

## Prolonged Sitting Induced LBP

### What is LBP?

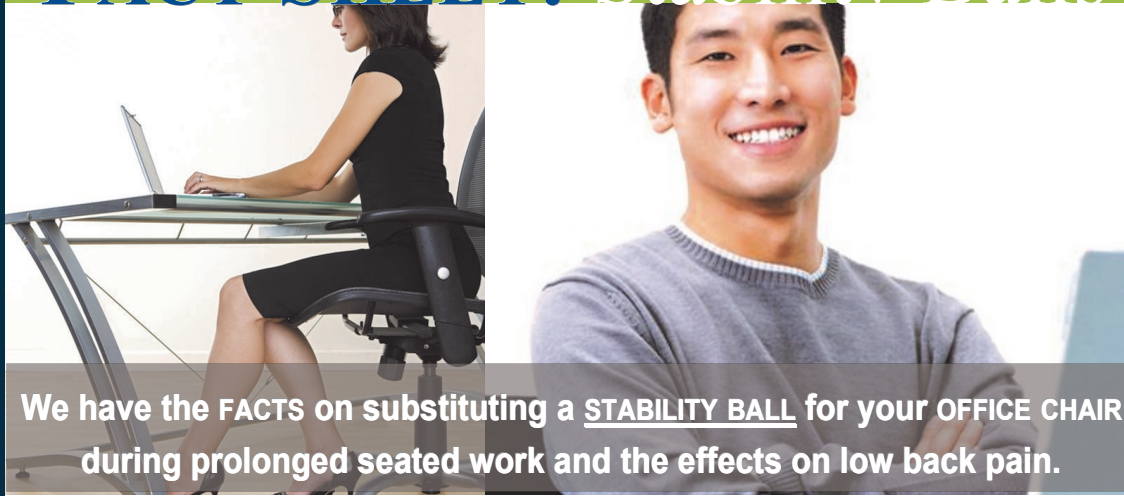
Low back pain (LBP) is one of the most common musculoskeletal disorders. It is believed to stem from chronic overuse as well as acute injury to the intervertebral discs, nerves, muscles, ligaments and/or vertebra of the lumbar spine (Roffey, 2010).

### THERE ARE THREE MAJOR CONTRIBUTING FACTORS:

1. Inadequate intervertebral disc nutrition
2. Spinal ligaments stress-relaxation relationship
3. Fatigued muscles

The main load bearing structure of the spine are the Intervertebral discs found between the vertebrae. Movement is very important to the health of these discs as it promotes blood flow to allow for proper nutrition. Prolonged sitting enhances static loading which decreases blood flow and nutrition to these structures. Furthermore, prolonged seated postures increase stress on the ligaments and muscles of the low back. This can result in muscle fatigue and injury to soft tissues (Kingma, 2008; Ergonomics at work, 2002).

# FACT SHEET: Stability Balls Vs. Office Chairs



We have the FACTS on substituting a STABILITY BALL for your OFFICE CHAIR during prolonged seated work and the effects on low back pain.

### Introduction

Seated computer work has been shown to cause increased tension on the spine and low back muscles. A clear relationship between prolonged sitting and low back pain has not yet been confirmed (Gregory, 2006; Dunk, 2010; Roffey, 2010). However, there is a population with low back pain that appears to be aggravated and/or induced by prolonged seating as exposure to static spinal loading will affect lumbar stiffness (Dunk, 2010; Kingma, 2009).

Recently, stability balls have been marketed by suppliers as an alternative to office chairs as a means to eliminate or prevent the development of low back pain (Gregory, 2006). Stability balls are very versatile are a great way to increase the difficulty of a workout routine, but, may not be as beneficial during prolonged seated work. Several studies have investigated these claims:

#### Claim:

The unstable nature of the stability ball is theorized to contribute to a reduction in low back pain by increasing core stability and strength with increased core muscle activation while sitting.

