Effect of Spinal and Hip Flexor stretching on Hip range of motion in IT office workers.

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ABSTRACT

Background: Long sitting hours have been recognized as an inevitable consequence of working conditions for many IT professionals. Long hours of sitting could cause adaptation through shortening of the hip flexor muscles, restricted hip movement, decreased lumbar spine flexibility, improper pelvic position and increased prevalence of musculoskeletal problems. These factors might adversely influence the posture, functional mobility and overall well-being of individuals. Stretching exercises have been traditionally employed in physiotherapy practice as a tool to improve muscle flexibility and joint mobility preventing limitations in movements. There are only a few studies that explored the effect of spinal and hip flexor stretching in combination on hip range of motion in IT professionals. This is why the current study was conducted to examine the effect of spinal and hip flexor stretching exercise program on hip range of motion in this particular group of people.

Objectives:

- To assess the baseline (initial) hip range of motion in office IT workers who sit for prolonged periods.
- To measure and compare hip range of motion before and after the stretching intervention.
- To determine whether combined spinal and hip stretching produces significant improvement in hip range of motion.
- To provide recommendations for workplace exercise programs that can help prevent stiffness and musculoskeletal problems in office employees.

Methodology: A pre-experimental design involving a single group with pre-test and post-test was used on 45 participants who were IT workers between 20 to 45 years old who engaged in desk jobs for a minimum of six hours per day. The outcome measures used were assessment of hip joint range of movement through universal goniometer, lumbar spine flexibility through Schober's test and tightness of hip flexors through Thomas test. A four-week programme of stretches for spines and hip flexors was done and post-intervention measurement was done with the use of the same outcome measures. Data collected were analyzed using paired t-test for continuous data and McNemar's test for the Thomas Test with p-value <0.05 as statistically significant.

Results: Statistically significant improvements were observed in hip flexion, extension, abduction, adduction, internal rotation, and external rotation on both sides following the intervention ($p < 0.001$). Schober's Test also demonstrated a significant improvement, indicating increased lumbar flexibility. The Thomas Test findings showed a marked reduction in hip flexor tightness after the intervention.

Conclusion: A four-week spinal and hip flexor stretching programme significantly improved hip range of motion, lumbar flexibility, and hip flexor muscle flexibility among IT workers. The findings suggest that these stretching exercises are an effective, safe, and simple physiotherapy intervention for individuals with prolonged sitting occupations.

Keywords: Hip range of motion, Hip flexor stretching, Spinal stretching, IT workers, Schober's Test, Thomas Test.

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INTRODUCTION

The rapid development of the IT sector has resulted in the rise in the number of people involved in sedentary desk work. IT office employees spend a considerable part of their working hours sitting at computer desks, engaging in minimal physical

activity. It has led to an increase in musculoskeletal problems and poor physical health in office workers[1].

The fact that prolonged sitting is known to be a major cause of muscle stiffness has been found. Staying in a seated position for hours on end leads to the process of adaptation of muscles and limits their range of motion, especially in the lower limbs[2].

Hip joint is a multi-axis synovial ball and socket joint which is responsible for offering stability as well as flexibility during functional movements such as walking, stair climbing, sitting, bending, and squatting. Sufficient hip ROM is important for maintaining normal patterns of movement and effective force transfer between the body trunk and legs[3].

The muscles of the hip joint play an important role in providing stability and proper functioning of the pelvis. The iliopsoas and the rectus femoris are the major hip flexor muscles which get adapted to shortened position when sitting for extended periods of time. Tightening of these muscles can lead to a change in pelvis alignment[4].

Proper pelvic alignment is essential for maintaining normal biomechanics of both the spine and the lower limbs. An imbalance in muscle activity around the pelvis can cause either increased anterior pelvic tilt or posterior pelvic tilt, causing restricted motion of the lumbar region, poor muscle activity, and disability in office workers with nonspecific low back pain[5].

The hamstring muscles affect the movement of the pelvis and spine. Lack of hamstring flexibility limits anterior rotation of the pelvis on forward bending of the trunk, resulting in increased movement of the lumbar spine. These biomechanical changes can lead to decreased mobility and hip joint range of motion[6].

Increasing hip joint flexibility is an objective of physiotherapy rehabilitation. There have been different types of treatment such as stretching exercise, mobility exercise, and therapeutic exercise which has been applied to increase hip joint ROM. There have been comparisons between various interventions that prove flexibility exercises enhance hip joint mobility[7].

