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Review

Physical activity and low back pain: A critical narrative review

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A B S T R A C T

Background: Non-specific low back pain (LBP) is the leading cause of years lived with disability worldwide. Physical activity is an integral part of LBP treatment.
Objective: To critically review available evidence regarding the efficacy of physical activity for people with LBP.
Methods: Up to date critical narrative review of the efficacy of physical activity for the managment LBP. The process of article selection was unsystematic; articles were selected based on authors' expertise, self-knowledge and reflective practice.
Results: Therapeutic physical activity for LBP includes a wide range of non-specific and specific activities. The efficacy of physical activity on pain and activity limitations has been widely assessed. In acute and subacute LBP, exercise did not reduce pain compared to no exercise. In chronic low back pain (CLBP), exercise reduced pain at the earliest follow-up compared with no exercise. In a recent systematic review, exercise improved function both at the end of treatment and in the long-term compared with usual care. Exercice also reduced work disability in the long-term. We were unable to establish a clear hierarchy between different exercise modalities. Multidisciplinary functional programs consistently improved pain and function in the short- and long-term compared with usual care and physiotherapy and improved the long-term likelihood of returning to work compared to non-multidisciplinary programs.
Conclusion: Physical activity of all types is an effective treatment for CLBP.

Introduction

The scientific literature, national and international recommendations advocate physical activity for the treatment of the most frequent chronic musculoskeletal disorders [1,2].

The World Health Organization defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity includes exercise defined as a planned, structured, and repetitive activity that aims to maintenain or improve physical fitness [3]. Adapted physical activity (APA) is an integral part of the treatment of chronic low back pain (CLBP) and is widely recommended. The term "APA" is not widely used in the international scientific literature and scientific articles often refer to "exercise" or "exercise therapy". This generic term refers to a structured exercise program that may involve specific exercise or non-specific physical activity, or a combination of both. Specific exercises aim to reduce and/or prevent specific impairments and activity limitations related to the underlying musculoskeletal pathology (muscle weakness and hypoextensibility, joint stiffness, instability, etc.). One of the biological factors related to non-specific low back pain (LBP) is the lack of muscle strength, power and endurance [4,5]. CLBP has been associated with generalized deconditioning, including muscular (loss of strength and endurance of trunk muscles, and elasticity of thigh muscles), cardiovascular, functional and psychological impairments

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[6]. The aim of non-specific physical activity is to reduce and/or prevent non-specific impairments and activity limitations related to the chronicity of the disorder or to iatrogeny, such as fatigue, clinically significant symptoms of anxiety and depression, and the decrease in muscle strength, power and endurance that contributes to the deconditioning syndrome. Exercises usually focus on muscle strengthening and stretching, pelvic and spinal mobility, and proprioception, as well as improving aerobic capacity and overall fitness. These programs can be supervised by a rehabilitation or adapted physical activity professional, or unsupervised and take place in the person's living environment (home, sports club, associations, etc.).

The efficacy of physical activity on patient centered outcomes, i.e., pain and activity limitations, has been widely investigated in non-specific CLBP [7]. However, the optimal content of APA or exercise therapy programs remains unknown.

The objective of this study was to critically review available evidence regarding the efficacy of physical activity for people with LBP.

Methods

We conducted an up to date critical narrative review. The process of article selection was unsystematic. Selection of articles was based on language (English), authors' expertise, self-knowledge, and reflective practice. We focused on physical activity, exercise and functional restoration programs in LBP. We searched MEDLINE via PubMed from inception to December 2020 for guidelines, trials, systematic reviews and meta-analyses with the MeSH terms ``physical activity", "exercises" and "low back pain" combined into the following equation: "low back pain" and "exercises" or "physical activity". We were particularly interested in the systematic reviews and meta-analyses included in the latest American College of Rheumatology (ACR), European League Against Rheumatism (EULAR) and Osteoarthritis Research Society International (OARSI) guidelines. We also searched the reference lists of systematic reviews and meta-analyses for relevant articles. We used the Narrative Review Checklist of Academy of Nutrition and Dietetics (additional material) for reporting.

Results

Various APA modalities have been evaluated: non-specific physical activities such as mind-body interventions and walking, more specific physical activities such as motor control/ stability exercises, and multidisciplinary functional restoration programs (MFRPs) that include both non-specific and specific activity.

