

# CHAPTER 8

## Spinal Rehabilitation Fundamentals

- **Lesson Purpose**

To give the student a comprehensive review and knowledge of spinal rehabilitation fundamentals.

- **Lesson Objective**

Upon completion the student will:

- Learn the basics behind spinal rehabilitation
- Understand the phases of spinal rehabilitation
- Learn the concepts of muscle mechanics and proprioception
- Learn typical spinal rehabilitation protocol sets

*“If I think I can, even if I don’t have necessarily the ability to do it, I may actually do it. And, if I think I can’t, given that I have the ability to do so, I’m likely not going to do it.”*

*Adapted from :  
American Society of Exercise Physiologists<sup>8</sup>*

## Introduction

Bed rest was once the solution to back pain; however, over the last decade, a shift has occurred, yielding an activity-based healing paradigm. This activity-based paradigm is supported by the premise that bones, ligaments, muscles and the discs of the spine have a natural ability to adapt to the load placed on them and become stronger.<sup>6</sup> This paradigm shift has come about due to the explosion of interest placed on biomechanics, physical medicine, and the direct effect that these disciplines have on a vast number of common ailments. Current research has placed more emphasis on how a person's genetics and personal behavior and how they influence various aspects of back pain.<sup>6</sup> Bogduk and Adams state, *"It would be wrong to assume that genetic influences on spinal pathology somehow reduce the importance of mechanical or biochemical factors: on the contrary, genes exert their influence by affecting the mechanical, biochemical, and metabolic properties of spinal tissues."*<sup>6</sup> Psychosocial behaviors have played a role in the patient's ability to heal long-term, and descriptions such as, "avoidance behavior," "fear and avoidance," and "anxiety behavior" have been used to describe many behaviors that prolong the patient's healing, and progress them into the chronicity stage. Simply put; avoidance behavior is the avoidance of an activity that tends to aggravate the patient's condition causing continual pain, particularly as it pertains to post surgical care and chronic care. Recent literature and clinical applications now address all aspects of back pain and specifically identifies all tissues involved in the cause of biomechanical dysfunction and pathology. This, in turn, allows for the development of an activity routine that is more effective in complimenting the patient's daily activities.

**FIGURE 8.A**

### General Statistics

- Back symptoms are the second leading reason for all physician visits.
- Direct health care costs will exceed 50 billion dollars this year.
- 85% of the public will experience low back pain.
- 2.5% of adults will see a doctor or lose time from work because of back pain.
- 15% to 20% continue to have some degree of symptoms for at least one year.
- 70% of all people who suffer low back pain attacks will have at least three or more reoccurrences.

## Basis for Spinal Rehabilitation

Musculoskeletal back pain can be separated into 3 distinct categories. Less than 2% of back pain cases are from serious diseases or ailments, such as tumor, infection, or fracture. Less than 10% of cases are caused by nerve root compression and 85-90% of cases are caused from “non-specific” mechanical dysfunctions.<sup>1</sup> Evidence has shown that back pain is often self-limiting or will go away on its own in six weeks. Experience and increasing amounts of literature have revealed a high reoccurrence rate when active care or exercises are not given in a timely manner. Years ago, practitioners attempted to quicken the healing process by giving a sheet of exercises to patients and letting them perform them on their own. Unfortunately, we have since learned that *uninstructed* exercise limits a patient understanding, and the accountability is lost between doctor and patient can be immense. Science has also learned that patients who expect an activity to be painful are less likely to perform regular tasks and patients who have a fear of pain tend to develop a chronic injury.<sup>1</sup> Addressing the patient’s psychological inhibitions about pain, addressing the weakness of the injured tissue, and educating the patient on how to fully heal, can decrease the reoccurrence rate of the injury.

**FIGURE 8.B**

### **Risk Factors for Chronicity<sup>1,9</sup>**

#### **Psychosocial Risk Factors:**

- Pain – avoidance behavior
- Abnormal fitness
- Job dissatisfaction
- Lower education levels
- Patient’s perception of fault
- Work status of patient
- When injury is the source of some form of compensation

#### **Physical Risk Factors:**

- Presence of muscular imbalance
- Poor motor control of movement
- Decreased spinal stability
- Decreased muscular strength
- Loss of flexibility
- Decreased cardiovascular condition levels

The biomedical model of correcting back pain is centered around the idea of structural diagnosis; in other words, placing the reason for pain on an image or a test that shows the exact damage supposedly causing the injury. Current practice places more emphasis on functional defaults found in the neuromusculoskeletal system to identify origins of pain.<sup>1</sup> Understanding the body's "desire" for homeostasis, forms the understanding of how back injury is prevented as well as how it breaks down. Guyton states, "all muscles of the body are continually being remodeled to match the functions that are required of them."<sup>5</sup> Injury results from the joint, muscle, or ligament being placed in a position of vulnerability and performing a task when the tissue is weakened especially when loading the muscle in its end-range. Spinal rehabilitation is a complex topic that is multifaceted, however for the basis of this book, explanations will be kept simplistic and the authors advise following the recommendations of your physician. As your knowledge grows, you are encouraged to continually seek deeper understanding.

