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Part 1 - Core Stability

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Optimal Posture

OPTIMAL POSTURE

- Neutral zone position is best for activation of core muscles and pelvic stabilisers



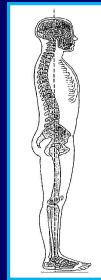
KYPHOTIC POSTURE - ROUNDED SHOULDERS

This posture inhibits optimal function of several key sections of the body.

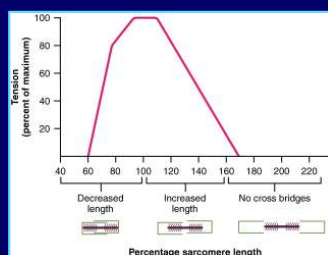


OPTIMAL POSTURE

- Optimal joint position
- Equal distribution of force
- Allows muscles to work at optimal efficiency
- Defined by musculoskeletal restrictions
- Symmetrical weight transference



MUSCLE LENGTH-TENSION RELATIONSHIP



• Mid-range is the best position from which to create power, strength and movement

GENETIC FACTORS AFFECTING POSTURE



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Maintaining Neutral Zone

MAINTAINING NEUTRAL ZONE

DEEP MUSCLES

- Transversus Abdominus
- Multifidus
- Diaphragm
- Pelvic Floor



MAINTAINING NEUTRAL ZONE

DEEP MUSCLES

- Transversus Abdominus
- Multifidus
- Diaphragm
- Pelvic Floor

OUTER MUSCULAR SYSTEMS

- Glut Max & Lats
- Obliques & Adductors
- Quadratus Lumborum & Glut Medius
- Hamstrings & Tibialis Anterior & Peroneals



What is Neutral Zone?

WHAT IS NEUTRAL ZONE?



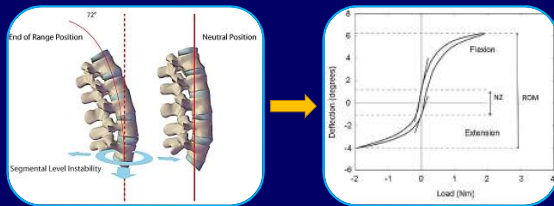
NEUTRAL ZONE



A zone of movement of the spine, from flexion through to extension, in which the joints and neural pathways are aligned in the optimal position for an individual.

This zone will differ from person to person depending on a range of factors.

WHAT IS NEUTRAL ZONE?



FINDING NEUTRAL ZONE



- Must be a position in which the client feels no pain, feels strong and feels comfortable
- To begin core stability exercises it is okay for a client to be slightly flexed or extended

What Disrupts Neutral Zone?

WHAT DISRUPTS THE NEUTRAL ZONE?



- Fatigue
- Postural dysfunctions
- Repetitive actions
- Muscle weakness
- Hyper or hypomobility

OPTIMAL SPINE STABILITY IS MAINTAINED BY MUSCULAR RESISTANCE
EVERYONE HAS A SLIGHTLY DIFFERENT NEUTRAL ZONE

HYPERMOBILITY AND HYPOMOBIITY



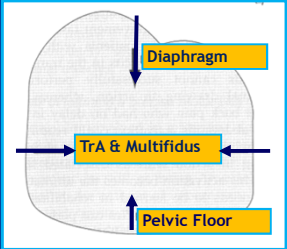
- **Hypermobility** - client has greater than normal range of neutral zone, ability to go into increased flexion and extension. More challenging to control a greater range of movement in each joint.
- **Hypomobility** - client has a decreased range of neutral zone, this will put more load onto structures creating a greater risk of dysfunction.