In a systematic review published in February 2017, Chou et al. included systematic reviews and randomized controlled trials (RCTs) that assessed the efficacy of conservative treatments in acute, subacute and CLBP, published up to November 2016 [8]. The authors identified 122 RCTs that evaluated exercise: 44 evaluated MFRPs, 2 evaluated Tai Chi and 14 evaluated yoga [8]. The comparisons were a placebo (or sham) intervention, no treatment, waiting list for surgery, usual care (defined as care left to the discretion of the general practionner) or another nonpharmacological intervention. Pain, function, return to work, and short-term (≤6 months) and long-term (≥1 year) adverse effects were assessed. Treatment effects were classified according to the standardized mean difference (SMD) and divided into 3 categories: small effect = SMD between 0.2 and 0.5, moderate effect = SMD between 0.5 and 0.8 and large effect = SMD >0.8 [8] (Table 1). Other reviews of interest focused on the effects of non-pharmacological treatments for acute and subacute LBP [9,10], on different modalities of physical activity for LBP, or specifically CLBP [11–19], and on work absenteeism and the ability to return to and remain at work [20–22].

Exercise therapy

The efficacy of exercise therapy has been extensively studied in LBP. The benefit of exercises for acute or subacute LBP has not been demonstrated [10,23]. In contrast, in CLBP, exercise reduced pain at the earliest follow-up compared with no exercise [23]. Compared with usual care, exercise improved function at both the end of treatment and in the long-term [24]. Exercice also reduced work disability in the long-term [25].

Three systematic reviews including 1993, 3957 and 4138 individuals respectively, were included in the systematic review by Chou et al [8].: a systematic review published in 2010 on the effects of exercise in short-, medium- and long-term CLBP (37 RCTs) [24], a systematic review published in 2010 on the effects of exercise on work capacity (23 RCTs) [25] and a systematic review published in 2013 on the effects of motor control exercises (16 RCTs) [26]. Chou et al. identified 51 additional RCTs [8]. The two 2016 Cochrane Group systematic reviews on motor control exercises [27,28] and the 2010 review on the value of exercises in preventing recurrence of LBP [29] were not included in the review by Chou et al [8].

In people with acute and subacute LBP, a recent systematic review with network meta-analysis (46 RCTs, 8765 participants) showed that, compared with an inert therapy (sham/placebo treatment or no treatment), exercise, heat wrap and manual therapy were the most efficient non-pharmacological treatments for the improvement of pain and disability [9]. Another systematic review of systematic reviews (24 systematic reviews, 11 RCTs, 1397 participants) found no clinically important difference between exercise therapy (whatever the type: general exercise therapy, stability exercises or McKenzie therapy) and other interventions (sham ultrasound, usual care, spinal manipulative therapy, advice to stay active, and an educational booklet) for people with acute LBP [10].

In people with CLBP, a meta-analysis based on individual participant data from 27 high-quality randomised clinical trials (3514 participants) showed that, compared with no treatment/usual care, exercise therapy reduced pain (mean effect= −10.7, 95% CI −14.1 to −7.4) and functional limitations (mean effect= −10.2, 95% CI −13.2 to −7.3) in the short-term (4 RCTs) [11]. Furthermore, the results showed a clinically relevant improvement [11]. Exercise reduced pain at the earliest follow-up compared with no exercise (but function did not improve) [23]. In a more recent systematic review with more stringent criteria, exercise compared with usual care reduced pain and improved function both at the end of treatment and in the long term [24].

Because of the high prevalence of LBP, the mean age of people affected and the high socioeconomic costs, return to work is one of the primary goals of treatment. A systematic review of 23 RCTs, 20 of which were subjected to meta-analysis, (comparisons of exercise interventions with usual care and of 2 different exercise interventions) showed that exercise (whatever the type) reduced work disability in the long-term (approximately 12 months) in subacute and CLBP [25]. A Cochrane review (5 RCTs, 1093 participants) assessed the efficacy of physical reconditioning, defined as graded activity with work-related exercises, on the duration oof sick leave compared to usual care in workers with acute, subacute and chronic LBP [30]. The results showed a probable small effect (SMD= −0.23, 95% CI −0.42 to −0.03) of intense physical reconditioning on the reduction of sick leave at 12 months for workers with CLBP [30]. The effectiveness of physical reconditioning on the duration of sick leave for people with acute or subacute LBP was uncertain [30].