### Rehabilitation Essentials

Rehabilitation, as it applies to spinal rehabilitation, is defined as the monitored administration of corrective biomechanics to joints and soft tissues. It treats biomechanical weakness, imbalance, dysfunction, recovery of metabolism, and blood flow demand to muscle tissue.<sup>1,2</sup> There are many disorders seen by the chiropractic profession that require rehabilitation (SEE FIGURE 8.C).

**FIGURE 8.C**

#### **Examples of Disorders Helped by Rehabilitation <sup>7</sup>**

Neurological (disc, disease, trauma, etc.)  
Disease (MD, RA, Bell's palsy, etc.)  
Congenital – developmental disorders from birth  
Structural (broken bones, post-surgery, amputee, etc.)  
Acquired – overuse/misuse syndromes  
(thoracic outlet, tennis elbow, etc.)

The underlying guiding principle of spinal rehabilitation is the **S.A.I.D. principle** which stands for ***Specific Adaptations to Imposed Demands***. It basically states that our physiological, neurological, and psychological adaptation will occur in direct response to imposed activity demands.<sup>10</sup> If, however, these demands are not specific to the activity demands of the action, no functional adaptation will take place.”<sup>10</sup> In other words, when rehabilitating a patient, try to make the exercise specific to his/her job, sport, or specific task. The goals of the S.A.I.D. principle are to:

1. Reduce neuromuscular compensation and activities that induce inflammation
2. Restore proper activities of daily living
3. Restore and establish proper kinetic chains during exertional activities

There are certain contraindications when evaluating a patient for spinal rehabilitation that should be determined by the overseeing clinician (SEE FIGURE 8.D for contraindications).

**FIGURE 8.D**

**Contraindications for Rehabilitation**<sup>1,2</sup>

Infection, communicable disease, fever  
Various systemic disorders (ex. severe forms of Rheumatoid Arthritis)  
Cancers (especially metastatic cancer)  
Uncontrolled or volatile circulatory/cardiovascular disease

**Caution:** Some cardiovascular diseases can benefit from aerobic and rehabilitative therapy, but must be approved and closely monitored in conjunction with the patient’s cardiovascular specialist, and should not be administered without the expressed consent of the physician treating the predominate issues. Typically, these patients are usually under the care of a cardiac rehabilitation specialist. These patients are usually restricted to passive modalities, light walking with heart monitor, and mild stretching techniques in an upright/vertical body posture. No exertive physical rehabilitation should be performed until these conditions are stabilized. Although there can be beneficial cardiovascular responses to a well constructed and carried out rehabilitation program, your goal is rehabilitating the muscles, ligaments, and joint tissues and NOT the heart and cardiopulmonary system.

### Phases of Rehabilitation (3 R's) <sup>1</sup>

- 1) **Reduce** pain, inflammation, and muscle hypertonicity. Length of treatment in this phase depends on the type and severity of the injury and will be determined by the diagnosing physician.
- 2) **Restore** range of motion (few days to a few weeks)
  1. Active vs. passive ranges of motion
  2. Introduce proprioceptive retraining (to be discussed later in this chapter)
  3. The brain must also be re-educated for more permanent results
  4. Age and certain chronic conditions can limit patients to phase one and two for treatment. (Performing resistance or remodeling treatment too soon can exacerbate the condition.)
- 3) **Remodel** (3 weeks and longer)
  1. Includes soft tissue re-education and rebuilding
  2. If a joint or muscle is strong, but the brain is not communicating with it or is not able to utilize it, then the muscle still behaves as though it is weak and is thus unstable. If that muscle is considered weak, then the other surrounding tissues will need to compensate for its weakness. This disrelationship often results in misuse and/or injury.
  3. Metabolic component – helping the injured muscle tissue to regain proper metabolism and blood flow via S.A.I.D. principle.

### Muscle Mechanics

Muscle tissue has four key functions: *to produce motion; to move substances through the body; to provide stabilization; and to generate heat.*<sup>11, 12</sup> When muscles are providing motion, they are essentially integrating the use of bones, joints and muscles together to create a motion. Muscles stabilize the body by placing the body in a position of sturdiness, such as when postural muscles contract, allowing the body to be sturdy in sitting or standing positions. There are four muscle characteristics to understand how a muscle works:

- 1) **Excitability** – the ability of a muscle tissue to receive and respond to stimuli.<sup>11</sup>
- 2) **Contractility** – the ability of a muscle to shorten or thicken.<sup>11</sup>
- 3) **Extensibility** – the ability of the muscle to stretch.<sup>11</sup>
- 4) **Elasticity** – the ability of the muscle to return to its original shape after contracting or extending.<sup>11</sup>

When a muscle is continuously stimulated for an extended amount of time, the muscle will progressively weaken until it does not respond. This is known as *muscular fatigue*.<sup>12</sup> Muscle tone occurs when there is sustained partial contraction of a skeletal muscle.<sup>5</sup> This tone is important for maintaining true posture. There are two abnormalities of muscle tone referred to as hypertonic or hypotonic.