Therapeutic exercise is one of the main aspects of physiotherapy treatment of musculoskeletal conditions. Correct stretching exercises ensure return of muscles to normal length, increase joint mobility, improve functional abilities, and prevent problems associated with movement. For these reasons, stretching is a popular method in rehabilitation[8].

Stretching of muscles is among the most recommended treatments aimed at increasing flexibility and returning normal joint movements. Static stretching is very common due to its easy-to-do nature, safety, and efficiency. The practice of stretching increases muscle extensibility and helps to enhance joint range of motion[9].

There are evidences which indicate that static stretching can bring about remarkable flexibility gains as well as range of motion improvement without impairing general physical performance of an individual when appropriately applied. Flexibility gains can reduce movement limitations and enhance functional activities[10].

The length of time spent during stretching exercises is an important determinant of flexibility benefits. Several studies have demonstrated that stretching exercises for an adequate amount of time will be associated with greater muscle extensibility and joint range of motion than shorter stretches[11].

There is evidence from systematic review that hamstring stretching improves flexibility and increases joint range of motion. It has been observed that regular stretching exercises done over weeks can bring clinically significant benefits in terms of muscle flexibility[12].

In the long term, there might be certain physiological changes in the muscle-tendon complex as a result of stretching, which contribute to the increased flexibility. Physiological adaptations make it reasonable to incorporate stretching into rehabilitation protocols[13].However, some researchers have suggested that improvements in range of motion following static stretching are primarily due to increased stretch tolerance rather than permanent structural changes within muscles or tendons. This highlights the complex mechanisms responsible for flexibility improvement[14].

The findings from the systematic review and meta-analysis study proved again that there is an improvement of the flexibility of hamstrings with the application of static stretching among adults[15].There have also been studies regarding the benefits of stretching in alleviating muscle soreness and in preventing injuries associated with exercise. Even if its efficacy in preventing injury varies greatly, still, stretching is considered important in enhancing flexibility and promoting normal movement[16].

Stretching in various positions has also been compared for effectiveness. Supine and standing stretches are both effective in improving the flexibility of hamstrings when done correctly and consistently[17]. Proper assessment of tightness in hip flexors is essential for assessing the results of treatment. Modified Thomas test is one of the tests that is widely applied in practice; nevertheless, it is necessary to provide proper control over pelvic tilt when testing hip extension[18].

The use of static stretches has been found to be helpful for relieving pain, disability and improving hip mobility in patients suffering from non-specific low back pain. Thus, flexibility exercises for the

lumbopelvic area may improve functional performance[19].

While prior research has focused separately on hip stretching, hamstring stretching, ergonomics and physical therapy exercises, there is little research on the effects of spinal and hip flexor stretches on hip range of motion among IT office workers. Hence, this study seeks to examine the effect of spinal and hip flexor stretches on hip range of motion among IT office workers, thereby providing a basis for the development of a physiotherapy intervention.

Materials and Methods:

Study Design

To examine the impact of spinal and hip flexor stretches on the hip joint range of motion among IT workers, the experiment pre-test and post-test design was employed. The study was carried out within the framework of the undergraduate physiotherapy research project aimed at establishing whether a four-week programme of spinal and hip flexor stretches would enhance the flexibility of those people whose occupations involve long periods of sitting. Hip joint range of motion, Schober's Test for the lumbar spine, and Thomas Test for the hip joint were used for measuring the effect of the intervention.

The required sample size was determined depending on the feasibility of the study and availability of the eligible subjects. The subjects were selected using convenience sampling technique among the working IT population. People meeting the predetermined inclusion and exclusion criteria were taken for the study.

The inclusion criteria involved IT professionals aged 20-40 years who had long sitting exposure of at least 6 hours daily due to work demands. People meeting the inclusion criteria were those who agreed to take part, could do the stretching exercise and gave consent to the study. Exclusion criteria involved people having recent injury to lower limbs or spine, neurological problems, musculoskeletal problem with mobility, major surgeries in hips or spine or any condition affecting the process of assessment or intervention. All participants underwent baseline assessment before the intervention and received a structured four-week spinal and hip flexor stretching programme. Post-intervention assessment was performed after completion of the programme to evaluate changes in hip range of motion, lumbar flexibility, and hip flexor muscle flexibility.

