



Centre of Research Expertise for the  
Prevention of Musculoskeletal Disorders



Centre for Research Expertise  
in Occupational Disease



Occupational  
Cancer  
Research  
Centre

## CRE-MSD studies find no benefit to using stability balls in the office

A stability ball is a large inflated ball up to 100 cm in diameter. It is primarily used for core stabilizing exercises such as abdominal crunches, although it is also used in rehabilitation settings to aid in whole body balance development and control. Recently, the popularity of stability balls has risen, as they are becoming an alternative to the standard office chair.

Using stability balls as office chairs is said to provide benefits such as increased core strength, improved posture and decreased discomfort through increased trunk muscle activation. The latter, decreased discomfort, is based on research that shows a positive relationship between reduced trunk muscle strength and/or endurance and individuals with low-back pain. From an ergonomics perspective, it is well established that more neutral spine postures at work may reduce the development of low-back pain.

If the claims associated with using a stability ball in an office environment are correct, then the stability ball may have some potential to decrease and/or prevent low-back pain associated with prolonged seated work. These potential benefits must be balanced with the potential for prolonged exposure to increased muscle activation and increased localized muscle pain, both of which can be detrimental to individuals.

### Original research at University of Waterloo

Researchers at the Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD) at the University of Waterloo were the first to investigate the ergonomic health benefits of stability balls in 2006. Prior to this work, no study had looked at the trunk muscle activation and spine posture of individuals sitting on a stability ball compared to those sitting on a standard office chair. Up until this point, there was only anecdotal evidence to suggest that, while the initial use of a stability ball as a chair may induce low-back pain, progressive use may actually help reduce low-back symptoms once the user has become accustomed to using a ball as a chair.

The first study conducted in Dr. Jack Callaghan's laboratory at the University of Waterloo examined trunk muscle activation patterns and lumbar spine posture in 14 healthy men and women. The participants sat on a stability ball for one hour and then on a standard office chair for one hour. Results showed no significant differences between the muscle activation patterns while on the ball versus the office chair. There was one negative outcome associated with the use of the ball: increased discomfort in both the low-back and buttocks regions was reported by all individuals while sitting on the ball as compared to the chair.

A similar study conducted in Dr. Stuart McGill's laboratory, at the University of Waterloo, further examined muscular activation patterns and lumbar spine postures while sitting on a stability ball, but this time compared to sitting on a standard wooden stool. This study also found no significant differences in muscle activation and lumbar spine posture. It is noteworthy that Dr. McGill's study added an assessment of spine loading and stability while sitting on the two surfaces, but



found no differences in the magnitude of these measures between the ball and stool.

Continuing the investigation back in Dr. Callaghan's laboratory, a recent study evaluated whether getting used to using a stability ball would produce the claimed benefits. It demonstrated no changes in muscular patterns or postures after two weeks of use, although the users did report a decrease in discomfort associated with using the ball over this period.

### No benefits to stability ball use

Given this research, it appears there are no benefits to sitting on a stability ball compared to a standard office chair. The benefits of using the stability ball were disproved by this research. Over a prolonged period of sitting, no differences in trunk muscle activation patterns were observed, suggesting the ball does not aid in core strengthening. Similarly, no differences were found in lumbar spine posture, suggesting that the ball does not actually invoke an improved posture. Moreover, an important finding of these studies collectively was that individuals actually complained of more discomfort when first exposed to sitting on the stability ball.

Therefore, the use of a stability ball as an alternative to the standard office chair is, at best, a questionable ergonomics practice, since the device itself, in the absence of other physical training and workstation interventions, does not provide any inherent benefits to the user. Further, using the stability ball as a chair may actually increase the risk of developing low-back discomfort and may increase the risk of sustaining an injury due to the inherently unstable nature of these balls. •

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## CREOD identifies highlights of hand-arm vibration conference

The 12th International Conference on Hand-Arm Vibration was held in Ottawa, June 13 to 17, 2011. The event—supported in part by the Centre for Research Expertise in Occupational Disease (CREOD)—is held every four years.