- A) **Hypotonic** essentially means a decrease in muscle tension, or a decrease in muscle tone.<sup>5,11</sup>
- B) **Hypertonic** essentially means an increase in muscle tension or an increase in muscle tone.<sup>5,11</sup>

*Muscular atrophy* refers to the weakening or wasting of muscles and the decrease in their size. Its opposite, *muscular hypertrophy*, refers to an increase of the diameter of the muscle fiber yielding more myofibrils.<sup>12</sup> Within the body, there is a constant process of homeostasis occurring and can often be characterized best by the antagonist/agonist relationship.<sup>5</sup>

An *agonist*, or prime mover, is a muscle whose contraction properties are chiefly responsible for producing a particular movement.<sup>12</sup> An example of this is the biceps brachii muscle's ability to flex the arm at the elbow. To extend the elbow in this instance, the triceps muscle is used as the antagonist of the biceps brachii muscle. An *antagonist* is also a prime mover, but opposes the agonist or its opposite muscle group.<sup>12</sup> Synergistic contraction refers to a muscle that assists the primary muscle

in a particular action.<sup>12</sup> For instance, the brachioradialis muscle may be the primary flexor of the elbow, but the biceps brachioradialis muscle is also a forearm flexor that helps the biceps muscle to perform the act of flexion. Synergistic muscles have a great ability in preventing movement at a joint by assisting the agonist stabilizer.<sup>11, 12</sup>

**In Depth:** *The Law of Reciprocal Inhibition* states that when an agonist muscle contracts to create a desired motion, its antagonist relaxes. For example, contraction of the biceps muscle causes relaxation of the triceps muscle.<sup>5</sup>

When breakdown in the muscular system occurs, weakness occurs in the locomotor system, yielding an injury and, in time, the need for rehabilitation. Our bodies have essentially two types of muscle to consider when understanding spinal rehabilitation. *Tonic* refers to a muscle that is primarily made up of *slow twitch fibers*, designed to fight gravity, such as postural muscles and these muscles tend to be *more endurance muscles*.<sup>1,5,11,12</sup> *Phasic* muscles are *faster twitch muscles*, designed to help you move, but have less endurance characteristics than tonic muscles. An example of a phasic muscle is the hamstring.<sup>1, 5, 11, 12</sup> An example of a tonic muscle is the soleus muscle. Within the body, there are muscles that tend to weaken and muscles that tend to become overtaut (SEE FIGURE 8.E).



**FIGURE 8.E**

### **Muscles that tend to tighten and weaken**

#### **Tend to Tighten**

- Upper Trapezius (neck and shoulders)
- Levator Scapula (neck to shoulder blade)
- Short Cervical Extensors (back of neck)
- Pectoralis Major (chest)
- Pectoralis Minor (deep chest muscle)
- Lumbar Erectors (low back)
- Psoas (hip flexor)
- Rectus Femoris (one of the quadriceps)
- Piriformis (deep hip muscle)
- Short and long Adductors (inner thighs)
- Hamstrings (back of legs)
- Gastrocnemius (superficial calf muscle)
- Soleus (deep calf muscle)

#### **Tend To Weaken**

- Serratus Anterior  
(finger-like muscles near armpit)
- Rhomboids (between shoulder blades)
- Middle and Lower Trapezius (mid-back)
- Triceps (back of arms)
- Gluteus Maximus (butt)
- Gluteus Medius (hips)
- Transverse Abdominis (deep abdominals)
- Rectus Abdominis – lower segments (abs)
- External and Internal Obliques (abs)
- Vastus Medialis (inner/front of knee)

Healthy muscles should have sustainable strength and controlled, smooth motion. When the muscle is shaking or choppy, it is a sign of weakness or instability. The axial skeleton, made up of the spine and pelvis, has many complex forces acting on it and has multiple integrated joint articulations producing simple observed motions. When understanding the appendicular skeleton (extremities), it is important to understand, the more motion a joint has, the more complex the biomechanics are and therefore the more intricate the rehabilitation protocols are.

There are many forces placed on the spinal tissues including compression, decompression, shearing (translation), and torsion (twisting). A kinetic chain is defined as a combination of segments and their surrounding structures that act to perform a function or motion.<sup>1, 2</sup> Kinetic chain requires multiple biomechanical properties to work properly. The mechanical properties of the skeletal system are the body's natural pulleys and levers. Walking is an example of multiple kinetic chains working at the same time to propel the body. Muscles contract in unison to move the arms and the legs separately, while working with the kinetic chain of the body's torso muscles to propel the body forward.

### Proprioception Fundamentals

With many spinal conditions, a person's proprioceptive ability is diminished or altered.<sup>1</sup> Motor unit function requires proper proprioceptive information.<sup>1</sup> Proprioception ***is the body's ability to identify where its limbs and head are in space.*** It is the brain's awareness of the body. This information comes from mechanoreceptors (mechanical nerve endings) located in the skin, muscles, fascia, tendons, and joints in combination with the visual and vestibular input of the brain.<sup>1</sup> Because the nervous system and musculoskeletal system are interdependent of each other, there is a natural need to address the proprioceptive defaults. Typically, proprioception exhibits its dysfunction by altered muscle balance, coordination, and motor performance.<sup>1</sup> Liebenson's text states, "*muscle imbalance is a systemic change in the quality of muscle function that results in altered joint biomechanics leading to pain, dysfunction, and eventually degeneration, as well as altered proprioception, which leads to adaptive changes in the central nervous system.*"<sup>1</sup> In other words, when muscles do not work together, they place too much stress on a joint causing it to degenerate and give poor feedback to the brain. He also states these deficiencies often perpetuate a chronic pain syndrome.<sup>1</sup> There are numerous ways to facilitate the proprioceptive/balance system, including the use of balls, wobble shoes, wobble board, foam rolls, and one legged stance maneuvers.<sup>1</sup> These exercises will be demonstrated later in the chapter.

