e.g., pain, physical function, social function [including return to school or work], emotional and psychological functioning [e.g., anxiety, depression, sleep], health-related quality of life)
Study Designs	Health technology assessments, systematic reviews, meta-analyses

Results

Forty-six systematic reviews (12 with meta-analysis) were identified regarding the clinical benefits and harms of exercise for adults with back pain. No relevant health technology assessments were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Forty-six systematic reviews¹⁻⁴⁶ (12 with meta-analysis)^{14-15,20-22,25,32-36,44} were identified regarding the clinical effectiveness of exercise for adults with back pain. There were a variety of exercise programs investigated in the literature, including aerobic, strengthening, range of motion, flexibility, walking, motor control, core, balance, endurance, sling exercise, cardiovascular, technology-supported exercise, proprioceptive training, the McKenzie method, Pilates, yoga, tai chi, resistance exercise training, and general exercise.¹⁻⁴⁶ Overall, the large volume of evidence suggested that exercise may be effective for symptom reduction in patients with back pain.¹⁻⁴⁶ The effectiveness of specific exercise programs varies.¹⁻⁴⁶ Exercise programs are well-tolerated by patients with back pain, demonstrated by the very few reported cases of adverse events in the literature.¹⁻⁴⁶ Detailed study characteristics are provided in Table 2.

Table 2: Summary of Included Studies on the Clinical Benefits and Harms of Exercise for Back Pain in Adults

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
Systematic Reviews and Meta-Analyses					
Chou, 2017¹	<ul style="list-style-type: none"> Total number of RCTs was NR Patients with acute or chronic nonradicular or radicular low back pain N = NR 	<ul style="list-style-type: none"> Non-pharmacologic therapies (including various exercises) 	<ul style="list-style-type: none"> Sham treatment Wait list Usual care Other therapies 	<ul style="list-style-type: none"> Pain Function 	<ul style="list-style-type: none"> Tai chi (low SOE) and yoga (moderate SOE) are effective for chronic low back pain Evidence supported the use of exercise and multidisciplinary rehabilitation for chronic low back pain (low to moderate SOE)
Geneen, 2017²	<ul style="list-style-type: none"> Overview of SRs 21 Included SRs (381 included studies) Adults with chronic pain N = 37,143 	<ul style="list-style-type: none"> Physical activity and exercise (including aerobic, strength, flexibility, range of motion, and core or balance training, yoga, Pilates, and tai chi) 	<ul style="list-style-type: none"> No exercise Minimal intervention 	<ul style="list-style-type: none"> Pain Function QoL Healthcare use Adverse effects 	<ul style="list-style-type: none"> Physical activity and exercise were reported to have a positive effect on pain severity, physical function, and QoL The quality of the evidence was low
Matheve, 2017³	<ul style="list-style-type: none"> 25 included RCTs Patients with 	<ul style="list-style-type: none"> Technology-supported exercise therapy 	<ul style="list-style-type: none"> Standard treatment Other 	<ul style="list-style-type: none"> Pain Disability QoL 	<ul style="list-style-type: none"> Evidence suggested adding technology-supported exercise therapy to standard

