INTRO TO CORE

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What is Core Stability and why is it important?
Core Stability:
Many authors have attempted to define core stability. Unfortunately a universally accepted definition is difficult if not impossible to obtain. This further validates the ambiguity to this term. However, a widely accepted definition of core stability is:
“Core Stability comprises the lumbopelvic-hip complex and is the capacity to maintain equilibrium of the vertebral column within its physiologic limits by reducing displacement from perturbations and maintaining structural integrity.”
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perturbation

/ˌpɜrdərˈbāSH(ə)n/

noun

1. anxiety; mental uneasiness.
   "she sensed her friend’s perturbation"

2. a deviation of a system, moving object, or process from its regular or normal state of path, caused by an outside influence.
   "some minor perturbation in his house’s cash flow"

Translations and more definitions

Perturbation - Wikipedia, the free encyclopedia
Core stability relates to the bodily region bounded by the abdominal wall, the pelvis, the lower back and the diaphragm and its ability to stabilize the body during movement.
Definition:

Core Stability is the synergistic effect of the contraction and activation of the musculoskeletal system combined with associated viscera to support and maintain functional movement. Core Stability is necessary for force transmission to ensure proper functional movement as well as maintain posture and support. Core Activation is the implementation and maintenance of Core Stability.

-TBurlage
Conclusion:

Core stability/activation is vital as it relates to the spine and pelvis for proper movement. It is imperative for safe and efficient functional movement of the spine, pelvis and extremities.
Is there a direct correlation to lack of Core Stability and injury?
It has been stated that core is characterized by “Proximal stability for distal mobility”
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When contracting, the primary role of the core stability muscles is to raise the intra-abdominal pressure and to increase the tension in the thoracolumbar fascia. The increase in intra-abdominal pressure stiffens and strengthens the relevant structural support around the spine, compacts the arthrogenic structures and in combination with abdominal contraction, it can encourage a rigid cylinder and stiffness to occur around the spine.
This gives the spine a relative degree of stability which is needed to facilitate superficial muscle activation and gross motor action.
Core stability is vital in order to maintain posture, proper movement as well as prevent musculoskeletal injury. There is substantial and definitive evidence demonstrating an association between core instability and injury. Multifaceted prevention programs including core stabilization exercises appear to be effective at reducing spine, pelvic and lower extremity injury rates.

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Balance deficiency was found in athletes with shoulder dysfunction. According to this study, greater shoulder dysfunction is correlated with greater balance and stability deficiency. Therapists and trainers should consider incorporating balance training as an integral component of core stability into rehabilitation of athletes with shoulder dysfunction.

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Core stability may provide several benefits to the musculoskeletal system, from maintaining low back health to preventing knee ligament injury. As a result, the acquisition and maintenance of core stability is of great interest to physical therapists, athletic trainers, and musculoskeletal researchers. Core stability is the ability of the lumbopelvic hip complex to prevent buckling and to return to equilibrium after perturbation. Although static elements (bone and soft tissue) contribute to some degree, core stability is predominantly maintained by the dynamic function of muscular elements. There is a clear relationship between trunk muscle activity and lower extremity movement. Current evidence suggests that decreased core stability may predispose to injury and that appropriate training may reduce injury. Appropriate intervention may result in decreased rates of back and lower extremity injury.

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athletes who experienced an injury over the course of a season displayed significant weakness in hip abduction and external rotation. Backward, logistic regression analysis of the core stability measurements reveals that hip external rotation strength was the sole significant predictor of injury status for the athletes in this study. These results highlight the importance of proximal stabilization for lower extremity injury prevention.

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Loading a dysfunctional movement pattern is both detrimental and dangerous.
-Gary Gray Founder of FMS
Compromised form will create substantial injury mechanisms.