### Example of Proprioceptive Injury

A football injury causes a running back to tear his ACL/meniscus/MCL ligaments of the knee. (The unhappy triad.) Typically, the recovery for a full ACL tear is one year. Much of the rehabilitation in this instance is focused on improving proprioceptive awareness. Part of the focus is placed on proprioception because of the knee's high level of proprioceptive mechanoreceptors within those torn ligaments.

### Tools of the Trade

High technological rehabilitation utilizes large workout machines to achieve strengthening in the muscular system. Most chiropractic offices utilize low technological rehabilitation for its ease of use, as well as the patients' ease of reproduction at home. Low tech. equipment includes wobble boards and discs, stretch bands and tubes, free weights, a trampoline, exercise balls, and stretching mats.<sup>1,2</sup>

### Concepts of Strengthening

When a given muscle is in its longest state, it has the potential to contract and be stronger to perform more work. When working the muscle, it is important to work the muscle through its full range of motion. During the first phase and initial portion of the second phase of rehabilitation, *isolate the dysfunctional muscle* and during the restoration and remodeling phase, make sure to work the *entire grouping of muscles*. During the second and third phases, focus should be on re-educating the brain, nervous system, and muscular communication to make sure these systems are working correctly with the other muscles involved in the kinetic chain. Concentrating on this can help to remove and prevent future faulty muscular compensations and therefore reduce future injuries. Muscles remember their actions, which allow practitioners to rehabilitate them easier. This concept is also a reason injury is created. For instance, when a person is sitting at a computer for multiple hours over multiple days and weeks, then muscles tend to form to that altered posture.

**Muscle Memory Exercise:**

Stand in doorway with hands in down position aggressively pressing outward against door frame for 1 minute. Step out and relax arms and watch them float up on their own.

**Tip:**

Stress the importance of training muscles in the correct position, because faulty position strengthening can lead to injury and pain.

**Dynamic Movers and Stabilizers**

Stabilizer muscles are smaller muscles that guide and stabilize joints during functional movements. As a general rule, these muscles should be rehabilitated and trained using light resistance and high repetition through full range of motion. Slower and smooth rate of motion is required to attain motor control and re-establish active ranges of motion. Dynamic muscles (beach muscles) are responsible for the majority of strength and power. The muscles are largely observed because of their size and should be rehabilitated and trained for full, smooth motion, strength, and increasing endurance.

**Aerobic Exercise**

Often, patients require some form of exercise to improve their cardiovascular fitness. Before these recommendations proceed, actions need to be taken by a qualified physician to insure proper cardiovascular health, prior to an exercise regimen suggestion. One way to measure cardio-pulmonary health is to measure the improvement of the heart's ability to deliver oxygen (O<sub>2</sub>) to the working muscles and then its conversion to improved endurance.<sup>4</sup> Aerobic exercise helps improve metabolism of the injured area, improve full body kinetic motion, and create sustained endurance to specific muscles and joint segments to decrease the chance of injury. Aerobic exercise should be a component of any prescriptive exercise. Exercise that is aerobic in nature is important in developing and/or maintaining overall conditioning and fitness.<sup>4</sup>

For aerobic exercise to be effective, it must be done on a regular basis. Any less than three times per week, or more than six times per week will be ineffective. Aerobic exercise should be performed for at least 20 minutes, or based on doctor's recommendation. Aerobic exercise should be performed in the range of 60% to 85% of the individual's maximum heart rate (MHR). SEE FIGURE 8.G. to learn to calculate a target heart rate.

**FIGURE 8.F**

<p><b>Examples of Aerobic Activity<sup>4</sup></b></p> <p>Running/jogging</p> <p>Cross-country skiing</p> <p>Stair climbing</p> <p>Stationary bike</p> <p>Rowing</p> <p>Walking</p> <p>Swimming</p> <p>Combine arm/leg ergonometer</p> <p>Dancing</p> <p>Hiking</p> <p>Skating</p> <p>Rope skipping</p> <p>Canoeing</p> <p>Endurance sports</p>
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**FIGURE 8.G**

<p><b>Finding Your Target Heart Rate <sup>4</sup></b></p> <p><b>Equation to calculate target heart rate</b></p> <p>220-Age of patient= MHR (Max. heart rate)</p> <p>MHR x (.60 to .85) = Target Heart Rate (THR)</p> <p><i>(.60 to .85 refers to 60-85% of our MHR)</i></p> <p><b>Example: Patient Age 35 at 60% (THR)</b></p> <p>220-35= 185(MHR)</p> <p>185 x .60= 111 Beats/minute for THR</p> <p>It is important that the patient maintain his/her target heart rate from 20 to 60 minutes for it to be considered aerobic activity.</p>
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**FIGURE 8.H**

