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EFFECT OF STATIC STRETCHING EXERCISES IN NON- SPECIFIC CHRONIC LOW BACK PAIN: A LITERATURE REVIEW

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ABSTRACT

Introduction: Low back pain is a widespread and displeased pain that disables the patient to do his daily affairs and may lead to his hospitalization. So, it can create physical and mental problems and too much medical expenditure in itself. One of the most important suggested exercises are static stretching exercises that has proven effectiveness on improvement of low back pain. The goal of this study was to review the results obtained in previous studies on static stretching in low back pain. **Objective:** to find the effectiveness of static stretching exercises in non-specific chronic low back pain. **Material And Methods:** An electronic database search, title and abstract search was conducted between 2010 to at present using Google Scholar, PubMed, Physiotherapy Evidence Database (PEDro) and Cochrane database. The study was double checked and the review used only full-text papers. A total of 15 studies were chosen to investigate the effectiveness of static stretching exercises in non- specific chronic low back pain. **Result:** According to a data search from 2010 to at present roughly fifteen free full articles suggest that static stretching exercises are beneficial in improving pain, ROM and flexibility in non- specific chronic low back pain. **Conclusion:** According to the findings of this review study, static stretching exercises are safe and feasible and has been found to improve pain, ROM, flexibility, muscle strengthening in non- specific chronic low back pain. From a practical point of view, stretching exercises are an affordable and easily workable method with a good therapeutic effect in pain in the musculoskeletal system of a functional nature. Muscle spasm and muscle imbalance are positively influenced by the administration of stretching exercises.

KEYWORDS

INTRODUCTION:

Every person in the modern era leads a hectic life that stresses their body and is viewed as unimportant by humans. Over time, this tension builds up to the point where it primarily manifests as low back discomfort. Any complaints of acute or persistent pain and discomfort in or around the lumbar area are referred to as low back pain [1]. The lumbar spine creates a secure, moveable transition between the thorax and pelvis through the intricate interaction of neurovascular and musculoskeletal components. Throughout a person's lifespan, the lumbar region repeatedly bears heavy loads while still allowing for the movement required to carry out a variety of activities related to daily living [2].

Although it is widely known that low back pain is a very common health issue, its impact is sometimes dismissed. In many parts of the world, low back pain is the primary cause of activity limitation and missed work, and it has a significant financial impact on people, families, communities, businesses, and governments. Up until a decade ago, low back pain was primarily believed to be a Western-specific issue. Nevertheless, a growing body of research has indicated that low- and middle-income countries also experience significant problems with low back pain [3].

Low back pain can be classified as psychogenic, non-mechanical, or mechanical. Specific and non-specific mechanical pain are the two categories. A low back pain that lacks a specific disease or aetiology is known as non-specific low back pain. The location, duration, and intensity of non-specific low back pain might vary; it typically affects the lumbosacral, buttock, and thigh regions without radiating pain down the leg or foot. According to Hoe et al., of those reporting low back discomfort, between 85% and 95% had an unidentified pathoanatomical reason as a result the conclusion of the diagnosis is non-specific low back pain. The occurrence of low back pain is found to be influenced by a number of characteristics, including an individual's age, sex, body composition, education level, and occupation [4].

Risk factors for an episode of non-specific low back pain include physical risk factors (e.g., prolonged standing or walking and lifting heavy weights), an unhealthy lifestyle (e.g., obesity), psychological factors (e.g., depression and job dissatisfaction), and previous episodes of low back pain [5].

Despite the multifactorial aetiology, physical therapies that result in analgesic effects, such as stretching exercises, could be viable alternatives as non-pharmacological therapies for reducing pain intensity in individuals with LBP through biomechanical and neurophysiological mechanisms, besides improving body posture, musculoskeletal disorders, and muscle pain[6,7]. Changes in the connective tissue involving tendons, ligaments, and muscle fasciae caused by factors that directly influence the range of motion (ROM) of a joint (aging, work, immobilization, injuries, metabolism disorders, or nutritional deficiencies) can predispose an individual to LBP [8,9]. In addition, low levels of flexibility of passive muscle structures (tendons, ligaments, and fasciae) may be associated with LBP [10]. In conditions of LBP, the muscles become spasmodic even at rest and the accumulation of metabolites can cause irritation in the nerve endings of the area, generating reflex spasm and increased pain [10,11]. The treatment for chronic LBP may involve physical exercises, medication, injections, physical therapy treatment, and, as a last resort, surgical intervention [12,13].