Motor control exercises are based on a motor learning approach to restore optimal control and coordination of the spine by the deep trunk muscles [31]. Motor control stabilisation exercises or core-stability exercises aim to improve neuromuscular impariments that are involved in both the onset and chronification of non-specific LBP

Table 1
Efficacy and safety of physical activity in non-specific low back pain: key findings from the most recent systematic review (Chou et al., 2017).

Author, year Method	Condition	Numbers	Physical activity	Comparators	Outcomes	Safety
Chou et al., 2017 SR of SR +MA of RCTs	Acute low back pain: <4 weeks - subacute low back pain: from 4 to 12 weeks - chronic low back pain: >12 weeks	3 SR+MA from 1993 to 4138 patients	Exercises: 122 RCT MBR: 44 RCTs Tai Chi: 2 RCTs Yoga: 14 RCTs	Placebo No treatment Usual care Other non-pharmacological intervention (without PA)	Pain Function Return to work Side effects Short-term: ≤6 months Long-term: ≥1 year Treatment effects ranked by mean difference - weak: SMD from 0.2 to 0.5 - moderate: SMD de 0.5 to 0.8 - large: SMD >0.8	No major side effects Exacerbation of pre-existing symptoms

Efficacy (SR results)

Exercises vs no exercise	**MCE vs non-specific exercises**	**MFRP vs physiotherapy**
Chronic low back pain	Chronic low back pain	Chronic low back pain
Back pain short-term: WMD out of 100 (95% CI) 10.00 (1.31 to 19.09)	Back pain short-term: WMD out of 100 (95% CI) −7.80 (−10.95 to 4.65)	Back pain short-term: SMD (95% CI) −0.30 (−0.54 to −0.06)
Disability short-term: WMD out of 100 (95% CI) 3.00 (0.53 to 6.48)	Back pain middle term: WMD out of 100 (95% CI) −6.06 (−10.94 to 1.18)	Back pain long-term: SMD (95% CI) −0.51 (−1.04 to −0.01)
Exercises vs usual care	Function short-term: WMD out of 100 (95% CI) −4.65 (−6.20 to −3.11)	Function short-term: SMD (95% CI) −0.39 (−0.68 to −0.10)
Acute and subacute low back pain	Function long-term: WMD out of 100 (95% CI) −4.72 (−8.81 to −0.63)	Function long-term: SMD (95% CI) −0.68 (−1.19 to −0.16)
Back pain no difference	**MFRP vs usual care**	**Tai Chi vs no Tai Chi**
Chronic low back pain	Chronic low back pain	Chronic low back pain
Back pain short-term: WM out of 100 (95% CI) −9.23 (−16.02 to −2.43)	Back pain short-term: SMD (95% CI) −0.55 (−0.83 to-0.28)	Back pain short-term: MD out of 10 (95% CI) −1.3 (−1.9 to −0.7)
Back pain: WMD out of 100 (95% CI) −4.94 (−10.45 to −0.58)	Back pain long-term: SMD (95% CI) −0.21 (−0.37 to −0.04)	Function short-term: MD according to the RMDQ (95% CI) −2.6 (−3.7 to −1.1)
Function short-term: WMD out of 100 (95% CI) −12.35 (−23.0 to −1.69)	Function short-term: SMD (95% CI) −0.41 (−0.62 to −0.19)	**Yoga vs usual care**
Function long-term: WMD out of 100 (95% CI) −3.17 (−5.96 to −0.38)	Function long-term: SMD (95% CI) −0.23 (−0.40 to −0.06)	Chronic low back pain
Inability to work long-term: OR (95% CI) 0.66 (0.48 to 0.92)	Return to work long-term: OR (95% CI) 1.04 (0.73 to 1.47)	Back pain à W24: MV (SEM) −18.9 (2.52) vs −4.4 (2.08) out of 100 points
MCE vs minimal intervention	**MFRP vs no MFRP**	Back pain à M6: MV (SEM) −15.7 (3.25) vs −2.7 (2.25) out of 100 points
Chronic low back pain	Chronic low back pain	Function à W24: MV (SEM) −8.3 (1.82) vs −2.3 (1.09), ODI score out of 100
Back pain short-term: WMD out of 100 (95% CI) −12.48 (−19.04 to −5.93)	Back pain short-term: SMD (95% CI) −0.73 (−1.22 to −0.24)	Function à M6: MV (SEM) −7.0 (2.17) vs 0.4 (1.44), ODI score out of 100
Back pain long-term: WMD out of 100 (95% CI) −13.32 (−19.75 to −6.90)	Function short-term: SMD (95% CI) −0.49 (−0.76 to −0.22)	**Yoga vs patient education**
Function short-term: WMD out of 100 (95% CI) −9.00 (−15.28 to −2.73)	Return to work long-term: OR (95% CI) 1.87 (1.39 to 2.53)	Chronic low back pain
Function long-term: WMD out of 100 (95% CI) −6.64 (−11.72 to −1.57)		Back pain short-term: SMD (95% CI) −0.45 (−0.63 to −0.26)
		Function short-term: SMD (95% CI) −0.45 (−0.65 to −0.25)
		Function long-term: SMD (95% CI) −0.39 (−0.66 to −0.11)

