

EFFECTS OF A SEDENTARY LIFESTYLE ON HIP EXTENSION AMONG THE GENERAL POPULATION

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HIGHLIGHTS

- Worldwide, 27.5% of adults are physically inactive. In the United States, more than 15% of adults are physically inactive, with a prevalence rate of 17.3-47.7%.
- A cross-sectional study was conducted to find out the effects of a sedentary lifestyle on hip extension among the general population in which sitting behavior and physical activity patterns were assessed using the Global Physical Activity Questionnaire.
- The majority of the individuals fall in the moderate level of physical activity (>150 hrs. per week). The mean Hip extension ROM was 18.14°, whereas it was concluded that the individuals that do prolong sitting and do less physical activity have a decrease in hip extension range of motion.

ABSTRACT

The hip joint is a ball and socket joint in which the femoral head is a ball, and the socket is the acetabulum. The limited hip extension correlates with many hip and lumbar spine pathologies and lower extremities. In these patients, the ROM of the hip has been limited which interrupts the patient's quality of life.

Objective: To assess the effects of a sedentary lifestyle on hip extension among the general population.

Material and Methods: A cross-sectional study was conducted for this research in which 163 participants were tested for this study. In addition, sitting behavior and physical activity patterns were assessed using the Global Physical Activity Questionnaire. Cut-off points were defined for low/high physical activity (150 min per week), prolonged sitting (>7 hours per day),

and minimal sitting, and high activity & prolonged sitting.

Results: Overall 163 participants were included in which, 76 males and 87 females were selected for the study. The mean & standard deviation of the age was 29±7.36 years, and the mean BMI was 2.27 kg/m². The majority of the individuals fall in the moderate level of physical activity (>150 hrs. per week). The mean hip extension range of motion was 18.14°. The majority of the individuals have a low level of physical activity and have a sedentary lifestyle.

Conclusion: Sedentary lifestyle results in decreased mobility and other comorbidities. Hence it was concluded that the individuals that do prolong sitting and do less physical activity have a decrease in hip extension range of motion.

Keywords: Hip Flexors, Hip Extensors, Hip Extension, Physical Activity, Sedentary Lifestyle, Stiffness, Sitting Behavior

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INTRODUCTION

The hip joint is a ball and socket joint in which the femoral head is a ball and the socket is the acetabulum. The hip joint is composed of two bones: the femur and the pelvis. In the hip joint, capsular ligaments play an important role in the stability of joints and mobility. The hip capsular ligaments are iliofemoral, ischiofemoral, and pubofemoral ligaments. These ligaments are very strong and provide stability and balance to the hip

joint.¹ The limited hip extension shows a relationship with many pathologies of the hip, lumbar spine, and lower extremities. Limited mobility affects the joint and decreases the mobility of the entire area of the joint. Limited hip mobility is also associated with bone diseases like osteoarthritis, groin pain, or a tear of the hip labrum. In these patients, the ROM of the hip has been limited which interrupts the patient's quality of life. During running limited hip extension causes the anterior pelvic tilt with the lumbar lordosis.²

Primary hip extensors are the gluteus maximus, hamstrings, and head of the adductor Magnus. All the muscles of the hip flexors and extensors work together to maintain and secure the neutral position of the hip.³ The Gluteus maximus is the hip's largest muscle that primarily provides a hip extension.⁴ The hamstring muscle is also involved in hip extension.^{5,6} During the beginning of the stance phase hip extensors are activated to prevent hip flexion.⁷ People with weaker hip extensors, take small steps when they walk to reduce hip flexion.⁸ Some people and athletes have decreased hip extensors ROM at the terminal stance that toes off.⁹ Weakness of the hip extensors is associated with many trunks-related pathologies in which the patient reports fatigue and loss of muscle strength.¹⁰ Along with gluteus maximus and hamstring muscles, the adductor magus is another primary hip extensor muscle. They all combine to perform hip extension either passive or active.¹¹

In sports injuries, the commonest injury is the injury of hamstring muscles and it has a greater risk of reoccurrence. Because the hamstrings are responsible for controlling the movements and forces around the hip and knee joints. A prone hip extension test is used to investigate the impairments in lumbopelvic neuromuscular coordination.¹² Prevalence of physical inactivity region-wise: Africa 27.5%, America 43.3%, Europe 34.8%, South East Asia 17%, and Western

Pacific 33.7%.¹³ Prevalence of school-going adolescent was 80.3%. School-going adolescents including boys and girls have a prevalence of physical inactivity including boys at 78.4% and girls at 84.4%. In 2018, a new target agreed that a 15% reduction in physical activity in adolescents by the year 2030.¹⁴ Worldwide 27.5% of adults are physically inactive. In Nigeria, the prevalence of physical inactivity is reported at 52% with women's rates being higher than males.¹⁵ In the U.S. more than 15% of adults are physically inactive with a prevalence rate of 17.3-47.7%.¹⁶ Risk factors associated with prolonged sitting and physical inactivity are cardiovascular diseases, type 2 diabetes, depression, anxiety, neck and shoulder stiffness, osteoporosis, osteoarthritis, bone fracture, or falls.¹⁷