Hand-arm vibration syndrome (HAVS) is an occupational disease involving the blood vessels, nerves and musculoskeletal system in the fingers, hands and arms. The condition is caused by the use of hand-operated vibrating tools. Symptoms include painful attacks of cold-induced finger blanching, numbness and tingling in the fingers, loss of sensation, decreased finger dexterity and loss of grip strength. Workers in the mining, forestry and construction sectors are most at risk.

Although the condition was first reported and acknowledged over 100 years ago, HAVS continues to be under recognized and under reported. Claims data reflect this gap as the number of accepted claims for HAVS in Canada is low. Improved recognition of the condition could have a positive impact on the compensation experience of affected workers and facilitate primary prevention efforts in the workplace.

### Conference highlights

*Screening and surveillance:* A roundtable on screening and surveillance for HAVS was part of the conference. It brought to light examples of screening/surveillance in different countries (Canada, the United States, Japan and Italy). The consensus was that there is a need for improved primary prevention and increased awareness of the hazard. The most important initial strategy is to focus on educational programs for high risk sectors such as mining, construction and forestry. It was agreed that medical surveillance for highly exposed workers would be helpful.

*Frequency weighting:* Vibration is characterized by its magnitude and frequency. Different frequencies confer different levels of risk. Currently, measurement of HAVS is done using a frequency weighting scale set by the International Organization for Standardization (ISO). The appropriateness of this scale has been called into question. A workshop was organized at the conference to address this issue. There was general agreement that the current ISO weighting scheme is problematic; however, there is no clear alternative at the moment.

*Foot-transmitted vibration:* Foot-transmitted vibration is an emerging area of interest in the study of vibration-related disease. Vascular dysfunction in the feet has been noted in some workers—for example, miners who stand on vibrating platforms when drilling. This condition has been termed 'vibration-white foot.' Further research is required to define the negative health effects related to foot-transmitted vibration. •

## OCRC says occupational cancer claims are on the rise

Many people believe that traumatic injuries and disorders are the most common cause of accepted workplace fatality claims in Ontario. This may have been true in the past, but it is not the case today.

Since 2001, there have been more accepted fatality claims related to occupational disease than those related to traumatic injuries and disorders, according to data published by the Association of Workers' Compensation Boards of Canada. Accepted occupational disease claims have been increasing steadily over the last dozen years. Even more notable, the vast majority of accepted occupational disease claims are the result of cancer, seen at an increasing rate.

In 1997, approximately 61 per cent of accepted occupational disease claims were attributed to occupational cancer. By 2010, these claims accounted for approximately 82 per cent of all occupational disease claims. Furthermore, occupational cancer accounted for about 63 per cent of all accepted workplace fatality claims in 2010.

Despite this trend, it is important to recognize that occupational cancer claims represent only a fraction of the total number of work-related cancers. The literature suggests this may be due to under reporting or not filing a claim. Changes in adjudication policies over time and a lack of awareness of the eligibility for claims have also been suggested. Another possible explanation is the lack of knowledge of the association between the exposure to workplace carcinogens and cancer, especially since occupational cancer may occur as much as 30 years after exposure has taken place.

To prevent the occurrence of future occupational cancers, it is imperative that occupational exposure limits are strengthened and enforced, and that all efforts towards toxic-use reduction are implemented. That's where the Occupational Cancer Research Centre (OCRC) comes in.

Established in 2009, OCRC is the first of its kind in Canada aimed at the prevention of occupational cancer through the identification and elimination of exposures to carcinogens in the workplace. It was established with the belief that everyone should have the right to work in a healthy environment. The Centre has three main research objectives:

- the surveillance of occupational cancers and workplace exposures;
- research into the causes of occupational cancer; and
- intervention research to develop and test prevention and exposure reduction strategies. •

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