CCI: confidence interval; MCE: motor control exercises; RCTs: randomized controlled trials; MFRP: Multidisciplinary Functional Restoration Program, M: months; MA: meta-analysis; MD: mean difference; MV: mean variation; PA: Physical Activity; ODI: Oswestry Disability Index; OR: odds-ratio; RMDQ: Roland Morris Disability Questionnaire; SEM: standard error of the mean; SMD: standardized mean difference; SR: Systematic Review; W: weeks; WMD: weighted mean difference.

[28]. The efficacy of such exercise has been mainly assessed in people with CLBP. Compared with minimal intervention, motor control stabilisation exercises reduced pain in the short- (2 RCTs) and long-term (2 RCTs) and improved function in the short-term (3 RCTs) in CLBP [26]. The effects of motor control exercises were also compared with more general exercises. Motor control exercises reduced pain in the short- (6 RCTs) and medium-term (3 RCTs), although the effects were not sustained in the long-term, and improved function in the short- (6 RCTs) and long-term (3 RCTs) [26]. A recent meta-analysis (2 controlled trials and 8 RCTs, 1081 participants) showed a short-term positive effect of motor control exercise on pain (SMD=−0.46, p<0.001) and disability (SMD=−0.44, p<0.001) in people with CLBP when compared to an active or passive control treatment [12].

The value of exercises performed after the initial episode of LBP to prevent recurrence was evaluated in a Cochrane review published in 2010 [29]. Compared with no intervention, exercise reduced the 1-year recurrence rate (odds ratio [OR] 0.50, 95% CI 0.34 to 0.73) as well as the 1.5- to 2-year recurrence rate (SMD= −0.35, 95% CI −0.60 to −0.10) with a moderate level of evidence, and reduced the number of days of sick leave within 1.5−2 years of the initial LBP episode (SMD= −4.37 days, 95% CI −7.74 to −0.99) with a low level of evidence. Results regarding the benefits of exercise performed during the LBP episode to prevent recurrence were discordant [29]. A recent network meta-analysis (40 RCTs) showed that both exercise combined with education (OR: 0.59, 95% CI 0.41−0.82) and exercise alone (OR: 0.59, 95% CI 0.36−0.92) prevented LBP episodes and that both exercise combined with education and education alone had large areas under the curve (surface under the cumulative ranking (SUCRA) = 81.3 and 79.4, respectively) [20]). Additionally, exercise (OR: 0.04, 95% CI 0.00−0.34 prevented LBP-associated work absenteeism [20].

