# A Pilot Study to Find Out Whether Low Intensity Dynamic Exercise Causes Vertebral Column Height Redication in Young


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## ABSTRACT


Intervertebral discs contribute one fourth of the total vertebral column height. IVD allow the movement between vertebral bodies and transmit the forces and the basis for locomotion .When the axial compression is greater than interstitial osmotic pressure ,water extrude through the disc wall and result in decrease in the height and total body height .During day ,due to constant force of gravity and muscular activity. This study was to find out whether low intensity exercise reduces vertebral column height. The low intensity exercise was 20 min jogging in the ground. The C7 and S2 spinous process were palpated and marked with a dot on the skin over the middle of the spinous process of 20 asymptomatic subjects of age group 18-21. It was measured before running and recorded vertebral column height. The subjects were allowed to run for 20 minutes in low intensity. Following the run, the subjects were aligned to palpate the C7 and S2 spinous process and the second vertebral column height measurement was taken. Height of the subject also measured prior and after the exercises by using stadiometer. This study shows that there is significant height difference ($p<0.05$) and No significant change in Vertebral Column Height / Trunk height ($P = 0.098$) after low intensity exercise. This study concludes that there is no statistically significant

reduction in vertebral column height after low intensity exercises, which have a high clinical relevance.

**Key words:** Vertebral Column Height, Intervertebral Disc, Youngs, Height, Loading response, Low Intensity Exercise.

# A PILOT STUDY TO FIND OUT WHETHER LOW INTESITY DYNAMIC EXERCISE CAUSES VERTEBRAL COLUMN HEIGHT REDICTION IN YOUNGS

## INTRODUCTION

The spinal column is one of the most important body parts. Without it you could not support yourself upright and perform many complex functions. A healthy spine will optimize the body's transmission of energy and go through daily tasks with ease and comfort.

Intervertebral discs (IVD) are the connection between two adjacent vertebras .It consist mainly of 3 parts;(i)Nucleus pulposus: the abundant mucopolysacharide in it help for movement in spine by deforming and under compression alter the shape of the disc, (ii)Annulus fibrosis : because of its high collagen content it act as load bearing structure, and (iii)The vertebral end plates : can tolerate high compressive forces. IVD's contribute one fourth of the total vertebral column height (VCH).[1,2]

IVD allow the movement between vertebral bodies and transmit the forces and the basis for locomotion .When the axial compression is greater than interstitial osmotic pressure, water extrude through the disc wall and result in decrease in the height and total body height. During day, due to constant force of gravity and muscular activity, IVD loses its height and when the person is recumbent water imbibed to the nucleus pulposus to restore the height. Dynamic load shrinks the IVD most than static load.[3,4]

IV discs appeared to perform differently in a variety of body positions in both genders. Discs are pads of soft tissue that lie between the vertebrae. Its main function is to act as shock absorbers and provide separation between each vertebra. It is also responsible for the flexibility of the spine. On average, your total discs account for one-quarter the length of your vertebral column 4.50" to 6" (12 to 15 cm) for most people. The thicker those discs, the longer your spinal column is and the taller you become.[5]

IVD are made up of water, and when the discs compress beyond a certain pressure, they will leak water through the disc wall. The result is a loss in disc height and volume, and therefore a slight change in overall height, as intervetebral discs make up one-third of the height of spinal coulumn.

Although everyone's vertebral column height decreases throughout the day, running speeds up the rate of shrinkage because the discs compress significantly more under the force of stride. Studies found that running for 30 minutes at moderate intensity decreases disc height

by about 6.3 percent.[6] Each disc in the lower spine is about seven to 10 millimeters thick, so if we assumed each disc was that thick (a generous assumption, as normal discs get as small as three millimeters higher up) that's a maximum about 10 to 15 millimeters off of height after a half-hour jog on the treadmill. Since it is proven that moderate intensity running decreases the height of the vertebral column,[7] we are trying to find out whether low intensity exercise do any role in reduction of vertebral column height.

**Objective** of the study is to find out whether low intensity exercise affect vertebral column height and thus to determine whether low intensity exercise is preferable for patients suffering from spinal segment diseases.

## METHODOLOGY

**Sampling:** The participants in the study were college students of age between 18-21 years of both sexes. The design of the study was pre-post interventional study. And the sampling technique we administered was purposive sampling. Subjects with scoliosis, limb length discrepancy were excluded from the study.

**Test Procedure:** The study utilized a pretest / post test to determine if there is any relation between low intensity exercise and vertebral column height. The low intensity exercise was 20 min jogging in the ground with the guidance and supervision of qualified physiotherapists. The C7 and S2 spinous process were palpated and marked with a dot on the skin over the middle of the spinous process of 20 asymptomatic subjects of age group 18-21. It was measured before running and recorded vertebral column height. The subjects were allowed to run for 20 minutes in low intensity. Following the run, the subjects were aligned to palpate the C7 and S2 spinous process and the second vertebral column height measurement was taken. Height of the subject also measured prior and after the exercises by using stadiometer.[8] To avoid measurement error we done three measurements of each variable by three different evaluators and calculated the average value for each variables.