Despite the existence of studies showing the positive effects of stretching exercises on LBP most of them combined these exercises with other therapeutic interventions and few of them evaluated stretching exercises alone [14,15,16,17,18,19]. Flexibility is an important physical capacity for health-related physical fitness, and it may be directly linked to body posture and musculoskeletal disorders [7,20]. This physical capacity can be evaluated using the maximum range of motion (ROM_{max}) achieved by one or more joints and it is usually trained in stretching exercises [20]. Such exercises can be performed with different possible organizations regarding the stretching techniques used, mainly passive-static, passive-dynamic, active-dynamic and proprioceptive neuromuscular facilitation (PNF) [20-23].

Mechanism of stretching: stretching exercises could reduce muscle tension on the nerve roots, thus minimizing LBP. Studies have shown a reduction of passive muscle stiffness in the resistance of the MTU to stretching and increased ROM_{max} [7,20,23]. The reduction in passive stiffness could result from the elastic deformation generated by the mechanical load of stretching exercises in the MTU structures, such as non-contractile intrasarcomeric proteins; intramuscular connective tissue, especially the perimysium; and extracellular matrix[24]

Static stretching (SS) is widely used in athletic, fitness, and clinical settings. It consists of a controlled continuous movement to the end range of motion (ROM) of a single joint or multiple joints where the

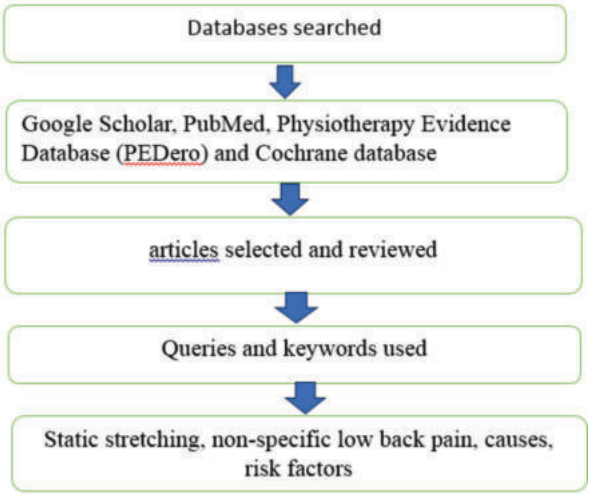
muscle(s) remains in a lengthened position for a specific period of time. Static stretching can be conducted by either contracting the agonist muscles (i.e., active static) or by using external forces such as gravity, the help of a partner, or stretching aids such as elastic bands (i.e., passive static). Generally, the main intended aims of SS are to increase ROM, mitigate injury incidence and improve athletic performance [25]

Keisuke Ohtsuki, et al in their study they found that the immediate changes in recovery of muscle tissue flexibility, decrease in pain and improvement in circulation following back exercises and direct stretching of Lower Back muscles, Tensor fasciae Latae, the Adductor Magnus and Hamstring muscle in Chronic Lower Back Pain [26]. The present study was aimed to review the results obtained in previous studies on static stretching in non -specific chronic low back pain.

OBJECTIVE- to find the effectiveness of static stretching exercises in non-specific chronic low back pain.

METHODS:

This review is a comprehensive search in international databases of Google Scholar, PubMed, Physiotherapy Evidence database (PEDro) and Cochrane was conducted to find results matching the keywords 'static stretching', 'non-specific low back pain', 'causes', 'risk factors' etc. The analysis excluded the data concerning the region other than low back pain. Finally, 15 peers reviewed studies were qualified. They described the etiology of low back pain, risk factors, mechanism of static stretching, inclusion criteria included studies on static stretching and non-specific low back pain published from the year 2010 to the present. Studies were prospective studies, retrospective studies, cross-sectional study, case- control studies, cohort studies, descriptive studies, correlational studies and review studies. Exclusion criteria included studies published before 2010. The main purpose of this review is to summarize the study about effectiveness of static stretching exercises in non-specific chronic low back pain. The following keywords were used in combinations: static stretching, non-specific low back pain, causes, risk factors.



