backrack™

Innovative technology in spinal care and pain relief

spinalbackrack.com

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In order to develop a fundamental understanding and mechanism of the Back-Rack instrument in treatment and prevention of the back pain conditions, a finite element analysis was performed. This new and modern approach is used in many scientific projects for specific applications. In this case it allowed to simulate the displacement parameter affecting decompression of the facet joints of the spinal vertebraes along the whole length of the human spine, figure1.

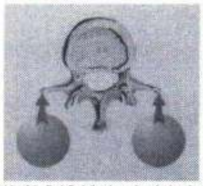

Figure 1. The principle of the Back-Rack function and mechanism showing the loadin points onto the spinal facets.

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The stimulation was carried out on a single spindle for three different parts of a human spine: thoracic, cervical and lumbar.
The measurements were performed for a number of cases: standard lying position of a person of an average weight, and also for situations when an increased local load was applied to different parts of the spine facet joints in a process of various exercise position of a person lying on the device.

Figure 2. 3D finite element structure of a single spindle.

3-diamentional finite element structure of a single spindle composed of two pseudo-balls and its analytical mesh is shown in figure 2. The dimensions and shape agrees with the patented model.
The modulus value of the material in consideration was properly chosen, as well as the load distribution along the whole length of the human spine for the purpose of the final element calculations. This allowed obtaining the actual displacement values along the spindle, as a result of the applied load to specific points. This displacement is directly responsible for the mechanical movement of the facet joint leading to stress release associated with the back pain problems.

Standard & motion position C

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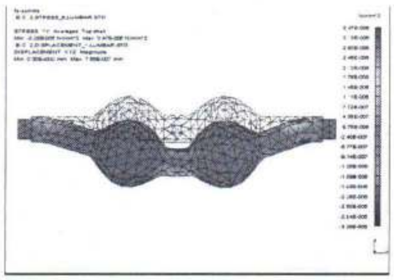
The graphical presentation of lumbar in standard-lying position is presented in the picture below.



Graphical presentation of lumbar in standard position

The linear graphs illustrate the symmetrical displacements in the direction of the applied load occurring along the spindle under certain loads. These vary in a systematic way, translating the load and therefore the equivalent stress into the relevant part of the spine, causing relief of the mechanical pain.
The initial standard position is shown in figure 3 for cervical, thoracic and lumbar regions of the spine.

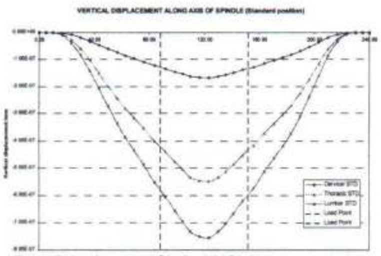


Figure 3. Displacements ~~for the standard~~-starting position.

As the load vary during specified motions performed by a patient on the Back-Rack, the displacement of a weight bearings vary accordingly, increasing its function over the affected regions, as demonstrated in figures 4, 5 and 6.

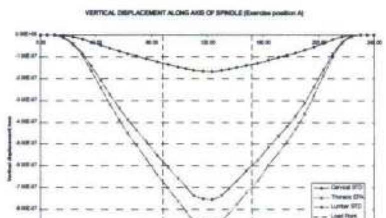


Figure 4. Displacements for the exercise position A, increasing the load acting on thoracic part.

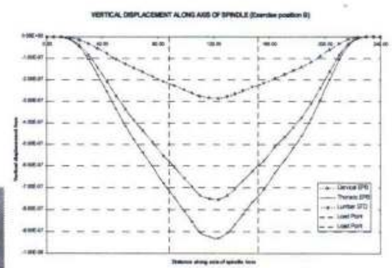


Figure 5. Displacements for the exercise position B, increasing the load acting on cervical and thoracic parts.

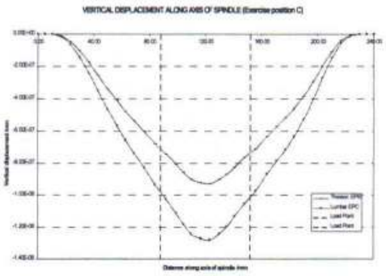


Figure 6. Displacements for the exercise position C, increasing the load acting on thoracic and lumbar parts.

A comparison between all considered cases is clearly presented in figure 7.

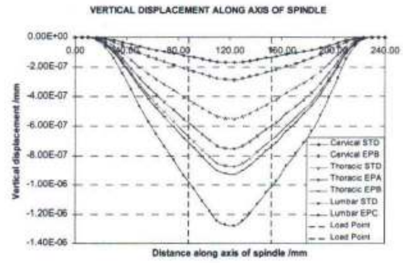


Figure 7. Comparison between displacements of the standard position and exercise positions: A, B and C.

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***The Back-Rack device simulation reflects and reproduces the actual and real situations related to mechanical back pain conditions.**
***The device has potential to relief in a systematic manner the pain condition, and the patient is in total control of the treatment and its dose. This is of paramount importance, when treatment is performed at home, or under other unsupervised conditions.**
***The device is ideal in prevention of the back pain, and spine relaxation.**
***The Back-Rack is a simple and easy devise to use and brings the desired result in back pain conditions.**

Scientific advice by Dr. Z.B.L. (Europ. Engineer MSc, PhD).