The different exercise modalities have not been sufficiently compared to establish a clear hierarchy. Moreover, a systematic review of 100 randomly selected studies, highlighted the poor reporting quality of exercise interventions for LBP [32]. A recent systematic review (18 RCTs, 1719 participants) that compared the efficacy of region-specific exercises to general exercise in adults with musculoskeletal disorders found no differences between the approaches in terms of pain reduction and disability [13]. Nevertheless, a network meta-analysis of 89 studies including 5578 participants with CLBP compared the efficacy of different modes of exercise training on pain, trunk muscle strength, physical function and mental health [14]. When compared with a true control, Pilates had the highest probability of reducing pain (SUCRA=100%; pooled SMD= −1.86, 95% CI −2.54 to −1.19) and resistance and stabilisation/motor control exercises had the highest probability of improving physical function (SUCRA=80%; −1.14 95% CI −1.71 to −0.56 and SUCRA=80%, −1.13 95% CI −1.53 to −0.74, respectively [14].

Multidisciplinary functional restoration programs

The concept of a physical deconditioning syndrome in people with CLBP was developed by Tom Mayer in the 1980s [33]. Physical deconditioning occurs after 4 to 6 months of physical inactivity. It involves a combination of a loss of spinal mobility, a reduction in muscle strength, power and endurance, and the psychosocial repercussions of LBP. MFRPs combine specific exercises, general physical activity, therapeutic education and psychosocial care and aim to restore the physical, psychosocial and socioeconomic situation of people with CLBP by involving them in an active care process. MFRPs involve multidisciplinary management, and are a form of multidisciplinary biopsychosocial rehabilitation (MBPSR).

The main indications for MBPSR are subacute and CLBP for which all other medical or surgical treatments have failed or have been rejected. In people with subacute, acute or CLBP, MBPSR reduced pain and improved function compared with usual care or physical therapy. It also increased the likelihood of return to work in the long-term compared with a non-multidisciplinary biopsychosocial program [34−36]. In contrast, there was no difference in the likelihood of return to work when compared with usual care [34−36]. In people with CLBP, MBPSR achieved short-term pain reduction compared with usual care, no multidisciplinary management or physical therapy [34]. MBPSR also provided a short-term improvement in function (Table 2).

MFRPs last between 3 and 6 weeks and include a follow-up period after the program. These multidisciplinary programs are designed for small groups of individuals (between 4 and 8). They include intensive physical and ergonomic care, psychosocial support and sometimes ergonomic and/or social action in the workplace. A distinction must be made between intensive programs of at least 100 h and semi-intensive programs. The common component is physical exercise (10 −40 h per week). Exercises include stretching, muscle strengthening and aerobic training. The main differences between the programs are in the muscle strengthening modalities: isotonic (when the force generated by the muscle is greater than the resistance), isometric (at constant muscle length) or isokinetic (at constant speed). The originality of MFRPs is the progression by contract: pain should not be considered as a limiting factor and exercises should be performed without considering pain. Pain is treated with classic analgesics or medications specific to chronic pain. The intensity and the number of repetitions of each exercise are determined according to tests carried out at the beginning of the program and at the end of each week and are gradually increased. Occupational therapy focusing on ecological situations is systematically provided. Psychological support can be provided individually and/or in groups and interviews with social workers are always proposed. These programs can be carried out on

Table 2
Multidisciplinary biopsychosocial management compared to different types of management (Kamper et al., 2014).

Type of management	Efficacy Pain	Function	Work
Usual care	Short-term 9 RCTs. SMD −0.55, 95% CI (−0.83 to −0.28) Long-term 7 RCTs. SMD −0.21, 95% CI (−0.37 to −0.04)	Short-term 9 RCTs. SMD −0.41, 95% CI (−0.62 to −0.19) Long-term 6 RCTs. SMD −0.23, 95% CI (−0.40 to −0.06)	Long-term 7 RCTs. OR 1.04, 95% CI (0.73 to 1.47)
Waiting list	Short-term 3 RCTs. SMD −0.73, 95% CI (−1.22 to −0.24)	Short-term 3 RCTs. SMD −0.49, 95% CI (−0.76 to −0.22)	
Physiotherapy	Short-term 12 RCTs. SMD −0.30, 95% CI (−0.54 to −0.06) Long-term 9 RCTs. SMD −0.51, 95% CI (−1.04 to −0.01)	Short-term 13 RCTs. SMD −0.39, 95% CI (−0.68 to −0.10) Long-term 10 RCTs. SMD −0.68, 95% CI (−1.19 to −0.16)	Long-term 8 RCTs. OR 1.87, 95% CI (1.39 to 2.53)

OR: odds-ratio; RCTs: randomized controlled trials; SMD: standardized mean difference.

an in-patient basis, which allows the person to be taken out of their usual environment, or in the day hospital, which allows them to return to their professional situation. Participants are encouraged by the provision of feedback on their progress.