-Dr Stuart McGill
Conclusion:
Core stability is imperative for safe and efficient functional movement of the spine, pelvis and extremities. Conversely, Core Instability has been directly linked to increase rates of injury of the spine, pelvis, upper and lower extremities.
Components of Core Structures:
(Kibler, Press and Sciascia 2006)
Presented here is the conceptual basis for the assertion that the spinal stabilizing system consists of three subsystems. The vertebrae, discs, and ligaments constitute the passive subsystem. All muscles and tendons surrounding the spinal column that can apply forces to the spinal column constitute the active subsystem. The nerves and central nervous system comprise the neural subsystem, which determines the requirements for spinal stability by monitoring the various transducer signals, and directs the active subsystem to provide the needed stability. A dysfunction of a component of any one of the subsystems may lead to one or more of the following three possibilities: (a) an immediate response from other subsystems to successfully compensate, (b) a long-term adaptation response of one or more subsystems, and (c) an injury to one or more components of any subsystem. It is conceptualized that the first response results in normal function, the second results in normal function but with an altered spinal stabilizing system, and the third leads to overall system dysfunction, producing, for example, low back pain. In situations where additional loads or complex postures are anticipated, the neural control unit may alter the muscle recruitment strategy, with the temporary goal of enhancing the spine stability beyond the normal requirements.
Panjabi proposed a classification model which offered an explanation into the functioning of the spine. His model consisted of three categories;

**Passive**
**Active**
**Neural**
Passive

The passive category consists of the basic components of the spine which allow for soft tissue attachment (Panjabi 1992).

- The lumbar vertebrae
- The joint capsules
- The intervertebral disc
- Associated Ligaments

These structures of the spine do not contribute to any significant spinal stability in the neutral alignment. The skeletal structure does support the basic framework and the tensile properties in the various ligaments do start to resist end range movement, however do not have the capability to produce forces which initiate spinal movement is not caused by the passive structures.
Active

The active structures (muscles of the core) are responsible for the initiation of gross spinal movement as well as providing and contributing to spinal segmentation.
Neural

The neural component, according to Punjabi, is responsible for receiving information from the various transducers and relaying the relative signal onto the active system to achieve segmental stability. Until sufficient stability has been achieved, the neural components continue to control the active systems.
Bergmark (1989) further classified the active system into the local and global stabilizing system.
Local Globalizing System

Maintenance of **spinal segment** stability and stiffness.
Global stabilising system

was stated to be more superficial and with a primary function to **generate force to control movement**, there is often eccentric contractions to control motion segments throughout range
Global mobilizers

A further active functional classification was suggested by Comerford and Mottram (2001). They have proposed the idea of “global mobilizers”. The primary role of these muscles is for shock absorption and to generate the gross spinal concentric contractions required for gross motor function.
A table proposed by Norris (2008), identifying the different characteristics between the stabilisers and mobilisers.
Proper Core Activation occurs not in response to movement or load, but in anticipation to movement!
It is necessary for all components to work in unison to facilitate proper movement as well as prevent injury via improper activation/support resulting in improper movement patterns.
Furthermore, studies suggest that prolonged improper movement patterns reinforce poor neuromuscular facilitation/inhibition (compensation) resulting in chronic alterations of posture, movement and subsequent injury.
Once Core Instability is encountered, it is essential to address and correct the imbalance in order to achieve a positive outcome.
Assess
Address
Progress
Discussion:
BASIC REVIEW OF CORE ANATOMY
Components (Anatomy) of Core structures

Stabilizers and Mobilizers

Functionally/anatomically these muscles can be divided into two sections:

1. Deep stabilization system
2. Superficial mobilization system
Anatomically, the muscles that are deeper in the body work more to stabilize the pelvis and spine, and the muscles that are located more superficially are more important for mobilization of the pelvis and spine.
1. **Deep Stabilization System**

Core Training places a lot of emphasis on working the deep muscles of the core. Research shows that the deep muscles contract first before any movement is initiated. DSS can also be further classified into autonomic (involuntary) and voluntary.

