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The role of daily physical activity in preventing low back pain

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Abstract

Low back pain (LBP) is a common disease in developed countries that places a substantial financial burden on healthcare systems. As many as 60–80% of the US population suffers from LBP over their lifetime, and although symptoms usually disappear within a few weeks of onset, their recurrence rate is high. In recent years, its significance to human health has gained increasing attention from the World Health Organization (WHO). LBP prevention guidelines recommend physical activity as one of the key countermeasures, with evidence indicating that it is crucial for primary and secondary prevention. According to many authors, combining moderate-intensity exercise and education programmes should be the first-line approach to preventing LBP. The current work provides a narrative review of physical activity in LBP prevention, outlines its role in protecting people from the occurrence (primary prevention) and recurrence (secondary prevention) of LBP symptoms, and suggests future research directions.
Key words: low back pain, prevention, physical activity, treatment

Introduction

Low back pain (LBP) is a widespread health problem in developed countries, is the fifth most common cause of doctor visits, and is a significant challenge for public health systems. In the US alone, 60–80% of the population is affected by LBP during their lifetime. Acute LBP symptoms usually occur in people aged 20–40 years, and although 40–90% of patients recover within six weeks of onset, the recurrence rate is high. LBP persisting longer than 12 weeks is classified as a chronic condition involving a risk of sleep problems, depression, anxiety, and disability [1]. Indeed, LBP is the leading cause of years lived with disability (YLDs) globally and presents a substantial challenge for primary care [2, 3].

On June 19, 2023, the World Health Organization (WHO) published an LBP fact sheet citing data from a systematic analysis of the Global Burden of Disease (GBD) Study 2021 published in Lancet Rheumatol [4, 5]. Prepared by the GBD 2021 Low Back Pain Collaborators, the article discussed the LBP burden at global, regional, and national scales from 1990 to 2020, LBP risk factors, and 2050 prevalence projections. The authors estimated that 619 million people suffered from LBP globally in 2020, with the number likely reaching 843 million by 2050, primarily due to population growth and ageing.

A natural consequence of LBP being the leading cause of disability globally is that no other patient group is more in need of rehabilitation for recovery. LBP risk increases with age to 80 and is the highest for those between 50 and 55. As many as 90 % of patients present with non-specific LBP, which can impair their mobility and lower quality of life (QoL) and well-being, limiting their ability to work and participate in family and social life. LBP contributes to work productivity loss, and its prevalence makes it a significant challenge for individuals and economies, warranting an appropriate response. According to Fereira et al. [5], using physical therapies to improve muscle strength and mobility and encouraging patients to return to or engage in physical activity (PA), adopt a healthier diet, and get enough sleep could effectively manage LBP.

The aetiology and clinical evaluations of LBP are classified using various systems created by neurologists, neuroradiologists, neurosurgeons, orthopaedists, rheumatologists, physiotherapists, psychologists, biomechanists, etc. Supported by statistical data and expert judgments, they allow for the evaluation of LBP mechanisms and symptoms, as well as psychological, social, professional, and occupational impacts [6].

Following the WHO's growing interest in how PA influences human health, they published a Global Action Plan on Physical Activity (GAPPA) 2018–2030 to promote active lifestyles [7], as well as a special issue of the British Journal of Sports Medicine and numerous scientific articles on PA benefits. The WHO PA guidelines presented by Bull et al. [8] in 2020 recommend that adults engage in 150–300 min of moderate exercise or 75–150 min of vigorous exercise per week or engage in equivalent PA. The guidelines also stressed that regular muscle-strengthening exercise and avoiding a sedentary lifestyle benefitted human health regardless of age and circumstances, but sedentary lifestyle criteria were not provided [8].

Wanjau et al.'s [9] systematic review of studies and an analysis of life tables conducted to evaluate the burden of osteoarthritis (OA) and LBP in Australia showed that the conditions were probably related to PA levels. Assuming that such causality exists, their model projected that meeting the 2025 WHO global target for PA would reduce the OA and LBP burden over the next 25 years by 70,000 and more than 11,000 prevalent cases, respectively. Over the lifetime of the current Australian population, 672,814 health-adjusted life years (HALYs) for OA (27 HALYs per 1,000 persons) and 114,042 HALYs for LBP (5 HALYs per 1,000 persons) could be gained. The HALY gains would be 1.4 (OA) and 11 (LBP) times greater if the 2030 WHO global target for PA and the Australian PA guidelines were met [9].

