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ROLE OF STATIC STRETCHING EXERCISES IN LOW BACK PAIN TO IMPROVE PAIN, ROM, STRENGTH: A REVIEW

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Abstract: A common medical condition that people deal with is Lower back pain. It is recognized as the main cause of disability in both developing and developed countries for all age groups. About 80% of patients—more often women than men—experience moderate to severe pain that limits their ability to go about their daily lives. As opposed to being an illness, lower back pain is a symptom. It can have a variety of causes, just like other symptoms like headache and dizziness. Low back pain is the most typical type of the condition. In both developed and developing nations, lower back pain ranks sixth in the total disease burden (disability-adjusted life-years). It is the primary cause of years spent by the disabled.

Material and Method: Google Scholar, Pub Med, the Physiotherapy Evidence Database, and the Cochrane Database were used to search electronic databases for titles and abstracts. The review included only full-text papers, which were double-checked to determine the role of static stretching exercises in lower back pain to decrease Pain, to improve ROM, and Flexibility. The ethical committee approved this study (BMU/FPT/215). **Result and Conclusion:** This review also analyzed published literature to understand the role of static stretching exercises in lower back pain to decrease Pain, to increase ROM, and Flexibility. This exercise shows positive effects. Expanding the availability and scope of these programs is a pressing concern for social support networks as well as global health and fitness providers.

Keywords: Static stretching, Pain, flexibility, ROM, Lower back pain

INTRODUCTION: Low back pain is an extremely common problem that most people experience at some point in their life.[1] According to international surveys, the 1-month prevalence of LBP is 19–43%, while the point prevalence is 15–30%. The lifetime prevalence of LBP is estimated to be between 50 and 85 percent worldwide. In developed nations, low back pain, often known as postural back discomfort, is thought to affect 60–70% of people (one-year prevalence 15–45%, adult incidence 5% annually). In India, almost 60% of people have experienced severe back pain at some point in their lives.[2,3]

Most people who experience activity-limiting low back pain go on to have recurrent episodes. The epidemiology of low back pain is accumulating, but for the most part studies are restricted to high-

income countries, which comprise less than 15% of the world's population. Little is known about the epidemiology of low back pain in the rest of the world.[4] Nociceptive factors play a major role in acute pain syndromes. Depending on how they are innervated, different spinal structures may be the cause of pain; however, anatomical knowledge alone cannot be used to evaluate clinical problems. Psychosocial factors play an important role in chronic pain and are essential in shedding light on how individuals manage their back pain.[5]

Most of the suffering and costs resulting from LBP are caused by a minority of patients who become 'chronic'. What does chronicity mean in the back pain field? When characterized by the duration of symptoms, chronicity does not provide a sufficient explanation for its socioeconomic impact.[6] Low back pain affects people of all ages and is a leading contributor to disease burden worldwide. Management guidelines endorse triage to identify the rare cases of low back pain that are caused by medically serious pathology, and so require diagnostic work-up or specialist referral, or both. Management consists of education and reassurance, analgesic medicines, non-pharmacological therapies, and timely review.[7]

In therapeutic, fitness, and sports contexts, static stretching (SS) is frequently employed. It involves a controlled, continuous movement to a single joint's or multiple joints' end range of motion (ROM), during which the muscle or muscles are held in a stretched position for a predetermined amount of time. Active static stretching involves tightening the agonist muscles; passive static involves using external forces like gravity, a partner's assistance, or stretching aids like elastic bands.[8]

One technique for elongating muscles to tolerance and maintaining the position for an extended period of time is static stretching. Muscle shortness can be resolved by static stretching, which involves placing the muscle in its long state and keeping it there for a while. Frequency and duration of static stretching have not been extensively examined. Additionally, the effect of multiple stretches per day has not been evaluated.[9]

One therapeutic technique utilized in medical rehabilitation is stretching, which lengthens muscles and fortifies collagen fibers. Seldom are instructions for stretching exercises provided. Although the isometric technique appears to be the most popular, other methods that could be used include static stretches, proprioceptive, or ballistic neuromuscular facilitation. In addition to the back, stretching exercises target the muscles in the legs, thighs, hips, and trunk.[10]

Material & Method: This meta-analysis was conducted according to PRISMA guidelines and registered at PROSPERO. MEDLINE (PubMed), Embase, Cochrane CENTRAL, Scopus and PEDro databases were searched from inception to 2010 for articles. Two independent researchers extracted data, assessed the methodological quality and rated the quality of evidence of studies.

After two training regimens—stretching and strengthening in a lengthened position— Aquino CF et al (2010) compared the changes in hamstring flexibility, peak torque angle, and stretch tolerance. Forty-five hamstring-tight patients were divided into three groups at random: control, stretching, and strength training in a stretched position. For eight weeks, the interventions were conducted three times a week.