**Proper core activation occurs in anticipation of movement, not movement itself!**
The deep muscles are close to the spine and pelvis and they can help to move the body, but their **primary role** is to **stabilize the pelvis and spine**. This protects these areas and gives you a strong foundation for the functional movement.
The core muscles that make the deep stabilization system are:

- Transversus abdominus
- Lumbar Multifidus
- The Pelvic Floor Muscles
- Diaphragm
- Internal Obliques
- Transversospinalis
Transversus abdominus

One of the most important core muscles. From the back it wraps around the torso, the top of the pelvis and attaches to the pubic bone and fascia in the front. It compresses the abdominal contents, thus adding stability to the lower back and pelvis.
Lumbar multifidus

runs on an angle from the sides of the vertebrae to the tips of the vertebrae. Because it runs on an angle it helps with rotational stability. Research shows that people with chronic lower back pain have significant atrophy (wasting away) of the multifidus.
The pelvic floor muscles

Connect the sacrum and pelvis to the pubic bone. Their primary job is to stabilize the inferior aspect of the abdominal cavity. The pelvis floor works with the transversus abdominus and multifidus to stabilize the pelvis. Kegel exercises are a great way to strengthen the pelvic floor muscles.
**Insertion:** Spinous processes of vertebrae

**Origin:** Transverse processes of vertebrae

**Multifidus**

**Actions:** Extension & lateral rotation of spine

**Side view**

- Transversus abdominus
- Pubic symphysis
Diaphragm

Primarily responsible for respiration as well as stabilization due to its attachment and integration into the ribcage. The diaphragm also forms the superior aspect (roof) of and therefore assists in stabilizing the abdominal cavity.
Internal oblique

Runs on an angle from the pelvis up to the ribs. Its primary role is in stabilizing the core, but it also helps to move the spine.
Transversospinalis muscles

Run from the transverse processes (sides of the vertebrae) to the spinous processes (tips of the vertebrae). The multifidus, semispinalis and rotators are included in this group. All of these muscles focus on segmental stability of the spine because they span just a few vertebrae in length. These muscles are also important for rotational stability.
**Transverse abdominis**
Located under the obliques, it is the deepest of the abdominal muscles and wraps around your spine for protection and stability.

**External abdominal oblique**
Located on the side and front of the abdomen.

**Internal abdominal oblique**
Located under the external obliques, running in the opposite direction.

**Rectus abdominis**
Located along the front of the abdomen, this is the most well-known abdominal. Often referred to as the "six pack."
2. **Superficial** Movement System

The core muscles that make the **Superficial** Movement System are:

- Latissimus Dorsi
- Erector Spinae
- Iliopsoas
- Hip Adductors
- Hip Abductors
- Hamstrings
- Gluteus Maximus
- External Oblique
- Rectus Abdominus
Traditionally, Core training focuses on pelvic stability. When the pelvis moves, the hips move, and when the pelvis moves, the lower back moves. If the pelvis is stable, the lower back and hip are stable, so any muscle that attaches to the pelvis is part of the core as well.
Latissimus dorsi

Commonly thought of as a back and shoulder muscle, but it also attaches to the pelvis, lumbar vertebrae, thoracic vertebrae, and ribs. The lats can help to tilt the pelvis forwards or to the side. It can negatively affect lower back posture when tight and inflexible.
Erector spinae

Group of muscles that people most commonly think of when they talk about lower back muscles. They are a group of superficial muscles that run the entire length of the spine. As the name suggests, these muscles help to keep the spine erect and they also pull the spine backwards. Every lower back exercise will place some emphasis on the erector spinae muscles.
Iliopsoas is the main hip flexor muscle. It attaches to the front of the lumbar spine and pelvis. It is primarily responsible for bending the hip, but it can also help to stabilize the pelvis, lower back, and hip.