The following two sections discuss the role of PA in preventing LBP occurrence in healthy people (primary prevention) and its recurrence in LBP patients (secondary prevention).

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Physical activity in primary lower back pain prevention

In the USA, only upper respiratory problems rank higher than LBP as a reason for medical consultations [10]. LBP symptoms, which usually appear for the first time between the ages of 20 and 40, dissipate within a few weeks of onset in most cases, with 40–90% of people recovering within six weeks [2]. Unfortunately, LBP tends to develop into a chronic condition with recurrent symptomatic episodes. A meta-analysis by da C Menezes Costa et al. evaluated data from 33 cohorts (with 11,166 participants) examined in terms of the prognosis of acute and persistent LBP. The variance-weighted mean pain scores for cohorts with acute pain were 52 at baseline, 23 at week six, 12 at week 26, and six at week 52 after pain onset (the maximum score was 100). For cohorts with persistent pain, the scores were 51 at baseline, 33 at week six, 26 at week 26, and 23 at week 52. After the first six weeks, during which the patient's condition significantly improved, the rate of improvement slowed. Low to moderate levels of pain and disability persisted at one-year follow-up, especially in those reporting chronic pain [11].

Deyo and Philips divided patients with non-specific LBP into two groups based on the medical assistance they needed. They found that most patients needed reassurance, as their condition was almost certain to improve. However, about 20% of patients were likely to develop chronic LBP and had complex psychosocial and occupational problems that needed to be addressed [3].

LBP prevention methods are well discussed in the literature, including European studies [12]. Among the wealth of recommendations on how to avoid LBP, particularly notable are those relating to risk factors, such as a sedentary lifestyle, overweight and obesity, that increase axial loads and lengthen the lever of trunk force. Other risk factors include limited PA and exercise, sudden twisting movements, repetitive movements, frequent overloading of one side of the spine, prolonged immobilisation, risky PA behaviours (omitting warm-ups, lifting heavy weights, especially without bending of the knees and hip joints, and lifting objects too quickly or too slowly), working long hours in an unnatural posture (e.g., frontal tilt), sitting, sitting in an unnatural posture for a long time, and frequent exposure to shocks and vibrations. The adverse effects of some of these factors can be mitigated by ergonomic chairs, armchairs with handrails that reduce pressure on the lower lumbar vertebrae, and isometric exercises that strengthen the abdominal and torso muscles. In women, a risk factor for lumbar-sacral pain is pregnancy, which increases body mass and stretches the abdominal cavity. Pregnant women can, therefore, benefit from exercises that strengthen the spine and stabilise its muscles, such as those performed during antenatal classes [12].

De Campos et al. [13] performed a systematic review and meta-analysis of 27 reports from 25 trials involving 8,341 participants to assess strategies used to mitigate the consequences of LBP. Moderate-quality evidence from the pooled results of three randomised controlled trials (RCTs) with 12 participants showed the ability of exercise programmes to make future LBP symptoms less severe, and the same-quality evidence from four RCTs with 471 participants pointed out that an exercise and education programme could help prevent LBP-related disability. However, the overall quality of evidence from the reports was low or very low, making it impossible for Campos et al. [13] to determine whether LBP patients' QoL and ability to work could be improved by prevention programmes in the long term. Consequently, the researchers suggested that more high-quality RCTs were needed to reliably evaluate the effectiveness of programmes intended to protect LBP patients from the consequences of their condition [13].

Hernandez-Lucas et al. [14] created a back school-based intervention for treating and preventing back pain in adults, consisting of an exercise and education programme. A quasi-experimental study with 56 healthy adults showed that the programme contributed to greater strength and flexibility of the lower spine, increasing its functionality. It also reduced the number of doctor consultations relating to LBP in the post-intervention year [14].

