

EFFECT OF PROLONGED STANDING ON KNEE JOINT PROPRIOCEPTION

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ABSTRACT

This study was designed to determine the effect of prolonged standing on knee joint proprioception. Knee joint proprioception was assessed using Ipsilateral joint position matching test in terms of the active range of motion performed by the subjects when given a passive range of motion to be achieved by the subjects. Descriptive survey research design was adopted for the study. The population for the study consisted of all the faculty and guards of the Galgotias University, physiotherapists and the medical technicians of the Kailash hospital, Greater Noida. . The sample of this study was made of one hundred and eleven (111) randomly selected using convenience sampling technique of both male and female. Hypotheses were postulated to find if prolonged standing affects knee joint proprioception. . The study revealed that there was a significant decrease in the proprioceptive accuracy of the patient. Based on the findings, it is clear that prolonged study adversely affects the knee joint health in the long run. The workers whose job profile consists of prolonged standing should take care of knee joint to prevent early degenerative changes in their joint.

Keywords: Proprioception, Knee joint, Proprioceptive accuracy.

Introduction

With increased advancements in lifestyle of the peoples, we have become prone to many types of diseases and pathologies. Evolution has makes us better and better with every moment passing in time and it is still going on. We have evolved in human as we see us now from the dryopithecus and ramapithecus, they were hairy and walked like gorillas and chimpanzees. ramapithecus was more like man whereas dry opithecus was more apelike. We have covered a long, very long distance to what we are now, the homo sapiens. What is interesting here is the change along the time. We have changed from the tiny brain size to the advance 1400 cranial capacity brain. But the brain is not the only thing which changed during evolution. The posture of our body has also changed significantly. When all the four limbs were used for mobility, it was called the quadrupedal posture. We use now the erect bipedal stance.⁽¹⁾

The maintenance of erect bipedal stance is unique and exclusive to humans only. It is the position of perfect balance which requires the minimum of the effort and therefore the position itself and the muscle work required to maintain it must vary considerably in accordance with the anatomical structure of the individual. Its advantages are:

- It allows person to use their upper extremities for the performance of large and small motor tasks.
- It has given us freedom for the use for our hands in different activities such as writing, driving, cooking or in some cases playing thumb wrestling with our friends.
- It has medical advantages also, if the upper extremities need to be engaged by the use of crutches, cane, or other assistive devices to maintain the erect posture then the mobility of the patient will not be compromised whether it will assist the patient in walking.⁽²⁾

It has some disadvantages also such as it increases the work of the heart, places increased stress on the vertebral column, pelvis and lower extremities and thus reducing stability. But at the cost of these small disadvantages we get to use our whole body for the betterment of the society and this world.⁽²⁾

In the erect bipedal stance, the weight of the body transfers with different bones to the ground.

However, specialists have suggested that induced fatigue of the individual through running or any other activity have reduced the proprioceptive accuracy of the knee joint in those individuals.⁽³⁾ Specialists have also suggested that knee joint is one of the most often injured joints in the human body and by prolonged standing there are a number of ill effects of prolonged standing on our body systems which includes low back pain, many disorders of the heart rate and blood pressures, carotid arteriosclerosis, leg oedema, orthostatic disorders etc.⁽⁴⁾ Having this background, this study aims to understand the danger of prolonged standing in the individuals requiring prolonged standing in their work profile. Dangers like reducing proprioceptive accuracy or early degenerative changes in their knee joint.

Methodology

Subjects were selected from the population of volunteers based on the inclusion criteria.⁽¹⁰⁾ Study included people having prolong standing in their occupation. Population Source was from Galgotias University, Kailash hospital the study included both male and female guards, maintenance staff and faculties of and physiotherapists, X-ray technicians. Sample size was about 111 subjects with age between 25 to 40 years. Study was carried out in Physiotherapy rehabilitation department's lab, in the Galgotias University campus and Physiotherapy rehabilitation department's OPD, in the Kailash Hospital. Equipments used were - Quadriceps table, towel, pillow, inch tape, weighing Machine

Procedure:

After taking verbal and written consent from subjects, the interested subjects underwent a brief subjective screening and filled a screening performa for ruling out exclusion criteria. The subjects fulfilling the inclusion criteria were included in study. The researcher was available if the Participant required assistance to complete the performa.