Outcome Measures

The following outcome measures were used in the study:

- **Hip Range of Motion (ROM):** Hip range of motion (flexion, extension, abduction, adduction, internal rotation, and external rotation) was measured using a universal goniometer.
- **Schober's Test:** Schober's Test was used to assess lumbar spine flexibility before and after the intervention.
- **Thomas Test:** Thomas Test was performed to evaluate hip flexor muscle flexibility and identify the presence of hip flexor tightness.
- **Pre- and Post-Intervention Assessment:** All outcome measures were assessed before the commencement of the four-week stretching programme and reassessed after completion of the intervention to determine the effectiveness of the stretching protocol.

Intervention

This intervention involved the administration of a structured programme of spinal and hip flexor stretches over a period of four weeks among IT workers. This was aimed at improving the flexibility of the hips, lumbar spine, and hip flexor muscles due to long periods of sitting. Participants did stretching exercise 5 days a week, each time for about 15 to 20 minutes. Exercise intensity and duration were gradually increased based on the participant's tolerance. Detailed 4 weeks spinal and hip flexor stretching protocol is shown in Table .

Table: Four-week Spinal and Hip Flexor Stretching Protocol

Weeks	Exercise	Duration / Sets / Reps
Week 1	Thomas Stretch (Hip Flexor) Cat-Cow Stretch (Spinal Mobility) Seated Hamstring Stretch	30 sec × 3 sets each leg 10 reps × 2 sets 30 sec × 2 sets each leg
Week 2	Thomas Stretch Cat-Cow Stretch Pigeon Pose (Hip external rotator + flexor) Seated Hamstring Stretch	35 sec × 3 sets each leg 12 reps × 2 sets 30 sec × 2 sets each side 30 sec × 2 sets
Week 3	Thomas Stretch Cat-Cow Stretch Pigeon Pose Standing Quadriceps Stretch Seated Hamstring Stretch	40 sec × 3 sets each leg 15 reps × 2 sets 35 sec × 2 sets each side 30 sec × 2 sets each leg 30 sec × 2 sets

Week 4	Thomas Stretch Cat-Cow Stretch Pigeon Pose Standing Quadriceps Stretch Supine Figure-4 Stretch Seated Hamstring Stretch	45 sec × 3 sets each leg 15–20 reps × 2 sets 40 sec × 2 sets each side 35 sec × 2 sets each leg 30 sec × 2 sets each side 30 sec × 2 sets

Participants

This study was carried out after securing the consent from the participants and approval from the Institutional Ethics Committee. The IT employees working in the office environments and those having to sit at the desk for long periods of time were requested to volunteer for the research. Those who were between the ages of 20 and 45 years working in the IT industry and sitting for at least 6 hours a day were regarded as eligible candidates for the study. All of the participants signed an informed consent form prior to their involvement in the study.The participants were recruited from different IT companies and office workplaces. They were actively involved in computer-related work requiring long periods of sitting during the course of their everyday work routine.

The exclusion criteria included individuals who had undergone hip or spine surgery, had any fractures of the spine or lower extremities in the recent past, suffered from inflammatory joint conditions, had any neurological condition, had any congenital or acquired musculoskeletal deformity in the hip or spine, had any acute musculoskeletal injury within the past three months, or had any condition that might affect their hip range of motion.

Procedure

Ethical approval was obtained prior to conducting the experiment from the Institutional Ethics Committee. Informed consent was taken from each participant and their demographics like age, gender, experience in years and hours spent sitting were recorded. Prior to the initiation of any procedure, assessment was done using hip range of motion through a universal goniometer, lumbar flexibility through Schober's Test and hip flexors tightness through Thomas Test.

After the first test, each participant was subjected to spinal and hip flexor stretching exercise for 4 weeks where 5 days per week consisted of spinal stretches and static hip flexor stretching in accordance with the standard protocol of the experiment. After completion of four weeks of the intervention, assessment of each participant was done again using the same method used in the beginning. The pre- and post- intervention assessment was compared statistically.

Ethical approval and participation consent

The ethical approval for undertaking the suggested studies has been obtained from the Institutional Committee of Ethics of Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India, vide their letter no. KVV/ IEC/02/2026 dated January 22, 2026. Every participant provided their informed permission in writing after being given the assurances of confidentiality and the freedom to discontinue participation at any moment.