The minimum duration of LBP or sick leave necessary before being prescribed MFRP has not been clearly defined. These programs are primarily proposed to severely disabled individuals of working age, whose physical and psychosocial situation has led to physical deconditioning and a loss of socioprofessional life. The benefits of functional rehabilitaion in people who are not working has not been assessed. Cardiorespiratory contraindications must be verified by an exercise test before beginning MFRP.

The review by Chou et al [8]. identified 44 RCTs that assessed the efficacy of this type of program in CLBP: 41 RCTs (6858 participants) included in a Cochrane meta-analysis published in 2014 [34] and 3 additional RCTs. The ability to return to and maintain work is the most clinically relevant endpoint for evaluating the efficacy of this type of program. Although most studies reported a positive effect of MFRP with return-to-work rates of 32% and 73% at 1 and 2 years respectively, the results depend on the social welfare system of the country. A study carried out in 6 different countries (Denmark, Germany, Israel, Sweden, the Netherlands and the United States) in people with CLBP who had been off work for at least 90 days, showed that the therapeutic management strategy (whatever the type) is not predictive of the participant's professional and functional status at 2 years. There are large disparities between countries regarding treatment (6% of participants underwent surgery on in the first year in Sweden compared with 32% in the United States) and regarding the rate of return to work at 1 year (32% in Denmark compared to 73% in the Netherlands) [37]. In France, the rate of return to work after MFRP is between 65 and 70% [38]. Three factors are particularly predictive of returning to and remaining at work: 1/ the goal of returning to work 2/ the intention of returning to work and 3/ the expectation of returning to work. These 3 factors correspond to what Anglo-Saxon authors refer to as the individual's attachment to his or her work and employer prior to the work accident. The intention not to return to the job that precedes a work injury is a negative risk factor for the effectiveness of MFRP. Similarly, people who express little hope of returning to work adhere less to MFRP than those who truly wish to return. The addition of return-to-work facilitation procedures such as returning part-time or adaptation of the job could improve these outcomes [21–22,39]. Employees who are given a facilitation program are twice as likely to return to work than those who are not and their number of days off work is more than halved.

Tai Chi, Yoga, Pilates and walking

Tai-Chi, Yoga and Pilates are mind-body interventions that are a group of healing techniques that enhance the mind's interactions with bodily function [15]. They are mainly used for people with CLBP. Compared with no exercise, yoga improves function in the short- and intermediate-term [40]. Compared to walking, yoga seems to reduce pain and activity limitation more in the short-term but less in the intermediate-term [17].

In the systematic review by Chou et al [8]., 2 RCTs of acceptable quality evaluated the efficacy of Tai Chi in CLBP (Table 1). They included 160 and 320 participants respectively and showed that Tai Chi reduced pain at the end of the program compared with no treatment or no Tai Chi [41,42]. The first RCT also showed improved function at the end of the program [41]. Another systematic review [16] included 2 additional Chinese-language RCTs that evalauted the efficacy of Tai Chi at 24 [43] and 28 [44] weeks. The results of these studies showed a reduction in pain in the Tai Chi group at the end of treatment (SMD=−0.81, 95% CI −1.11 to −0.52) [16].