In 2017, Shiri and Falah-Hassani [15] published the results of a systematic review and meta-analysis of 36 studies involving 158,475 participants, which they performed to determine how leisure-time PA influences non-specific LBP. According to their findings, participation in sports or other recreational PA in the past month or 6–12 months reduced the risk of frequent and chronic LBP. The risk was lowered by 11% in moderate or very active people, 14% in moderately active people, and 16% in very active people compared with those who did not exercise regularly. Accordingly, Shiri and Falah-Hassani [15] estimated the reduction in the risk of chronic LBP related to leisure PA at 11 to 16%. The limitations of the studies they included in their review require this conclusion to be interpreted with caution, but were it validated by future research, the implications of this effect size for public health would be immense [15].

Physical activity in secondary low back pain prevention

The number of studies dealing with PA in secondary LBP prevention is relatively smaller. Having searched the Cochrane Database, Choi et al. only found 13 reports from nine studies with nine interventions for their systematic review of exercises used in preventing LBP recurrence, four of which, with 407 participants, evaluated post-treatment exercise programmes, and five, with 1,113 participants, examined exercise as a form of therapy. Four studies had a low risk of bias, and it was unclear for the other studies. According to moderate-quality evidence from the studies, post-treatment exercise programmes were more effective in reducing the rate of LBP recurrence one-year post-intervention, and the same-quality evidence from two studies showed significantly fewer recurrences at six to twenty-four months after the intervention. Very low-quality evidence pointed to subjects participating in post-treatment exercises having fewer sick leave days after six to twenty-four months. However, the effectiveness of exercise programmes in reducing the number of LBP recurrences or its recurrence rate was supported by conflicting evidence. Overall, Choi et al. [16] postulated that more studies looking at the measurement validity of LBP recurrences and the effectiveness of post-treatment exercise were needed.

Ribaud et al.'s [17] extensive systematic review of studies found that, despite physical exercise being widely recommended as part of LBP rehabilitation programmes, some patients did not know whether or not they could continue to be physically active, and others were hesitant about resuming or engaging in sports or recreational activity. A database search yielded a set of 2,583 grade 1–4 reports published in English or French between 1990 and 2011, of which only 13 met the review criteria. The results of the analysis showed that moderate-intensity PA, such as swimming, walking, and cycling, helped LBP patients stay fit and control pain, but they were too inconsistent to determine which specific activities could

be safely pursued. Nevertheless, Ribaud et al. [17] managed to establish that sports and recreational physical activities other than ball games, such as tennis, horse riding, martial arts, gymnastics, golf, and running, could be harmlessly resumed or pursued at a lower intensity or a lower level of competition. Consequently, they concluded that moderately intense regular PA improved the performance of chronic LBP patients without exposing them to an increased risk of acute pain. However, they remarked that a return to sports may require adjustments, so it should be agreed upon between the patient's physiotherapist and personal coach [17].

Essman and Lin [18] reviewed studies investigating the effectiveness of walking, aerobic exercise, yoga, Pilates, and Tai Chi-based exercise programmes in LBP management. The review established that their efficacy was comparable and provided an overview of the benefits that personalised exercise programmes and appropriate counselling strategies can contribute to LBP prevention and management.

A 2018 report on LBP prevention and treatment presented by Foster et al. [19] on behalf of the Lancet Low Back Pain Series Working Group recommended a wide range of measures, including strategies for implementing best practices, redefining clinical pathways, integrating health and occupational interventions with a view to reducing work disability, reforming compensation and disability claims policies, as well as public health and prevention policies.

Gupta et al. [20] studied the device-measured PA and register-based sickness absence of 925 Danish employees for four years to formulate advice on LBP prevention and rehabilitation. They concluded that the risk of employees missing many workdays due to sickness could be reduced by adjusting PA advice to whether its purpose is LBP prevention or rehabilitation and specifying activity domain and intensity. Accordingly, employees with LBP should be recommended to spend more time undertaking light-intensity PA than moderate-to-vigorous-intensity PA and avoid moderate-to-vigorous-intensity recreational activities [20].