A person who has excessive anterior pelvic tilt has limited hip extension ROM and there will be reduced extensibility of the hip flexors.¹⁸ The time we increase physical activity with a little less time of sitting improves overall health conditions and gives a better healthy life.¹⁹ Physical inactivity is more seen in urban communities as compared to rural ones.²⁰

When we sit for a longer period, it badly affects our back muscles as well as our whole body muscles. When a person sits for more than 1 hour, after twenty minutes the person's posture goes into a slumped position which could lead to many serious health hazards and muscular fatigue. When a person sits unsupported for a longer period, he adopts poor posture which led to an increased risk of many musculoskeletal conditions as well as the condition in which nerve compresses which could be more dangerous.²¹

Sedentary behavior leads to changing musculoskeletal properties with increasingly stiffening of the thoracic spine which could lead to possibly humped posture. Physical activity includes linear and dynamic motions which involve all body segments being moved.²² When a person eats with

no physical activity, this will lead to the deposition of fat in the body and even in the arteries which could lead to many heart diseases.²³ By regular exercising, the flow of blood becomes good even if it will supply to overall body parts and the brain. Some older adults engage in moderate physical activities which enhance their capacity and boost their metabolism to fight against some diseases.²⁴

There is potentially not much research about the prolonged sitting and physical inactivity associated with limited hip extension. Therefore, the objective of this study is to look out for the association between prolonged sitting and physical inactivity with limited hip extension.

MATERIAL AND METHODS

A cross-sectional study was conducted for this research in which 163 participants were tested for this study, of which 76 were male, and 87 were female. In addition, sitting behaviors and physical activity patterns were assessed using the Global Physical Activity Questionnaire. Participants that are participating in this research from The University of Lahore Teaching Hospital to assess their sitting behavior and physical activity. A written consent form was given to all participants. All participants were called to participate if they lie between the age of 18 to 65 years. Exclusion criteria included pregnancy, co-morbidity interrupting supine lying, lower quadrant pain, and other neurological disorders.

Each participant independently completes the Global Physical Activity Questionnaire. Participants were interrogated to complete and record the intensity, frequency, and duration of the physical activity performed, and sedentary behavior was documented as how much time was spent in sitting activities overall the day.

To measure the passive hip extension degree, participants were instructed to prone lying, and the goniometry was aligned between the greater

trochanter of the femur and the lateral epicondyle of the knee. The stationary arm lies along the greater trochanter of the femur, and the moving arm lies along the lateral epicondyle of the knee. Three readings were recorded for the rest of 1 minute. The final measurement was recorded by applying a small stretch on the tested limb until the patient felt the stretch sensation. There was an observable change in the passive hip extension with a small stretch. This procedure was performed on each side to assess the passive hip limitation, measured with goniometry. Each side was tested, and a small reduction in the range was measured due to bony limitation.

RESULTS

One hundred sixty-three participants were selected for the study, including 76 males and 87 females. The mean (SD) age was 29(7.36) years, and the mean BMI was 2.27 kg/m². The graph shows that the majority fall in moderate physical activity (>150 hrs. per week). The mean and standard deviation for Hip extension ROM was 18.14° (Table-I).

Table I: Descriptive statistics of age and hip extension range of motion of participants

	Mean	Standard Deviation	Minimum	Maximum
Age in years	29	7.36	19 years	58 years
Hip Extension in Right Hip	18.14°	±1.34	15.0°	20.5°
Hip Extension in Left Hip	18.14°	±1.34	15.0°	20.5°

In table II, gender and BMI were described of participants, in which 46.6% were males and 53.4% were females. Moreover, healthy participants were 30.1%, Underweight was 25.8, overweight was 30.7 and obese was 13.5%.

Table II: Frequency & Percentage of Gender and Body Mass Index in Participants

Variable	Construct	Frequency	Percent age
Gender	Male	76	46.6%
	Female	87	53.4%
	Total	163	100.0%
BMI	Normal	49	30.1%
	Underweight	42	25.8%
	Overweight	50	30.7%
	Obese	22	13.5%
	Total	163	100.0%

The majority of the participants have prolonged sitting activities. Most individuals have a low level of physical activity and a sedentary lifestyle which could lead to a danger of various serious chronic conditions that affects a person's health very badly. Many people have low physical activity with prolonged sitting time, leading to reduced muscle mass and muscle properties that limit the range of motions, specifically limited hip extension. According to table III, participants with minimal sitting were 39.3% and prolonged sitting 60.7%. Whereas 71.8% of people were having a sedentary lifestyle and only 28.2% were active. Overall physical activity was measured and as per the total score of GPAQ, the level of physical activity was low at 34.4%, moderate at 53.4% and high at only 12.3%.