Statistical analysis

The collected data were compiled, tabulated, and statistically analysed to evaluate the effect of spinal and hip flexor stretching on hip range of motion among IT workers. Descriptive statistics were used to summarise the demographic characteristics of the participants. The outcome measures, including hip range of motion, Schober's Test, and Thomas Test, were analysed by comparing the pre-intervention and post-intervention values. The results are presented in the following tables and interpreted accordingly.

RESULTS

Table 1. Demographic Characteristics of the Participants (n = 45)

Variable	Value
Sample size	45
Age (Mean ± SD)	28.38± 2.62Years
Gender	Male : 23 (51.1%) Female : 22 (48.9%)
Years in IT (Mean ± SD)	4.91 ± 2.25 years
Daily Sitting Hours (Mean ± SD)	8.98 ± 0.54 hours/day

Interpretation

A total of 45 IT workers participated in the study. The mean age of the participants was 28.38 ± 2.62 years. Among them, 23 (51.1%) were male and 22 (48.9%) were female. The participants had an average work experience of 4.91 ± 2.25 years in the IT sector and reported an average daily sitting duration of 8.98 ± 0.54 hours.

Table 2. Comparison of Hip Range of Motion Before and After the Intervention (n = 45)

Hip Range of Motion	Pre-intervention (Mean ± SD)	Post-intervention (Mean ± SD)	t-value	p-value
Hip Flexion (Right)	106.07 ± 3.86	113.73 ± 3.35	-56.86	<0.001*
Hip Flexion (Left)	106.40 ± 4.17	114.04 ± 3.59	-48.94	<0.001*
Hip Extension (Right)	12.58 ± 1.98	17.38 ± 2.14	-30.45	<0.001*
Hip Extension (Left)	12.82 ± 2.19	17.58 ± 2.15	-24.88	<0.001*
Hip Abduction (Right)	33.49 ± 1.69	37.22 ± 1.26	-23.78	<0.001*
Hip Abduction (Left)	33.71 ± 1.77	37.44 ± 1.27	-20.03	<0.001*
Hip Adduction (Right)	16.02 ± 0.69	18.56 ± 0.94	-31.03	<0.001*
Hip Adduction (Left)	16.00 ± 0.74	18.53 ± 0.99	-31.03	<0.001*
Internal Rotation (Right)	29.29 ± 2.92	37.36 ± 2.75	-78.70	<0.001*
Internal Rotation (Left)	29.49 ± 3.03	37.71 ± 2.86	-64.90	<0.001*
External Rotation (Right)	35.40 ± 2.67	40.16 ± 1.54	-19.13	<0.001*
External Rotation (Left)	35.64 ± 2.93	40.49 ± 1.77	-17.97	<0.001*

Interpretation:
The paired *t*-test demonstrated statistically significant improvements in all hip range-of-motion parameters following the four-week spinal and hip flexor stretching programme. Significant increases were observed in hip flexion, extension, abduction, adduction, internal rotation, and external rotation on both the right and left sides ($p < 0.001$), indicating that the intervention effectively improved hip joint mobility.

Table 3. Comparison of Schober's Test Before and After the Intervention (n = 45)

Outcome Measure	Pre-intervention (Mean ± SD)	Post-intervention (Mean ± SD)	t-value	p-value
Schober's Test (cm)	10.01 ± 0.55	13.43 ± 0.62	-86.27	<0.001

Interpretation:
The paired *t*-test showed a statistically significant improvement in Schober's Test scores following the four-week intervention ($p < 0.001$). This indicates that the spinal and hip flexor stretching programme significantly improved lumbar spine flexibility among the participants.

Table 4. Comparison of Thomas Test Findings Before and After the Intervention (n = 45)

Thomas Test	Pre-intervention n (%)	Post-intervention n (%)
Positive	45 (100.0%)	8 (17.8%)
Negative	0 (0.0%)	37 (82.2%)
Total	45 (100.0%)	45 (100.0%)

Interpretation:
Before the intervention, all participants had a positive Thomas Test, indicating hip flexor tightness. After the four-week spinal and hip flexor stretching programme, 37 participants (82.2%) demonstrated a negative Thomas Test, while only 8 participants (17.8%) remained positive, indicating a marked reduction in hip flexor tightness.