### **Effects of Aerobic Exercise<sup>4</sup>**

#### **Prolonged Effects of Regular Aerobic Exercise**

Improvement in overall wellness  
Decreased risk of heart disease  
Increased strength of the heart  
Increased ability to handle stress  
Increased oxygen uptake  
Improved self esteem and confidence

## **8 Principles to Rehabilitation**

- 1) Rehabilitate the correct muscles properly in proper order and stage of the injury. (Also, refer to CHAPTER 7 for modalities and techniques.)
- 2) Set proper goals for each stage.
- 3) Know the desired and undesired outcomes of the treatment.
- 4) When uncertain, seek answers from a reputable source
- 5) Learn the protocols, techniques, exercises, and stretches that your chiropractic physician prefers and how he/she relays information to his/her patient population.
- 6) Know what you are treating. Ask questions and apply your anatomy knowledge every time you work, i.e. what muscles or joints are you helping and how are they being helped by what you do?  
— Become familiar with the kinds of problems that your chiropractic physician treats.
- 7) Individualize each patient's routine and prescription to his/her condition and goals. It is important that the doctor and patient establish responsible and achievable goals during the rehabilitation process. Goals should address improvement, restoration, and the maintaining of strength, flexibility, endurance, coordination, relaxation and *specific skill levels*.
- 8) Goals should be documented and re-evaluated periodically,

### **Points to Consider**

- 1) Avoid uneven motions or recruiting of muscle groups that are not typically used during the maneuver.

- 2) Place emphasis on the form of the maneuver. Rehabilitation is about the quality of the exercise and not the quantity of repetitions.
- 3) When observing a patient through an exercise and something looks awkward, consult the chiropractic physician prior to continuing.
- 4) Always warm-up the muscle prior to an exercise by performing a light version of the type of action expected to perform through the full active range of motion.
- 5) It is important to re-lengthen the muscle after exercise. Make sure to teach the proper stretch as directed by your doctor.
- 6) Be careful applying intense therapeutic modalities (myofascial release, trigger point therapy, Russian therapy, etc.) and resistance work in the same day.
- 7) Heating the muscle before the exercise and cooling the muscle after, can improve recovery time.
- 8) If the patient states that pain is occurring at the end of the exercise motion, decrease the motion by 10% to 15% and resume. If the patient continues to have pain, stop the exercise, and consult the physician.

### Protocols and Sets

Delivering appropriate explanations and descriptions of exercise is imperative for overall patient understanding. Below are multiple explanations of various spinal stabilization exercises and the initial phases of each, within its respective group. It is beyond the scope of this book for which condition these exercises are specific. However, with the aid of the office physician, these sequences will be a great jumping-off point on your way to understanding rehabilitation in the chiropractic setting. These regimens will be explained in a way that the patient will understand and assumes the patient will have been educated in basic terminology. The initial focus of spinal strengthening is broken down into two main groups: body awareness and improving core strength. Core strength is defined here by the global interaction of the muscles of the torso. It is the synergy between the front and back muscles of the torso, as well as the upper and lower muscle groups of the torso. “Crunches” or “sit ups” are not viewed as the primary maneuvers to strengthen the core. Core synergy in rehabilitation combines multiple muscles to work together to become stronger than any one muscle working on its own to protect the spine and resist the forces that act on it.

## Abdominal Hollowing + Pelvic Tilt

### A. On the Floor or Mat

1. Lying on your back, begin with your knees and hips bent while resting your feet flat on the floor.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Do not hold your breath or raise your chest. Place your hands just below your belly button on either side of your hips to feel if you are tensing the correct muscles.
3. Next, gently rock your pelvis backward so the small of your back presses flat against the floor. Do not lift up through the legs to do so.

### Abdominal Hollowing – Lying





## B. While Sitting

1. In a seated position, begin with your torso upright and knees and hips bent so your feet rest flat on the floor.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Do not hold your breath or raise your chest. Place your hands just below your belly button on either side of your hips to feel if you are tensing the correct muscles.
3. Next, gently rock your pelvis as if you were tucking your rear end underneath you. Do not lean forward to do so. The small of your back should be flat.

### Abdominal Hollowing – Seated



### C. While Standing

1. In a standing position, begin with your torso upright and feet flat on the floor, hip-width apart. Keep your knees “soft” – do not lock your knees.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Do not hold your breath or raise your chest. Place your hands just below your belly button on either side of your hips to feel if you are tensing the correct muscles.
3. Next, gently rock your pelvis as if you were tucking your rear end underneath you. Do not lean forward to do so. The small of your back should be flat.

### Abdominal Hollowing – Standing



## Dead Bug Progressions (on floor)

### A. Supine Single Leg Raises

1. Lying on your back, place your hands on your hips and draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to keep your spine stable. Do not hold your breath.
2. Rock your pelvis backward so the small of your back presses flat against the floor (“Pelvic Tilt”).
3. Slowly raise your left leg until your hip is bent at 90 degrees. Then return your leg slowly back to the floor. Be sure to maintain the Ab Brace + Pelvic Tilt.
4. Repeat this movement with the right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 1 – 2*



*Step 3 – 4*

### B. Supine Single Leg/Opposite Arm Raises

1. Lying on your back, extend your arms perpendicular to the floor. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to keep your spine stable. Do not hold your breath.
2. Rock your pelvis backward so the small of your back presses flat against the floor (“Pelvic Tilt”).
3. Slowly raise your left leg until your hips are bent at 90 degrees AND raise your right arm until it is perpendicular to the floor. Then return your leg and arm to starting position. Be sure to maintain the Ab Brace + Pelvic Tilt (do not let back arch).
4. Repeat this movement with the right leg and left arm.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating sides).



