STOTT PILATES®

Introduction to the STOTT PILATES® Principles

The STOTT PILATES Movement System™ provides a framework to create intelligent and mindful exercise that serves as the foundation for tailored exercise programming. The physical and mental conditioning created by these exercises can enhance movement effectiveness or efficiency in daily and sport specific environments. The approach is based on the STOTT PILATES Principles, incorporating recognized movement patterns, movement qualities and integration of the fascial system. The STOTT PILATES Movement System encompasses every exercise in the repertoire using every piece of small and large equipment, and can easily be applied to any type of training in order to achieve desired results and determined goals.

The STOTT PILATES Principles serve as guidelines for instructors to follow when teaching exercise sequences in the repertoire, as well as reference points for clients when performing them. The Principles ensure consistency toward the optimal performance of these movements and are the basis of movement assessment, cueing and correcting. Following these principles allows instructors to provide safe effective workouts for their clients. As part of the understanding and application of the Principles, it is important to recognize that the human body is designed to move in patterns, not individual isolated parts. These movement patterns are reviewed within the STOTT PILATES Principles to help understand each Principle in the context of the exercises and functional activities.

STOTT PILATES Principles

When teaching the STOTT PILATES Principles to educate students and clients about optimal biomechanics and their application to exercise movements, there are three key objectives to emphasize:

- **What** is the Principle?
- **Why** is it beneficial?
- **How** can we experience these benefits?

As part of the understanding and application of the STOTT PILATES Principles, the concept of movement health must be discussed. Movement health is dependent on alignment and flexibility in addition to motor control. Recognition of how exercises are performed is an indicator of movement health. It reflects quality and control, balance and force transfer.

Introduction

WHAT: Breathing

When discussing the benefits of the Breathing Principle there are three key elements to highlight:

1. Mind Body Awareness
2. Three-Dimensional Nature of Breath
3. Muscle Activation

There are many choices of exercises that integrate all three key elements of Breathing. When establishing a workout program for a client, rather than teaching every exercise, it is important to choose the appropriate exercises based on your assessment of the client's posture, goals and body type to maximize integration of the Principle's key benefits.

Instructor Guidelines & Observation:
When teaching movement skills, the instructor requires the ability to observe, understand and facilitate optimal movement patterns by providing strategies to enhance those patterns where movement effectiveness and/or efficiency may have decreased.

WHY: Mind Body Awareness

Mind Body Awareness is an essential component of motor learning and relearning, and the first key element of breathing. Breathing is a tool that promotes concentration, awareness of self and supports the body through motion. The exercises of Notice Natural Breath Pattern, Breathing Flexed Forward and Lateral Rib Cage Breathing Supine, are appropriate programming choices to highlight this key benefit.

In the following sections, the movement experiences may be done in either a vertical (standing or sitting) or supine position. The choice should be dependent on the needs of your client and the teaching environment.

STANDING EXERCISES

HOW: Exercise 1

NOTICING NATURAL BREATH PATTERN

goal: create awareness of existing breath pattern

start position: standing in a natural posture

movement: breathe smoothly, noticing natural breath pattern

Instructor Cues:

- Stand, and breathe naturally, focusing only on your breath
- Are you breathing in and out through your nose or mouth?
- What speed is your breathing pattern, slow or fast?
- As you focus on breathing are you able to relax, or do you feel anxious?
- As you focus on breathing, do you feel any tension or discomfort?

Instructor Observations:

- What, if any, postural changes are happening on the inhale and exhale?
- Where is the breath entering and exiting the body, through the nose or the mouth?
- What is the rate of breath, calm, normal, fast, slow?
- Are there any obvious areas of physical tension?
- Use subtle cues to determine the client's state of mind (emotional state). This is important in order to take optimal next steps in their workout/program.

Common Breath Patterns

start position (for all): standing in a natural posture

1. NOSE BREATHING – inhaling and exhaling through the nose
   The nose is designed to help breathing be safe, efficient, and effective. Tiny hairs in the nasal canals filter out potential allergens, preventing them from entering the lungs. Breathing through the nose moisturizes and warms the air to body temperature, making it easier for the lungs to use. Nasal breathing triggers the release of nitric oxide, a vasodilator, which helps to widen blood vessels. This can help improve oxygen circulation in the body. Breathing through the nose also requires the diaphragm to work harder to pull the air into the lungs.
2. MOUTH BREATHING – inhaling and exhaling through the mouth
   Mouth breathing tends to illicit a more superior vertical breath pattern which often overuses the accessory / auxiliary breathing muscles such as the scalenes, trapezius, and sternocleidomastoid.
3. BELLY BREATHING – expanding the lower abdomen
   Expanding the lower abdomen while inhaling can relax the body but when used alone does not facilitate the creation of intra-abdominal pressure (IAP), important in creating greater torso stability.
4. STOTT PILATES BREATHING – inhale through the nose, exhale through the mouth
   The breath pattern used in the STOTT PILATES repertoire incorporates an inhale through the nose which ensures activation of the diaphragm, and an exhale through slightly pursed lips. Pursed-lip breathing can increase abdominal muscle recruitment on expiration.

   The STOTT PILATES breath pattern encourages a three-dimensional motion of the rib cage, allowing the diaphragm and lungs to expanding in all directions in synch with the deep abdominals and pelvic floor. This creates the ideal length-tension relationship of the deep muscles of the rib cage-lumbo-pelvic region to promote optimal muscle recruitment and modulation of appropriate IAP needed for torso stability.

In addition to the mechanics of the breath, the STOTT PILATES Movement System uses a suggested breath and movement pattern to encourage movement efficiency and effectiveness. Breathing in this controlled manner offers many benefits, including improving awareness and mind-body connection. Incorporating specific breath patterns during STOTT PILATES exercises should prove beneficial for most clients, however, individual accommodations can be made as required, such as altered breath patterns or breath to movement relationships.

WHY: Three-Dimensional Nature of Breathing

The rib cage expresses breath with three mechanical motions. The upper rib cage moves with a pump handle emphasis. The lower rib cage moves with a bucket handle emphasis. The last two ribs display a caliper motion.

HOW: Exercise 2

UPPER RIB CAGE MOVEMENT

goal: create awareness of pump handle pattern

note: this experience is a directed breathing task, so concentration and centering are required. This also overlaps with the mind-body benefit.

start position: standing, place both hands on the upper rib cage on the sternum

movement: ***in:*** focus on what happens in the area of the hands, ***ex:*** through the mouth. Repeat with a stronger, longer breath.

Instructor Cues:

- As you focus on the area where the hands are positioned, do you notice an expansion with slight elevation or any change in your posture when breathing in and out?
- Take a deeper breath into the hands exaggerating the focus up into the hands and notice how this creates tension into the neck and shoulders, an increase in elevation in the upper chest, an extension in the upper back and a forward and backward sway in the posture.

Instructor Guidelines & Observation:

The upper rib cage moves with a pump handle action. During the inhalation phase, this results in an expansion where the front of the rib cage and sternum move in an anterior and slightly superior direction and the back of the rib cage expands posteriorly and slightly superiorly. The motion occurring at the front has greater amplitude when compared to the back. During the exhalation phase the reverse motion occurs. The spine has minimal movement and postural sway during quiet breathing.

Focusing the breath into the upper rib cage may promote a more vertical style of breathing where there is more superior motion compared to the anterior/posterior expansion seen with an optimal pump handle action. The result is overuse of the accessory breathing muscles, including the scalenes, trapezius, and sternocleidomastoid, and facilitating an increased postural sway from the associated extension of the upper spine.