## RESULTS

Statistical Analysis: For the descriptive statistics mean and standard deviations were used for age, pre-post pulse rate, pre-post height, and pre-post vertebral column height. Paired sample t test was used to compare the means of height difference and vertebral column height within the group with p value $<0.005$ considered as statistically significant.

Table 1 shows the descriptive statistics of the subjects participated in the study. The pulse rate of the subject, height and vertebral column height prior to the moderate intensity exercise was 79.50 bpm, 166.35 cm, and 47.15 cm respectively. After the moderate intensity exercise the subjects pulse rate, height and vertebral column height was changed to 98.30 bpm, 164.84 cm and 44.90 cm respectively. The mean difference of height and vertebral column height prior and after to the exercise was 1.51 cm, and 2.25 cm correspondingly.

Table 1.Descriptive statistics of the subjects

| Variables | Mean ± Std. Dev |
|---|---|
| Age | 19.70 ± 1.25 |
| Pulse pre (bpm) | 79.50 ± 4.43 |
| Pulse post (bpm) | 98.30 ± 10.06 |
| Height Pre (cm) | 166.35 ± 7.30 |
| Height post (cm) | 164.84 ± 7.08 |
| Height Difference (cm) | 1.51 ± 0.82 |
| Vertebral column height Pre (cm) | 47.15 ± 5.43 |
| Vertebral column height Post (cm) | 44.90 ± 3.45 |
| Vertebral column height Difference (cm) | 2.25 ± 3.85 |

Within the group comparison by using paired t test shows significant difference in height (p=0.000) and vertebral column height shows statistically not significant difference (0.098).

Table 2.Paired sample t test comparison within the group

| Variable | Mean ± SD | t value | Sig. (2 –tailed) |
|---|---|---|---|
| Height (Pre – Post) | 1.51 ± 0.82 | 5.84 | 0.000 |
| Vertebral column height (Pre – Post) | 2.25 ± 3.85 | 1.85 | 0.098 |

## DISCUSSION

The study is initiated to check the effect of low intensity exercises (20 minutes jogging) on vertebral column height. Twenty healthy volunteers participated in this study. The vertebral column height is measured by noting the distance in centimeters between C7 and S2 spinous process before and after the exercise. The study shows that there is no statistically significant difference in vertebral column height after a low intensity exercise, which is clinically relevant when considering the exercise prescription of an IVDP patient.

The loss of vertebral column height is a well documented phenomenon in literature. The reason behind the loss over 24 hours are fluid loss due to decrease disk volume, radial bulging of annular fibers, bulging of vertebral end plates into vertebral body and increase in lordosis. In most of the studies the vertebral column height is checked after a sternous

exercise (one hour running, static loading for 3-4 hours etc.) all the studies have proved that the VC height reduces by 1.2- 1.5 mm.[9,10,11]

The only way for the discs to return to a more youthful state is to stimulate the spine. This can be done by regular stretching and moving the spine through its full range of motion so that blood circulation and fluid content of the discs are increased. Otherwise, the discs may lose its elasticity and become rigid, and hence will lead to height loss. Regular stretching and inversion can help increase your height by expanding the discs and lengthening your spine. These discs acquire nourishment through fluid-attracting and fluid-absorbing qualities of its jelly-like nucleus. During non-weight bearing activities (like sleeping) the discs expand as they soak up fluid, increasing the length of the spine by as much as an inch overnight.[12] However, the pull of gravity during the day results in compression fatigue that causes the average adult loses an inch in height each day primarily because fluid is squeezed out of the spinal discs (this reverses during sleep). Therefore, if you measure yourself in the morning right after you wake up, you are about an inch taller than if you were to measure yourself at night.
The second important component of the spine is the supporting muscles i.e. adjoining muscles and ligaments. They help you move and support your spine. Muscles are used for three basic functions; support, movement and posture control.

Present study aims to find out whether a low intensity exercise too makes such changes and found that it doesn't affect much. The reason behind it can be the short term nature of the spine loading. It has been proved that the radial bulging never occur immediately after the load is applied and the creep mechanism following loading takes time reason being the biochemical composition of annular fibers. The fluid in the disk also won't gain or lost over a short period of time. Our findings are supported by the study conducted by M. Kordi et al on the disk height in bed ridden patients using MRI.[13]They have found that the immediately following bed rest there is no change in vertebral disk height and the height increased only after 3-6 months of bed rest.

## CONCLUSION

This study concludes that there is no statistically significant reduction in vertebral column height after low intensity exercises, which have a high clinical relevance. We also recommend conducting this study in large population to find out clinical correlations.

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**Conflict of Interest:** The authors have no conflicts of interest to disclose.

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