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
	<ul style="list-style-type: none"> low back pain N = NR 		<ul style="list-style-type: none"> treatments Placebo 		<ul style="list-style-type: none"> treatment improves pain, disability, and QoL Technology-supported exercise therapy alone does not improve outcomes compared to other treatments or placebo
Rothberg, 2017⁴	<ul style="list-style-type: none"> 6 included RCTs Patients with nonchronic, nonradicular, low back pain N = NR 	<ul style="list-style-type: none"> Complementary therapies (including exercise) 	<ul style="list-style-type: none"> Standard medical therapy 	<ul style="list-style-type: none"> Pain Functionality 	<ul style="list-style-type: none"> Addition of exercise to standard medical therapy showed no benefit
Wieland, 2017⁵	<ul style="list-style-type: none"> 12 included RCTs Patients with chronic non-specific low back pain N = 1,080 	<ul style="list-style-type: none"> Yoga 	<ul style="list-style-type: none"> No specific treatment Minimal intervention (e.g. education) Another active treatment 	<ul style="list-style-type: none"> Pain Function Adverse effects 	<ul style="list-style-type: none"> Low- to moderate-certainty evidence suggested that yoga improves back function (at 3 and 6 months) compared to non-exercise controls It is unclear if yoga is more effective than other exercise programs
Chang, 2016⁶	<ul style="list-style-type: none"> Number of included RCTs was NR Patients with chronic low back pain N = NR 	<ul style="list-style-type: none"> Yoga 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Physical functioning Disability Pain Psychological symptoms 	<ul style="list-style-type: none"> Yoga was reported to decrease pain and disability Additional research is needed to determine the effect on psychological symptoms
Gordon, 2016⁷	<ul style="list-style-type: none"> Number of included studies was NR Patients with non-specific low back pain N = NR 	<ul style="list-style-type: none"> Physical activity 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Not specified in abstract 	<p><i>"A general exercise programme that combines muscular strength, flexibility and aerobic fitness is beneficial for rehabilitation of non-specific chronic low back pain"</i>⁷</p>
Ishak, 2016⁸	<ul style="list-style-type: none"> 3 included studies Elderly patients with low back pain N = NR 	<ul style="list-style-type: none"> Strengthening exercises 	<ul style="list-style-type: none"> Control group 	<ul style="list-style-type: none"> Pain Disability Functional performance 	<ul style="list-style-type: none"> Evidence of fair quality suggested that strengthening exercises reduce pain intensity, disability, and improve functional performance
Kamioka, 2016⁹	<ul style="list-style-type: none"> Overview of SRs 9 Included SRs N = NR 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain Functionality 	<ul style="list-style-type: none"> Pilates exercise was associated with pain relief and functional improvement in the short

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
					<ul style="list-style-type: none"> term No adverse effects or harms were reported
Lawford, 2016¹⁰	<ul style="list-style-type: none"> 7 included RCTs Adults with chronic low back pain N = 869 	<ul style="list-style-type: none"> Walking 	<ul style="list-style-type: none"> Other non-pharmacological management Usual care 	<ul style="list-style-type: none"> Disability QoL Function 	<ul style="list-style-type: none"> Low quality evidence suggested that walking is as effective as other non-pharmacological management treatments for improving disability, function, and QoL
Lin, 2016¹¹	<ul style="list-style-type: none"> 8 included RCTs Adults with chronic low back pain N = NR 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> Usual care Other exercises 	<ul style="list-style-type: none"> Pain Functional capacity Functional ability 	<ul style="list-style-type: none"> Pilates improved pain relief and functional ability compared to usual care Pilates and other exercises showed similar outcomes
Macedo, 2016¹²	<ul style="list-style-type: none"> 3 included RCTs Adults with acute, non-specific low back pain N = 197 	<ul style="list-style-type: none"> Motor control exercise 	<ul style="list-style-type: none"> Spinal manipulative therapy Other forms of exercise Medical treatment 	<ul style="list-style-type: none"> Pain intensity Disability Function QoL Recurrence 	<ul style="list-style-type: none"> Very low to moderate quality evidence reported that motor control exercise provides no benefit over spinal manipulative therapy, other forms of exercise, or medical treatment More evidence is required before firm conclusions can be drawn
AHRQ, 2016¹³	<ul style="list-style-type: none"> 156 included SRs and RCTs Adults nonradicular or radicular low back pain N = NR 	<ul style="list-style-type: none"> Noninvasive treatments (including exercise) 	<ul style="list-style-type: none"> Placebo No treatment, Usual care Sham therapy Inactive therapy Another active therapy 	<ul style="list-style-type: none"> Pain Function 	<ul style="list-style-type: none"> Evidence suggested that exercise was more effective than placebo, no intervention, or usual care for acute and chronic low back pain (low to moderate SOE)
Saragiotto, 2016¹⁴	<ul style="list-style-type: none"> MA performed 32 included RCTs Patients with acute or chronic non-specific low back pain N = 2,628 	<ul style="list-style-type: none"> Motor control exercise 	<ul style="list-style-type: none"> Minimal intervention Other treatment 	<ul style="list-style-type: none"> Pain intensity Disability 	<ul style="list-style-type: none"> Motor control exercise improves pain compared to minimal intervention No clinically important difference between motor control exercise and other exercise interventions
Saragiotto, 2016¹⁵	<ul style="list-style-type: none"> MA performed 29 included RCTs Patients with chronic non- 	<ul style="list-style-type: none"> Motor control exercise 	<ul style="list-style-type: none"> Minimal intervention Other treatment 	<ul style="list-style-type: none"> Pain intensity Disability Function QoL Return to work 	<ul style="list-style-type: none"> Very low to moderate quality evidence suggested motor control exercise is superior to a minimal intervention