Pocovi et al.'s [21] systematic review and meta-analysis included 19 trials with 2,362 participants with chronic or recurrent LBP that assessed the effectiveness of walking, running, cycling, and swimming programmes in preventing or managing non-specific LBP. Low-certainty evidence indicated that, in the short (eight trials) and medium term (five trials), walking and running were less effective at reducing pain than interventions involving manual therapies, massage, heat, ultrasound, traction devices, etc. High-certainty evidence suggested they were also inferior at reducing disability in the short (eight trials) and medium term (four trials), although slightly more effective than limited or no intervention at reducing pain in the short (10 trials) and medium term (six trials), and disability in the short term (seven trials). However, data scarcity prevented the authors from drawing meaningful conclusions about the usefulness of cycling and swimming. They concluded that, even though walking and running were inferior to alternate interventions, they could be recommended over minimal or no intervention for managing chronic and recurrent LBP [21].

Quentin et al.'s [22] systematic review and meta-analysis included 33 studies with 9,588 patients and set out to assess the effect of home-based exercise on non-specific LBP. A reduction in pain intensity and functional impairment was only observed in participants who exercised at home and those who exercised at home and in other settings. Exercises stretching the trunk, pelvis, or legs made pain symptoms less severe, but relaxation and postural exercises did not influence their intensity. The most effective at reducing pain intensity proved to be supervised training, while yoga improved functional limitation. Insufficient data prevented Quentin et al. from making firm conclusions about the duration of training programmes and the individual sessions. The general conclusion from the review was that exercising at home could reduce pain intensity in LBP patients and mitigate functional impairments [22].

A systematic review and meta-analysis by Steffens et al. [23] focused on studies aiming to prevent LBP occurrence. Their search for pertinent articles yielded 6,133 publications, of which only 23 reports on 21 RCTs with 30,850 participants were included in the analysis. The reports presented moderately strong evidence that exercise and education programmes lowered the risk of LBP, as well as low-quality evidence of their relatedness to sickness absence. According to low to very low-quality evidence, exercise alone had the potential to lower the risk of LBP and sickness absence, and moderate to very low-quality evidence suggested that education alone was unlikely to prevent the occurrence of LBP and related sickness absence. Low to very low-quality evidence excluded the possibility of back belts reducing the risk of LBP episodes or sickness absence, and low-quality evidence found that shoe insoles did not protect against LBP. Steffens et al. [23] concluded that, compared to other interventions, exercise-only programmes, or programmes combining exercise and education, could effectively prevent LBP occurrence. However, the quality of evidence in the reviewed studies proved insufficient to determine the ability of education, training, or ergonomic adjustments to prevent LBP-related sickness absence [23].

Vadalà et al. [24] focused their analysis on 12 publications [seven RCTs and three non-randomised controlled trials (NRCTs)], one pre and post-intervention study [PPIS], and one case series [CS]) to determine the usefulness of PA for treating chronic LBP in the elderly. The studies had 686 participants and varied significantly regarding their design, intervention, and outcome variables. The authors [24] found a trend in post-treatment data, showing improvements in disability and pain. However, low-quality evidence, a high risk of bias, language-related problems, non-significant results in some studies, and a paucity of pertinent literature led to the conclusion that more solid evidence was needed to ascertain the effects of PA on chronic LBP in elderly patients.

Discussion

A sedentary lifestyle has many definitions, though it is generally described as the opposite of being physically active. According to Pate et al. [25], it is characterised by "activities that do not increase energy expenditure significantly above resting levels [such as] sleeping, sitting, driving, lying down, watching television, sitting in front of a computer [and] involve energy expenditure at the level of 1.0–1.5 metabolic equivalent units (MET)" [25]. A sedentary lifestyle should not be equated with insufficient PA (physical inactivity). Even if one gets enough PA, sitting for more than seven to 10 hours per day is detrimental to human health.

PA and exercise are understood to refer to the same phenomenon and are used interchangeably, but they have different meanings. The WHO definition of PA is the unclear explanation proposed by Caspersen et al. [26] in 1985, who described PA as "any body movement produced by skeletal muscles that leads to the expenditure of energy." Caspersen et al. [26] classified exercise as a subset of PA involving planned, organised, and repeatable activities undertaken with an ultimate or intermediate goal of improving or maintaining

physical fitness, understood as a set of health-related attributes and skills that can be measured using specific tests. PA in everyday life is classified based on where it is done (workplace, home) and its purpose (sport, physical conditioning). Strath et al. [27], who presented a PA assessment guide on behalf of the American Heart Association (AHA), concluded that PA had four dimensions, including (1) method or type, (2) frequency (every day, several times a week), (3) duration (e.g., 15 min, 30 min, 45 min, 60 min, 90 min), and (4) intensity (low, moderate, high).