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Optimal Core Stability

OPTIMAL CORE STABILITY

1. Diaphragm
2. Transversus Abdominus
3. Pelvic Floor
4. Multifidus
5. Internal Oblique

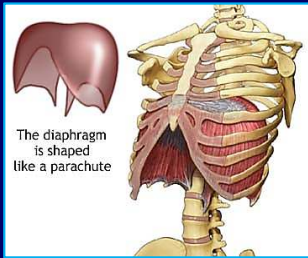


The diagram illustrates the core stability system as a mesh structure. Three yellow boxes with arrows point to the top, center, and bottom of the mesh, labeled 'Diaphragm', 'TrA & Multifidus', and 'Pelvic Floor' respectively.

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Diaphragm & Lateral Basal Breathing

DIAPHRAGM & LATERAL BASAL BREATHING

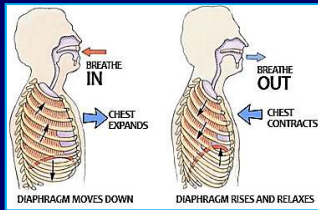


- Facilitates TrA and pelvic floor
- Part of deep core unit
- Reduces tension and work in the accessory muscles of breathing (SCM, Scalenes, Upper Trapezius, Levator Scapula, abdominals)
- Phrenic Nerve C3-C5

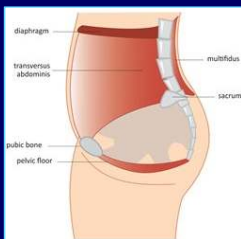
LATERAL BASAL BREATHING

Optimal Breathing:

- Lateral basal breathing - using diaphragm
- Nose breath to inhale and mouth to exhale - cleans & humidifies the air
- Improved oxygen exchange
- Reduces neck tension



DIAPHRAGM & LATERAL BASAL BREATHING



Pelvic floor drops down when breathing in, then lifts to help push breath out.
The diaphragm, abdominals and pelvic floor work together in breathing.



Dysfunctional Breathing

DYSFUNCTIONAL BREATHING



Dysfunctional Breathing Patterns:
Accessory muscles should be used during exercise and respiratory diseases only

Overactive and tight rectus abdominis and obliques will cause reduced lateral expansion and use of the diaphragm

DIAPHRAGMATIC BREATHING - Practical



Supine Breathing



4pt



Seated breathing using feedback



Seated breathing with band



Supine



Side-lying

Transversus Abdominus Anatomy

TRANSVERSUS ABDOMINUS ANATOMY



- Note orientation of fibres
- TrA is NOT just a static stabiliser but is involved in rotation of the trunk
- Nerve Supply T7-T12 so thoracic spine mobility is essential for ensuring good nervous innervation of the TrA
- Timing of TrA is essential for controlling neural zone of lumbar spine

TRANSVERSUS ABDOMINUS



- Transversus Abdominus and pelvic floor muscles need to be activated before any other global abdominal muscles during an exercise.
- Timing of TrA is essential for good core stability

TRANSVERSUS ABDOMINUS



- Active Anatomy recommends thoracic mobility and lateral basal breathing exercises before beginning core strength training
- This will assist with activation of TrA and quality of contraction

TRANSVERSUS ABDOMINUS FACTS

- Line of fibres are not purely horizontal
- Has a role in rotation of the spine not just stability
- Easier to contract with movement of the legs and arms (TrA is a movement muscle!)
- Timing of TrA is essential - must be first before movement (feed forward)
- Supplied by nerves from thoracic T7-T12
- Inhibited by pain - can be left or right side only
- Facilitated with breathing and pelvic floor contraction
- Left and Right TrA are functioning separately with leg and arm movements - opposite TrA stabilises

TRANSVERSUS ABDOMINUS

- Movement will facilitate activation of Transversus Abdominus
- Moving the left leg will help to activate the right Transversus Abdominus - it is a contralateral stabiliser