Author	Groups	Title	Conclusion
Syeda Anum Riaz et al,2023 [27]	Group A or treatment group received conventional physiotherapy treatment as well a static stretching exercise Group B or control group received conventional physiotherapy treatment only	The effect of static stretching of hamstring muscle on the non-specific low back pain	There was a significant improvement in VAS, SFGD, Passive Straight leg Raise PSLR (right leg), PSLR (left leg) and level of disability pre- and post-treatment in the treatment group. This study concluded that static stretching of hamstrings is effective in decreasing non-specific low back pain
Siddhi V. Bhosle et al ,2021 [4]	two groups were divided as Control and Experimental group	Effectiveness of Myofascial Release, Muscle Energy Technique and Stretching of Quadratus Lumborum Muscle in Patients with Non-Specific Low Back Pain	The result of the study proved that there was extremely significant difference in improvement of pain, disability and functional assessment in Experimental group when compared to the Control group. This study concluded that the combined effect of Myofascial release, Muscle energy technique and stretching of Quadratus Lumborum has shown to be effective in treatment of patients with non-specific low back pain.
Mohammadreza Hatefi et al, 2021 [28]	Control (n=15) and experimental (n=15) groups. The experimental group received 3 stretch practice sessions per week for a period of 8 weeks	the effect of static stretching exercises on hip range of motion, pain and disability in patients with non-specific low back pain.	The results of demonstrated a significant difference in PROM, pain and disability after 8 weeks of stretching exercises in participants with NSLBP and limited hip extension.
Mohammad Bagher Shamsi et al,2020 [29]	Three groups: static stretching (n=15), strengthening exercises in lengthened hamstring position (n=15), control group (n=15)	Modelling the effect of static stretching and strengthening exercise in lengthened position on balance in low back pain subject with shortened hamstrings.	The results of study that based on GEE model, by controlling other variables, participants of static stretching exercise showed more improvement in balance than control group ($\beta = 9.58$, p-value = 0.014). The conclusion of study was that the static stretching exercise was more effective than muscle strengthening exercise in lengthened position.
Ekta Pandey et al, 2018 [30]	Group A: Group A (15 patients) received core stability warm up and spinal extension exercise. Group B (15 patients) received the same treatment line with addition of Quadratus Lumborum stretch.	The effect of stretching on Shortened Quadratus Lumborum in Non-Specific Low Back Pain.	This study concluded that there was significant difference between Group A and Group B on the basis of Oswestry low back pain Questionnaire, though there was no significant difference between Group A and Group B on the basis of VAS.
Lee JH et al, 2017 [14]	The subjects were divided into two groups: one group conducted hamstring stretches and the other group received nerve mobilization treatment	The treatment effect of hamstring stretching and nerve mobilization for patients with radicular lower back pain.	It was concluded that the patients with radicular lower back pain showed significant differences in pain level, pressure threshold, knee extension angle, and disorder index of lower back pain for both the hamstring stretching group and nerve mobilization group after the

			treatment. Hamstring stretching and nerve mobilization can be usefully applied for the therapy of patients with radicular lower back pain.
Hae-In Bae et al, 2017 [31]	static stretching group (control, n = 12) static stretching using a load group (experimental, n= 11)	The effects of static stretching using a load on TFL in patients with low back pain.	This study concluded that before and after the intervention, the experimental group showed significant differences in VAS, stand and reach test, and the ODI (P<0.05) in before and after the intervention. Therefore, static stretching using a load can be actively utilized for low back pain patients with shortened TFL.
Keane LG et al, 2017 [15]	Three groups, Land Based Stretching (N = 10), Aqua Stretch (N = 10) and Control (N = 9).	Comparing Aqua Stretch with supervised land-based stretching for Chronic Lower Back Pain	It was observed that in the Aqua Stretch group for pain reduction (P = 0.006), kinesiophobia (P = 0.029), and perceived disability (P = 0.001). Both techniques are suggested to be beneficial for CLBP patients however Aqua Stretch has key additional benefits including time efficiency, cost effectiveness.
Praveen Kumar et al, 2015 [32]	Three groups: group A, group B and group C group A : muscle energy technique and group B: PNF stretching and Group C: Static stretching	Efficacy of Muscle Energy Technique and PNF Stretching Compared to Conventional Physiotherapy in Program of Hamstring Flexibility in Chronic Nonspecific Low Back Pain.	The results showed that there is significant improvement by MET and PNF stretching in comparison of conventional group static stretching used in hamstring flexibility in significantly decrease pain in low back and increase active knee extension range of motion in hamstring flexibility in three groups. Therefore, it is concluded the MET, PNF and static stretching can be use as an effective therapeutic manoeuvre for decrease pain, improving ROM and increase flexibility of tight hamstring in chronic low back patient.
Priscila Lawand et al, 2015 [16]	Sixty-one patients with chronic low back pain were randomly allocated to either the GPR group or a control group. Patients in the GPR group underwent one weekly 60-minute session of GPR for a period of 12 weeks. The control group remained on the waiting list under drug treatment, with no physical intervention.	The effect of a muscle stretching program using the global postural re-education (GPR) method for patients with chronic low back pain.	The GPR group demonstrated statistical improvements (P < 0.05) in the VAS and RMQ as well as the pain, emotional aspects, limitation in physical functioning, vitality and mental health subscales of the SF-36 immediately after the intervention (three months), which were maintained through to the six-month evaluation. Based on the findings, a stretching program using the GPR method showed effective at improving pain, function, some quality-of-life aspects (emotional, limitations in physical functioning, vitality and mental health) and had no effect on depressive symptoms in patients with chronic low back pain
Fernanda Queiroz Ribeiro Cerci Mostagi, PT, MSc et al, 2014 [33]	two groups: the Pilates group (PG) (n = 11) and the general exercise group (GEG) (n = 11).	Pilates versus general exercise effectiveness on pain and functionality in non-specific chronic low back pain subjects	There were no differences between the groups. When analysed over time, the GEG demonstrated improvements in functionality between baseline and the end of treatment (P Z .02; Cohen's d Z 0.34) and baseline and follow-up (P Z .04; Cohen's d Z 0.31). There were no differences between the Pilates and general exercises with regard to pain and functionality in NSCLBP subjects but general exercises were better than Pilates for increasing functionality and flexibility.
Diogo Henrique Constantino Cole dam et al, 2012 [34]	four groups: male control group (MCG, n=15); male intervention group (MIG, n=14); female control group (FCG, n=15); and female intervention group (FIG, n=14). The FIG and MIG took part in a 16-week intervention program that consisted of six stretching exercises performed during the warm-up period of physical education classes	Chronic effect of static stretching performed during warm-up on flexibility in children	Static stretching during warm-up had a chronic effect of improving flexibility in the male and female intervention groups after 16 weeks. The results revealed a significant group × time interaction (F=1.54, p< 0.0001 The performance of stretching exercises during warm-up can increase flexibility in children.
França FR et al, 2012[18]	Two groups Group 1 (SS) and Group 2 (ST) In the segmental stabilization group (SS), exercises focused on the TrA and lumbar multifidus muscles, whereas in the stretching group (ST), exercises focused on stretching the erector spinae, hamstrings, and triceps surae.	Effects of muscular stretching and segmental stabilization on functional disability and pain in patients with chronic low back pain: a randomized, controlled trial.	It was demonstrated that both techniques improved pain and reduced disability. In this study, SS was superior to muscular stretching for the measured variables associated with chronic low back pain.