Both before and after the programs ended, the subjects were evaluated. Stretch tolerance, peak torque angle, and hamstring flexibility were evaluated using data from an isokinetic dynamometer. Strengthening in the extended position altered the peak torque angle in the direction of knee extension, according to the data analysis (p=0.001). There was no discernible difference in flexibility (p=0.449). Stretch tolerance increased in both experimental groups (p=0.001).[10]

Fabio Renovato Franca, Thomaz Nogueira Burke, et al. (2012) conducted a randomized controlled trial with 30 participants to examine the effects of segmental stabilization and muscle stretching on pain and functional disability in patients with chronic low back pain. The subjects were randomized into one of two groups according to the nature of the intervention. While the stretching (ST) group worked on stretching the erector spinae, hamstrings, and triceps surae, the segmental stabilization (SS) group targeted the TrA and lumbar multifidus muscles. The effects of intervention were compared in terms of pain severity (visual analogue scale and McGill pain questionnaire), functional disability (Oswestry disability questionnaire), and TrA muscle activation capacity (Pressure Biofeedback Unit, or PBU). Sessions took place twice a week for 30 minutes each, during a 6-week intervention. Comparing groups within and between groups was done using analysis of variance. The study's findings showed that both therapies were successful in reducing pain and enhancing disability (P <.001). For every variable, the SS group's gains were noticeably higher. TrA was not successfully activated by the stretching group (P =.94). Both methods decreased disability and enhanced pain. In this study, SS outperformed muscle stretching for the variables that were linked to persistent low back pain.[11]

In order to improve hamstring flexibility in individuals with persistent, non-specific low back pain, Praveen Kumar and Monika Moitra (2015) studied the efficacy of PNF stretching and muscle energy approach in addition to conventional physiotherapy. 30 participants with persistent, non-specific low back pain and hamstring tightness, both men and women, between the ages of 20 and 40, were recruited for the study. The treatments were given five days in a row for a total of four weeks. The results showed that MET and PNF stretching dramatically increased hamstring flexibility in three groups, leading to a significant reduction in low back pain and an increase in active knee extension range of motion when compared to typical group static stretching.[12]

In their 2017 study, Hae-In Bae, Dae-Young Kim, and associates investigated how static stretching under load affected TFL in those with low back pain. Twenty-three subjects were enrolled based on the selection criteria. Static stretching without a load (control, n = 12) and static stretching with a load (experimental, n = 11) were the two randomly assigned groups into which the participants were divided. Every participant in the group stretched for 15 minutes each day for two weeks, spending 30 seconds on the right side and 50 seconds on the left. Before and after the intervention, all groups were evaluated using the visual analogue scale (VAS), the stand-and-reach test, and the Oswestry disability index (ODI). The experimental group's VAS, stand and reach test, and ODI showed significant differences

(P<0.05) before and after the intervention. Static stretching with a load can therefore be beneficial for patients with shortened TFL who experience low back discomfort.[13]

Mohammad Bagher Shamsi et al,2020 compared the effect of stretching exercise and strengthening exercise in lengthened position of the hamstring muscle on improving the dynamic balance of the person in patients with chronic low back pain with short hamstring muscles. 45 hamstring shortening patients who were referred to the physiotherapy clinic at Kermanshah University of Medical Sciences in Kermanshah, Iran, were divided into three groups at random: 15 for static stretching, 15 for strengthening exercises in the lengthened hamstring position, and 15 for control. In addition to receiving standard physical therapy for low back pain, the two intervention groups also underwent programs of strengthening and stretching exercises in extended positions. The results demonstrate that, according to the GEE model, participants in static stretching exercises improved their balance more than those in the control group when other variables were controlled ($\beta = 9.58$, p-value = 0.014).[14]

Mohammadreza Hatefi, Farideh Babakhani, et al. (2021) investigated the effects of static stretching exercises on hip range of motion, pain, and disability in patients with non-specific low back pain. Thirty females with NSLBP were split into two groups at random: 15 in the control group and 15 in the experimental group. For eight weeks, the experimental group had three stretch practice sessions a week. Prior to and during the intervention, the Oswestry low back pain Disability Questionnaire (ODI), visual analogue scale (VAS), and passive hip range of motion (PROM) were used. For all measuring outcomes, the group × time interactions were not significant ($p > 0.05$), according to the results of the mixed model analysis of variance. Time, however, had a significant impact (ODI: $p = 0.002$, VAS: $p = 0.001$, PROM-R: $p = 0.016$, PROM-L: $p = 0.001$). In the experimental group, this resulted in notable changes in the ODI, VAS, PROM-R, and PROM-L before and after the intervention.[15]

In a comparative study, Ahmad Osailan, Abdulaziz Jamaan, et al. (2021) investigated how stretching and instrument-assisted soft tissue mobilization affected the hip active range of motion, muscle torque, and power in people with tight hamstrings. Random assignment was used to divide the twenty-three individuals into two groups. Eleven individuals received manual stretching, while twelve had IASTM. A goniometer was used to quantify the hip flexion range of motion before and after both therapies, and a Humac isokinetic dynamometer was used to measure the torque and hamstring muscle power. Results showed no significant difference between the two groups' improvements in HMC torque, HMC power, and hip flexion active range of motion. Both groups had significant improvements in hip flexion active range of motion, and group 1 demonstrated significantly better HMC power when comparisons were made within each group. In non-athletes with HMC tightness, the results of the study demonstrated that the IASTM was equally effective as manual stretching in improving hip flexion active range of motion, muscle torque, and power.[16]