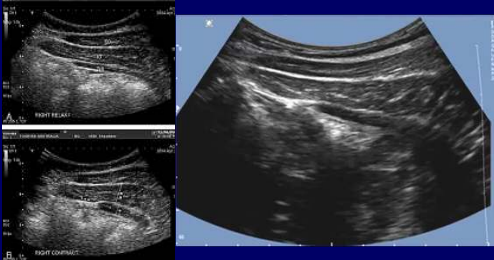


TRANSVERSUS ABDOMINUS

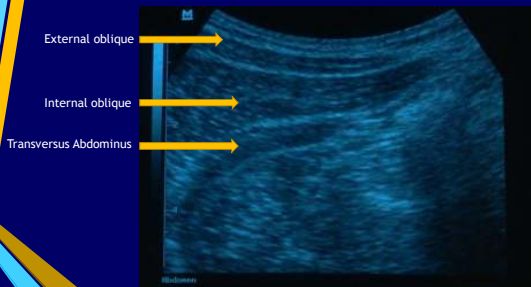
- Transversus Abdominus is inhibited by pain
- Pain or injury on the right side of the back will affect the right side of TrA
- Moving the left arm or leg - opposite to painful side - will show reduced stability



TRANSVERSUS ABDOMINUS RTUS - Good



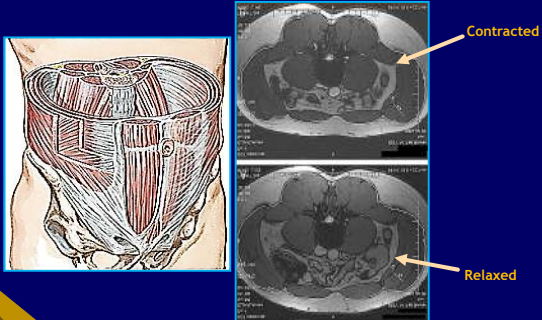
TRANSVERSUS ABDOMINUS RTUS - Good



TRANSVERSUS ABDOMINUS RTUS - Bad



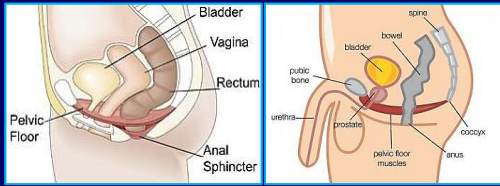
TRANSVERSUS ABDOMINUS CONTRACTION



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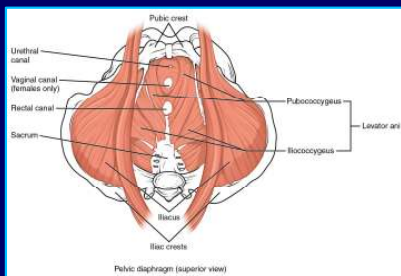
Pelvic Floor

PELVIC FLOOR



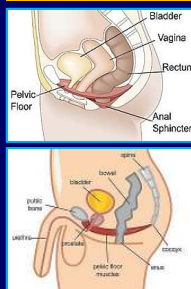
Nerve Supply S3-S4

PELVIC FLOOR



Pelvic diaphragm (superior view)

PELVIC FLOOR



- Activate the pelvic floor muscles right at the front, as if trying to stop urine flowing
- Lifting up and into the body
- Tightening around the vagina (females)
- Lifting testicles (males)
- Gentle inward lift, not pushing down and out

TOP TIPS FOR PELVIC FLOOR MUSCLE TRAINING

- Do not clench your buttocks and tuck bottom under
- Do not use your inner thighs - adductor muscles
- Do not hold your breath - keep normal breathing
- Do not push downwards - gripping abdominals
- Your lower tummy will draw in - you should feel a lift and squeeze sensation from the pelvic floors
- Contract the muscle gently - this is better than trying too hard
- Think of a quiet wee.....shhhhh!

PELVIC FLOOR ACTIVATION

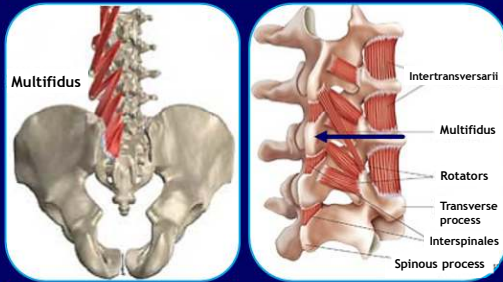


Best position for pelvic floor activation is sitting on the edge of a chair or a ball with slight lean forwards.