The subjects were then instructed about the procedure and test. Initially the subjects were asked to sit on the quadriceps chair in the high sitting position erect posture with hip flexed at 90 degrees and knee flexed at 90 degrees. Then the patients were asked to close their eyes to exclude the visual stimulus, then the knee of the subject was extended 30 degrees from the initial 90 degrees flexed position passively. The knee was kept at that position for 2 seconds for the subject to remember the position. Then the knee was passively brought back to the initial starting position. The subject was then asked to actively extend the knee to the position achieved passively by the subject. Three trials were taken and the readings were recorded for each subject. This study used direct observations of the subjects' proprioceptive accuracy on a quadriceps table using degree of angle of the knee joint extension from a 90°degree flexed position of the joint via 'Ipsilateral joint position matching test'⁽⁵⁾ to assess proprioceptive accuracy of the knee joint.

Results

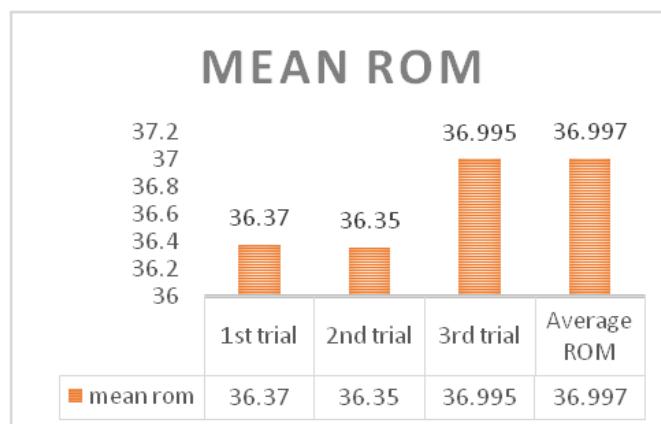
111 subjects both male and female participated in the study. Subjects had an average age of 32.95 years ranging from 25 to 40 years. The BMI of the subjects ranged between 15.625 to 25.718 kg/m².

Required statistical measures of central tendencies mean, median and mode were performed to find out the prevalence of loss of proprioception in the knee joint after a minimum of more than 30 minutes of standing in the sample population.

The results of the statistical analysis of range of motion data is as follows:

Active range of motion	Mean	Standard deviation	Median	Mode
1 st trial	36.37	5.99	40	40
2 nd trial	36.35	6.94	40	30
3 rd trial	38.33	6.59	40	40
Average score	36.997	6.51	40	36.67

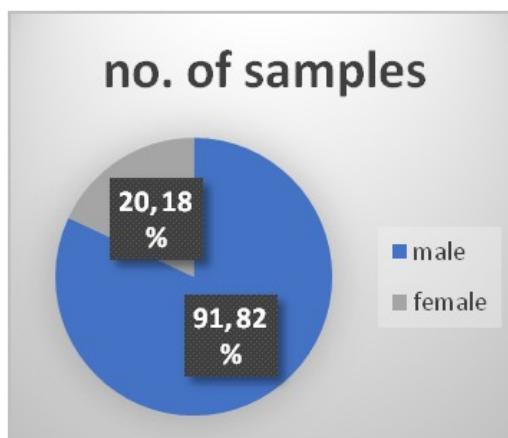
Table.1 Illustrating the result scores of subjects` active range of motion.



Graph1. Shows the mean ROM.

Variable	Mean ± SD	Median	Mode
Age(yrs.)	32.954 ± 4.72	33	32
Height(m)	1.615 ± 0.075	1.61	1.62
Weight(kgs.)	57.45 ± 6.78	58	58
BMI(kg/m ²)	22.037 ± 2.36	22.04	21.36

Table. 2 Illustrating the demographic data of the subjects



Pie chart 1. Shows the male and female sample participated in the study.

