

Original Research Article

Immediate effect of positional stretches of hamstring muscles on hamstring tightness in desk job workers: an experimental study

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ABSTRACT

Background: Prolonged sitting and limited movement during desk work may contribute to reduced hamstring flexibility. This study examined the immediate effect of positional hamstring stretching in desk job workers and compared stretching performed in standing and sitting positions.

Methods: An experimental study was conducted among 60 desk job workers aged 30-45 years in Pune, Maharashtra, India, from 11 April 2025 to 9 October 2025. Participants were selected by convenience sampling. Hamstring tightness was assessed on both sides using the active knee extension (AKE) test with a universal goniometer. Participants performed hamstring stretches in standing and sitting positions, with each stretch held for 30 seconds, followed by 15 seconds of rest, for three repetitions on each leg. Paired t-tests were used to compare pre- and post-stretching values within each condition, and unpaired t-tests were used for comparison of post-standing and post-sitting values. Data were analysed using Microsoft Excel, with $p < 0.05$ considered statistically significant.

Results: Standing stretching reduced the measured hamstring tightness angle on the right from $53.73 \pm 10.33^\circ$ to $37.41 \pm 10.43^\circ$ ($t=26.47$, $p < 0.0001$) and on the left from $53.05 \pm 8.46^\circ$ to $35.55 \pm 9.17^\circ$ ($t=27.15$, $p < 0.0001$). Sitting stretching reduced the right-side value from $53.73 \pm 10.33^\circ$ to $37.80 \pm 10.57^\circ$ ($t=25.63$, $p < 0.0001$) and the left-side value from $53.05 \pm 8.46^\circ$ to $35.38 \pm 9.25^\circ$ ($t=28.55$, $p < 0.0001$). The difference between post-standing and post-sitting values was not statistically significant on either side (right: $t=0.19$, $p=0.84$; left: $t=0.099$, $p=0.92$).

Conclusions: Both positional stretching approaches produced a significant immediate change in the measured hamstring tightness angle. Neither standing nor sitting stretching showed a clear advantage over the other in the present sample.

Keywords: Active knee extension, Desk job workers, Flexibility, Hamstring tightness, Physiotherapy, Stretching

INTRODUCTION

Hamstring tightness is a common finding in physiotherapy practice and can affect lower-limb movement and flexibility. People who work at a desk often spend several hours in the same sitting position with limited opportunities for movement. Prolonged computer use, static postures and poor ergonomic conditions have been associated with musculoskeletal complaints among office workers.¹⁻³

The hamstring muscles are involved in both hip and knee movement and also contribute to lumbopelvic mechanics. When hamstring flexibility is reduced, it may influence movement during everyday activities. Stretching is therefore commonly included in physiotherapy programmes to improve flexibility. Previous systematic reviews have reported improvements in hamstring flexibility following static stretching, including when the active knee extension (AKE) test is used to assess the outcome.⁴⁻⁶

The AKE test is a commonly used clinical measure of hamstring muscle length. Earlier research found the test to be reliable when the position of the hip, stabilization and measurement procedure are kept consistent.⁷ More recent work has also reported good intra-rater and inter-rater reliability, supporting the use of the AKE test in clinical and research settings.⁸

The immediate increase in range of motion after stretching is probably not due to one mechanism alone. Changes in muscle-tendon stiffness may contribute, but an increased tolerance to the stretch also appears to play an important role.⁹⁻¹¹ Studies of the hamstrings have reported short-term changes in stiffness and range of motion after stretching, although the size and duration of these changes can vary according to the intensity and duration of the stretch.¹²⁻¹⁴

For desk job workers, standing and sitting stretches are simple options because they need little space or equipment and can be performed during a short work break. Previous studies have shown improvements in hamstring flexibility with different stretching positions and durations, and systematic reviews support stretching as an effective way of improving range of motion.^{4-6,15} However, there is limited evidence specifically comparing immediate standing and sitting positional hamstring stretches in desk job workers.

The present study was therefore undertaken to determine the immediate effect of positional hamstring stretching on hamstring tightness in desk job workers and to compare the effects of stretching in standing and sitting positions.

METHODS

Study design and setting

This experimental study was carried out among desk job workers in Pune, Maharashtra, India, from 11 April 2025 to 9 October 2025.

Participants and sampling

Sixty desk job workers were recruited using convenience sampling. Participants were men and women aged 30-45 years who worked at a desk for 6-8 hours per day and had bilateral hamstring tightness. Eligible participants had desk-based employment and no other part-time job.