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Multifidus Muscle

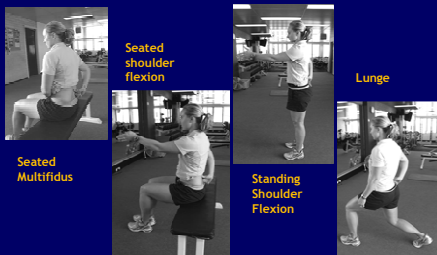
MULTIFIDUS ANATOMY



MULTIFIDUS PRACTICAL TIPS

- Sitting in slumped poor posture - nothing
- Sitting in good posture upright - low level
- FEEL for OPPOSITE multifidus muscles stabilising
- Sitting leaning forward - using under load of gravity - Increased
- Standing Rocking side to side
- Standing arm lift forwards
- Standing lunge forwards - feel it adjust to load of moving leg

MULTIFIDUS ACTIVATION



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Core and Lower Abdominal Exercise Progressions

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Setup for Core Exercises

SETUP FOR CORE EXERCISES

- Lying in supine, ensure spine in neutral zone
- Check hips, knees and feet are in alignment
- Relax head, neck and shoulders
- If client is uncomfortable, consider using a pillow or towel
- Place hands on lower abdominal area, feel for TA activation



**** Activate core and lateral basal breathing before beginning core exercises ****




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Lateral Basal Breathing



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Side-lying Breathing



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Four Point Breathing

Feedback for Breathing

LATERAL BASAL BREATHING



- Use a band or hands to help clients to check for lateral expansion
- Sitting on a ball or bench in front of a mirror is an effective tool
- Watch neck and clavicles for use of accessory muscles of breathing

Leg In / Leg Out Openings

LEG OPENINGS / KNEE DROPS

- Feet on ground, shoulders relaxed down and back, head in neutral position
- Place hands onto lower abdominals by locating ASIS, moving fingers down and in 2-3cms, then feeling through obliques for TA activation



** Activate core and lateral basal breathing before beginning core exercises **

LEG OPENINGS / KNEE DROPS



WATCH FOR:

- Opposite pelvis lifting off
- Opposite shoulder moving
- Back arching
- Ribs flaring

AIM OF EXERCISE:

- Maintain core activation and breathing while hip moves in hip socket.

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Heel Raises

ALTERNATING EXERCISES



Shifting weight and transfer of stabilising muscles mimics functional movement.

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Alternate Leg Lifts

COMPENSATORY MOVEMENTS



Any addition of weight or increase of lever could lead to compensatory movements.

Watch your client's neck and shoulders for movement or muscle activation.

Alternate Leg Slides

ALTERNATE LEG SLIDES

- Only slide the leg as far as the client can keep neutral zone
- Watch for back arching, abdominal doming or pelvis rocking

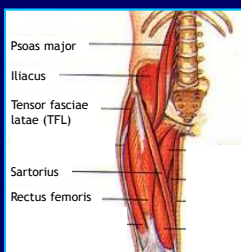


Alternate Leg Ball Slides

Double Leg Ball Slides

Table Top Ball Slides

HIP FLEXOR MUSCLES



- Ensure your client's leg is in good alignment to avoid excessive load on one hip flexor muscle.
- Include a quadriceps and/or hip flexor stretch when using this exercise with your client.


