

## **Teach Rotation with Anti-Rotation**

When you watch someone hit a golf ball, throw a punch or simply retrieve groceries from the car, it's evident that human movement occurs in all three planes of motion (PNF Patterns). A review of major muscles attached to the trunk, above the ischial tuberosity and below the superior aspect of the sternum reveals that 87.5% of the core muscles are oriented either diagonally or horizontally, and one action that these muscles perform is rotation (Santana 2000).

The "serape effect," first introduced by Logan and McKinney in 1970, shows how the internal and external obliques, rhomboids, and serratus anterior produce rotational force for throwing and kicking (Logan & McKinney 1970). The serape effect concept has been expanded to include the powerful hip flexors and adductors in the lower extremities, further demonstrating the spiral line of the human body (Santana, McGill & Brown 2015).

Anti-rotation and rotation (allowing rotation in some activities and not in others) are important for daily life. The fascia, muscles and connective tissue of the deep core are the means by which forces are generated to maintain spine stability (Colston 2012). One main function of the core is to stabilize the spine and pelvis in a neutral zone, which enhances power transfer and reduces shear loading on the spinal disks (Colston 2012).

Research supports this concept by stating that core musculature is organized similarly to an architectural tensegrity model (McGill 2007). Think of an army tent with guy wires. The weight of the canvas provides some stability through compressive loading, but the main stability comes from the lateral guy wires that come off the frame in a 360-degree fashion, providing tensile loads. McGill proposes that core muscles function in a similar way, originating from and inserting at angles on the spine, pelvis and ribs. This "human guy-wire system," when functioning properly, provides spinal stability through both compressive and tensile loads. The core's guy-wire system not only reduces injuries by stabilizing the spine but also stores elastic energy for tasks that involve force production.

The analogy of firing a cannon from a canoe comes to mind when considering the importance of core stability. You've seen that concept with your clients.

One of the best athletic examples of the core's function in stability comes from research done by Juan Carlos Santana and team, in which they compared kinetic and electromyographic metrics for a standing cable press versus a traditional bench press (Santana, Vera-Garcia & McGill 2007). They found that individuals could bench-press only half of their body weight while standing, and when they failed during a standing press, core stability (or lack of it) was the limiting factor. Simply put, this indicates that stiffening the torso causes "power generated at the hips [to be] transmitted more effectively by the core" (McGill 2010).

Where do we start if core stability is a limiting factor in power transfer and, at some point, transverse-plane loading needs to be introduced?

### **Rotational Training**

Regardless of goals, we must understand the importance of core stability exercises to help clients reach their goals.



**Pallof Press.** This torsional buttressing task is named after the physical therapist John Pallof, who pioneered the move (Gentilcore 2018). The exercise is a great way to introduce rotational loads that require a bracing core contraction.

- Start in tall position, sideways to anchor point, elbows flexed, both hands clasping resistance at sternum level.
- Maintain neutral spine and extend both hands (straighten elbows) directly from chest. It's common for the lower back to arch; do not allow this to happen.
- Pause at end range of each rep and hold for 2 or 3 seconds. Ask the client to feel the challenge of controlling anti-rotation through the torso and hips.



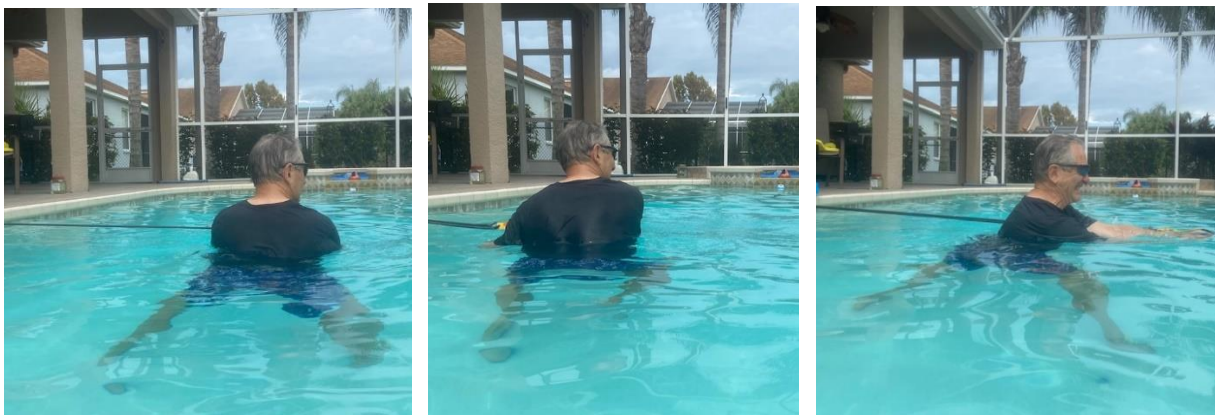
**Cylinder Rotation.** You can teach clients to anti-rotate in the transverse plane with the Pallof press. This is cylinder rotational move that also mobilizes the hips, ankles and feet. In this exercise, the client rotates through the hips while maintaining a neutral spine. The move is designed to “groove” hip rotation while limiting twisting in the lumbar spine, which “reduces the intrinsic strength of the disc annulus” (McGill 2007). Ideally, the torso rotates on top of the hips in the same way a cylinder rotates on a countertop: The top and bottom of the cylinder

accelerate at the same speed and travel the same distance while the countertop remains stable. This could cause torque in the hip, knee and ankle SO ...



**Complete Cylinder Rotation.** A similar movement occurs as the shoulders, spine and pelvis accelerate at the same speed and travel the same distance on top of the hip joints. The rear-leg gluteus maximus fires hard to assist with external rotation as the front hip goes into internal rotation.

- Start facing toward anchor, both hands clasping resistance, arms extended off chest, elbows slightly bent.
- Make sure to brace core, then rotate shoulders, spine, pelvis and hips/feet —like a cylinder—away from anchor.
- Note that rotation occurs on longitudinal axis. Pause at end range to check form.
- Ensure that stretchcordz do not touch torso as this signals over-rotation.



**Rotation with Step.** The client may feel slightly robotic at this point in the progression. However, this progression focuses on fluidity and power. With common ADLs we don't move

like cylinders. There's some spinal rotation and disassociation between the shoulders and pelvis, which places a diagonal stretch on the oblique sling system.

Athletes rely on the stretch-shortening concept to increase explosive power in all types of sports (Chu 2011). The pre-stretch also happens in many daily tasks, such as throwing luggage into the trunk of a car. Capitalize on this stretch-shortening cycle by adding a lead-leg step to the previous exercise.

- Start in narrow stance, side diagonal facing anchor, both hands clasping resistance with arms slightly flexed in ready position in front of sternum.
- Lift knee up while simultaneously moving arms back toward resistance anchor, creating pre-stretch and harnessing energy between shoulders and pelvis. Motion comes from hips and thoracic spine, *not* lumbar spine.
- While stepping with lead leg, press forward and horizontally with both hands. Pivoting off rear foot helps minimize knee stress while improving balance and alignment.

Maintain minimal-to-moderate core-bracing contraction to help stabilize lumbar spine in neutral during both pre-stretch (eccentric) and power (concentric) phases. You might want to offer a tactile cue by tapping on the client's rectus abdominis to ensure there's a light core contraction prior to the pre-stretch, or cue a diaphragmatic breath during the pre-stretch, which will increase intra-abdominal pressure. This helps stabilize the lumbar spine.

## References

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