HOW: Exercise 3

LOWER RIB CAGE & LAST TWO RIBS

goal: create awareness of bucket handle and caliper patterns

start position: standing, hands on the side and back of ribs

movement: ***in:*** focus the breath where the hands are placed, visualizing a bucket handle movement of the lower rib cage expanding out and up, ***ex:*** allow ribs to return.

Instructor Cues:

- Breathe in, focusing the breath into your hands
- Can you feel how the expansion of the ribs happens laterally and more posteriorly / into the back?

Instructor Guidelines & Observation:

The lower rib cage moves with a bucket handle emphasis, which is lateral and superior expansion during the inhalation phase and the reverse during the exhalation phase. The last two ribs display a caliper motion. During inhalation these ribs move laterally and reverse direction during exhalation. There should be symmetry in the amplitude of motion between the left and right sides of the lower ribs. This awareness of bucket handle and caliper motions of the rib cage promotes a more posterior lateral breath pattern.

A restriction in the bucket handle motion may result in a more superior vertical breath in an effort to compensate for the lack of inferior and lateral expansion.

HOW: Exercise 4

THREE-DIMENSIONAL BREATHING

goal: create awareness of a three-dimensional pattern

start position: stand, one hand on the sternum and the other wrapped around the front of the ribs to the opposite side of the ribs and lower back

movement: ***in:*** focus the breath where the hands are placed, ***ex:*** allow ribs to return. Repeat on the other side.

Instructor Cues:

- Try to breathe into both hands equally
- How does it feel if you only focus on the lower hand versus the upper? Or vice versa?
- With this position do you notice more expansion on one side of the rib cage than the other?

Instructor Guidelines & Observation:

The volume, speed and effort of the inhale should be adjusted so there is minimal spinal extension, postural sway and / or accessory breathing. With an optimal three-dimensional breath, the alignment and length of the torso should be maintained.

When the anterior, posterior and lateral motions of the rib cage are restricted, the amount of superior upper rib cage motion can become greater. In addition, it may be more difficult to activate the deep stabilizers of the rib cage-lumbo-pelvic region.

SUPINE EXERCISES

WHY: Mind Body Awareness

HOW: Exercise 1

NOTICE NATURAL BREATH PATTERN

goal: create awareness of existing breath pattern

start position: supine, in a tension-free position

movement: Breathe smoothly, noticing natural breath pattern

WHY: Three-Dimensional Nature of Breathing

- Reference explanation above.

HOW: Exercise 5

BREATHING FLEXED FORWARD

goal: encourage breathing into the sides and back of the rib cage

start position: sitting in a neutral position, weight on top of sit-bones, arms relaxed

movement: ***in:*** prepare, ***ex:*** initiate from the top of the head and sequentially articulate spine into forward flexion, relaxing over legs.

Then… ***in:*** through the nose, feeling the sides and back of rib cage expand, ***ex:*** through pursed lips, allowing the rib cage to close. Complete 3-5 breaths. On last exhale, initiate from tail and sequentially articulate spine, rolling up to starting position.
Repeat

Props & Modifications:

a. PELVIS RAISED on a Foam Cushion, Barrel, Box or Chair

Instructor Guidelines & Observation:

Be aware of the position of the pelvis. There may be excessive tension created from the hip flexors or the quadratus lumborum, so try different props or modifications to release the tension. This tightness may contribute to an accessory breathing pattern.

HOW: Exercise 6

LATERAL RIB CAGE BREATHING SUPINE

goal: encourage breathing into the sides and front of the rib cage

start position: supine, hands on sides of the rib cage

movement: ***in:*** feel the rib cage expand laterally into hands, ***ex:*** feel the rib cage. Return. Keep the thoracic spine in its normal curve, neither flexing nor extending.

Instructor Guidelines & Observation:

When programming, those with a kyphotic posture will experience restriction in the anterior / superior motion – the pump handle action. Lying in a supine position allows the anterior rib cage to expand more freely.

WHY: Muscle Activation

Breathing is the mechanism used to provide gas exchange in the body. Oxygen is transported to working muscles and used to create the energy necessary for muscle contractions. The muscle fiber type seen in stabilizer muscles has a preference for energy that is created using oxygen. Therefore, if we maximize efficient gas exchange, we promote a metabolic environment for ideal deep muscle activation. In addition, the muscles of respiration – diaphragm, transverse abdominals and pelvic floor – maintain the pressure gradient in the thoracic and abdominal cavities. IAP provides a spinal unloading effect in all directions of spinal movements, similar to how a car airbag operates to prevent impact of the body against the dashboard. The IAP generates an expansion or tension force that counterbalances the compression force generated by the abdominal wall activation and spinal motion to prevent excessive compression of the spine. Muscle activation of the deep stabilizers and pressure management modulates the appropriate stiffness of the lumbo-pelvic region to create optimal stability for the tasks being performed.

HOW: Exercise 7

PELVIC FLOOR SITTING

goal: create awareness of pelvic floor engagement

start position: seated, legs crossed, torso vertical

movement: ***ex:*** sense a lift between the bony landmarks, ***in:*** allow pelvic floor muscles to eccentrically lengthen.

Props & Modifications:

a. PELVIS RAISED on a Foam Cushion, Barrel or Box

b. QUADRUPED or SUPINE POSITION

c. PELVIS HINGED slightly forward (this may help target the anterior portion of the pelvic floor that typically co-contracts with the transverse abdominals).

Instructor Guidelines & Observation:

Contraction of the pelvic floor aids in firing the transversus and creating stability for the pelvis and lumbar spine. The pelvic floor is a group of muscles that extend from the pubic bone anteriorly to the coccyx posteriorly, and between the ischial tuberosities (sit-bones) on each side.

HOW: Exercise 8

TRANSVERSUS ENGAGEMENT

goal: create awareness of transversus abdominis activation

1. TRANSVERSUS ENGAGEMENT SUPINE

start position: supine, knees flexed, feet on Mat, fingertips medial to the ASIS

movement: ***ex:*** feel the pelvic floor gently lifting and allow the abdominal wall to and generate tension without allowing the spine to move, ***in:*** maintain connection as the abdominal wall expands.

2. TRANSVERSUS ENGAGEMENT QUADRUPED

start position: on hands and knees, pelvis and spine neutral

movement: ***ex:*** feel the pelvic floor gently lifting and allow the abdominal wall to contract and generate tension without allowing the spine to move.

Instructor Guidelines & Observation:

The muscle fibers of the transversus abdominis wrap horizontally around the sides of the torso between the lower ribs and the pelvis. They attach into the abdominal aponeurosis in front and the thoracolumbar fascia in back. Tightening this muscle creates the feeling of a girdle around the torso, stabilizing the spine and stabilizing the lumbar spine on the pelvis. Whether inhaling or exhaling, activation of the transversus enables the lumbo-pelvic region to remain stable throughout an exercise.

