Revised personal version of:

> Fryer, J., Zhang, W., Preliminary investigation into a seated unloading movement strategy for the lumbar spine: A pilot study. Journal of Bodywork and Movement Therapy (2008). In press.

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Intervertebral disc height loss is considered by many as an indication of decreased intervertebral function. In many scientific circles, decompression or unloading is a common theme in the pursuit of treatments associated with this loss and function. These interventions range from conservative to surgical treatments with varying success.

To date it is undisputed that lesions to intervertebral discs are intricately tied to pain syndromes--from annular tears to sequestered disc herniations. But understanding the real-time nature of intervertebral discs has been difficult to measure. Recumbent 3T MRI has played a significant power tool in the identification of diagnostic disc lesions and in turn, given us a snap-shot in time of possible reasons why patients may hurt in functional dynamic settings. The advent of upright MRI is becoming more useful as it able to image biological tissues under load but work is required to increase the power of the magnets to increase imaging resolution.

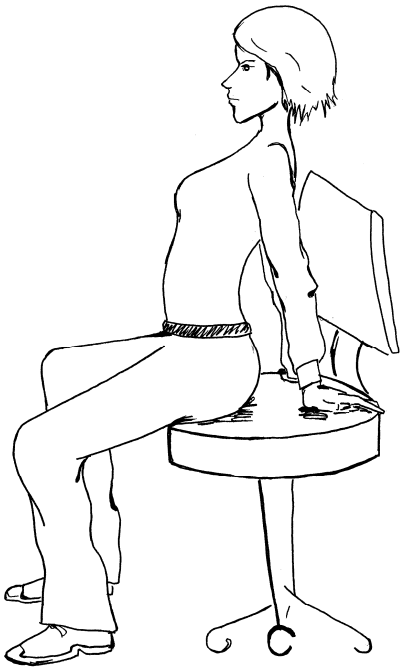
Recently, research popularity associated with sustained loads has surfaced in the literature. For example, Little et al. found that sustained loads on the lumbar spinal discs caused mechanobiological creep to occur at a faster rate when compared to repetitive flexion loads.[1] Others have found "static compressive loading initiates a number of harmful responses in a dose-dependent way".[2] Furthermore, it is beginning to appear that the hydraulic nature are dependent on the *intra*vertebral pressures that contribute to an outward pressure into the disc(s) helping; encouraging intervertebral spacing. These improvements of in vitro studies have shown intervertebral disc creep to differ greatly when pressures within vertebrae are accounted for.[3] Ultimately, intervertebral discs are

the largest avascular tissue in the body and require a nutrient route be as dynamic as possible. It is through endplate transport where the disc acquires the vast majority of its nutrient supply.[4] More recent research has demonstrated an increase in oxygen levels in dynamically loaded discs when compared to static loading.[5]

Therefore, if we know the route of nutrition is through endplates, understanding the hydraulic mechanics that encourage facilitative influx and associated efflux, to and from these discs, is of paramount importance. The purpose of my recently published article is to begin this discussion: At what frequency should the discs be unloaded? Should the disc wait for sleep/recumbancy to unload the compressive diurnal effects of gravity load or should these discs be unloaded more frequently throughout the day? Interestingly, the act of shifting while sitting very often involves a decompression moment when someone utilizes the upper extremities.