*Step 1 – 2*



*Step 3*

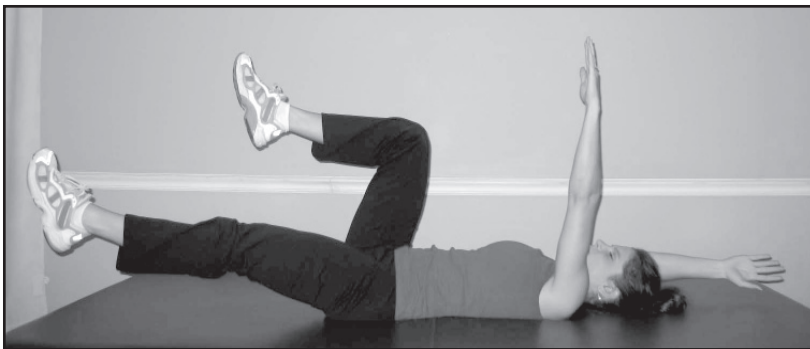
### C. Dead Bug

1. Lying on your back, begin with your hips and knees bent, while having feet in the air. Extend your arms perpendicular to the floor. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to keep your spine stable. Do not hold your breath.
2. Rock your pelvis backward so the small of your back presses flat against the floor (“Pelvic Tilt”).
3. Slowly raise your right arm over your head while you slowly extend your left leg straight out. Then slowly return to the starting position. Be sure to maintain the Ab Brace + Pelvic Tilt (do not let back arch).
4. Repeat this movement with the right leg and left arm.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating sides).



*Step 1 – 2*



*Step 3*

## Floor Bridge Progressions (on floor)

### A. Bridge with Pelvic Dips

1. Lying on your back, rest your arms at your sides with palms facing upward.
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”). Then rock your pelvis backward so the small of your back presses flat against the floor (“Pelvic Tilt”).
3. Squeeze both glute muscles and slowly raise your pelvis off the floor into a bridge position. Be sure to maintain the Ab Brace + Pelvic Tilt + Glute Squeeze (do not arch your back).
4. Slowly relax both glutes and lower pelvis back to the ground. Relax, then reset Ab Brace + Pelvic Tilt + Glute Squeeze before next rep. (Shown: Progressive Option for Step 4. After bridge position, relax both glutes and lower pelvis halfway back to ground. Relax glutes only. Do not let go of Ab Brace + Pelvic Tilt.)

**Recommendations:** 2 Sets x 15 repetitions.



*Step 3*



*Step 4*

## B. Bridge with Heel Raises

1. Begin on your back with arms resting at your sides with palms facing upward.
2. Do Ab Brace + Pelvic Tilt + Glute Squeeze, then raise into a bridge position.
3. Slowly raise your left heel off the floor. Be sure to maintain the Ab Brace + Pelvic Tilt + Glute Squeeze (do not let hips drop while lifting heel). Slowly lower heel again to the floor and repeat with a right heel raise.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*

### C. Bridge with Steps

1. Begin on your back with arms resting at your sides with palms facing upward.
2. Do Ab Brace + Pelvic Tilt + Glute Squeeze, then raise into a bridge position.
3. Slowly lift your left foot 3-4 inches off the floor. Be sure to maintain the Ab Brace + Pelvic Tilt + Glute Squeeze (do not let hips drop while lifting foot). Slowly lower foot again to the floor and repeat with the right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*



### D. Bridge with Leg Extension

1. Begin on your back with arms resting at your sides and palms facing upward.
2. Do Ab Brace + Pelvic Tilt + Glute Squeeze, then raise into a bridge position.
3. Slowly extend your left leg until it is straight. Be sure to maintain the Ab Brace + Pelvic Tilt + Glute Squeeze (do not let hips drop while extending leg). Slowly lower leg again to the floor and repeat with the left leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*

## Quadruped Progressions (on floor)

### A. Single Arm Raise

1. Position yourself on hands and knees while drawing in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Keep your back as flat as possible with your neck and head aligned with the rest of your body.
2. Extend your right arm straight out until your upper arm is next to your left ear.
3. Return arm to starting position. Alternate and repeat movement with the left arm.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating arms).



*Step 1*



*Step 2*

## B. Single Leg Raise

1. Position yourself on hands and knees while drawing in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Keep your back as flat as possible with your neck and head aligned with the rest of your body.
2. Extend your left leg straight back so that it is parallel to the floor.
3. Return leg to starting position. Alternate and repeat movement with the right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 1*



*Step 2*

### C. Single Leg/Opposite Arm Raise “Cross-Crawl”

1. Position yourself on hands and knees while drawing in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Keep your back as flat as possible with your neck and head aligned with the rest of your body.
2. Extend your right leg straight back so that it is parallel to the floor WHILE raising your left arm next to your left ear.
3. Return leg and arm to starting position. Alternate and repeat movement with the left leg/right arm.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating sides).