- Bodies of twelfth thoracic and all lumbar vertebrae
- Psoas major muscle
- Psoas minor muscle
- Iliacus muscle
- Femur (lesser trochanter)
Adductors

are the muscles of the inner thigh. Most people don't think of the inner thigh muscles as core muscles, but all of the adductor muscles attach to the pubic bone, which is the front part of the pelvis. Because they attach to the pubic bone they can help to stabilize the pelvis, especially when standing on 1 leg.
Hamstrings

The muscles on the back of the thigh, they attach to the bottom of the pelvis. Strong hamstrings can help to anchor and stabilize the pelvis, conversely tight inflexible hamstrings can pull on the pelvis and negatively affect lower back posture.
Gluteus maximus

The largest muscle in the body. It attaches to the back of the pelvis. It extends thigh at the hip, and assists in laterally rotating the thigh. It works with the hamstrings to move the pelvis and also helps to stabilize the pelvis. Bridges can be considered a core exercise because it works the glutes while keeping the spine stable.
Hip abductors (gluteus medius and minimus)

also attach to the pelvis. The gluteus medius and minimus are very important for hip stability, and they are especially important for stabilizing the hip and pelvis when standing on one leg. They are also of primary importance during ambulation (heel strike/toe off) with respect to core stability.
External obliques

Attach to the ribs and pelvis but they are located superficially compared to the internal obliques. The external obliques are designed slightly more for moving the spine than stabilizing, but the external obliques do also help to stabilize the pelvis and lower back.
Rectus abdominus

Arguably the most popular core muscle. It runs down the front of the spine, and it is the main muscle for flexing and bending. It is the main muscle for core exercises such as crunches and sit-ups.
Transverse abdominis
Located under the obliques, it is the deepest of the abdominal muscles and wraps around your spine for protection and stability.

Internal abdominal oblique
Located under the external obliques, running in the opposite direction.

External abdominal oblique
Located on the side and front of the abdomen.

Rectus abdominis
Located along the front of the abdomen, this is the most well-known abdominal. Often referred to as the “six pack.”
What are the benefits of core strength training to the patient?

Greater efficiency of movement (increased Range of Motion)
Improved body control and balance
Increased power output from both the core musculature and peripheral muscles such as the shoulders, arms and legs
Helps to reduce the potential for training and sports injuries/ADL’s.
Improved balance and stability
Improved athletic performance
Conclusion:

All of the core muscles are important. When you perform basic functional movements that require your spine to be stable, you challenge these core muscles.

It is crucial that all core muscles work synergistically in order to initiate proper core activation (both anterior and posterior chain).

The plank exercise, bridges, alternate arm and leg raises, and abdominal hollowing are examples of exercises that can increase core stability by stimulating Core Activation. Any exercise or piece of equipment that requires your muscles to work harder to keep your spine stable will increase the muscle work in both the superficial and deep stabilization system of the core. Equipment such as the bosu ball, wobble board, or an exercise ball can increase how much the deep core muscles work during exercises.
Why Should we care about Core Stability?
Active Care vs Passive Care:
What is ACTIVE CARE?!
Active Care (therapy) means the patient is actively involved in the treatment.
What is Passive Care
Passive Care is when something is done to you.
Passive treatment implies lack of participation.
Passive therapy generally requires another person to apply the treatment. Passive therapies usually demand more resources in terms of time and money. **Passive therapy can foster dependence.**
Is Traditional Chiropractic Care Active or Passive?
Why have active care in a chiropractic office?
Patient becomes **accountable** for their **care** (skin in the game).

AC allows patient to maintain progress achieved throughout treatment.

Allows the provider to cater to and attract the non-traditional chiropractic patient.
Studies demonstrate a more favorable outcome if patient is actively engaged in their treatment.
“Give a man a fish and he will eat for a day. Teach a man to fish and he will eat for a lifetime”.

-Confucius (Circa 551-479)
Active Care Examples:
Active Rehab!

-Mobility
- MFR
  - Lacrosse Ball
  - The Stick
  - Foam Roller, etc.

