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The Effect of Prolonged Sitting on Thoracic Spine Mobility among College Students

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Abstract

Background and aims: Sitting over a prolonged period not only creates physiological health problem and cardiovascular diseases, but also increases the risk of musculoskeletal disorders. The goal of this study is to determine whether there is a link between thoracic spine mobility and prolonged sitting, and the objectives are, to assess whether there is a connection between the length of time spent sitting and the mobility of the thoracic spine and examine the effect of extended sitting on the mobility of the thoracic spine.
Methodology: The inclusion and exclusion criteria were checked on patients who were willing to participate in the study, they will provide an overview of the study before measuring thoracic mobility using methods such as the sitting rotation test (bar in front), in order to limit movement in participants lower extremities during thoracic rotation, a small ball was placed between their knees and a PVC bar with a tape marker at the halfway also used, which helps to fix the upper extremity. Using revised Oswestry to measure thoracic disability levels, the values were evaluated.
Results: The statistical analysis showed that those who spend more time in sitting had limited thoracic rotation range of motion. Also, the questionnaire of thoracic pain showed pain and high disability index who spend more time in sitting and travelling.
Conclusion: In people who spend more than 7 to 8 hours sitting, the study's findings showed that their thoracic spine mobility was decreased. According to the questionnaire, people who spend a lot of time sitting and travelling during the course of a day as well as those who experience discomfort or restriction when performing ADLs had a high disability index for thoracic spine pain.

Keywords

Prolonged sitting, Thoracic spine mobility, goniometer

Introduction

Sedentary lives are an unwanted aspect of modern civilization that affect a sizeable section of the population. With computerization in the office, improvements in transportation, and advancements in home technology, prolonged sitting has gradually become the norm (Owen et al.,2012)

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Therefore, it is conceivable that sedentary behaviours could lead to musculoskeletal alterations in the relatively rigid thoracic spine, that would cause spinal problems in the vicinity. The concept "regional interdependence" explains a connection between the onset or persistence of pain in one anatomical area and seemingly unrelated problems in another (Sueki et al.,2013).

Sitting over a prolonged period of time not only creates physiological health problem and cardiovascular diseases, but it also increases the risk of musculoskeletal disorders, and according to the reports, sitting posture puts around two times pressure on intervertebral disc than the standing posture does, and the posture become awkward or poor among students (Wilmot et al., 2012).

The use of physiotherapy techniques that concentrate on the thoracic spine in cases when neck and shoulder discomfort are present is well supported by the available research. It is now more important than ever to examine the connection between the inactivity, exercise, and the thoracic spine mobility. Given that sitting for just one hour increases spinal stiffness, it is logical to assume that sedentary habits could alter the relatively stiff thoracic spine musculoskeletal structure, that lead to the dysfunction of the nearby spinal regions (Walser et al ,2009).

Sedentary behaviour involves sitting down during activities like conversation and work. Since sitting typically consumes 1.0 to 1.5 METS of energy, moderate activities like swimming and cycling do not fall under this category. It might be argued that physically active people have better thoracic mobility because exercise increases the soft tissue mobility and prevents the muscle from shortening and stiffening of joints caused by static postures (Pate et al., 2008).

It is still unclear, nevertheless, what constitutes physical activity in terms of "duration of activity," "kind of activity," and "how often" the activity is done. With sedentary lives rapidly becoming the norm and proof that with of our daily lifestyle sitting for longer period time make worsen the health, physical activity was previously described as "more than 150 minutes of moderate to strenuous physical exercise each week", without the regular exercise and sedentary habits, the risk factors of disease conditions develop rapidly even with the young age population (Steene-Johannessen et al ,2016).

Methodology

A total of 50 subjects were chosen using convenient sampling based on inclusion criteria (both genders and age group 19 to 22 years) and exclusion criteria (other musculoskeletal problems) and provided with an overview of the study before measuring thoracic mobility using methods such as the sitting rotation test (bar in front). A small ball with 21cm of diameter was put between the knees of the participants which helps to reduce mobility in the lower extremities during thoracic rotation, and a PVC bar with a tape marker at the halfway also used, which helps to fix the upper extremity. The seated rotation test (bar in front) was used to evaluate the range of motion, the location on the spine between T1 and T2 was discovered by palpating inferiorly from C7, was marked with a piece of a tape. The individual was sitting with knees and hips flexed at 90-degree angle. To fix the position of the upper extremities, a 105-cm long and 2.5-cm diameter polyvinyl chloride pipe bar was utilised, with a use of a tape, mark the halfway at the bar. Crossing one's

arms across the bar with the bar across the chest is the front position, then using goniometer to measure the angle, after measuring those with decreased range of motion and increased thoracic spine stiffness, the exercise leaflet was given to them. Using revised oswestry to measure thoracic disability levels, then the values were evaluated.