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
	<ul style="list-style-type: none"> specific low back pain N = 2,431 			<ul style="list-style-type: none"> Recurrence 	<ul style="list-style-type: none"> Very low to low quality evidence suggested that motor control exercise is more effective than exercise plus electrophysical agents Moderate to high quality evidence suggested that motor control exercise provides similar outcomes to manual therapies and low to moderate quality evidence that it provides similar outcomes to other forms of exercises
Yamato, 2016 ¹⁶	<ul style="list-style-type: none"> 10 included RCTs Patients with nonspecific acute, subacute, or chronic low back pain N = 510 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> Minimal intervention Other exercises 	<ul style="list-style-type: none"> Pain Disability Function Global impression of recovery 	<ul style="list-style-type: none"> Low to moderate quality evidence reports that Pilates is more effective than minimal intervention Additional research is required to ascertain whether Pilates is more effective than other forms of exercise
Chang, 2015 ¹⁷	<ul style="list-style-type: none"> Number of included studies was NR Patients with chronic low back pain N = NR 	<ul style="list-style-type: none"> Core strength training strategies 	<ul style="list-style-type: none"> Resistance training 	<ul style="list-style-type: none"> Not specified in abstract 	<p><i>“All of the core strength training strategies examined in this study assist in the alleviation of chronic low back pain; however, we recommend focusing on training the deep trunk muscles to alleviate chronic low back pain”¹⁷</i></p>
Gutke, 2015 ¹⁸	<ul style="list-style-type: none"> Number of included studies was NR Pregnant patients with lumbopelvic pain N = NR 	<ul style="list-style-type: none"> Physiotherapy interventions (including specific exercises) 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Authors concluded that the evidence reviewed regarding the effectiveness of exercise for pregnancy-related lumbopelvic pain was weak and limited
Kuss, 2015 ¹⁹	<ul style="list-style-type: none"> 9 included studies Elderly patients with subacute or chronic non-specific low back pain N = NR 	<ul style="list-style-type: none"> Physical therapy approaches (including strength training and endurance training) 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain Function 	<ul style="list-style-type: none"> Low quality evidence reported that physiotherapeutic techniques have a small-to-moderate effect on pain and a small effect on function No comments specific to

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
					the effectiveness of exercise therapies were made in the abstract
Liddle, 2015 ²⁰	<ul style="list-style-type: none"> MA performed 34 included RCTs Pregnant patients with low back and pelvic pain N = 5,121 	<ul style="list-style-type: none"> Any intervention (including land-based and water-based exercise) 	<ul style="list-style-type: none"> Usual prenatal care 	<ul style="list-style-type: none"> Low-back pain Pelvic pain Functional disability Sick leave Adverse effects 	<ul style="list-style-type: none"> Evidence of low quality suggested that exercise may reduce pregnancy-related low back pain Moderate to low quality evidence reported exercise improves functional disability and reduces sick leave
Meng, 2015 ²¹	<ul style="list-style-type: none"> MA performed 8 included studies Patients with chronic low back pain N = 310 	<ul style="list-style-type: none"> Aerobic exercise 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Disability Pain Depression Anxiety Heart rate Sit-and-reach test Maximum oxygen consumption 	<p><i>“The current meta-analysis provides reliable evidence that aerobic exercise could effectively diminish pain intensity and improve the physical and psychologic functioning of chronic low back pain patients”²¹</i></p>
O'Connor, 2015 ²²	<ul style="list-style-type: none"> MA performed 26 included RCTs and qRCTs Patients with chronic musculoskeletal pain (including chronic low back pain) N = 2,384 	<ul style="list-style-type: none"> Walking interventions 	<ul style="list-style-type: none"> Control interventions 	<ul style="list-style-type: none"> Pain Function 	<ul style="list-style-type: none"> Evidence of fair methodological quality suggested that walking is associated with significant improvements in pain and function in the short to medium-term Long-term effectiveness is uncertain
Patti, 2015 ²³	<ul style="list-style-type: none"> 26 included RCTs and qRCTs Patients with chronic low back pain N = 2,384 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> No treatment Minimal intervention Other exercises 	<ul style="list-style-type: none"> Pain Disability 	<ul style="list-style-type: none"> Pilates exercise reduced pain compared to minimal physical exercise intervention
Saragiotto, 2015 ²⁴	<ul style="list-style-type: none"> Number of included studies was NR Patients with low back pain N = NR 	<ul style="list-style-type: none"> Yoga 	<ul style="list-style-type: none"> Abstract not available online for free 	<ul style="list-style-type: none"> Abstract not available online for free 	<ul style="list-style-type: none"> Abstract not available online for free
Searle, 2015 ²⁵	<ul style="list-style-type: none"> MA performed 45 included RCTs 	<ul style="list-style-type: none"> Exercise interventions 	<ul style="list-style-type: none"> Control group Other treatment group 	<ul style="list-style-type: none"> Pain 	<p><i>“Our results found a beneficial effect for strength/resistance and</i></p>