Chair-Care

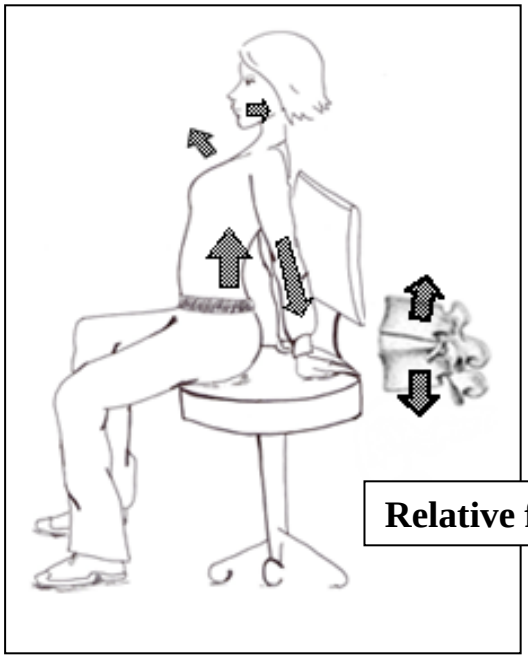
This anti-creep movement strategy was developed in 1998 and was put into clinical chiropractic practice between 1999-2008. This exercise was primarily recommended as a temporal decompressive creep strategy to those patients with low back pain related to sitting…with the clinical desire to deliver more nutrients and hydraulic structure to lumbar intervertebral discs. The clinical outcomes have been good and difficult to ignore. This was the impetus of the recent publication in the Journal of Bodywork and Movement Therapies. Weaving current understandings of intervertebral disc mechanobiology with concepts of joint stability, this exercise called ‘chair care’ appears to encompass many fundamental therapeutic principles. This unloading strategy resembles a montage of four different treatment styles: McKenzie, Cox flexion, intermittent traction, and abdominal bracing (McGill 2002) and combines them into a simple seated exercise that can be done almost anywhere and *anytime*. It is also similar to an observed orthopaedic disc sign called Minors when the upper extremities are utilized in the act of lower spinal unloading.



A seated anti-axial-creep movement strategy, chair care

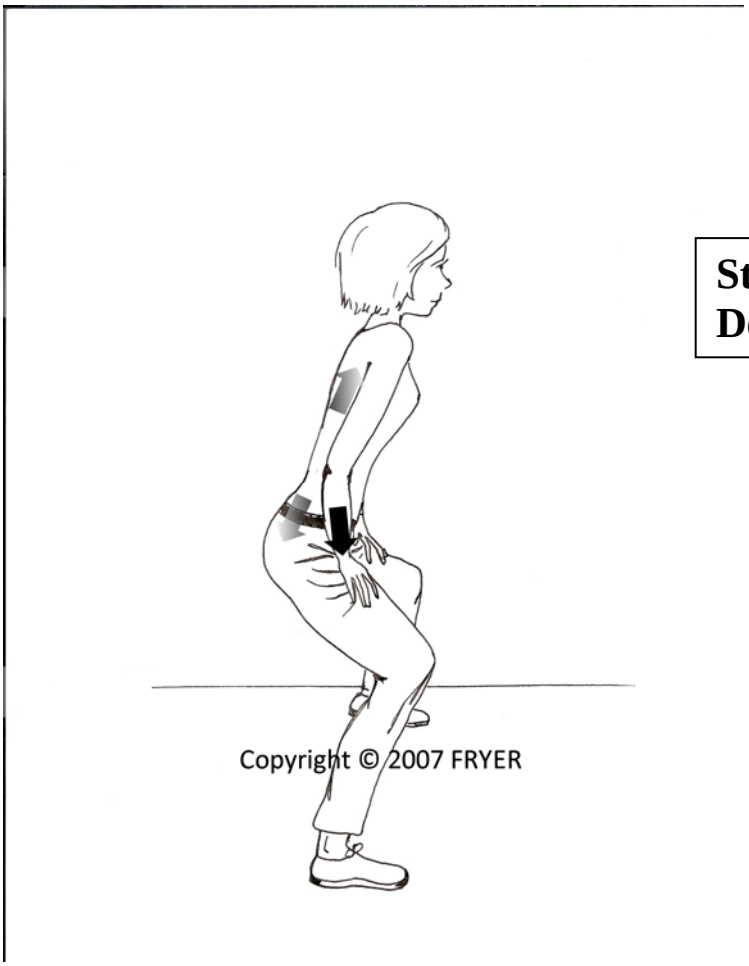
Instructions: Press into the seat cushion with your hands and relax the lower back while creating a distraction moment in the lumbar spine. The majority (approx. 60-80%) of your full weight should be supported by the shoulder girdles. Be sure to keep the chin retracted and arms externally rotated. Hold for 5 seconds. Most people feel a stretching in the lower back while the weight is "taken off" the lumbar spine. Gently return to neutral sitting posture for 1-3 seconds, allowing the full weight to be re-supported by the spine. Repeat 4 times.