*Step 1*



*Step 2*

## Cervical Therapeutic Exercises

### A. Neck Retraction

1. In a relaxed position, neck protrudes and shoulders round forward (Photo 1).
2. To strengthen deep cervical flexors, draw ears straight back over dropped shoulders, keeping the chin parallel to the floor (Photo 2). Do not tuck chin under or tilt chin back to retract neck.

**Recommendations:** Perform 2 Sets x 15 repetitions (hold each repetition 3-5 seconds) or hold for 30-60 seconds 3-5x a day.



*Photo 1*



*Photo 2*

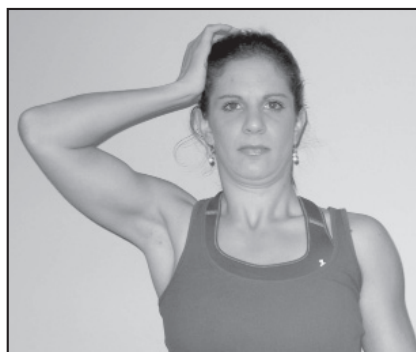
### B. Neck Retraction with Isometric Contractions

1. Begin with neck retraction, drawing your ears over your shoulders and keeping your chin parallel to the floor. (Do not tuck chin under or tilt chin back.)
2. Place two fingers on your forehead and apply LIGHT resistance. Do not move your forehead. Keep holding your neck retraction. Hold 8-10 seconds.
3. Apply LIGHT resistance on the right side of your head. Hold neck retraction against this resistance for 8-10 seconds.
4. Apply LIGHT resistance on the back of your head. Hold neck retraction (do not push head forward). Hold 8-10 seconds.
5. Apply LIGHT resistance on the left side of your head. Hold neck retraction against this resistance for 8-10 seconds.

**Recommendations:** 2 Sets x 10 repetitions (each direction).



*Step 2*



*Step 3*



*Step 4*



*Step 5*

### C. Neck Retraction on a Ball (various phases)

1. Position yourself on your hands and knees with a body-ball at your forehead.
2. Draw your chin in (neck retraction) and hold the position against the ball for 3-5 seconds.

**Recommendations:** 2 Sets x 15 repetitions.

3. While holding neck retraction, raise your right arm off the floor and extend it straight forward, keeping your thumb facing up. Hold 3-5 seconds.

**Recommendations:** 2 Sets x 15 repetitions.

4. Follow with raising your right arm to the side while holding the neck retraction. Make sure to keep your thumb up and hold for 3-5 seconds.

**Recommendations:** 2 Sets x 15 repetitions.

5. Extend both arms to the sides with your thumbs facing up. Hold 3-5 seconds.

**Recommendations:** 2 Sets x 15 repetitions.



*Step 2*



*Step 3*



*Step 4*



*Step 5*



## Upper Back/Torso Exercises

### A. Modified Wall Angel

1. Begin by holding neck retraction by gliding your ears straight back over your shoulders while keeping your chin parallel to the floor.
2. Straighten your arms and have your palms facing down.
3. Pinch shoulder blades together and push palms down toward the floor.

**Recommendations:** 2 Sets x 15 repetitions (hold repetitions for 3-5 seconds).



*Step 2*



*Step 3*



## B. Wall Angel

1. Standing with your back against a wall, begin by drawing in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”), doing a Pelvic Tilt, and holding neck retraction by gliding your ears straight back over your shoulders while keeping your chin parallel to the floor.
2. Raise arms and keep both pinky fingers on the wall.
3. Bring elbows to your sides, keeping pinky fingers on the wall.
4. Return to start.

**Recommendations:** 2 Sets x 15 repetitions.



*Step 2*



*Step 3*

### C. Cat/Camel

1. Position yourself on hands and knees while drawing in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Keep your back as flat as possible with your neck and head aligned with the rest of your body.
  2. Slowly drop your pelvis as if you were tucking your rear end underneath you while arching your upper back and tucking your chin to your chest.
  3. Follow by slowly rocking your pelvis in the opposite direction as if you were sticking your rear end out while pinching your shoulder blades together and looking slightly upward.
- Note: Movement should be seen at shoulder complex and pelvis, not at elbows or knees.

**Recommendations:** 2 Sets x 15 repetitions (hold each repetition for 3-5 seconds).



*Step 1*



*Step 2*



*Step 3*

### D. Standing Cat/Camel

1. While standing, draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Keep your back as flat as possible with your neck and head aligned with the rest of your body.
2. Slowly drop your pelvis as if you were tucking your rear end underneath you. Round your shoulders forward with the backs of your hands together, and tuck your chin to your chest.
3. Follow by slowly rocking your pelvis in the opposite direction as if you were sticking your rear end out while pinching your shoulder blades together and looking slightly upward. Note: Movement should be seen at shoulder complex and pelvis, not at elbows or knees.