HOW: Exercise 9

BREATH PATTERN SUPINE INCORPORATING ABDOMINALS

goal: promote awareness of abdominal activation

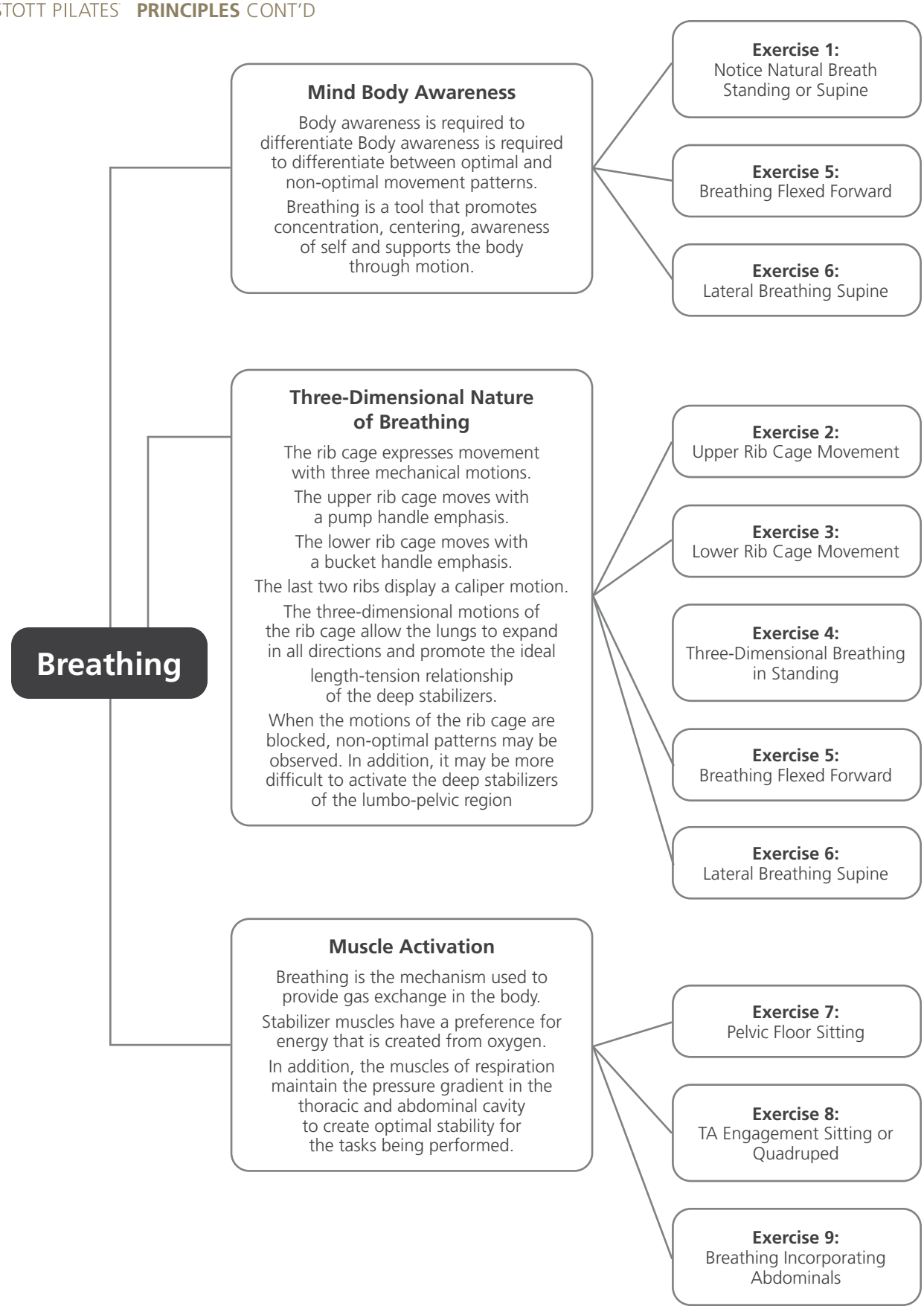
start position: supine with arms relaxed at sides

movement: ***in:*** through the nose, expanding the rib cage laterally, ***ex:*** strongly exhale through the mouth, focus first on pelvic floor and transversus engagement. As you exhale more deeply, you may feel the obliques engage to help press the air out. ***in:*** through the nose, maintaining engagement of the abdominal muscles and allow the muscles to lengthen to encourage lateral expansion of the rib cage, ***ex:*** repeat the exhale as above.

note: A flattened appearance of the abdomen should occur as a result of the abdominal wall contracting not as a result of the spine flexing toward the floor.

Instructor Guidelines & Observation:

This last step puts all the elements together in in the breath pattern used in exercises, not only supine, but in all other positions. It promotes awareness of layering the muscle contraction of the external obliques and the rectus abdominis on top of the underlying activity of the deep stabilizers.



WHAT: Pelvic Placement

It is important to emphasize stabilization of the pelvis and lumbar spine both statically and dynamically in all positions and throughout all movements. When we need to control the position of the pelvis during movements of the torso or the periphery, there are two positions that are most often used – neutral and imprint.

NEUTRAL

In a neutral position the natural anterior convex curve of the lumbar spine is present and the deep stabilizer muscles are in a midrange length. This provides the ideal length-tension relationship that allows the muscles to react to different forces and loads on the body with appropriate stiffness and control. Neutral alignment should not be achieved by forcibly arching the back, but rather by allowing the weight of the sacrum to rest on the Mat. With the transversus abdominus engaged, no strain should be felt through the spinal extensors in the lumbar area. There should also be no excessive tension in the hip flexors. If muscular tension occurs, shift the pelvis slightly toward a posterior placement. It is more important for the lumbar area not to strain than for the ASIS and symphysis pubis to lie in the same horizontal plane. Neutral pelvic placement is a good place from which to promote efficient movement patterns.

IMPRINT

An imprinted position should be used to ensure stability of the pelvis and lumbar spine if neutral alignment cannot be maintained in either open or closed chain exercises. An imprinted position combines a slight posterior pelvic tilt with a lengthening of the lumbar spine. The normal curve of the lumbar spine lengthens toward flexion by engaging the oblique abdominals to approximate the pelvis and the rib cage anteriorly, and lengthen the lumbar spine posteriorly. When there is weakness in the obliques and other abdominals placing them in this slightly shortened position may help maintain their engagement. This is also useful when certain postural tendencies are present (for example, lordosis). The degree of contact between the lumbar spine and the Mat differs from person to person. It is not necessary to press the lower back all the way into the Mat or to tuck under by overusing the rectus abdominis and gluteal muscles as this may decrease stability.

The eventual goal of programming is to decrease the amplitude of the imprint until neutral can be achieved with control.

HOW: Exercise 1

ROCKING PELVIS

goal: explore the available range of motion

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart on Mat, arms long by sides

movement: with a smooth breath: rock pelvis through anterior and posterior tilts to explore range of movement. Neutral placement will be somewhere in between the two.

HOW: Exercise 2

NEUTRAL TO IMPRINT

goal: create awareness of pelvic positions

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart on Mat, arms long by sides.

movement: ***in:*** maintain neutral alignment, ***ex:*** contract abdominals to slightly posteriorly tilt pelvis and lengthen lumbar spine, ***in:*** maintain imprinted position, ***ex:*** return to neutral.

note: The transversus abdominis should remain engaged throughout while the obliques shorten as the pelvis and ribs move toward imprint, then lengthen as pelvis and ribs return to neutral.

HOW: Exercise 3

LEG SLIDES

goal: create awareness of pelvic control against peripheral movement

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart on Mat, arms long by sides.

movement: ***ex:*** prepare, ***in:*** maintain neutral and slide one foot along the Mat as far away as possible while maintaining pelvic stability, ***ex:*** return to starting position. Repeat with other leg, then with both legs.

note: This exercise can be performed in an imprinted position if pelvic stability cannot be maintained in neutral. This may be necessary particularly when performing the bilateral variation.

HOW: Exercise 4

LEG LIFTS & TOE TAPS

goal: create awareness of pelvic control against peripheral movement in neutral or imprint

1. LEG LIFTS

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart on Mat, arms long by sides.

movement: ***in:*** prepare, ***ex:*** maintain neutral and lift one leg to tabletop, ***in:*** lower leg to Mat.
Repeat with other leg, then with each leg consecutively (lift one leg, then the other to join it) or bilaterally (both legs together).