Exclusion criteria

The exclusion criteria were recent fracture, surgery or lower-extremity injury within the preceding six months; known spinal deformity; childbirth within the preceding year; visual or auditory defects that could interfere with participation; regular yoga or physical exercise; and diagnosed neurological, cardiovascular or musculoskeletal pathology.

Ethical considerations

The study protocol was presented to the institutional ethics committee of the college, and ethical clearance was obtained before participant recruitment. The study was explained individually to eligible participants, and written informed consent was obtained before assessment and intervention.

Outcome measure

Hamstring tightness was assessed using the active knee extension (AKE) test. Participants were positioned supine with the test hip flexed to 90°, while the opposite limb was stabilized. They actively extended the knee to the end of the available range and held the position for approximately five seconds. The popliteal angle was measured with a universal goniometer. An AKE score of 20° or more was considered indicative of hamstring tightness. The reliability of the AKE test has been reported previously.^{7,8}

Intervention

Baseline AKE measurements were taken before stretching. For the standing stretch, the participant stood facing an examination table, placed the heel on the edge of the table, kept the back straight and leaned forward from the hips. The foot was maintained in dorsiflexion. The position was held for 30 seconds, followed by 15 seconds of rest, and repeated three times on each leg. After a 15-minute interval, the sitting stretch was performed. The participant sat upright on a chair, extended one leg forward with the heel on the floor, kept the back straight and leaned forward from the hips with the foot in dorsiflexion. The same 30-second stretch, 15-second rest and three-repetition protocol was followed on each leg. AKE measurements were taken immediately after each stretching condition. Participants were asked not to bounce or jerk during the stretch and to stop at mild tension rather than pain.

Statistical analysis

Data were expressed as mean and standard deviation. Paired t-tests were used to compare pre- and post-stretching measurements for each condition. Unpaired t-tests were used to compare the post-standing and post-sitting measurements. Statistical analysis was performed using Microsoft Excel. A p value of <0.05 was considered statistically significant.

RESULTS

A total of 60 desk job workers were included in the analysis. Of these, 29 participants (48.33%) were aged 30-35 years, 20 (33.33%) were aged 36-40 years and 11 (18.33%) were

aged 41-45 years. There were 37 males (61.66%) and 23 females (38.33%) in the study. After standing stretching, the measured hamstring tightness angle decreased significantly on both sides. A similar significant decrease was observed after sitting stretching. The detailed pre- and post-stretching values are shown in Table 2.

With standing stretching, the mean reduction was 16.32° on the right and 17.50° on the left. With sitting stretching, the mean reduction was 15.93° on the right and 17.67° on the left.

There was no statistically significant difference between the post-standing and post-sitting measurements on either

side. The complete statistical findings are provided in Tables 1-3.

Table 1: Demographic characteristics of participants (n=60).

Characteristics	Category	N (%)
Age (years)	30-35	29 (48.33)
	36-40	20 (33.33)
	41-45	11 (18.33)
Sex	Male	37 (61.66)
Sex	Female	23 (38.33)

Table 2: Within-condition changes in measured hamstring tightness angle.

Condition	Side	Pre, mean±SD (°)	Post, mean±SD (°)	t	P value
Standing	Right	53.73±10.33	37.41±10.43	26.47	<0.0001
Standing	Left	53.05±8.46	35.55±9.17	27.15	<0.0001
Sitting	Right	53.73±10.33	37.80±10.57	25.63	<0.0001
Sitting	Left	53.05±8.46	35.38±9.25	28.55	<0.0001

Values are mean±SD. Paired t-test; p<0.05 considered statistically significant.

Table 3: Comparison of post-standing and post-sitting measurements.

Side	Post-standing, mean±SD (°)	Post-sitting, mean±SD (°)	t	P value	Interpretation
Right	37.41±10.43	37.80±10.57	0.19	0.84	Not significant
Left	35.55±9.17	35.38±9.25	0.099	0.92	Not significant

Unpaired t-test as used in the submitted analysis; p<0.05 considered statistically significant.

DISCUSSION

This study looked at the immediate effect of positional hamstring stretching in 60 desk job workers and compared two practical positions- standing and sitting. The main finding was that the measured hamstring tightness angle decreased significantly immediately after both types of stretching, on both the right and left sides. The two positions produced similar immediate results.

On the right side, standing stretching reduced the mean measured tightness angle from 53.73±10.33° to 37.41±10.43°, giving a mean reduction of 16.32°. This agrees with previous research showing that static stretching can produce an immediate improvement in hamstring flexibility. Medeiros et al reported improvements in hamstring flexibility, including AKE measurements, after static stretching.⁴ A broader review also found that hamstring stretching can improve range of motion across different techniques and stretching protocols.⁵ The change seen in the present study was relatively large compared with some studies in healthy young adults. This may be related to the fact that our participants had hamstring tightness at baseline and performed three 30-second stretches.