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
	<ul style="list-style-type: none"> Adults with non-specific acute, subacute or chronic low back pain N = NR 				<i>coordination/stabilisation exercise programs over other interventions in the treatment of chronic low back pain and that cardiorespiratory and combined exercise programs are ineffective</i> ²⁵
Yamato, 2015 ²⁶	<ul style="list-style-type: none"> 10 included RCTs Adults with chronic low back pain N = 510 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> Minimal intervention Other exercises 	<ul style="list-style-type: none"> Pain Disability Global impression of recovery QoL 	<ul style="list-style-type: none"> Pilates exercise programs decreased pain and disability compared to minimal intervention (low to moderate quality evidence) There is no conclusive evidence Pilates is superior to other forms of exercise
Lee, 2015 ²⁷	<ul style="list-style-type: none"> 7 included RCTs Patients with chronic low back pain N = NR 	<ul style="list-style-type: none"> Sling exercise 	<ul style="list-style-type: none"> Any type of treatment 	<ul style="list-style-type: none"> Trunk muscle activation Trunk muscle thickness Pain Disability 	<ul style="list-style-type: none"> Due to the small number of trials, unclear if sling exercise is beneficial to patients with chronic low back pain
McCaskey, 2014 ²⁸	<ul style="list-style-type: none"> 18 included RCTs Patients with chronic neck or back pain N = 1,380 	<ul style="list-style-type: none"> Proprioceptive training 	<ul style="list-style-type: none"> Usual care Home based training Educational therapy Strengthening Stretching Endurance training Inactive controls 	<ul style="list-style-type: none"> Pain Function 	<ul style="list-style-type: none"> Proprioceptive training may be more effective than no intervention (low quality evidence) Proprioceptive training may be more effective than conventional physiotherapy (low quality evidence) Proprioceptive training may be inferior to educational and behavioural approaches (low quality evidence)
Rodrigues, 2014 ²⁹	<ul style="list-style-type: none"> 10 included RCTs Patients with musculoskeletal pain (including back pain) N = NR 	<ul style="list-style-type: none"> Workplace exercises (including resistance training, cardio respiratory exercises, Pilates, stretching, postural orientation and exercises for 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain 	<i>“Workplace resistance training performed at 70-85% [repetition maximum], three times a week for 20 minutes promotes reduction of the pain in shoulders, wrists, cervical, dorsal and lumbar spine. However, there is no consensus regarding the total duration of the intervention for the</i>

