

Doctors of chiropractic can use the information gained from this study along with generally-accepted biomechanical principles to educate their patients about safe lifting strategies.

What is the Safest Way to Lift?

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Lifting, bending and twisting activities are associated with an increased risk for low back injury in occupational settings.¹ Because of this association, many studies have been conducted over the years to assess the biomechanical and kinesiological patterns during various lifting strategies and materials handling tasks. Despite this research, the specific activation patterns on the deep spinal muscles during common lifts are unclear and no consensus appears to exist regarding which type of lift is the safest. Since doctors of chiropractic are well-positioned to take leadership roles in occupational health and ergonomic assessment, they should be aware of the current research related to proper lifting strategies.

The purpose of this article is to describe the findings from a study by our group that utilized muscle functional magnetic resonance imaging (MRI) to characterize lumbar muscle usage during common lifts.² While muscle functional MRI has been used to assess various skeletal muscle groups during exercise, including the lumbar muscles,^{3,4} this technology has not been widely implemented to study muscle activation patterns during common lifts.

Methods

Thirteen college-aged individuals in good general health participated in this study. The participants performed three dynamic lifting tasks (squat, stoop, and asymmetric stoop) with an external load (milk crate) that was stan-

dardized at 50 percent of peak trunk extension strength. The squat involved lifting a milk crate placed directly in front of the participant from the floor to waist level while bending at the knees. The stoop involved by lifting the milk crate placed directly in front of the participant with the knees straight. The asymmetric stoop was the same as the stoop, but the milk crate was placed to the side off the participant. Muscle functional MRI scans were obtained at rest and following each of the lift, which were performed in three sets of 10 repetitions. Muscle transverse relaxation time, which provides an indication of specific activation levels of individual muscle, was assessed for the lumbar quadratus lumborum, erector spinae (iliocostalis lumborum and longissimus thoracis), and multifidus.

Results

The key findings of this study are as follows:

- ▶ The activity of the lumbar multifidus and erector spinae muscles was significantly greater during the stoop than the squat;
- ▶ The contralateral (i.e. the side of the body opposite from the direction in which the milk crate was moving towards) lumbar multifidus was de-activated during the asymmetric stoop compared with the stoop. This de-activation was not noted in the erector spinae muscles.

Discussion

The most important finding of this study is that the contralateral lumbar multifidus is de-activated during the asymmetric stoop. This finding provides additional support regarding the unsafe nature of asymmetric lifts and activities that involve moving an object that is not positioned directly in front of the body. Since the lumbar multifidus plays an important role in stabilizing the spine and core region,⁵ any

lifting activity that results in imbalances of multifidus activation can potentially de-stabilize the spine and leave the lumbar region vulnerable to injury. In agreement with previous work, more activation was noted in all the studied posterior lumbar muscles during the stoop compared with the squat. However, it is unclear if more or less activation of the lumbar muscles is optimal for safe materials handling. While increased activation of these muscles may improve spinal and core stability, too much high activity over extended periods of time may make these muscles fatigue and unable to provide postural support. Future research by our group and others may help shed additional light on this fundamental occupational health issue.

Conclusion

Muscle functional MRI was successfully used to characterize the activation and recruitment of the deep posterior lumbar muscles during three common lifts. Doctors of chiropractic can use the information gained from

this study along with generally-accepted biomechanical principles to educate their patients about safe lifting strategies, including:

- ▶ Only perform lifting activities when an object is placed directly in front of the body. Avoid asymmetric lifting (or lifting from the side) by re-positioning the body or the object to be lifted so that the object is directly in front of the body.
- ▶ When performing a squat or stoop lift, make sure that the object to be lifted is as close to the body as possible. ◀FCA

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