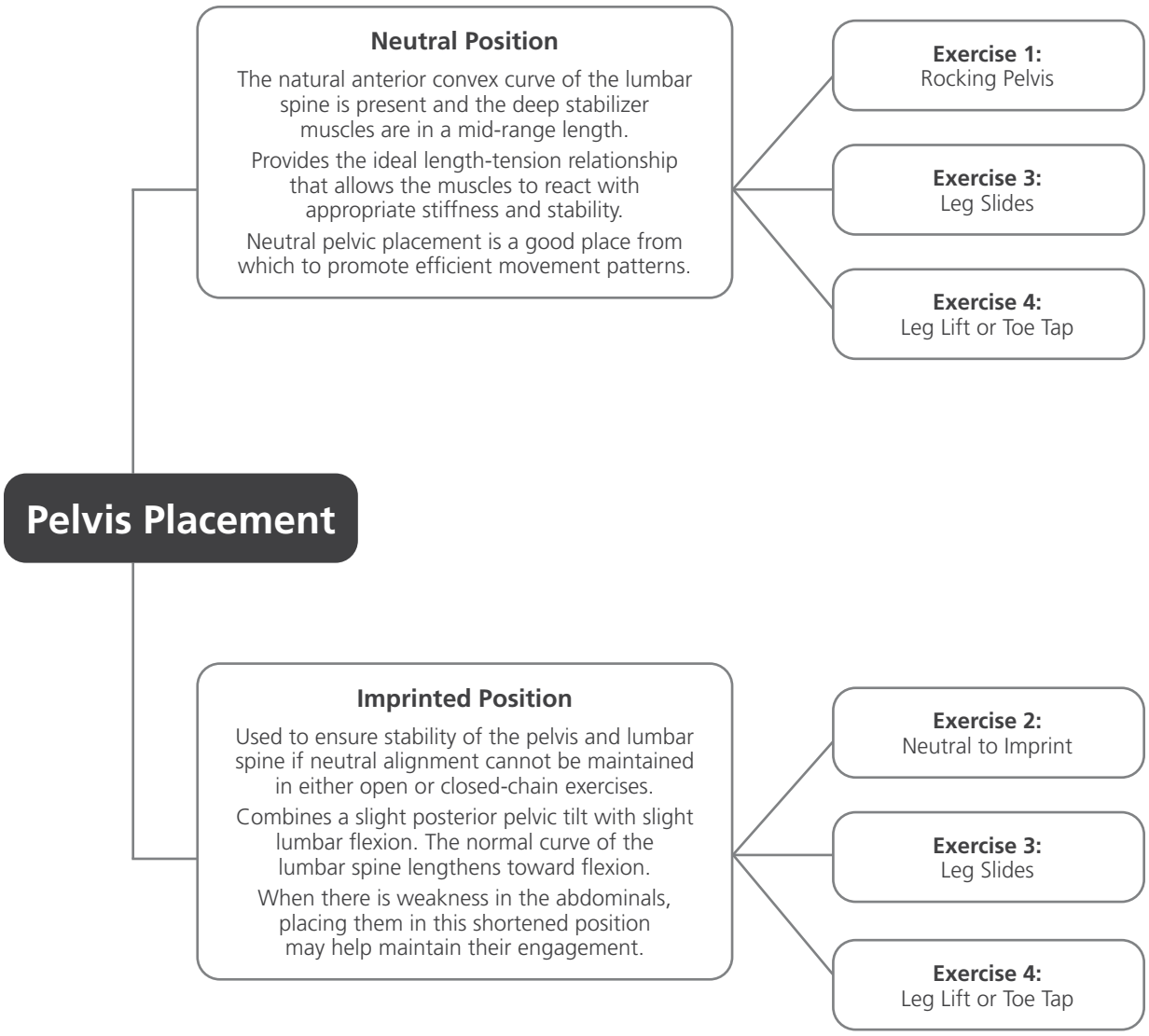
note: This exercise can be performed in an imprinted position if pelvic stability cannot be maintained in neutral. This may be necessary particularly when performing the consecutive or bilateral variation.

2. TOE TAPS

start position: imprinted with both legs in tabletop position

movement: ***in:*** prepare, ***ex:*** reach one foot toward the Mat, extending the hip joint, ***in:*** return to tabletop. Repeat with other leg.

note: This exercise can be performed in neutral once strength and stability can be demonstrated.



WHAT: Rib Cage Placement

When discussing optimal Rib Cage Placement there are three key beneficial elements to emphasize:

1. Bony Connections
2. Muscular Connections
3. Physiological Motions

BONY CONNECTIONS TO THE THORAX

The articular relationship of the rib cage to the thorax provides an indirect assessment of the alignment of the thoracic spine and a visual reference to assist in establishing a neutral position. This relationship highlights a mechanical interdependence,

where movement and alignment in one area affects the other. Ideally, the rib cage should be stacked over the pelvis so the thoracic and pelvic diaphragms are parallel.

MUSCULAR CONNECTIONS TO DEEP STABILIZERS & PELVIS

The abdominal wall attaches to the lower ribs and the pelvis. The abdominal muscles must often be recruited to maintain the rib cage, thoracic spine and pelvis in proper alignment. Often the rib cage will lift up in the supine position or deviate forward in a sitting position causing the thoracic spine to extend. Engagement of the obliques will ensure proper alignment at all times. In a postural kyphosis, the abdominal muscles may be shortened. Various techniques can be employed to expand the anterior rib cage and improve alignment. Muscular connections are directly related to effective breathing as was discussed earlier in the Breathing Principle.

PHYSIOLOGICAL MOTIONS OF THE SPINE

RELATED TO BREATHING, SPINE, RIB CAGE, DIAPHRAGM, DEEP ABDOMINALS AND PELVIC FLOOR

Dynamically, there is an inter-relationship between breathing and the movement of the rib cage and thoracic spine. During active inhalation the spine extends and during active exhalation the spine flexes. We use this relationship during STOTT PILATES exercise to support these spinal movements. During quiet breathing these spinal movements should be minimal and not observed. If needed, the exhale breath can be used for abdominal recruitment where necessary in any part of a movement to ensure safety and control. Maintaining the pelvic floor and diaphragm parallel gives you the maximal effect of the breath and optimal IAP. Experiencing breath and challenging the diaphragm and pelvic floor in a variety of positions allows us to create the greatest connection, engaging the musculature most effectively. This allows us to function well in any position. There needs to be a synchronicity between breath and movement. When we move from the breath, a more natural relationship will be found with the breath facilitating the movement, not fighting against it.

HOW: Exercise 1

ARM RAISES & SCISSORS

goal: challenge rib cage placement against movement of the arms

start position: supine, pelvis and spine neutral, knees flexed, feet hip-distance apart, arms long by sides

movement: ***in:*** reach arms to ceiling, ***ex:*** reach arms overhead only as far as abdominal connection can be maintained and rib cage maintains alignment with the pelvis, ***in:*** reach arms to ceiling, ***ex:*** lower arms down by sides

Instructor Guidelines & Observation:

- Ensure the head is well supported especially if there is moderate to severe kyphosis to prevent compensations
- Use the Mat as reference to set the pelvic and rib cage relationship in supine. Highlight that the rib angles have equal weightbearing with the sacrum, not the spinous processes.
- Clarify the difference between structurally flared ribs and ribs popping due to spinal extension. If the rib angles are in contact with the Mat in supine, then likely a structural rib cage position rather than spinal extension exists.