- Constant low level muscle activity has not been shown to have adverse health affects, but can lead to the development of muscle fatigue which may result in improper and awkward postures (i.e. slumped back posture, spread legs for support, leaning on support surface to balance) which may enhance the strain on the low back and spine.
- Higher resting muscle activation also contributes to enhanced fluid loss from the intervertebral discs due to higher forces on the spine, enhancing lumbar stiffness.

#### Claim:

Stability balls will offer more comfort while sitting for long period of time compared to an office chair.

- There is an increase in contact surface while seated on a stability ball which is more uniformly distributed compared to an office chair. This has actually been shown to increasing discomfort (Gregory, 2006).
- This along with back muscle fatigue makes sitting on a stability ball for extended periods of time very uncomfortable during prolonged sitting.
- Office chair seat pans are designed to distribute the weight away from the softer tissues and load under your sitting bones (ischial tuberosities) which have greater "pressure thresholds" (Gregory, 2006; McGill, 2006).

#### Fact:

No significant differences have been found in muscle activation when sitting on an office chair compared to a stability ball (Gregory, 2006). But, constant low level muscle activation of the lower back muscles have been noted (Kingma, 2009).

#### Fact:

More discomfort was reported when sitting on a stability ball for prolonged periods of time (Kingma, 2009; Gregory, 2006, McGill, 2006).

## Prolonged Seated Work & Low Back Pain

**“Those with low back pain have decreased abdominal strength and postural control as a result of this injury” (Gregory, 2006)**

#### Claim:

The unstable nature of the stability ball is also theorized to contribute to a reduction in low back pain by allowing for greater lumbar spine motion. This will be beneficial for both the intervertebral and muscle nutrition.

- The stability ball does offer more trunk motion but this is at the increased cost of lumbar muscle and spine loading (Kingma 2009).
- Studies have reported Increased spinal shrinkage due to greater muscle and spine loading which enhances compression when sitting on the stability ball (Kingma, 2009; Dunk, 2010).
- Higher compression will increase stiffness and prevent nutrients and blood flow to these areas; a major contributing factor to LBP (Roffey, 2010).

#### Fact:

There have been no significant differences observed in lumbar motion when sitting on a stability compared to an office chair, but enhanced spinal shrinkage has been observed (Kingma, 2008; Dunk, 2010).

## Further Considerations:

### A Stability Ball:

- Is not easily height adjustable.
- Is not very stable.
- Will roll away when not seated.
- Is not very mobile when seated.
- Does not have armrests or a backrest.
- May be a tripping hazard.

### Conclusion

Stability balls are great for exercise due to their instability which will challenge core strength, but do not seem conducive in the workplace where prolonged seating will occur.

There appears to be no great advantages to using a stability ball within a workplace where a position requires prolonged seated work and may in fact have detrimental effects.

Although no postural or muscle activation differences have been reported in research, these studies have primarily examined young individuals, free of back pain or confounding issue over a 1-2 hour period. Considering, they still reported increased low back fatigue and greater discomfort which are major contributing risk factor for LBP.

Those who are at risk of having or have experienced low back pain should be cautious as sitting on a stability ball may aggravate or create new issues.

### Recommendations: Low Back Pain Management

1. Rest your back! Muscles and soft tissues need time to recover from stress and injury.
2. Gentle stretching and massage will increase blood flow and relax irritated muscles.
3. Consider an office chair with a high degree of adjustability to allow for proper seated postures.
4. While sitting change seated postures regularly, before symptoms appear.
5. Introduce breaks frequently throughout your day to get you up and out of your chair to move around.

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#### Sources:

1. Dunk, NM and Callaghan, JP (2010) *Work* 35: 3-14.
2. Ergonomics at Work Inc., Introduction to office ergonomics, 2002
3. Gregory et al. (2006) *Human Factors* 48(1) 142-153
4. Kingma, I and van Dieen, J (2009) *Applied Ergo* 40: 199-205.
5. McGill, SM et al. (2006) *Clin Biomech* 21(4) 353-360.
6. Roffey, DM et al. (2010) *The Spine Jour* 10: 252-261.