DISCUSSION

This study was designed to determine the effect of prolonged standing on knee joint proprioception. Knee joint proprioception was assessed using Ipsilateral joint position matching test in terms of the active range of motion performed by the subjects when given a passive range of motion to be achieved by the subjects. There was a significant decrease observed in the proprioceptive accuracy of the patient.

This decrease in knee joint proprioception after prolonged standing can occur due to generalised fatigue of the joint. This phenomena happens due to the accommodation of the exteroceptors (Exteroceptors are the receptors which controls the proprioceptive property whether position sense or the movement sense of the joint).⁽⁶⁾ On prolonged standing, there is continuous transfer of impulses to the exteroceptors about the static or dynamic standing position of the lower limb, because of this continuous impulses, the nerve gets accommodated and hence simultaneous checking of proprioception gives altered readings.

In this study we have targeted knee joint because:

- (1) The knee joint is a weight bearing joint so is sensitive to proprioception.
- (2) The articular surface of knee joint is not congruent.
- (3) The knee joint is more prone to injury than any other joint of the body.¹¹

In this study we found it fascinating that after prolonged standing there was decrease in knee joint proprioceptive accuracy irrespective of their gender. However Nese Sahin et al (2014) have stated in their study 'Evaluation of knee joint proprioception and balance of young female volleyball players: a pilot study.' that the female have more stable proprioception at their knee joint than males because of lower centre of gravity, lower centre of gravity provide more stability to the knee joint of females.⁽⁷⁾

In the current study we also found out that there was a significant role of BMI (Body Mass Index) in decreasing proprioceptive accuracy of the subject. The person having BMI on the higher side or the subject with endomorphic built appears to have poor proprioceptive accuracy than the person with ectomorphic built. So on this basis of this study we can also state that the obese individuals are more likely to have loss of proprioception than the thin individuals with lean body.

In our study we also found out that the subjects in their late 40's have more altered proprioceptive readings than the middle aged adults. So we can state that age also plays a major role in altering proprioceptive accuracy in the individuals. The person loses its proprioceptive ability with increase in age. Takashi Nagai et al. (2007) has also stated in their study 'Effect of Age and Osteoarthritis on Knee Proprioception.' that due to increase in age there is a loss of mechanoreceptors which in turn leads to decreased proprioception and

balance of an individual.⁽⁸⁾ Goble et al. (2017) also states that joint position sense becomes more accurate during childhood and adolescents, peaks in young adults and progressively deteriorates after this.⁽⁷⁾ Now a day in every profession there is great physical demand of our body. In the result of our study we can now say that prolonged standing has really adverse effect on our knee joint which can produce early degenerative changes like osteoarthritis. Thomas R waters et al (2015) suggests that there are a number of ill effects of prolonged standing on our body systems which includes low back pain, many disorders of the heart rate and blood pressures, carotid arteriosclerosis, leg oedema, orthostatic disorders etc. It also creates many types of pregnancy issues in the females.⁽⁴⁾

Due to prolonged standing the person becomes more prone to osteoarthritis in even younger age. Knoop j et al (2011) suggests that knee osteoarthritis and loss of proprioception are reciprocal to each other. If a person is having OA then she also been having loss of proprioception. He also states that loss of proprioceptive accuracy can be considered as a precursor of early osteoarthritis.⁽⁹⁾

Limitations to the study

- This study does not take in account various other methods to assess the proprioception in the individuals.
- There were also a small number of female subjects which also add up to the limitations.
- This study also has not taken in account the walking or any activity induced fatigue.

Future scope

Further studies are also needed to evaluate the other decreasing properties of knee joint due to standing for long hours. This study can also be used as a diagnostic tool to improve quality of life.

Conclusion

This study has clearly revealed that there is a significant effect of prolonged standing on knee joint decreased proprioception in the prolonged standing working profile individuals. It can be now clearly reasoned why there is seen more prevalence of the degenerative conditions in such individuals.

The evidence of decreased knee joint proprioception because of prolonged standing has now highlighted the need of such individuals to take rest between their works. The result of this study also clearly suggests the importance of physiotherapists in assessing the proprioception in the middleaged adults and take the occupational history seriously in their accounts before treating a patient with degenerative changes in the knee.

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