HOW: Exercise 2

ACTIVE BREATHING WITH PHYSIOLOGICAL SPINAL MOTION

goal: create awareness of natural motions of the spine when breathing

start position: supine, knees flexed, feet on the Mat

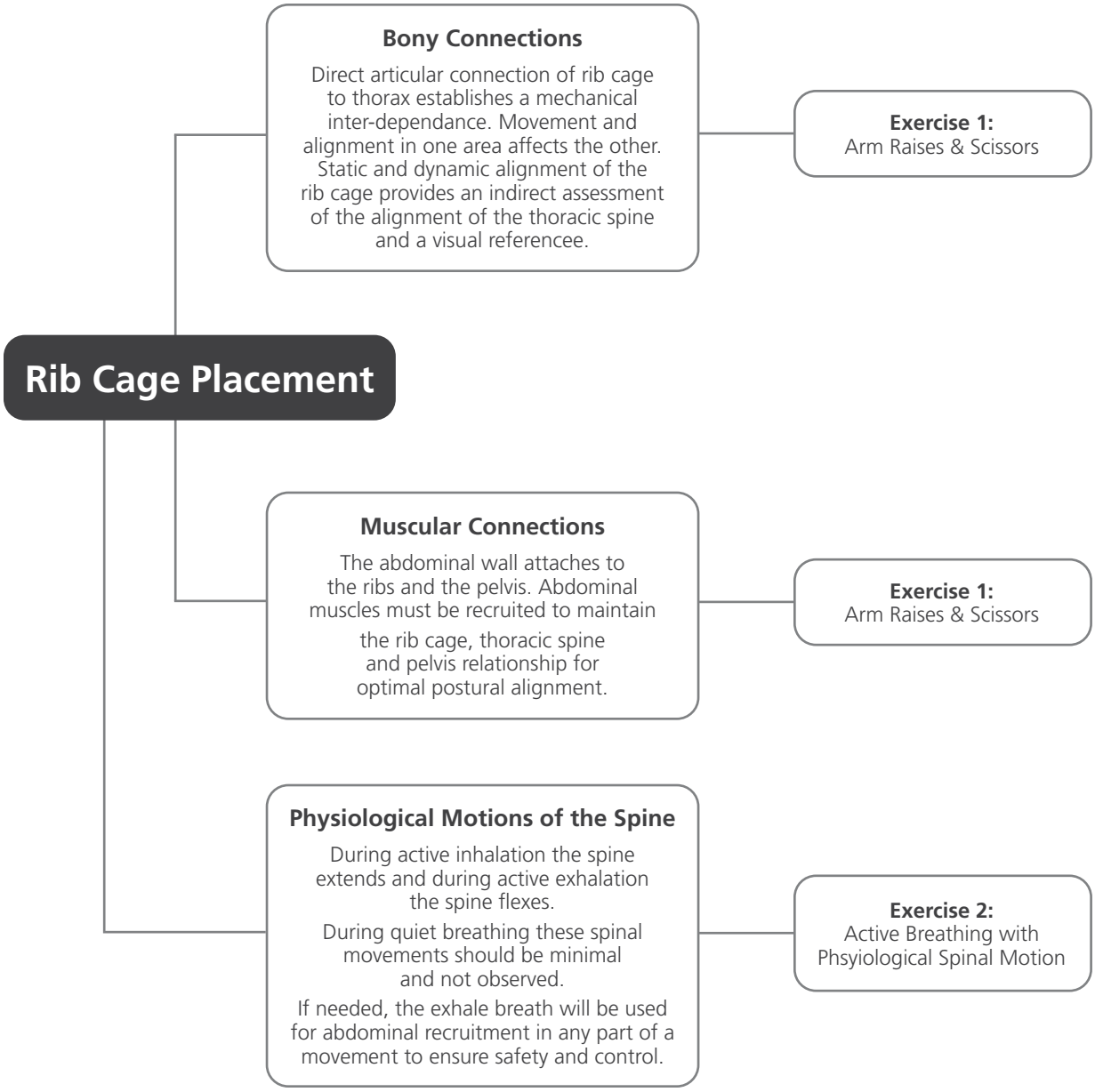
movement: actively inhale and allow the thoracic spine to extend and the chest to lift up toward the ceiling, opening the rib cage, actively exhale and flex the thoracic spine, lowering and closing the rib cage.

Props & Modifications:

1. HEAD ON PAD or cushion to improve cervical alignment
2. SEATED if the Mat impedes spinal motion

Instructor Guidelines & Observation:

- The relationship between the rib cage and the pelvis is crucial to effectively engage the lumbo-pelvic stabilizers to create torso stability.
- Using the exercise of Lateral Breathing Supine, allowing the spinal motion creates a direct awareness of the inter-relationships between each of the Principles, in particular the Breathing and Rib Cage Placement.



WHAT: Scapular Mobility & Stability

Being aware of Scapular Mobility & Stability is important during the initiation and performance of every exercise. When stability is absent, there is a tendency to overwork muscles around the neck and shoulders. A sense of width should be maintained across the front and back of the shoulder girdle. The shoulders should not be allowed to overly round forward or squeeze completely together. The scapulae should lie flat on the rib cage and glide across it without coming away from it. An appreciation of movement control and appropriate muscle tension, not rigidity, should be maintained.

When explaining the concept of Scapular Mobility & Stability, there are two key elements to discuss:

1. Lack of Articular Support
2. Increased Muscular Support

WHY: Lack of Articular Support

Since the scapulae lack a direct bony attachment to the rib cage and spine, they have a great deal of mobility. They have direct attachments to the clavicles and indirect attachment to the rib cage.

WHY: Increased Muscular Support

The scapulae must rely on the axio-scapular muscles to act like dynamic ligaments for additional support. These muscles modulate tension through contraction to keep the scapulae controlled against the rib cage while at rest and during spinal and arm motions to ensure a stable position of the scapula. Because of this, protraction / retraction / elevation / depression and upward / downward rotation movements created by these muscles enhance stabilization and maintain the health of the axio-scapular muscles.

Movements of the scapulae:

1. Protraction / Retraction
2. Elevation / Depression
3. Upward / Downward Rotation

In the STOTT PILATES Movement System, we consider the following concepts when speaking of the movement of the scapulae and spine.

PUSH & PULL MOVEMENT PATTERN

We consider "push movement patterns of the upper body" and "pull movement patterns of the upper body" as biomechanical movements. A push movement pattern features a habitual sequence of joint motions, specifically, extension of the elbow, flexion of the shoulder and protraction of the scapula with or without spinal flexion. A pull movement pattern demonstrates the opposite movements. These patterns are sequences of joint movements that are developed through life from birth, and are necessary in many functional activities.

PUSH & PULL FORCE

This is a mechanical effect on an object or person that we use to create, stop or modify movement.

PUSH & PULL ACTIVITY

A "push task" & "pull task" or activity integrates use of forces with push or pull movement patterns respectively within the context of the environment. It is the resultant effect of movement pattern and force.

UPPER BODY MOVEMENT PATTERNS

PUSH MOVEMENT PATTERN

Critical in creating the movement required for a push activity when working against resistance, moving objects away from us, or our ourselves away from fixed objects. Pushing motions activate the anterior musculature and can occur bilaterally or unilaterally. A pushing movement pattern can be used to facilitate scapular protraction and progress into protraction with spinal flexion.

BILATERAL PUSH IN NEUTRAL

start position: standing, arms relaxed down by sides

movement:flex elbows then imagine pushing something away from you, allow the scapulae to protract keeping the spine in neutral. Return to start position, relaxing arms down by sides

BILATERAL PUSH WITH FLEXION

start position: standing, arms relaxed down by sides

movement: flex elbows then imagine pushing something away from you, allow the scapulae to protract and the spine to flex. Return to start position, relaxing arms down by sides.