-Stability (Core)
- Abdominal hollowing
- Dead Bug
- Bird Dog
- Stability Training
- Rocker Board
- Wobble Board
- BOSU Trainer
- Resistance Training
- Vibration Therapy, etc.
Any modification of the amount and manner of exercise or activity can be considered AC.

Learning to do sport/work activity in the correct manner is an example of AC (Work Hardening).
Self applying passive therapies could be considered **active therapies**. Developing a heightened awareness of the subtle changes in the intensity, frequency, and duration of the symptoms allows improved communication with the health care professional in order to determine future direction of treatment.
The patient’s role is to **actively participate** in the treatment process by integrating information and modifying activities with respect to the symptoms. The clinicians role is assisting the patient in determining the parameters of the symptoms and in recognizing the parameters that exacerbate the symptoms. The clinician is the director, and instructor of the treatment process. The patient is the student, analyst, and assistant.
Passive Care Examples:
Massage
Ultrasound
IFC
Laser
Manipulation
Ice/Heat
Passive therapy always requires another person to apply the treatment. Passive therapies usually demand more resources in terms of time and money. Passive therapy can foster dependence.
Active Care in a Traditional Chiropractic Office?
What is Active Care?

Patient is actively involved in their care (exercise/rehab), does work.

How does it differ than Traditional Chiropractic Care?

Patient is treated, has work done to them (Passive).

Patient goes through a Treatment Plan (corrective vs pain), released.
Why implement AC?

Give the patient an active role in their treatment (skin in the game)

Creates an accountability factor

Research supports a more favorable outcomes of AC vs PC
Wellness vs Pain Control?

Allows DC to attract and retain the non-traditional chiropractic patient

Creates long term patients through WOM and referrals.

Prevents a loss of patients to other AC professionals.
What are challenges to the implementation of AC?
Difficult for DC (Perception is reality)

Takes too long (perceived lack of time)

Not comfortable in a rehabilitative setting

lack of proficiency creates anxiety

No set procedures/steps

Needs to be easy!
Difficult for the patient (Perception is reality)

Takes too long (perceived lack of time)

Not comfortable in a rehabilitative setting

lack of proficiency creates anxiety

No set procedures/steps

Needs to be easy!
Keys to successful Active Care Procedures in a Chiropractic Office
AC MUST be: **SAFE**

**Simple**

**Automatic**

**Fast**

**Effective**
When do we begin ACTIVE CARE?
IMMEDIATELY!

Example:

Spinal Bracing Strategy ASAPT

(As Soon As Patient Tolerates)
Basic AC/CA Progression

Floor
  Supine
  Prone
Quadruped
  DeadBug
  BirdDog
Ball
  Supine
  Prone
Standing (Begin FM)
  Stable Surface
    Two Legs
      One Leg
  Unstable Surface
    Two Legs
      One Leg
Why?!
MOTION IS LOTION!!

Must get the patient moving!!

MFSS
MFSS

Mobility

First,

Strength/Stability

Second!
PFROM (Pain Free Range Of Motion) before LOAD.
Patient must regain **PRFOM** before loading affected joint/tissue
FUNCTIONAL MOVEMENT must be pain-free (less than 4/10NPS)
WHY???
PFROM allows for efficient/effective Functional Movement
Why is **Functional Movement** important?
FM “resets” the system after a “fault”
Fault

A break(down) in the circuit (movement pattern).
Faults occur in response to:
Imbalance (weakness, core instability)

Trauma (injury)

Poor technique
FAULTS MUST BE CORRECTED TO ACHIEVE RESOLUTION OF DYSFUNCTION!!
FUNCTIONAL MOVEMENT MUST BE RESTORED TO ELIMINATE FAULTS!!
Core Stability is vital for proper Functional Movement!!
What is Functional Movement?
Functional movement: movement based on real-world situational biomechanics. They usually involve multi-planar, multi-joint movements which place demand on the body's core musculature and innervation.
When **Functional movement** becomes altered,
Faults occur within the system and eventually,
The machine breaks down.
Incorporate Active Recovery (not just for athletes)
Basic AC/CA Progression