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Resistance Band Leg Slides

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Top Tip for Stability Exercises

TOP TIP FOR STABILITY EXERCISES



- Contralateral core muscles activate to stabilise when moving arms or legs

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- Contralateral core muscles activate to stabilise when moving arms or legs
- When moving the right leg, the left core muscles will be recruited at a greater percentage to stabilise

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TOP TIP FOR STABILITY EXERCISES



- Contralateral core muscles activate to stabilise when moving arms or legs
- When moving the right leg, the left core muscles will be recruited at a greater percentage to stabilise
- Back pain can inhibit core muscles
- Consider increasing the reps on the opposite side to the injury to assist with recovery



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Top Tip for Stability Exercises



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Double Leg Lift and Lower



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Four Point Position Setup

4PT POSITION SETUP



- Ensure spine in neutral zone
- Sacrum, thoracic spine between shoulder blades, and back of head should touch a pole placed along spine
- Knees below hips and hands below shoulders

4PT POSITION SETUP



- Watch your client's head - fatigue leads to a poke neck posture
- Feet should be relaxed in this position
- Ensure client can activate core and engage in lateral basal breathing before progressing to other exercises

4PT POSITION SETUP



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Four Point Arm Transfers

4PT LEG SLIDES



- Watch your client's head - fatigue leads to a poke neck posture
- Feet should be relaxed in this position
- Ensure client can activate core and engage in lateral basal breathing before progressing to other exercises

Four Point Leg Transfers

Four Point Arm and Leg Transfers

Table Top / Dead Bugs

DEAD BUG POSITION



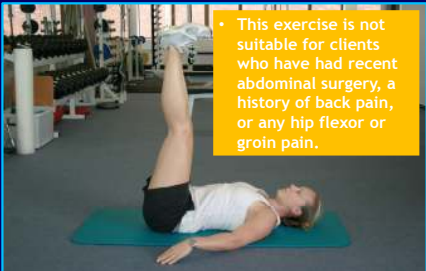
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**Double Leg Lift
Bent Knees**

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**Double Leg Lift
Straight Legs**

DOUBLE LEG LIFT - STRAIGHT LEGS



- This exercise is not suitable for clients who have had recent abdominal surgery, a history of back pain, or any hip flexor or groin pain.

DOUBLE LEG LIFT - STRAIGHT LEGS

- This is an advanced exercise and recommended only for clients who already have excellent core awareness and the ability to maintain neutral zone position during movement.



DOUBLE LEG LIFT - STRAIGHT LEGS

- A double leg lift with straight legs is a challenging exercise requiring hamstring length, hip flexor strength, as well as core activation strength
- Adding speed or push to the exercise will add an even greater amount of difficulty



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Upper Abdominal
Strength Progressions

CORE & PELVIS EXERCISE PROGRESSIONS

1. Core and Lower Abdominal Progressions



CORE & PELVIS EXERCISE PROGRESSIONS

1. Core and Lower Abdominal Progressions

2. Upper Abdominal Strength Progressions



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Ball Crunch

BALL CRUNCH



- Ensure client is engaging the core before beginning the abdominal crunch
- Head is always supported by the hands
- Maintain small gap between chin and chest
- Encourage client to look over knees, not stare at ceiling
- Hamstrings and gluteal muscles will activate to maintain good lower body position

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Forward Ball Roll - Knees

FORWARD BALL ROLL - KNEES

- Kneel at the ball with the elbows on the ball
- Assume a neutral alignment in the spine and engage the core
- Activate lateral basal breathing
- Knees hip-width apart, feet can be tucked under for support
- Start with elbows underneath shoulders
- Slowly roll ball away from body and then back toward the body



FORWARD BALL ROLL - TOES



- Kneel at the ball with the elbows on the ball
- Assume a neutral alignment in the spine and engage the core
- Activate lateral basal breathing
- Feet hip-width apart
- Start with elbows underneath shoulders
- Slowly roll ball away from body and then back toward the body

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Forward Barbell Roll

FORWARD BARBELL ROLL - KNEES



- Introducing unstable equipment adds a degree of challenge to the exercise
- Ensure good scapula control, neck position and core control
- Check for back arching - could indicate overuse of hip flexors
- Control is paramount! The further away from the body the barbell is rolled, the more difficult this exercise will be