PULL MOVEMENT PATTERN

Critical in creating the movement required for a pull activity when working against resistance, moving objects towards us, or ourselves towards fixed objects. Pulling motions engage the posterior musculature and can occur bilaterally or unilaterally. A pulling movement pattern can be used to facilitate scapular retraction and progress into retraction with spinal extension.

BILATERAL PULL IN NEUTRAL

start position: standing, arms relaxed down by sides

movement: reach arms forward then imagine pulling something toward you, flexing both elbows wide and back, allow scapulae to retract keeping the spine in neutral. Return to start position, relaxing arms down by sides.

BILATERAL PULL WITH EXTENSION

start position: standing, arms relaxed down by sides

movement: reach arms forward then imagine pulling something toward you, flexing both elbows wide and back, allow scapulae to retract and upper spine to extend. Return to start position, relaxing arms down by sides.

ROTATION MOVEMENT PATTERN WITH PUSH & PULL

Rotation integrates both the push and pull movement patterns. In many day-to-day activities, the body must be able to both create and resist rotation. A rotational pattern simultaneously uses the anterior and posterior musculature. When performing a rotation movement, it is useful to incorporate the ideas of push and pull to create movement in the transverse plane.

UNILATERAL PUSH WITHOUT ROTATION

start position: standing, arms relaxed down by sides

movement: flex one elbow, then imagine pushing something away from you. Allow the scapula to protract keeping the torso facing front. Return to start position, arm down by side. Repeat on the other side.

UNILATERAL PUSH WITH ROTATION

start position: standing, arms relaxed down by sides

movement: flex one elbow then imagine pushing something away from you, allow the scapula to protract and the spine to rotate. Return to start position, arm long by side.bRepeat on the other side.

UNILATERAL PULL WITHOUT ROTATION

start position: standing, arms relaxed down by sides

movement: reach one arm forward, then imagine pulling something toward you, allow the scapula to retract, keeping the torso facing front. Return to start position, arm long by side. Repeat on the other side.

UNILATERAL PULL WITH ROTATION

start position: standing, arms relaxed down by sides

movement: reach one arm forward, then imagine pulling something toward you, allow the scapula to retract and the spine to rotate. Return to start position, arm long by side. Repeat on the other side.

TORSO ROTATION WITH PUSH & PULL

start position: standing, arms reaching forward in front of shoulders

movement: simultaneously pull one elbow back allowing that scapula to retract, and push the opposite arm forward, allowing that scapula to protract, creating rotation of the spine. Return to start position with arms reaching forward. Repeat on the other side.

Instructor Guidelines & Observation:

During this movement, if there is a tendency to bias toward spinal extension, more emphasis should be put on the push motion, and likewise if there is a bias towards flexion of the spine, the pull pattern should be emphasized.

SCAPULAR MOBILITY & STABILITY

The scapulae must accommodate the movements of the arms and thoracic spine and must react appropriately in a variety of situations. For example, the scapulae naturally elevate during overhead arm movements and protract during thoracic flexion. Programming Scapula Isolations that demonstrate all the motions of the scapulae integrates these key elements. Movements of the scapulae, in any direction, can be done either in an upright seated position or in a supine position. Supine is recommended when instability of the shoulder girdle or thorax is observed. The compression provided between the torso and the Mat helps isolate the movements to the scapulae alone. A seated position allows greater range of motion, is a more functional position in space and provides gravitational challenge to the muscles.

Instructor Guidelines & Observation:

When performing movements that incorporate scapular mobilization and stabilization, the following should be noted:

- Symmetry of shoulder height before arm movement
- Resting scapula placement in relation to rib cage and spine before arm movement
- Scapulo-humeral movement, control and rhythm as the arms move
- Dynamic postural balance relating to the lumbo-pelvic, hip and thoracic spine as the arms move
- Ability to control movement of scapula with appropriate muscle activity, not rigidity
- Differences between bilateral and unilateral movements

HOW: Preparation Exercise

SCAPULAR SETTING ON A NEUTRAL SPINE

goal: find a tension-free starting position for each client

start position: standing, pelvis and spine vertical, hands placed on top of the head

movement: Gently elevate the scapulae, bringing the shoulders up by the ears; while maintaining good neutral alignment of the rib cage over the pelvis and the head over the shoulders, widen the elbows out to the sides; gently depress the scapulae without creating tension or jamming the shoulders down; let the arms float effortlessly off the head and down by the sides. The resulting position of the scapulae should be tension free and is a good starting position from which stabilization can be encouraged.

note: Repeat this exercise several times and point out that a functional neutral starting position may feel different than a natural resting position.

HOW: Exercise 1

SCAPULA ISOLATIONS / PROTRACTION & RETRACTION

goal: mobilize the scapulae

start position: pelvis and spine neutral, arms in front of shoulders, palms facing in

1. PROTRACTION TO NEUTRAL
   in: protract scapulae, widening between shoulder blades, ***ex:*** bring scapulae back to a neutral position widening across the collarbone.
2. RETRACTION TO NEUTRAL
   movement: ***in:*** retract scapulae, bringing shoulder blades in toward the spine, ***ex:*** bring scapulae back to a neutral position, widening across the back.

HOW: Exercise 2

SCAPULA ISOLATIONS / ELEVATION & DEPRESSION

goal: mobilize the scapulae

start position: pelvis and spine neutral, arms long by sides

movement: ***in:*** elevate scapulae, sliding shoulder blades up toward ears, ***ex:*** depress scapulae, sliding shoulder blades away from ears.

HOW: Exercise 3

ARM SCISSORS

goal: create awareness of scapular movement with arm movement

start position: pelvis and spine neutral, arms reaching in front of shoulders

movement: ***in:*** prepare, ***ex:*** reach one arm overhead, other arm down by side, ***in:*** reach both arms in front of shoulders. Repeat scissoring arms the opposite way.