NOTE: Advanced users: abdominal bracing (as per McGill, 2002 p.210) engagement prior and during the return to the resting neutral phase. Relaxation from bracing should take place upon the anti-axial-creep (decompression) phase of this exercise to relieve the buttressing effect and allow full recompression of the spine. (this advanced level was not explained for this study)

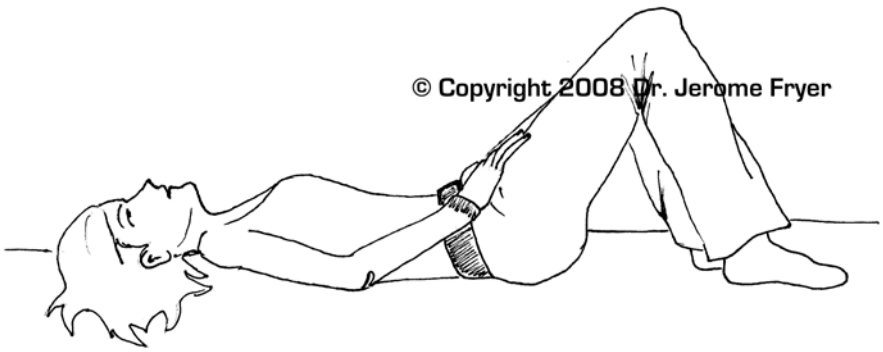


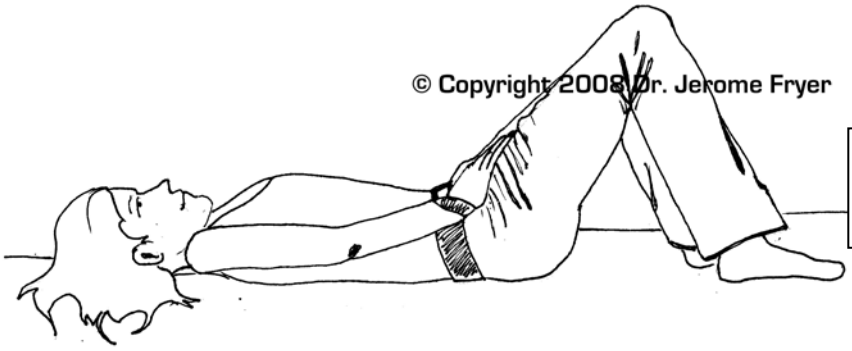
Relative force vectors

Since the accepted pilot study of “chair-care”, I have since designed options for people who require lumbar decompression while standing (Standing Decompression) and/or during recumbancy (Supine Decompression). The optimal rate of unloading to loading is still something researchers must determine. My follow-up work with MRI upright has suggested that the rate of unloading to unloading is much more frequent than what has been previously thought. Preliminary data analysis suggests that unloading, whether it is through these decompression strategies, or even through the act of shifting using the upper extremities to unload the lower spine, should occur every 8-10 minutes! More systematic research must be done. **Words of caution are warranted in any highly inflammatory states of spinal disease with decompression.**



Standing Lower Spine Decompression





Supine Lower Spine Decompression

All in all, humans naturally unload and possibly should unload more frequently. Whether it is in the form of chair-care or just grabbing an arm-rest upon rising out of a chair or whether it comes in the form pressing elbows into a table-top when sitting, common unloading naturally occurs using the upper extremities during the day in humans. Interestingly, knuckle walkers demonstrate much less spinal osteoarthritis compared to bipedals.[6] Is it due to the frequency of spinal unloading?

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[1] Little J, Khalsa P Human lumbar creep during cyclic and static flexion: creep rate, biomechanics, and facet joint capsule strain. Annals of Biomedical Engineering (2005) Vol 33, No. 3 March 391-401.

[2] Lotz JC, Colliou OK, Duncan NA, Liebenberg E Compression-induced degeneration of the intervertebral disc: an in vivo mouse model and finite-element study. Spine. (1998) 23, 2493-506.

[3] Huber G, Morlock MM, Ito K, Consistent hydration of intervertebral discs during in vitro testing. Medical Engineering & Physics 29 (2007) 808-813.

[4] Urban J P, Smith S, Fairbank J Nutrition of the intervertebral disc Spine (2004) Vol 29, No 23 2700-2709.

[5] Huang, C.-Y., Gu, W.Y. Effects of mechanical compression on metabolism and distribution of oxygen and lactate in intervertebral disc. Journal of Biomechanics (2008) 41, 1184–1196.

[6] Jurmain R Degenerative joint disease in African great apes: an evolutionary perspective Journal of Human Evolution (2000) 39, 185–203.