RESEARCH ABSTRACT

Function of Diaphragm During Postural Tasks

By Dr. Irene Davis

INTRODUCTION

Back pain is one of the most common musculoskeletal problems medical professionals treat. There has been much attention given to the importance of the hip, pelvic, spinal and abdominal musculature in back health. Recently, more attention has focused on the role of the diaphragm in back related problems. While the primary role of the diaphragm is to assist in respiration, it also significantly contributes to trunk stabilization. The purpose of this study was to compare the function of the diaphragm during postural tasks between individuals with chronic low back pain and healthy controls.

METHODS

Eighteen individuals with chronic low back pain and 29 healthy controls participated in the study. The patients comprised seven with spondylosis and spinal stenosis, two with spondylolisthesis, five with spondylolisthesiostenosis, and four with failed back surgery syndrome (patients operated on for advanced spondylosis, spinal stenosis, and disk hernia not due to an injury). None of these conditions was a result of spine or pelvic traumatic injury. Both groups presented with normal pulmonary function tests. In order to assess diaphragmatic function, a dynamic magnetic resonance imaging system was synchronized with a specialized spirometric system. Subjects were tested in the supine position, first during tidal breathing and then during isometric flexion of the upper and lower extremities.

DISCUSSION

There are clear differences in the diaphragmatic functions of patients with chronic low back pain. The significance of the greater height and lower excursions may indicate a lack of diaphragm control in these patients. However, it is unclear whether these mechanics preceded the back pain or were a result of the back pain.

Prospective studies are needed to elucidate this further. Regardless, there appears to be an association of abnormal diaphragm function with low back pain. This suggests that approaches such as dynamic neuromuscular stabilization might be a valuable component of rehabilitation programs for low back pain.

REFERENCE:

continuing from cover story

stability in the spine; movement in rotation and new movement patterns develop. Those basic patterns are used as an adult. For example, reaching to turn over is the same pattern performed when standing to throw.

When a balance of muscle use is lost, dysfunction that may lead to pain follows.

Dr. Alena Kovesova of The Prague School said DNS provides a set of dynamic tests that allow clinicians to search for key dysfunctions. Then the challenge becomes how to fix the dysfunction.

“I have to guide the patient with my hands, I have to utilize verbal instruction, and I have to teach the patient how to restore ideal stereotypes to deal with his pain himself,” she said.

A therapist practicing DNS when evaluating a baseball player with shoulder pain such as rotator cuff strengthening but also with range-of-motion and rotation may lead to pain follows.

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“It is important for the therapist to treat the entire chain.

**BASEBALL EMBRACES**

Ken Crenshaw, athletic trainer for the Arizona Diamondbacks, calls DNS “a revolutionary approach.” The key to its effectiveness, he said, is in understanding an athlete’s dysfunction and correcting it.

“Baseball is kind of a dysfunctional sport to an extent,” he said. “It’s very repetitive. There’s some incredibly high forces about the shoulder and elbow. Probably (the) highest known human movement is about the throwing shoulder in the professional baseball player. That in itself creates a lot of asymmetry, a lot of overuse, a lot of dysfunction.”

Likewise, the Los Angeles Dodgers have taken to DNS concepts. Sue Falzone is the team’s athletic trainer and physical therapist and works at Athlete’s Performance in Phoenix. DNS concepts, she said, have enabled therapists and clinicians to help athletes with their performance.

“If you don’t have that central stability, your ability to create power is going to be so decreased,” she said.

*REFERENCES:*


**Q&A

**Dynamic Neuromuscular Stabilization**

By Alicia Bettis and Jeremy Ansbach

**WHAT IS DYNAMIC NEUROMUSCULAR STABILIZATION?**

DNS is a manual rehabilitative approach that is based upon the developmental principles of kinesiology (DK). DK follows predictable patterns or programs of development. For example, an infant lifts his head, grasps a toy, rolls over, creeps, then crawls.

DNS involves using those same patterns with an activation of the deep neck flexors, diaphragm, abdominal wall, and pelvic floor in order to activate proper function and movement.

**WHAT IS A MYOFASCIAL SLING?**

A myofascial sling is a fibrous functional connection of several individual muscles composed of the trunk, upper extremity, and lower extremity.

The sling produces a “line of pull,” producing a strain and the contractile tension that is required to create a movement.

The link between the upper extremity and lower extremity is the trunk, also referred to as the core. The core provides the stability that allows the body to function as a comprehensive unit.

**HOW DO PHYSICAL THERAPISTS INTEGRATE DNS?**

Along with addressing range-of-motion and strength deficits, the therapist integrates DNS into the treatment by first training the patient on appropriate rib and diaphragm positions. As the patient’s activation of core musculature improves to include abdominal and gluteal functional activities are included in the program. Those foundational movements then are integrated into total body movements.