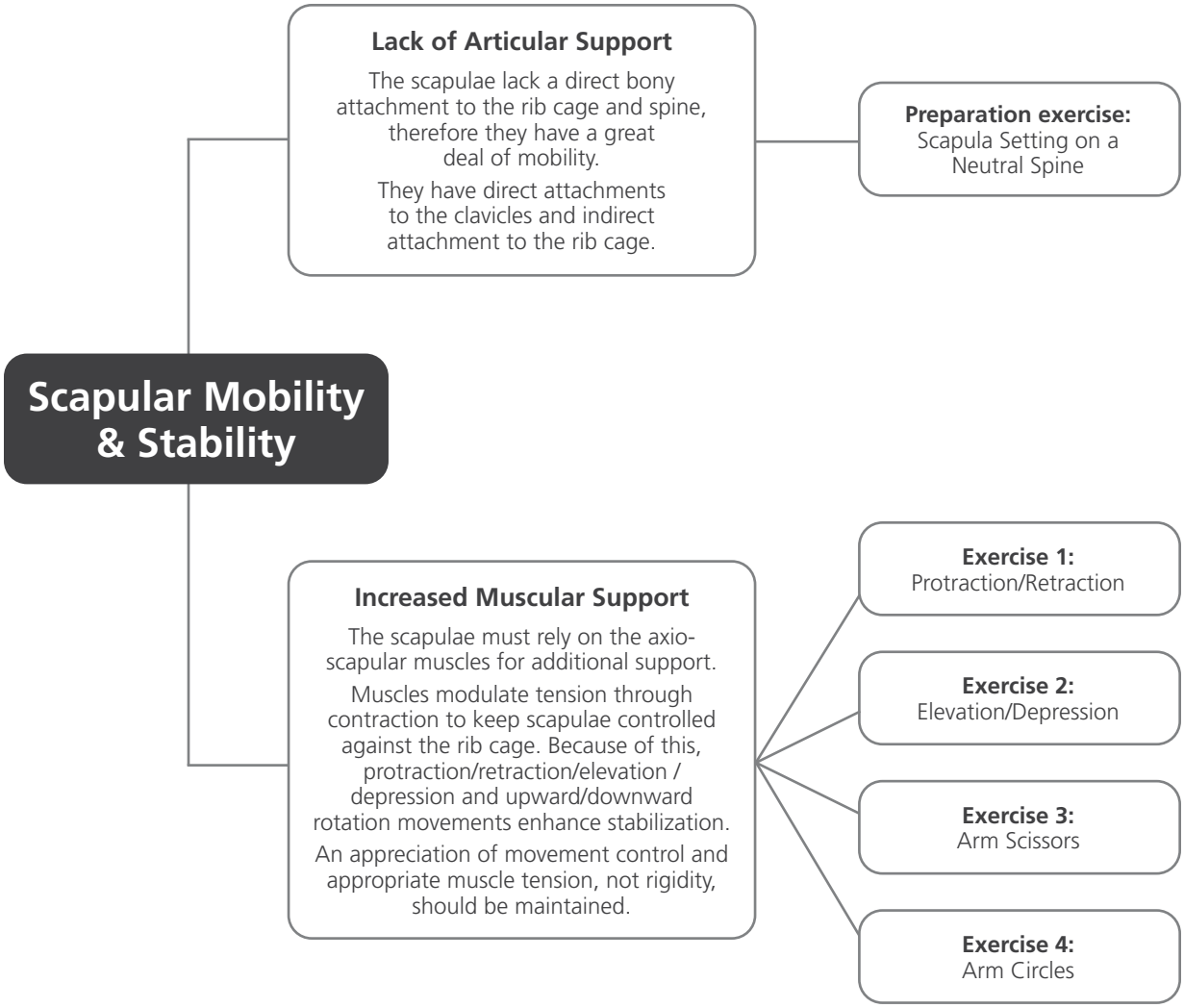
HOW: Exercise 4

ARM CIRCLES

goal: create awareness of elevation/depression with upward/downward rotation

start position: pelvis and spine neutral, arms long by sides

movement: ***in:*** reach arms in front of shoulders and overhead, ***ex:*** circle arms out to sides and around to hips. Repeat circles in the opposite direction.



WHAT: Head & Cervical Placement

To provide a biomechanical advantage to support the weight of the head and neck, and in most instances, the cervical spine should continue the line created by the thoracic spine in neutral as well as during flexion, extension, lateral flexion and rotation.

There are two biomechanical regions to emphasize in this principle:

1. Upper cervical which includes head and the upper two cervical vertebrae
2. Lower cervical which includes C3-7

WHY: Upper Cervical & Head Control

The weight of the head should balance over the lower cervical spine, shoulders and torso when sitting or standing in neutral to minimize stress through the head and neck. Cervical flexion should begin with a slight head nod, referred to as cranio-vertebral flexion. Anatomically this is a movement of the head on C1-2. This action will stimulate the deep neck flexors to enhance segmental stiffness to prevent overactivity of the superficial neck muscles. Programming head nods will teach the client how to create and feel this stabilization. To initiate cervical extension, begin with a slight chin lift. This will activate the deep cervical extensors and prevent over-activity of the more superficial global muscles. Using the eyes to initiate each motion will tap into a motor control reflex to enhance the proper muscle activation and promote ideal alignment.

WHY: Lower Cervical Control

To provide a biomechanical advantage to support the weight of the head and neck, in most instances, the cervical spine should continue the line created by the thoracic spine in neutral, or during flexion, extension, lateral flexion and rotation. Avoid jamming the chin into the chest during flexion movements and positions or back of head to base of neck during extension movements and positions.

A neutral position should also be maintained when lying supine. If there is a kyphosis or forward head posture, pads or cushions under the head may be necessary to support it, and prevent overextension and unnecessary tension in the cervical spine.

HOW: Exercise 1

CRANIO-VERTEBRAL FLEXION (HEAD NOD)

goal: create segmental flexion of the upper cervical spine

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart, arms long by sides.

movement: ***in:*** lengthen the back of the neck, leaving the head on the Mat, ***ex:*** return to neutral

note: the head nod must be performed in a closed kinetic chain position, with the head in contact with the Mat or cushion, or the superficial muscles will be recruited.

Instructor Guidelines & Observation:

In flexion, initiate with cranio-vertebral flexion, then deepen it to initiate flexion of the lower cervical spine. Once cervical flexion and scapular stabilization are established, the upper torso can be flexed by contracting the abdominals to move the rib cage toward the pelvis. When flexing the upper torso, focus should be on creating an even flexion through the thoracic and cervical spine. When extending the upper torso, focus on creating an even extension through the thoracic and cervical spine. Avoid creating hyperflexion or hyperextension in these positions.

Programming a Modified Ab Prep and Modified Breast Stroke Prep will integrate this relationship into the body

HOW: Exercise 2

MODIFIED AB PREP

goal: incorporate the Head Nod into a full upper spine flexion movement

start position: supine, pelvis and spine neutral, knees flexed, feet abducted hip-distance apart, hands behind head for support

movement: ***in:*** perform Head Nod, lengthening the back of the neck, ***ex:*** maintain length through back of neck and flex thoracic spine, ***in:*** stay, allow weight of head to drop into hands, maintaining length in back of neck, ***ex:*** return, allowing cervical spine to return to neutral once head is on the Mat.

HOW: Exercise 3

MODIFIED BREAST STROKE PREP

goal: incorporate the head and cervical extension into a full upper spine extension movement

start position: prone, pelvis and spine neutral, hands on Mat by shoulders, legs parallel and adducted, nose directly toward Mat. Use a small Foam Cushion under forehead if necessary to support the cervical spine (placing forehead on Mat will create too much flexion, chin on Mat creates too much extension).

in: prepare, ***ex:*** gently depress and retract scapulae, reach top of head away from tailbone to begin extending thoracic spine, allowing cervical spine to be incorporated into the full thoracic extension, ***in:*** stay, ***ex:*** return upper torso to the Mat, maintaining length of cervical spine.

Instructor Guidelines & Observation:

The Modified Breast Stroke Prep incorporates a reverse head nod and spinal extension. This movement allows us to create a smooth extension through the thoracic spine. Since the cervical spine rests in an anteriorly convex position, and is naturally extended, it is unnecessary to perform an isolated reverse head nod. The movement will be incorporated into the full cervical and thoracic extension pattern. When moving into extension, simultaneously initiate with scapular retraction and depression to allow space for the thoracic spine to extend and prevent excessive cervical extension. The extension movement is created by the spine and supported by the arms.

Head & Cervical Placement

Upper Cervical & Head Control

The weight of the head should balance over the lower cervical spine, shoulders and torso when sitting or standing in neutral.

Begin cervical flexion with a slight head nod, a movement of the head on C1-2. This action stimulates the deep neck flexors and prevent overactivity of the superficial neck muscles. Initiate cervical extension with a slight chin lift.

Use the eyes to initiate these motions.

Exercise 1:
Head Nod

Lower Cervical Spine Control

The cervical spine should hold its natural curve with the head balancing directly above the shoulders when sitting or standing in neutral.

To provide a biomechanical advantage to support the weight of the head and neck, the cervical spine should continue the line created by the thoracic spine in neutral, or during flexion, extension, lateral flexion and rotation.

Avoid jamming the chin into the chest.