In the systematic review by Chou et al., 14 RCTs evaluated the efficacy of yoga in CLBP [8] (Table1): 10 RCTs (1056 participants) that were included in a systematic review published in 2013 [45] and 4 additional RCTs. Compared with usual care, yoga reduced pain at 24 weeks and at 6 months and improved function at 24 weeks [40]. Compared with exercise, yoga was associated with reduced pain and improved function, however the effects were small and were not always significant [45–49]. Compared with therapeutic education, yoga was associated with short-term (5 RCTs), but not long-term pain reduction and short- (5 RCTs), and long-term (4 RCTs) improvement in function [50]. In a review published in 2017, the Cochrane Group [17] included 12 RCTs (1080 participants) and found results similar to those of Chou et al [8]. Compared with no exercise (9 RCTs, 810 participants), yoga provided small to moderate improvements in function at 3 to 4 months (SMD= −0.40, 95% CI −0.66 to −0.14) and at 6 months (SMD= −0.44, 95% CI −0.66 to 0.22) and small improvements at 12 months (SMD= −0. 26. 95% CI −0.46 to −0.05). It also reduced pain between 3 and 4 months and at 6 and 12 months, although the reduction did not reach the minimum clinically important change (20 mm on a scale of 0 to 100 mm) [17,51]. The risk of exacerbation of LBP was higher in the yoga group (6 RCTs, risk difference 5%, 95% CI 2% to 8%) [17]. Compared with exercise (4 RCTs, 394 participants), yoga resulted in little or no improvement in function at 3 months (SMD= −0.22, 95% CI −0.65 to 0.20) and 6 months (SMD= −0.20, 95% CI −0.59 to 0.19) but reduced pain at 7 months (SMD= −20.40 of 100, 95% CI −25.48 to −15.32) [43]. There were no differences regarding adverse events (3 RCTs, 1% risk difference, 95% CI −4% to 6%) [17]. Finally, when yoga was combined with exercise and compared with exercise alone (1 RCT, 24 participants), there was little or no improvement in function at 10 weeks (SMD= −0.60, 95% CI −1.42 to 0.22) or pain (SMD= −3.20 of 100, 95% CI −13.76 to 7.36) [43]. The authors concluded that, compared with no exercise, yoga resulted in a small to moderate improvement in function at 3 and 6 months with a low to moderate level of evidence [17]. A recent meta-analysis (31 RCTs, 3193 participants) compared the efficacy of yoga and walking on pain and activity limitation and found that yoga was more effective in the short- and intermediate-term [18].

Data from the literature regarding the benefits of Pilates in CLBP were synthesized in a Cochrane Group systematic review published in 2015 (10 RCTs, 510 participants) [19]. Compared with minimal intervention, Pilates provided short-term (<3 months) (7 RCTs, mean difference [MD] −14.05 out of 100, 95% CI −18.91 to −9.19) and medium-term (between 3 and 12 months) pain reduction (2 RCTs, MD −10.54 of 100, 95% CI −18.46 to −2.62) and improved function in the short- (5 RCTs, MD −7.95, 95% CI −13.23 to −2.67) and medium-term (MD −1.17, 95% CI −18.41 to −3.92). Data from the 4 RCTs comparing Pilates with exercise could not be analyzed in a meta-analysis because of the high level of heterogeneity. Only 2 RCTs evaluated adverse effects: 1 RCT found no adverse effects and 1 RCT reported only minor adverse effects [19].

Walking, by definition, is a form of general exercise. Data from the literature regarding the benefits of walking as a therapeutic intervention for CLBP were synthesized in 2010 in a systematic review without meta-analysis [52]. Only 4 studies were included: 2 RCTs [53,54], 1 cohort study [55] and 1 case-control study [56]. Three studies suggested that walking resulted in pain reduction with a low to moderate level of evidence.

Safety was poorly described in the majority of RCTs. No serious adverse effects were reported for any type of APA. The most common adverse effect reported was worsening of preexisting symptoms.

Conclusion

According to the results of our critical narrative review, physical activity should be strongly recommended as part of the management of CLBP. Consistent evidence showed that general exercise, specific exercise interventions and multidisciplinary functional restoration programs reduced pain and improved physical function in people with CLBP. Exercise reduced pain in the short-term, compared with no exercise, improved function both at the end of treatment and in the long-term compared with usual care, and reduced work disability in the long-term. Exercise was also useful after an episode of LBP to prevent recurrence, reduce the number of recurrences and to reduce the number of days off work in the two years following the initial episode of LBP. MFRPs reduced pain and activity limitation in the short- and long-term compared with usual care and physical therapy and reduced the number of days off work compared with a non-multidisciplinary program in the long-term. The optimal delivery of physical activity still has to be clearly defined in terms of modalities, quantity and intensity of the intervention, supervision, and setting. The benefits of physical activity in acute and subacute LBP have not been demonstrated. Further RCTs should take into account the biological, psychological and social dimensions of LBP, factors relating to poor functional prognosis and risk factors for social and professional disengagement in order to provide optimal, individualized treatment.

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Supplementary materials

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