In the AHA scientific statement presented by Fletcher et al. [28] in 2013, physical exercise was divided into relatively intense and absolutely intense. The criteria for the division were the maximum heart rate calculated from the table for age and MET (one MET corresponds to the amount of O^2 consumed at rest, calculated as 3.5 ml O^2/kg body weight/min, or 1 kcal/kg/hour, or 4.184 kJ/kg/hour). For instance, 50–69% of maximum heart rate and a MET of 3.0–5.9 indicates moderate exercise intensity, and 70–89% of maximum heart rate and a MET above six indicates severe exercise intensity. Everyday activities such as eating a meal and taking a shower have a MET of 1–1.5 and 3–3.5, respectively [28]. A systematic review of 137 studies led Hoy et al. to the conclusion that the population groups with the highest LBP prevalence were women and people aged 40–80. After adjusting for methodologic variation, they estimated the mean ± standard error of the mean (SEM) point prevalence at 11.9 ± 2.0 % and the one-month prevalence at 23.2 ± 2.9 %. Their concluding observation was that population ageing would probably increase the global proportion of people affected by LBP in the coming decades significantly. The authors encouraged the adoption of recent recommendations for a standard definition of LBP and a consultation on a recently developed tool for assessing the risk of bias in prevalence studies [29].

LBP tends to be a recurrent condition rather than a single episode. Due to its multiple adverse consequences, including burden, disability, and sick leave, it is a serious challenge for public health systems worldwide. Many LBP prevention guidelines promote programmes combining moderate-intensity exercise and education as the first-line measure against its symptoms. Indeed, research evidence confirms that PA is at the core of primary and secondary LBP prevention.

In December 2023, Verville et al. [30] published a systematic review of the advantages and disadvantages of structured exercise programmes for chronic primary LBP in adults. The review was based on RCTs retrieved from scientific databases comparing structured exercise programmes with placebo/sham, standard care, or no intervention (including comparator interventions for which an attributable effect of exercise could be isolated). Thirteen RCTs were synthesised with an overall low or unclear risk of bias. The evaluation of individual types of exercise (mostly very low-quality evidence) found that aerobic exercise and Pilates were associated with more pain reduction than intervention; the same was observed for motor control exercises and sham exercise. Meanwhile, mixed exercise and Pilates were associated with increased functional improvements compared to standard care, and no intervention and transient increases in minor pain were related to mixed exercise compared with no intervention and yoga compared with standard care. For other comparisons and outcomes, little or no difference was found. From this review, the authors concluded with moderate certainty that structured exercise programmes likely reduce pain and functional limitations in adults and older adults with chronic prolonged LBP [30].

Heneweer et al. [31] conducted a systematic review of thirty-six cohort or case-control studies published from 1999 to 2009 to examine the correlation between PA (in and outside the workplace) and LBP. Heavy workload, accumulating loads, and lifting frequency were found to involve a moderate to strong risk of LBP development, and flexed, rotated, and uncomfortable lumbar spine positions entailed a high risk of LBP symptoms. Results for leisure-time PA, sports, and exercise proved inconsistent. Heneweer et al. [31] concluded that there was a relationship between LBP occurrence and the nature and intensity of PA. However, given the variety of PA types and intensities and the fact that the final physical load is the sum of all activities, it is difficult to state beyond doubt which activity is the cause of LBP [31].

Future directions

The association between PA and LBP still raises many questions, and it seems that recommendations included in a comprehensive report by the International Paris Task Force on Back Pain are still valid. In the “Priorities for Research” chapter, signatories suggested assessing the impact of rest and maintaining activity in patients with LBP associated with sciatica, developing and evaluating functional scales with which it will be possible to assess the therapeutic success of each type of activity, developing and evaluating strategies related to prescribing activities for patients suffering from LBP along with assessing the results of therapy, assessing strategies related to maintaining activity or limiting rest in the workplace, examining the effectiveness of return to work as therapy (therapeutic return to work), incorporating basic concepts related to course prescriptions into medical school curricula and continuing medical education programmes, and incorporating basic sports medicine training into medical school curricula [32].