_Abdominal Stabilization Methods_

**CASE STUDY**

**Abdominal Stabilization Methods**

By Alicia Baughman

**PATIENT HISTORY**

An 18-year-old male presented to physical therapy complaining of low back pain when carrying his backpack, bending, extending, rotating and pitching during baseball. A high school senior, the patient had committed to playing college baseball.

Diagnostic images were negative at the time he was seen. This was the second time he had undergone physical therapy for low back pain related to pitching, with the first episode approximately three years prior and consisting of repeated lumbar extension.

**ASSESSMENT**

An analysis of the patient’s posture revealed a flat thoracic spine. He exhibited a significant increase in thoracic and lumbar paraspinal tone and a decrease in bilateral gluteal tone. Trunk range of motion was 60 degrees of flexion and 10 degrees of extension, with increased motion at a transition zone. Side bending was 15 degrees to the right and 10 degrees to the left, with increased motion at a transition zone. Bilateral hip extension was significantly limited: minus 29 degrees from neutral on the right and minus 21 degrees from neutral on the left.

A strength assessment revealed poor transversus abdominal strength and bilateral glutal strength less than 3/5.

**TREATMENT**

Initial treatment consisted of manual techniques to normalize muscle imbalances around the lumbo-pelvic region. This consisted of increasing hip flexor flexibility and performing lumbar spine paraspinal soft tissue massage. These two techniques helped to decrease compressive forces through the lumbar spine. The patient was taught abdominal stabilization methods that incorporated dynamic neuromuscular stabilization (DNS). In a sagine position, the patient was cued to lower his rib cage and contract his oblique, pelvic floor and transverse abdominal muscles. While maintaining this con traction, the patient performed extremity movements. The level of resistance, position and duration were increased and challenged as the patient progressed.

The exercises gradually progressed to upright standing. Once stabilization techniques in upright position were done well, functional tasks were integrated to include throwing and pitching drills.

**OUTCOME**

Upon discharge, the patient was able to return to baseball and pitching without pain. All trunk movements were pain free. The patient demonstrated improved gluteal strength and lumbar stabilization with extremity movements.
stability in the spine; movement in rotation and new movement patterns develop. Those basic patterns are used as an adult. For example, reaching to turn over is the same pattern performed when standing to throw. When a balance of muscle use is lost, dysfunction that may lead to pain follows.

Dr. Alona Kovesova of The Prague School said DNS provides a set of dynamic tests that allow clinicians to search for key dysfunctions. Then the challenge becomes how to fix the dysfunction. “I have to guide the patient with my hands, I have to utilize verbal instruction, and I have to teach the patient how to teach the patient how to teach the patient how to,” he said. “It’s very repetitive. There’s some incredibly high forces about the shoulder and elbow. Probably (the) highest known human movement is about the throwing shoulder in the professional baseball player. That in itself creates a lot of asymmetry, a lot of overuse, a lot of dysfunction.” Likewise, the Los Angeles Dodgers have taken to DNS concepts. Sue Falzone is the team’s athletic trainer and physical therapist and works at Athletes’ Performance in Phoenix. DNS concepts, she said, have enabled therapists and clinicians to help athletes with their performance. “If you don’t have that central stability, your ability to create power is going to be so decreased,” she said.

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This article is an excerpt from Dynamic Neuromuscular Stabilization: Therapists Integrate DNS?, by Ken Crenshaw, athletic trainer for the Arizona Diamondbacks, and Sue Falzone, athletic trainer and physical therapist at Athletes’ Performance in Phoenix. DNS provides a set of dynamic tests that allow clinicians to search for key dysfunctions. Then the challenge becomes how to fix the dysfunction.

**REFERENCES:**


Sned, Philip (Dec. 22) “DNS Interview with Sue Falzone, PT,” retrieved March 2013 from http://www.youtube.com/watch?v= gfR7i16A

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**CAPS**

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**FUNCTION OF DIAPHRAGM DURING POSTURAL TASKS**

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**REFERENCE:**


**BABY STEPS**

The DNS approach has gained widespread popularity in rehabilitation facilities. A physical therapist evaluates a patient’s movements and compares them to the ideal posture. These are based on the developmental positions and ideal movement patterns of a healthy baby.

Based on developmental kinesiology, DNS looks at how a baby develops. If a baby has a normal brain, it will develop ideally because the brain controls the muscles, which figure prominently in skeletal formation and development.

During the first year of life, a baby’s normal development leads to muscle activation and extreometry movements. The idea is that a balance must exist between the thoracic region, diaphragm, pelvic floor and abdominals in order to provide stability when arms and legs move.

If coordination does not exist, a breakdown will occur in the kinetic chain (a term used to describe systems – including nervous, muscular and skeletal – working together in a chain to create a movement or event) that can lead to overuse or injury of a particular region. For a pitcher, that “chain” starts from push off and ends with follow through. Each throw requires strength, flexibility and range of motion in the foot, ankle, knee, thigh, core, thoracic spine, shoulder, elbow and forearm.