FORWARD BARBELL ROLL - TOES



- Increased lever adds even more challenge to the exercise
- Scapula stability, neck position and deep core muscle activation remain important to protect lower back
- Focus on control rather than range of movement

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Plank Additions

PLANK ADDITIONS



Introducing unstable equipment will add extra challenge to these exercises

Cable Crunch

CABLE CRUNCH



- Engage the core before moving
- Exhale to bend from the trunk and touch the knees with the elbows
- Inhale and slowly return to start position

UPPER ABDOMINAL EXERCISES

- Most people have a slightly kyphotic posture, and tend to have tighter upper abdominal muscles and weak lower abdominal muscles.
- Remember to ensure core is activated first and your client has good lower abdominal strength before progressing to upper abdominal exercises.



UPPER ABDOMINAL EXERCISES

- Most people have a slightly kyphotic posture, and tend to have tighter upper abdominal muscles and weak lower abdominal muscles.
- Remember to ensure core is activated first and your client has good lower abdominal strength before progressing to upper abdominal exercises.



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Oblique Strength Progressions - Side Bending

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Side Bend Over Ball

SIDE BEND OVER BALL



- Side-lying with the ball between pelvis and armpit
- One foot in front of the other - can be top or bottom leg in front
- Distance between the feet increases the base of support
- Bottom hand on shoulder with top hand reaching down side

SIDE BEND OVER BALL



Hands can also be placed across chest, behind head, or reaching above head

SIDE BEND OVER BALL - FEET ANCHORED



- Anchor feet using a box, back extension machine or wall
- Increase difficulty by holding and/or pulsing at the top

Dumbbell Side Bend

DUMBBELL SIDE BEND



- Ensure client is not twisting or rotating
- The further your client reaches, the more load is placed on the lower back
- Use only light weights for this exercise

Saxon Side Bend

Side Leg Lifts

SIDE LEG LIFTS



- This exercise incorporates the anterior oblique system, activating adductors, trunk muscles, oblique muscles, and quadratus lumborum.
- Ensure core is engaged before beginning the exercise, and continue with lateral basal breathing.

SIDE LEG LIFTS - USEFUL CUES




- Lengthen through the top of the body and side
- To engage adductors, squeeze knees or ankles together before lifting
- Lengthen through both legs before lifting




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Side Leg Lifts with Ball



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**Oblique Strength Progressions
- Twisting**



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**Oblique Twist
Side-to-Side Exercise**

Ball Side-to-Side Exercise

BALL SIDE TO SIDE EXERCISE



- Activate core to begin
- Keep knees and feet together to engage adductor muscles

Side-to-Side Exercise - No Ball

Side-to-Side Exercise - Straight Legs


SIDE TO SIDE EXERCISE - STRAIGHT LEGS



- Arms out to the side for increased base of support
- Clients must have a minimum of 70 degrees of straight leg raise to do this exercise
- This exercise should not be attempted by clients with back complaints

Russian Twist

RUSSIAN TWIST



- Stop exercise immediately if client experiences any back pain
- Only add weight to this exercise after client can complete with arms across chest or outstretched



Russian Twist with Ball

RUSSIAN TWIST WITH BALL AND WEIGHTS



- Obliques and adductors work to stabilise across pubic symphysis
- This exercise requires hip flexors to be held on statically throughout - even if feet are anchored
- Requires core and abdominal strength to maintain "v" position and protect lower back

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Oblique Crunch

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**Oblique Crunch
on Ball**

OBLIQUE CRUNCH ON BALL



- Focus on obliques and adductors working together while core is activated

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**Oblique Twist
Shoulders on Ball**

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Oblique Twist with Band

OBLIQUE TWIST WITH BAND



- Ensure gluteus maximus is activated during exercise to stop hips from dropping down
- Encourage clients to keep pelvis square whilst rotating upper body



Seated Rotation



Woodchop