Among home exercise programmes, the Williams flexion exercises, designed to improve flexion of the lumbar vertebra and strengthen the gluteus and abdominal muscles while limiting lumbar extension [33], and the McKenzie extension exercises that emphasise motion with increased lumbar extension, are the most popular. Notwithstanding their popularity, few studies have compared the efficacy of the Williams or McKenzie exercises with placebo or each other. One must agree with the Dydyk and Sapras [34] opinion that home exercise programmes can be considered part of the standard of care for LBP, along with other conservative treatment options.

A very attractive, universal, and safe form of PA is Nordic Walking (NW). In a Saulicz et al. [35] study involving 40 people aged 29 to 63, four-week NW training improved physical fitness in participants with chronic LBP, significantly lessened their sense of disability, and improved their self-assessments of health.

Pocovi et al. [36] recently outlined a prospectively registered pragmatic RCT, which they called WalkBack. Designed as a multicentre study, WalkBack is intended to assess the effectiveness of a six-month progressive and individualised walking and education programme to prevent LBP recurrence, including cost-effectiveness. All participants will be followed up for at least 12 months, and the economic aspect of the programme will be evaluated in terms of disability-adjusted life years. The WalkBack trial will provide evidence of the effectiveness and cost-effectiveness of a walking intervention to prevent LBP recurrence [36].

Few reports compare LBP to body posture and movement patterns, particularly in physically active people and athletes. Koźlenia et al. [37] tested thirty-five elite male college athletes playing soccer, handball, and basketball and found that poor-quality movement patterns were associated

with lower agility [37]. Dinc et al. [38] implemented an exercise programme using a functional movement screen (FMS) and correctives in 67 young male athletes (14–19 years of age) from a Super League Football Club. After 12 weeks of exercise, the intervention group had a significant increase in total FMS scores, deep squats, hurdle steps, and trunk stability push-ups, and non-contact injury incidence was higher in the control group than in the intervention group. Based on these results, the authors concluded that periodic movement screening and proper corrections with functional training are valuable for creating better movement capacity, building physical performance, and more effective injury prevention [38]. Domaradzki et al. [39] studied body posture in 45 men aged 25.2 divided into three groups depending on the sport they practised, including a Kickboxing Group (KB), a Kickboxing and CrossFit Group (KBCF), and a CrossFit Group (CF). Among the kickboxers, the angle of the thoracolumbar region and the angle of inclination of the thoracolumbar and lumbosacral regions significantly increased compared to the other groups. The authors concluded that kickboxing can be a factor in increasing the risk of postural defects. Furthermore, CrossFit training had a beneficial effect on the shape of physiological curvatures of the spine in combat sports athletes [39].

Conclusions

LBP is a common disabling condition in developed countries characterised by a high rate of recurrence and an increased risk of sleep problems, depression, anxiety, disability, and sick leave. The association between daily PA and LBP is twofold. Indeed, inappropriate and excessive PA can cause LBP, but undertaking it intentionally while following recommendations can prevent pain recurrence.

Fundamental to primary LBP prevention is the teaching of basic anatomy, spine function, and biomechanics. Furthermore, advice on using the spine in a healthy manner on a daily basis and the need to avoid a sedentary lifestyle, being overweight, obesity, and risky PA behaviours is vital to avoiding back pain. In addition, walking, exercising, and engaging in other recreational activities in leisure time and as part of daily PA is also important.

Evidence indicates that PA contributes significantly to secondary LBP prevention, but should only be undertaken when there are no pain symptoms and after consulting with a personal coach. According to many authors, programmes consisting of moderate-intensity personalised exercises and education should be the first-line approach to secondary LBP prevention.

This narrative review has demonstrated that the quality of existing studies on LBP prevention is moderate. Therefore, more research using sophisticated study protocols is needed to advance our knowledge on the subject.

Ethical approval

The conducted research is not related to either human or animal use

Disclosure statement

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Conflict of interest

The authors state no conflict of interest.

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