Final Interpretation for Results Section
The general results obtained from the current study showed significant improvements in all the outcome measures after the four-week spinal and hip flexor stretching program. The hip ROM was significantly increased in flexion, extension, abduction, adduction, internal rotation, and external rotation on the right and left sides. The lumbar flexibility, evaluated using Schober's Test, also showed significant improvement after the intervention program. Moreover, the Thomas Test results showed significant reduction in hip flexor muscles tightness with most of the subjects showing negative test results after the intervention. The statistical test results showed highly significant differences between the pre-and post-intervention values ($p < 0.001$). From the above results, it can therefore be concluded that a spinal and hip flexor stretching program is effective in increasing the hip ROM, lumbar flexibility, and hip flexor muscle flexibility of IT workers who sit for long durations.

DISCUSSION

This research study was performed to investigate the effects of spinal and hip flexor stretching on hip flexibility in IT workers. A group of 45 participants went through a four-weeks stretching exercise regimen. Hip flexibility, lumbar flexibility, and hip flexor muscles tightness were assessed prior to and post intervention by means of the universal goniometer, Schober's Test, and Thomas Test, respectively. The results showed statistically significant improvement in all measurements, proving that spinal and hip flexor stretching is an effective method of increasing flexibility and mobility in IT workers[8].

Prolonged sitting is one of the occupational risk factors in IT workers which is related to decreased hip flexibility, adaptive muscle shortening of the hip flexor muscles, abnormal positioning of the pelvis, and decreased lumbar flexibility. These biomechanical issues can predispose to the development of musculoskeletal problems as well as affect movement abilities. Stretching improves muscle extensibility and restores joint flexibility and movement[2,5].

Improvements in hip flexion, extension, abduction, adduction, internal rotation, and external rotation were seen in the current study after the intervention period of four weeks. These may be due to increased muscle flexibility, decreased muscle stiffness, and better neuromuscular control as a result of stretching exercises. Improvement in joint range of motion and muscle flexibility as a result of stretching programs has been seen in other studies as well [15].

An improvement in hip extension was also noted after the intervention. Sitting for long periods of time causes hip flexor muscles to be in a shortened position; therefore, their range of motion becomes restricted and limits the hip extension as well as misalignment of pelvis. Stretching exercises normalize muscle length, pelvic movements, and hip joint movements. These results are similar to studies carried out on office workers in the past [1].

The level of lumbar spine flexibility measured through the Schober Test was significantly increased due to the effect of the intervention, implying an increased ability to move the lumbar spine. Enhanced lumbar spine flexibility might play a role in ensuring proper posture as well as alleviating mechanical load on the lumbar spine. In a similar way, results of the Thomas Test imply significant relaxation of hip flexors, suggesting that the stretching program had a positive effect on restoring hip flexor muscle length. These results are consistent with other research concerning therapeutic stretching and hip flexibility [19,20].

In general, results obtained in the current study correspond with those of other investigations indicating that stretching exercises increase muscle flexibility, enhance joint mobility, and help relax muscles [14].

Thus, spinal and hip flexor stretching exercises can be considered as an easy, safe, and low-cost physiotherapy approach that can be used by IT workers to increase flexibility, maintain their functional movement, and prevent any negative musculoskeletal outcomes resulting from prolonged periods of sitting. Their regular practice either in everyday activities or wellness programs at the workplace might assist in improving posture and preventing muscle tightness.

CONCLUSION

The present study concludes that a four-week spinal and hip flexor stretching programme significantly improved hip range of motion, lumbar flexibility, and hip flexor muscle flexibility among IT workers. Significant improvements were observed in all hip range-of-motion parameters, Schober's Test, and Thomas Test following the intervention. Therefore, spinal and hip flexor stretching can be considered an effective, safe, and simple physiotherapy intervention for enhancing flexibility, maintaining functional mobility, and reducing musculoskeletal tightness associated with prolonged sitting among IT workers.

LIMITATIONS

The present study had certain limitations. The sample size was relatively small, which may limit the generalizability of the findings. The intervention duration was limited to four weeks; therefore, the long-term effects of the spinal and hip flexor stretching programme could not be evaluated. The absence of a control group limited the ability to compare the effectiveness of the intervention with other approaches. Additionally, factors such as workplace ergonomics, daily physical activity, and lifestyle habits were not controlled, which may have influenced the outcomes.

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Ethical Approval

Ethical approval for the present study was obtained from the Institutional Ethics Committee of Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, India, vide letter no. KVV/IEC/02/2026 dated January 21, 2026.

Conflicts of Interest

We claim that there are no conflicts of interest in the content of this study.

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