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
		relaxation)			<i>decrease of musculoskeletal pain in these regions</i> ²⁹
Stuber, 2014 ³⁰	<ul style="list-style-type: none"> • 5 included studies • Athletes with low back pain • N = 151 	<ul style="list-style-type: none"> • Core stability exercises 	<ul style="list-style-type: none"> • Not specified in abstract 	<ul style="list-style-type: none"> • Back pain intensity • Disability 	<ul style="list-style-type: none"> • Due to very low quality and quantity of evidence, unclear if core stability exercises are beneficial to athletes with low back pain
Wells, 2014 ³¹	<ul style="list-style-type: none"> • 14 included RCTs • Patients with chronic low back pain • N = NR 	<ul style="list-style-type: none"> • Pilates exercise 	<ul style="list-style-type: none"> • Usual care • Physical activity 	<ul style="list-style-type: none"> • Pain • Functional ability 	<ul style="list-style-type: none"> • Pilates improved pain and functional ability compared to usual care • Pilates was reported to be equally effective compared to massage therapy and other forms of exercise
Yue, 2014 ³²	<ul style="list-style-type: none"> • MA performed • Number of included RCTs was NR • Patients with chronic low back pain • N = NR 	<ul style="list-style-type: none"> • Sling exercise 	<ul style="list-style-type: none"> • Other treatments (including other forms of exercise, traditional Chinese medical therapy, and acupuncture) • No treatment 	<ul style="list-style-type: none"> • Pain • Function • Return to work 	<ul style="list-style-type: none"> • Based on limited evidence, sling exercise was more effective than thermomagnetic therapy • There was insufficient evidence to conclude if sling therapy was more effective than other forms of exercise, physical agents combined with drug therapy, traditional Chinese medical therapy, or acupuncture
Aladro-Gonzalvo, 2013 ³³	<ul style="list-style-type: none"> • MA performed • 9 included RCTs • Patients with persistent, non-specific low back pain • N = NR 	<ul style="list-style-type: none"> • Pilates exercise 	<ul style="list-style-type: none"> • Placebo treatment • Minimal intervention • Other physiotherapy treatments 	<ul style="list-style-type: none"> • Pain • Functional disability 	<ul style="list-style-type: none"> • Pilates was moderately superior to other physiotherapy treatments in reducing disability and was more effective for pain relief and disability than minimal intervention • Low methodological quality limits these results
Bystrom, 2013 ³⁴	<ul style="list-style-type: none"> • MA performed • 16 included RCTs • Patients with chronic and recurrent low back pain • N = NR 	<ul style="list-style-type: none"> • Motor control exercises 	<ul style="list-style-type: none"> • General exercise • Spinal manual therapy • Minimal intervention 	<ul style="list-style-type: none"> • Pain • Disability 	<ul style="list-style-type: none"> • Motor control exercises were superior to general exercise and spinal manual therapy for disability • Motor control exercises were superior to minimal intervention for pain and disability

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
Holtzman, 2013³⁵	<ul style="list-style-type: none"> MA performed 8 included RCTs Patients with chronic low back pain N = 743 	<ul style="list-style-type: none"> Yoga 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain Functional disability 	<ul style="list-style-type: none"> Yoga demonstrated a medium to large effect on functional disability and pain Methodological concerns needs to be addressed in future studies before definitive conclusions can be made
Miyamoto, 2013³⁶	<ul style="list-style-type: none"> MA performed 8 included RCTs Adults with chronic nonspecific low back pain N = NR 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> No treatment Minimal intervention Other types of exercises 	<ul style="list-style-type: none"> Pain Disability 	<ul style="list-style-type: none"> Pilates was not superior to other forms of exercise for reducing pain intensity Pilates was more effective than minimal intervention for reducing short-term pain and disability
Pennick, 2013³⁷	<ul style="list-style-type: none"> 26 included RCTs Pregnant women with low back and/or pelvic pain N = 4,093 	<ul style="list-style-type: none"> Any treatment (including exercise) 	<ul style="list-style-type: none"> Usual prenatal care 	<ul style="list-style-type: none"> Pain Disability Sick leave 	<ul style="list-style-type: none"> Evidence of low quality suggested that exercise significantly reduced pain and disability in pregnant women with low back pain
Sansonnens, 2013³⁸	<ul style="list-style-type: none"> 4 included studies Patients with chronic low back pain N = NR 	<ul style="list-style-type: none"> McKenzie method 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain 	<ul style="list-style-type: none"> The McKenzie method was effective in reducing pain Additional studies and long-term results are needed to confirm these findings
Schaafsma, 2013³⁹	<ul style="list-style-type: none"> 41 included RCTs and cluster RCTs Workers with back pain N = 4,404 	<ul style="list-style-type: none"> Physical conditioning (as part of a return to work strategy) 	<ul style="list-style-type: none"> Usual care Exercise therapy 	<ul style="list-style-type: none"> Sickness absence duration 	<p><i>“The effectiveness of physical conditioning as part of a return to work strategy in reducing sick leave for workers with back pain, compared to usual care or exercise therapy, remains uncertain”³⁹</i></p>
Wells, 2013⁴⁰	<ul style="list-style-type: none"> Overview of SRs 5 Included SRs (10 included studies) Patients with chronic low back pain N = NR 	<ul style="list-style-type: none"> Pilates exercise 	<ul style="list-style-type: none"> Not specified in abstract 	<ul style="list-style-type: none"> Pain Disability 	<ul style="list-style-type: none"> Due poor methodological quality and quantity of primary studies, unclear if Pilates exercise is beneficial to patients with chronic low back pain