Results

A sample of 50 was taken according to the criteria and responses were obtained. At first the 50 respondents self-reported questionnaire (thoracic spine pain disability percentage data was obtained, in that 10 respondents (30%) were categorized under severe disability index (27.6±1.6) (mean and SD) and majorly 25 respondents (50%) came under moderate disability (19.96±2.90), then 15 respondents came under mild disability index (9.13±2.13), according to the questionnaire. Most of them who spend more time in sitting and traveling, had severe disability and moderate disability index. Some had mild disability during their ADL activities due to thoracic pain (Table 1).

DOMAIN	OUTCOME MEASURE [mean ± SD]	
ROTP DQ	Mild – 9.13±2.13 Moderate- 19.96±2.90 Severe – 27.6±1.64	
	RIGHT	LEFT
ROM & SITTING DURATION	27^o to 30^o – 28.2^o ±1.63	28.4^o±1.5
	25^o to 27^o – 26.06^o±0.88	25.6^o±0.73
	22^o to 24^o - 23.1^o ± 0.87	22.7^o±0.67

Table 1: Results of the study

The statistical analysis showed that those who spend more time in sitting had limited thoracic rotation range of motion, sitting duration 6 to 7 hours in 25 samples (27o - 30o), R (28.2o ±1.63) , L (28.4o±1.5), 7 to 8 hours sitting duration among15 samples (25o - 27o), R (26.06o±0.88), L (25.6o±0.73) , more than 8 hours in 10 samples (22o -24o), R (23.1o ± 0.87), L (22.7o±0.67).There was an significant reduction in thoracic mobility those who spent more than 6 or 7 hours in sitting in their daily life.

Discussion

The following study carries out the information about the relationship between prolonged sitting and its effects on thoracic spine mobility in the middle age population of the age group (19 to 22). Then using the ROTPD Questionnaire and thoracic rotation range of motion, the thoracic pain disability percentage and mobility was found out. The relevant data was analyzed statistically to find the values.

The study findings, with a large effect size, offer preliminary support for the notion that physical activity has positive effects on thoracic spine mobility by means of improving the mobility, a proxy for spinal musculoskeletal health, and prolonged sitting has negative effects,

even though no causal relationship can be inferred from the results (Heneghan et al., 2018). Research on sedentary behaviours must go beyond the first, encouraging studies on TV watching in order to understand the potential health impacts of other usual sedentary behaviours.

The risk ratios (RR) of diabetes, cardiovascular disease, cardiovascular death, and all-cause mortality, rise by 112 percent, 147 percent, and 90 percent, respectively, with increasing levels of sedentary habits by the modernization of the world (Wilmot et al, 2012), In a recent study, like a meta-analysis which looked at the connection between TV watching time and health outcomes only included a few studies and one sedentary behaviour. Specifically, the risk ration of the diabetes and heart disease and overall mortality, because watching TV has been found to be a poor predictor of typical sedentary behaviour, particularly in men, it may potentially overstate the true influence of ordinary sitting-associated sedentary behaviour on fitness findings. The effect of limiting inactive time on metabolic health requires urgent further research. Future diabetes preventive campaigns must emphasise the change in current modern lifestyle and the dietary habits. (Grøntved et al., 2011),

Males showed a nonsignificant trend toward a similar U-shaped correlation between sitting during leisure time and the neck shoulder pain, however sitting during work was associated with the opposite relationship, less sitting was associated with less pain intensity than moderate sitting. In this U-shaped relationship between daily sitting duration and neck shoulder pain, moderate sitting was associated with lower pain intensity than both less and more sitting (Hallman et al., 2015).

The results for thoracic spine rotation ROM were consistent with previously published normative values. The proposed technology involves half-kneeling while sitting with the lumbar region locked. All in-tester and inter-tester ICC values are above 0.85, which is regarded as a good result. All techniques also have smaller measuring errors (SEM). MDC value less than 6 ° and less than 3°23. Anatomical markers like the spine of the scapula were easier to see when the bar placed in front of the chest (seated rotation) and the half kneeling position. Those who had trouble holding their balance during the half-kneeling position, have found more stability in the sitting rotation test than the half kneeling position; however, several participants found it challenging to keep the ball between their knees. We were unable to tell whether this was due to true hip adductor muscle weakening or rather an inability to rotate the trunk while keeping a stable pelvis. The combination of better stability and improved visualisation of anatomical landmarks in the seated rotation test (bar in front) helped the examiners to get similar results in most of the time. Participants who struggled to keep balance, faced difficulties in the half-kneeling positions and the bar in rear position, this leads to shaking of the participant during the measurement, makes the examiners more challenging to get the accurate results (Portney et al., 2009).

The inability to balance in this position could be an indication of several problems in the trunk or lower extremities. The clinician may need to conduct additional tests to ascertain the precise cause of the patient's incapacity to complete the test in this situation (Johnson et al,.2012). Although we were not able to conclude that the motion occurring only at the thoracic spine, so the values obtained was compared with the previously known or reported normal spine rotation range of motion values. (Willems JM et al,.1996).

Conclusion

In people who spend more than 7 to 8 hours sitting, the study's findings showed that their thoracic spine mobility was decreased. According to the questionnaire, people who spend a lot of time sitting and travelling during the course of a day as well as those who experience discomfort or restriction when performing ADLs have a high disability index for thoracic spine pain.

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