Exercise 2:
Modified Ab Prep

Exercise 3:
Modified Breast Stroke Prep

WHAT: Lower Body Mobility & Stability

HIP, KNEE, ANKLE & FOOT ALIGNMENT

The lower extremity consists of an interdependent set of joints and muscles that includes the hip, knee, ankle and foot, which work together as a functional unit known as the lower kinetic chain. In order to function optimally, the lower kinetic chain requires the ability for these segments to frequently change length and position to transfer loads while modulating control of flexibility, stiffness and balance during static and dynamic tasks. Maintaining a full range of all the possible movements of the hip, knee, ankle and foot is important to the functioning of the lower kinetic chain.

There are three main objectives when teaching this Principle:

1. Static & Dynamic Alignment
2. Flexibility
3. Force Management

LOWER BODY MOVEMENT PATTERNS

HINGE MOVEMENT PATTERN

An optimal hinge pattern requires flexion at the hip joints, with the pelvis moving on the femur, while keeping the spine in a neutral alignment. The knees may flex slightly if necessary. It is the initiation of any bending, squatting or lunging pattern and is performed in the sagittal plane.

HINGE

start position: standing in a neutral position, feet hip-distance apart

movement: flex at the hip joint hinging the torso forward, keeping the spine neutral, extend the hips to return to neutral.

SQUAT MOVEMENT PATTERN

An optimal squat pattern combines hip and knee flexion and ankle dorsiflexion while maintaining a neutral spine. This movement pattern is part of a sit-to-stand activity and is used to raise and lower the body in space and occurs in the sagittal plane.

SQUAT

start position: standing in a neutral position, feet hip-distance apart

movement: flex the hips and knees and dorsiflex ankles keeping the heels on the floor and the spine neutral, extend the knees and hips to return to neutral.

STEP / LUNGE MOVEMENT PATTERN

A step or lunge is a progression from the squat movement and includes a stepping pattern that uses a weight transfer to move from two legs to one.

STEP

start position: standing, arms long by sides

movement: step one leg forward, then step back.

LUNGE

start position: standing, arms long by sides

movement: step one leg forward, flexing both knees and lowering back knee toward the floor.

WHY: Static & Dynamic Alignment

Efficient load management and force transfer is dependent on optimal alignment and muscle recruitment. Misalignment of any one of the joints in the lower kinetic chain, either statically or dynamically can affect all the other joints in the chain, having a negative influence on the pelvis, spine and shoulders. When there is a focus on neutral placement of the pelvis and spine, it is much easier to maintain optimal alignment and control of the lower segments.

HOW: Exercise 1

NOTICE NATURAL STANDING ALIGNMENT

goal: create awareness of natural standing position

start position: standing, pelvis and spine neutral, feet abducted hip-distance apart, arms long by sides

movement: breathe naturally, become aware of the placement of the torso and the weight distribution on the feet.

Instructor Guidelines & Observation:

In an ideal standing position there should be a tripod of support through the base of the big toe to the little toe and heel.

The pelvis should be positioned directly over the feet, with the hip, knee and ankle in neutral alignment. Weightbearing should be in the center of the feet.

Standing alignment provides initial impressions and may influence subsequent movement behaviors that may present themselves as the client moves. For example, if the knees are hyperextended, ankles are plantar flexed and the hips are extended, the terminal position of the squat might be impacted.

HOW: Exercise 2

SQUAT

goal: create awareness of dynamic alignment

start position: standing, pelvis and spine neutral, feet abducted hip-distance apart, arms long by sides

movement: ***in:*** maintain torso in neutral and flex hips, knees and ankles to squat, ***ex:*** return to vertical. Repeat, reversing breath.

Instructor Guidelines & Observation:

The Squat requires dynamic weightbearing through the lower chain, and mobility through the hip, knee, ankle and foot. Ideally, the femurs will be parallel to the floor, the torso and the tibias will be on the same angle with the heels on the ground and the spine in neutral. The knees should travel toward the forefoot and the feet pronate slightly. From the front view, the knees should stay in line with the toes. Variations to the movement, alignment and range of motion may be necessary based on torso and leg length as well as mobility.

WHY: Flexibility

When completing a movement, the body takes the path of least resistance, so if one joint in the chain is stiffer than an adjacent joint, movement will occur where it is easiest. For example, if in rotation, the hip lacks flexibility, the movement might occur in the lumbar spine or the knee instead. This may lead to a compensatory movement over time leading to wear and tear or injury.

HOW: Exercise 3

STANDING TWIST

goal: create awareness of flexibility in the transverse plane

start position: standing, pelvis and spine neutral, arms crossed chest with hands on shoulders

movement: breathe naturally, rotate freely to the left and right in a habitual pattern, allowing the weight to shift from the inside edge to the outside edge of each foot.

Instructor Guidelines & Observation:

In the Standing Twist there should be contributions from the pelvis, hip, ankle and foot. For example, with rotation to the right, the right foot supinates and the left foot pronates, the right hip internally rotates, the left hip externally rotates and the pelvis rotates to the right. There should be symmetry in rotation to the opposite side and similar ease of motion.

HOW: Exercise 4

PLIÉ

goal: create awareness of flexibility of the transverse and coronal planes

start position: standing, pelvis and spine neutral, legs wide, laterally rotated as far as possible with the feet turned out only as far as the knees

movement: ***in:*** flex hips and knees and dorsiflex ankles, maintaining as much lateral rotation at the hip joint as possible, and keeping the pelvis and spine vertical, ***ex:*** return to start position.

Modification:

a. ADDUCTION Can be done with heels together to focus on the adduction range of motion

Instructor Guidelines & Observation:

The Plié requires dynamic weightbearing through the lower chain, and mobility through the hip, knee, ankle and foot. Ideally, the torso should stay vertical and neutral. The knees should travel toward the forefoot and the feet pronate slightly, the knees should stay in line with the feet. Variations to the movement, alignment and range of motion may be necessary based on torso and leg length as well as mobility.

WHY: Force Management

The lower kinetic chain requires the ability to control its related segments in non-weightbearing exercises or open chain activities. During weightbearing exercises or closed chain activities it is important to anticipate movement using ground reaction forces.

Applying pressure into the ground compresses the joints, providing proprioceptive feedback that enables the musculoskeletal and fascial systems to work more effectively for force creation and transmission through the lower extremity. The ability to support the proximal segments of the lower extremity on the stable tripod of the foot in weightbearing or closed kinetic chain exercises is necessary for proper function.

HOW: Exercise 5

STEP

goal: create awareness of weight shift and use of ground reaction forces

start position: standing, pelvis and spine neutral, feet abducted hip-distance apart, hands on hips

movement: ***ex:*** step forward allowing both knees to flex slightly when the forward foots touches the Mat, ***in:*** return.

HOW: Exercise 6

STEP LUNGE

goal: create awareness of weight shift and ground reaction forces in a larger range of motion

start position: standing, pelvis and spine neutral, feet abducted hip-distance apart, hands on hips

movement: ***ex:*** step forward into a split stance keeping torso upright and flex both knees to allow back knee to touch the floor and back heel to come off the Mat, ***in:*** press into front foot and return to standing parallel

Instructor Guidelines & Observation:

The Step and Lunge will require the ability to balance on one leg and weight transfer. There should be a pre-shift without allowing the supporting leg to move past the midline of the body or dropping one side of the pelvis. There should be a weight shift onto the front leg and softening in the knee to absorb the ground reaction force and create a spring effect.

A Lunge requires higher level balance ability. The torso should remain upright without rotations and the pelvis should be level and centered between the feet. There should be ease of motion with a smooth transition from two feet to one foot with no hesitation or loss of balance.