On the left side, standing stretching reduced the mean value from 53.05±8.46° to 35.55±9.17°, with a mean

reduction of 17.50°. This finding is also in line with previous studies showing that stretching can produce an acute increase in hamstring range of motion.^{6,9} Bandy and colleagues reported improvements in hamstring flexibility with static stretching and highlighted the importance of stretching duration.¹⁵ In the present study, three 30-second repetitions were used, which is a relatively simple protocol that can be incorporated into routine physiotherapy or workplace exercise programmes.

Sitting stretching produced a mean reduction of 15.93° on the right, with the value decreasing from 53.73±10.33° to 37.80±10.57°. This result is consistent with previous work showing that hamstring flexibility can improve with stretching performed in different positions, including seated approaches.^{6,16} Although the amount of improvement can vary depending on the stretching technique and the participants, the present findings suggest that a seated stretch can also produce an immediate change. This may be useful for desk job workers because the exercise can be performed without leaving the workplace for long.

On the left side, sitting stretching produced a mean reduction of 17.67°, from 53.05±8.46° to 35.38±9.25°. This is consistent with earlier evidence that a single stretching session can improve hamstring flexibility in the short term.^{6,9} A recent meta-analysis of 27 randomized

controlled trials also reported similar short-term improvements in hamstring range of motion following static and dynamic stretching.¹⁷ These findings support the view that a brief stretching session can produce a measurable immediate change in flexibility.

When the two positions were compared, there was no statistically significant difference between the post-standing and post-sitting measurements. On the right, the post-standing value was $37.41 \pm 10.43^\circ$ compared with $37.80 \pm 10.57^\circ$ after sitting stretching ($p=0.84$). On the left, the corresponding values were $35.55 \pm 9.17^\circ$ and $35.38 \pm 9.25^\circ$ ($p=0.92$). In this sample, therefore, neither position appeared to provide a greater immediate effect. This is useful from a practical point of view because desk job workers can choose the position that is easier to perform in their work environment. Previous studies have shown benefits from different hamstring stretching positions, although direct comparisons of standing and sitting positional stretches in desk workers are limited.^{5,6}

The immediate changes seen in this study may be related to more than one physiological mechanism. A systematic review and meta-analysis reported a reduction in muscle-tendon unit stiffness after acute static stretching.¹⁰ Studies specifically examining the hamstrings have also reported short-term changes in stiffness after stretching.^{12,13} At the same time, improvements in range of motion do not always occur in proportion to changes in muscle stiffness, suggesting that greater tolerance to the stretch may also be involved.¹¹ Since the present study did not directly measure stiffness, passive torque or stretch tolerance, these mechanisms can only be considered possible explanations for the findings.

The fact that the measurements were taken immediately after stretching is important when interpreting the results. Hatano et al reported that improvements in range of motion and stretch tolerance can remain after the reduction in passive stiffness has begun to return towards baseline.¹⁴ Other research has also shown that the intensity and duration of stretching can influence the short-term mechanical response of the hamstrings.^{13,18} Therefore, the improvement found in the present study should be viewed as an immediate response and not as evidence that the hamstrings became permanently longer.

The findings may have practical value for physiotherapy and workplace health programmes. Desk job workers can perform either a standing or a seated hamstring stretch during a short work break, without requiring specialized equipment. Previous evidence supports the use of stretching for improving flexibility, and recent research suggests that even relatively short stretching doses can be useful.^{6,19} However, because this study measured only the immediate response, these findings support stretching as a short-term flexibility strategy rather than demonstrating a long-term correction of hamstring tightness.

This study had several limitations. Convenience sampling may have reduced the representativeness of the sample. The participants were limited to desk job workers aged 30-45 years from Pune, so the findings may not apply to other age groups, occupations or populations. Only the immediate response to stretching was assessed, and there was no follow-up to determine how long the changes lasted. Differences in workplace ergonomics and other lifestyle factors were not specifically controlled. In addition, the study did not directly assess muscle-tendon stiffness, stretch tolerance or other physiological mechanisms that could explain the change in AKE measurements. Future studies could include larger and more diverse samples, better control of workplace factors and longer follow-up periods.

CONCLUSION

A single session of positional hamstring stretching produced a significant immediate reduction in the measured hamstring tightness angle in desk job workers. Both standing and sitting stretches showed significant changes on the right and left sides, while neither position was significantly better than the other. These findings suggest that either position may be a practical option for providing a short-term flexibility exercise during the working day.

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