Floor
  Supine
  Prone
Quadruped
  DeadBug
  BirdDog
Ball
  Supine
  Prone
Standing (Begin FM)
  Stable Surface
    Two Legs
      One Leg
  Unstable Surface
    Two Legs
      One Leg
Spondylolysis and Spondylolisthesis Rehabilitation Exercises

- Pelvic tilt
- Dead bug exercise
- Gluteal stretch
- Partial curl
- Double knee to chest
- Quadruped arm/leg raise
- Side Plank
Glute Bridge
Glute Bridge

Legs
Glute Bridge
GLUTE BRIDGE

UNIT:
Prehab.

OBJECTIVE:
To activate, develop, and improve the firing/muscle-recruitment patterns of the glutes.

STARTING POSITION:
Lie supine (faceup) on the floor, with your knees bent 90 degrees and feet flat on the floor. Squeeze a rolled-up towel, a doubled-over TheraBand pad, or even a ball between your knees.

PROCEDURE:
With your belly button drawn in, bridge your hips toward the ceiling by firing your glutes. Only your shoulders and heels remain on the ground. Maintain a strong hip contraction throughout the range of motion. Hold, then lower your hips toward the floor without touching it and then repeat.

COACHING KEY(S):
Initiate the movement with your glutes, and don’t let the glutes come all the way down.

YOU SHOULD FEEL IT:
In your glutes, not your lower back and hamstrings.
GLUTE BRIDGE
SINGLE LEG

KEEP YOUR BACK STRAIGHT &
ALIGNED WITH YOUR HIPS

SQUEEZE GLUTES & LIFT
HIPS TOWARDS THE CEILING

AVOID ARCHING YOUR BACK
Dead Bug
Dead Bugs?!
The Deadbug:

- Fill the balloon/belly
- Long controlled inhalation through the nose
- Back into ground
- Slow controlled limb movement
- Exhale forcefully through mouth until all air is out
- Resist Extension
Rib-cage controlled so it doesn’t flare upwards

Arm held strongly at 90°

Chin gently tucked in
Lengthen back of the neck

Resting hand relaxed at 30°-45°
Use to help balance

Hip, knee and ankle held strongly at 90°

Feet begin firmly on the floor
Close but not touching

Neutral spine position maintained
The gap is about finger-width
Modify as patient progresses
Bird Dog
Examples of FM
Squat (BST)
Basic Squat Technique

- Neutral Head Position
- Straight Back
- Knees behind toes
- Hips below parallel
- Weight on heels
Perfect
Dead Lift
Deadlift, like the squat, is a very effective and efficient Functional Movement due to the incorporation and facilitation of the musculoskeletal structure.
Kettle Bell Swings

Attempt to incorporate Functional Movement into therapeutic activities
Dr Tom’s Sit Exercise
Basic Box Squat Technique with Hip Hinge, core (glute, ham, lat, etc) activation (movement emphasized with the deadlift)
These are a few examples of FM that can be incorporated into a rehab setting with a very small footprint and allows the patient to transition into active care.
Conclusion
Core Stability is vital for functional movement. It’s imperative to assess for deficits, address any faults within the system and correct them in order for the patient to maintain a favorable outcome.
Incorporation of Active Care in a traditional chiropractic setting is simple and effective.
Mobility First, Stability Second!
Remember your progressions
Basic AC/CA Progression

Floor
  Supine
    Prone
Quadruped
  DeadBug
    BirdDog
Ball
  Supine
    Prone
Standing (Begin FM)
  Stable Surface
    Two Legs
      One Leg
  Unstable Surface
    Two Legs
      One Leg
Discussion
Demonstration
References


2) Wikipedia, Core Stability, Definition


5) McGill and Norman 1987

6) Putnam 1993, Zattara and Bouisset 1988


Thank you!!

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