Maria Angélica Ferreira Leal Puppin et al, 2011 [17]	two groups: the Stretching Group (n=30) underwent stretching exercises twice a week; the Control Group (n=25) was subjected only to evaluation.	Stretching in non-specific chronic low back pain: a strategy of the GDS method	This study concluded that the sequence of stretching exercises used in the GDS method is effective in reducing pain, functional disability, and improving global flexibility in patients with non-specific chronic low back pain.
Karen J Sherman et al, 2011 [19]	Three groups: Yoga (92 patients) or conventional stretching exercises (91 patients) or a self-care book (45 patients).	A randomized trial comparing yoga, stretching, and a self-care book for chronic low back pain	It was concluded that Yoga classes were more effective than a self-care book, but not more effective than stretching classes, in improving function and reducing symptoms due to chronic low back pain, with benefits lasting at least several months.

DISCUSSION:

This review assessed the current evidence for static stretching exercises are effective in non-specific chronic low back pain. The aim of this review was to synthesize the effect of static stretching exercises in non specific chronic low back pain. The results of this review showed that static stretching exercises had a beneficial effect on improving pain, ROM, flexibility in non-specific chronic low back pain.

Stretching exercises as part of the rehabilitation process in lumbar pain. The stretching is a therapeutic method, included in medical rehabilitation. It is used to increase muscle length and joint volume, also to strengthen collagen fibres. The American College of Sports Medicine also recommends static stretching as part of a general fitness program. Gawda P et al also reports that selected techniques for stretching therapy improve the range of movement of the spine and reduce pain in patients with chronic nonspecific lumbar pain [35].

The stretching programs for CLBP patients that have been reported in the literature show that they are effective in reducing pain, improving functional condition and quality of life (emotional, limitations in physical functioning, vitality and mental health), accelerating the return to normal daily activity or even to work (Lawand et al., 2015; Gawda et al., 2015)[16,35]. A systemic stretching program focused on the back, trunk, thighs, hips and legs is effective in CLBP patients, and can be performed before and after other exercises, as part of prevention (Johnson, 2012; Niederer et al., 2018) [36,37]. Overall, the majority of included studies demonstrated that static stretching exercises significantly improved pain, ROM and flexibility in non-specific chronic low back pain.

CONCLUSION:

Current data indicate that static stretching exercises are safe and feasible and has been found to improve pain, ROM, flexibility, muscle strengthening in non-specific chronic low back pain. From a practical point of view, stretching exercises are an affordable and easily workable method with a good therapeutic effect in pain in the musculoskeletal system of a functional nature. Muscle spasm and muscle imbalance are positively influenced by the administration of stretching exercises.

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