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
Hagen, 2012⁴¹	<ul style="list-style-type: none"> • Overview of SRs • 9 Included SRs (224 included trials) • Patients with musculoskeletal conditions (including low back pain) • N = 24,059 	<ul style="list-style-type: none"> • Exercise therapy 	<ul style="list-style-type: none"> • Not specified in abstract 	<ul style="list-style-type: none"> • Pain • Function 	<ul style="list-style-type: none"> • Exercise therapy demonstrated a positive effect for pain and function in patients with low back pain
Kristensen, 2012⁴²	<ul style="list-style-type: none"> • Number of included studies was NR • Rehabilitation patients with various musculoskeletal conditions (including chronic low back pain) • N = 1,545 	<ul style="list-style-type: none"> • Resistance training 	<ul style="list-style-type: none"> • Not specified in abstract 	<ul style="list-style-type: none"> • Muscle strength • Pain • Functional ability 	<ul style="list-style-type: none"> • Resistance training increased muscle strength, reduced pain, improved functional ability
Lillios, 2012⁴³	<ul style="list-style-type: none"> • Number of included studies was NR • Pregnant women with low back or pelvic girdle pain • N = NR 	<ul style="list-style-type: none"> • Core and lower extremity strengthening 	<ul style="list-style-type: none"> • Control • Alternate intervention 	<ul style="list-style-type: none"> • Pain • Adverse events 	<p><i>“Although all the studies reported reduction in symptoms, there is no conclusive evidence to support exercise as a superior intervention for the treatment of pregnancy-related low back pain and pregnancy-related pelvic girdle pain”⁴³</i></p>
Pereira, 2012⁴⁴	<ul style="list-style-type: none"> • MA performed • 5 included studies • Adults with non-specific chronic low back pain • N = 139 	<ul style="list-style-type: none"> • Pilates exercise 	<ul style="list-style-type: none"> • Control group (no exercise) • Lumbar stabilization exercise 	<ul style="list-style-type: none"> • Pain • Functionality 	<ul style="list-style-type: none"> • Pilates did not improve pain or functionality in patients with non-specific low back pain compared to control and lumbar stabilization exercise groups
Richards, 2012⁴⁵	<ul style="list-style-type: none"> • 4 included studies • Pregnant women with low back or pelvic pain • N = 566 	<ul style="list-style-type: none"> • Antenatal physical therapy (including exercise) 	<ul style="list-style-type: none"> • Not specified in abstract 	<ul style="list-style-type: none"> • Functionality 	<ul style="list-style-type: none"> • Exercise was found to improve functional outcomes

First Author, Year	Study Characteristics	Intervention(s)	Comparator(s)	Outcomes	Conclusions
Scharrer, 2012 ⁴⁶	<ul style="list-style-type: none"> • 2 included RCTs • Patients with subacute and chronic low back pain • N = 566 	<ul style="list-style-type: none"> • Medical training therapy 	<ul style="list-style-type: none"> • Placebo • No intervention • Other interventions 	<ul style="list-style-type: none"> • Pain • Functional status • Absenteeism 	<p><i>“There is moderate evidence that would support the effectiveness of medical training therapy in the treatment chronic low back pain. Future high quality RCTs will have to clarify whether medical training therapy is effective and would be superior to other forms of therapeutic exercise.”⁴⁶</i></p>

Abbreviations: AHRQ = Agency for Healthcare Research and Quality; MA = meta-analysis; NR = not reported; QoL= quality of life; qRCT = quasi-randomized controlled trial; RCT = randomized controlled trial; SOE = strength of evidence; SR = systematic review.

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No literature identified.

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Appendix — Further Information

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