Taizan Fukaya , Shingo Matsuo et al (2021) conducted a study on acute and chronic effects of static stretching at 100% versus 120% intensity on flexibility. Twenty-three healthy men were randomly assigned to perform 1 min of static stretching 3 days/week for 4 weeks at 100% intensity (n = 12) or 120% intensity (n = 11). Compared with the 100% intensity group, the 120% intensity group had significantly greater acute increases in ROM after all 12 sessions, a significantly greater decrease in passive stiffness after 11 of 12 sessions, and a significantly greater increase in peak passive torque after six of 12 sessions. Regarding the chronic effects, ROM was significantly increased in both groups after 2 and 4 weeks of stretching. Peak passive torque significantly increased in the 100% intensity group after 2 and 4 weeks of stretching, and after 4 weeks in the 120% intensity group. Stretching at 120% intensity resulted in significantly greater acute improvements in ROM, peak passive torque, and stiffness than stretching at 100% intensity.[17]

Masatoshi Nakamura et al (2024) aimed the study to find out chronic effects of a static stretching intervention program on range of motion and tissue hardness in older adults. The SS intervention program was conducted at least three times a week for 10 weeks in the ankle plantar flexor muscles of 24 community-dwelling older adults (73.8 ± 5.1 years; height: 156.0 ± 6.8 cm; body mass: 52.7 ± 8.0 kg). The SS intervention program consisted of 4 × 30-s repetitions. The results showed that the 10-week SS intervention program significantly increased DF ROM (+9°, $p < 0.01$, Cohen's $d = 1.37$) and decreased tissue hardness (−0.9, $p = 0.04$, Cohen's $d = -0.27$). However, there was no significant correlation between these changes ($r = 0.086$, $p = 0.561$). The results of this study suggest that a 10-week SS intervention program can effectively increase DF ROM and decrease tissue hardness but that the increase in DF ROM is related to stretch tolerance rather than changes in tissue hardness.[18]

Morten Pallisgaard Støve et al (2024) conducted a study to find the effect of stretching intensity on pain sensitivity. A randomized, repeated- measures crossover study was performed to examine the effect of stretching to the first point of pain onset and stretching to the point of a sensation of stretching (discomfort). The primary outcome was regional and distant pressure pain thresholds. Thirty- one participants (n = 24 female) were available for analysis. We observed a 22.2% increase in regional pressure pain thresholds (93.2 kPa, p = 0.001) and a 15.0% increase in distant pressure pain thresholds (50.9 kPa, p = 0.012) following stretching to the point of stretch. We observed a 20.0% increase in regional pressure pain thresholds (90.3 kPa, p = 0.001) and a 15.1% increase in distant pressure pain thresholds (52.1 kPa, p = 0.004) following stretching to the point of pain. The results showed that local and widespread pain sensitivity decreased following acute stretching, regardless of stretching intensity. No differences in pain sensitivity were found between stretching to the point of stretch or stretching to the first onset of pain.[19]

Discussion: This review aimed to provide an overview of the impact of static stretching exercises in lower back pain to lowers down pain, increase ROM and flexibility. This study evaluated the available data supporting the role of effectiveness of static exercises in lower back pain. Every study that was

part of this evaluation looked into how exercise therapy may help to decrease pain, improve ROM, flexibility has an effect on good performance. The American College of Sports Medicine also suggests static stretching as part of a comprehensive training regimen. Furthermore, several stretching techniques increase the range of motion of the spine and reduce pain in patients with chronic low back pain, according to Gawda P et al.[20] When compared to SS without pain, Kataura et al. (2017) found that high-intensity SS with pain significantly improved range of motion and reduced passive stiffness.[21] Muscle provides passive tension due to its structurally inherent viscoelastic characteristics. Muscle's neuro-reflexive characteristics, particularly peripheral motor neuron innervation (alpha motor neuron) and reflexive activation (gamma motor neuron), cause active tension. [22] In fact, prior research has demonstrated the advantages of stretching, showing that increasing joint length is associated with an increase in range of motion. Increases in joint range of motion are frequently the outcome of static stretching.[23]

Conclusion: Static stretching exercises have been demonstrated to reduce pain, increase range of motion, and flexibility in lower back pain. Current research supports the safety and practicability of these exercises. Stretching exercises are a cost-effective and Journal of the Asiatic Society of Mumbai ISSN: 0972-0766 UGC Care Group 1 Journal simple way for treating functional discomfort in the musculoskeletal system. Stretching exercises can help with muscle spasms and imbalances.

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