Table III: Lifestyle Status of Participants

Variable	Construct	Frequency	Percentage
Sitting	Minimal Sitting	64	39.3 %
	Prolonged Sitting	99	60.7 %
Lifestyle	Sedentary	117	71.8 %
	Active	46	28.2 %
Global Physical Activity Questionnaire	Low Physical Activity	56	34.4 %
	Moderate Physical Activity	87	53.4 %
	High Physical Activity	20	12.3 %

DISCUSSION

Long periods of sitting have been designed into our lives in today's culture in a variety of contexts,

including travel, the office, and the home. According to recent research, sedentary activity, which includes activities like watching television and working at a desk all day, is negatively correlated with several health outcomes, including type 2 diabetes, cardio-metabolic risk factors, and early mortality. Importantly, these negative connections continue to exist even when leisure-time physical activity is taken into consideration.

Adults spend the majority of their sedentary time sitting, which hurts their health.²⁰ Sitting up too much raises your risk of developing diabetes, heart disease, and early mortality.²¹ Additionally linked to musculoskeletal health is prolonged sitting, according to research. For instance, studies have shown a correlation between the amount of time blue-collar employees spend sitting and the severity of their low back discomfort. Similar trends have been seen in studies looking at various musculoskeletal pain types, such as the prevalence of neck-shoulder pain and daily sitting time²² and the relationship between upper quadrant MSK pain and sitting time.²³ Because persons with higher MSK pain, choose to sit down rather than in other positions; these studies cannot conclusively establish cause and effect. They do, however, encourage additional studies that should look into physiological mechanisms that may be responsible for the links between prolonged sitting and musculoskeletal pain.

The observed correlation between extended sitting and musculoskeletal pain may be caused by several processes. These include muscular exhaustion brought on by the constant activation of the muscles that sustain posture or poor posture when seated that puts more strain on the anatomical structures.²⁴ Adaptive changes in passive tissue stiffness or osseous restriction, which may then result in postural misalignment and/or movement dysfunction, are another potential explanation. Prolonged sitting may also

cause these changes. The hip flexor muscles are in a relaxed condition when the hip is bent to about 90 degrees while sitting. Therefore, it is possible that prolonged sitting could increase passive muscle stiffness or cause osseous alterations that limit passive hip extension by causing a hip extension deficit. Such a modification could worsen anterior pelvic tilt alter the lumbar spine's position, and put more strain on the spine. It is not yet known, though, whether prolonged sitting is linked to variations in passive hip extension.²⁵

Multiple causes can lead to alternate muscle length and/or passive stiffness. This means a reduction in the quantity of in-series sarcomeres or a modification in the stiffness of connective tissue. It's interesting to note that women who wear high heels frequently have shorter gastrocnemius muscle fascicle lengths and decreased ankle range of motion.²⁶ This result demonstrates how persistently under-stretching muscles can produce passive stiffness.

However, while routinely under-stretching is linked to a loss in muscle length, stretching and shortening exercises like walking can counteract the effects of extended sitting. In keeping with this notion, extended periods of inactivity and low levels of physical activity are probably linked to an increase in the passive stiffness of the hip flexor and extensor muscles. In our study, the mean ROM of the hip extension was 18.14°, respectively. The majority had an 18.14° degree of hip extension when measured by the goniometer.

Although prolonged sitting or physical activity may reduce passive hip flexibility, little study has been done to examine possible correlations. There has been only one prior study of the connection between sitting and physical activity and thoracic spine mobility. However, the experiment did not evaluate passively hip extension. As indicated by Thomas Test, the current study's goal was to investigate the connection between prolonged sitting behavior or physical activity and passive

hip extension. According to our predictions, prolonged periods of inactivity could be associated with a reduction in passive hip extension respectively. Figure 16 shows that the majority of the individuals perform a low level of activity and have prolonged sitting habits.

On at least five days of the week, US Federal Guidelines Adults should engage in aerobic activity for at least 150–300 minutes per week at a moderate intensity, 75–150 minutes per week at a vigorous intensity, or an equivalent combination of moderate and vigorous intensity.²⁷ Spreading out your aerobic exercise throughout the week is ideal. It is underlined that this is in addition to the low-intensity everyday activities (referred to as "baseline activity"), which include things like standing, taking it easy while you walk, and lifting light objects. The results of our study show that the majority perform 30 minutes of vigorous activity a week which included weight lifting, cardio, gym training, and another task that cause a rapid increase in heart rate and breathing rate. The majority of 60 minutes of moderate physical activity during the week. The fact that there are now much fewer needs for physical activity is concerning, though, as a result of developments in personal transportation, communication, workplace, and domestic entertainment technologies. Therefore, this baseline level of physical activity is decreasing. Exposure to surroundings that demand or encourage extended sitting is mostly to blame for the decline in activity.

CONCLUSION

The majority of the population is having a sedentary lifestyle with the passage of time and adapting to prolonged sittings either in workstations or during house chores. Eventually, the prolonged sitting and low physical activity level cause limited hip extension range of motion that further hinders the activities of daily living and affects the overall quality of life of the participants.

DECLARATIONS

Consent to Participate: Written consent had been taken from participants. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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