**Recommendations:** 2 Sets x 15 repetitions (hold each repetition for 3-5 seconds).



*Step 2*



*Step 3*

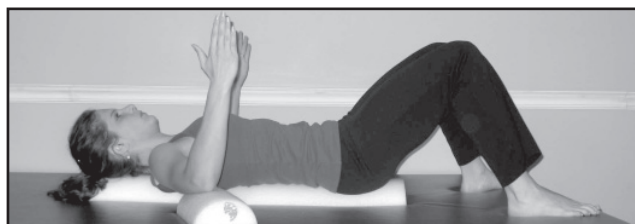
### E. Scap Stabilization

1. Position yourself with one long foam roll underneath your spine and one short foam roll underneath each tricep (upper arm). Your head should be resting on the long foam roll; your knees and hips bent so that your feet are flat on the ground; your arms should be angled at 45 degrees on the short foam roll, with your elbows bent and palms facing in toward each other.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Rock your pelvis backward so the small of your back is flat against the long foam roll (“Pelvic Tilt”).
3. Pinch the long foam roll with your shoulder blades and hold for 3-5 seconds. Do not elevate your shoulders.
4. Next, position yourself with the long foam roll underneath your spine with your head resting at the top and your knees and hips bent so your feet are flat on the ground.
5. Then extend your right arm above your head so that your forearm rests on a short foam roll. Your thumb should be pointed toward the floor.
6. Draw in your lower abdominal muscles to stabilize your spine. Rock your pelvis backward so the small of your back is flat against the long foam roll.
7. Press your right arm down so your shoulder blade depresses. Do not bend your elbow. Hold 3-5 seconds.

**Recommendations:** 2 Sets x 15 repetitions.



*Step 1 – 3*



*Step 4 – 7*

## F. Lat Pull-Downs

1. Position yourself so you are seated on a body-ball (or chair) with your hips and knees at a 90 degree angle and feet flat on the floor, hip-width apart.
2. Hang a band over a door, and grasp one end of the band in each hand. Look straight ahead and hold “Neck Retraction.”
3. Begin by pinching your shoulders downward.
4. Pull the band toward your chest. Make sure you are pinching your shoulder blades down and together before you bring the band to your body.
5. Hold for 3-5 seconds. Release the band. Relax your shoulders forward. Reset, and repeat exercise.

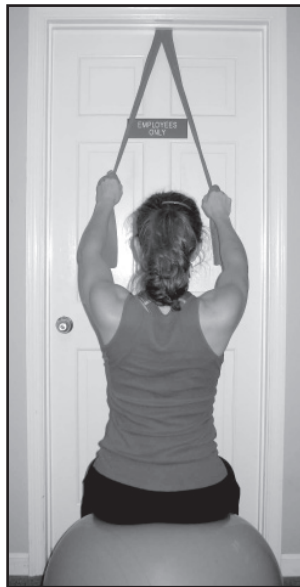
(Cues: Pinch shoulder blades down, Pull band to body, Release band, Relax shoulders)

**Recommendations:** 2 Sets x 15 repetitions (holding each repetition for 3-5 seconds).

### Lat Pull-Downs (rear view)



*Step 1 – 2*



*Step 3*



*Step 4*

**Lat Pull-Downs (side view)**



*Step 1 – 2*



*Step 3*



*Step 4*

### G. Rhomboid Rows

1. Position yourself so you are seated on a body-ball (or chair) with your hips and knees at a 90 degree angle and feet flat on the floor, hip-width apart.
2. Hang a band around a door handle. Grasp one end of the band in each hand. Look straight ahead and hold “Neck Retraction.”
3. Begin by pinching your shoulder blades back and together.
4. Pull the band toward your belly button. Make sure you are pinching your shoulder blades back and together before you bring the band to your body.
5. Hold for 3-5 seconds. Release the band. Relax your shoulders forward. Reset, and repeat exercise.

(Cues: Pinch shoulder blades together, Pull band to body, Release band, Relax shoulders)

**Recommendations:** 2 Sets x 15 repetitions (holding each repetition for 3-5 seconds).



*Step 1 – 2*



*Step 3*



*Step 4*

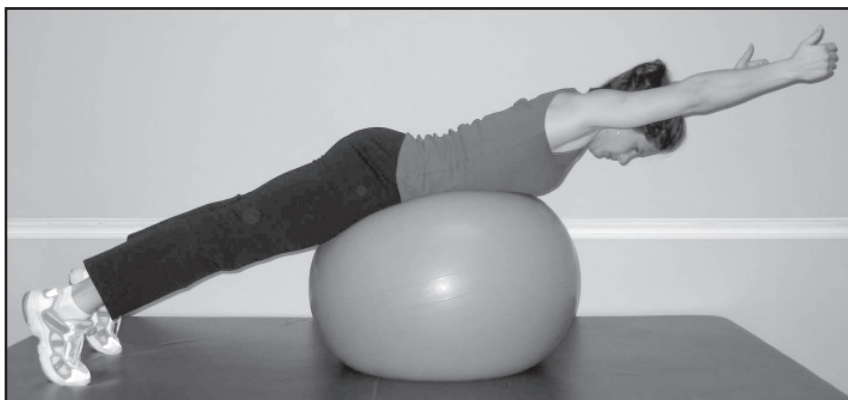
### H. Superman on a Ball

1. Place feet against the bottom of a wall with a body-ball under your hips.
2. Straighten your legs while you slightly raise your chest and extend your arms, thumbs facing up, until the upper arms are by your ears.
3. Keep lower abdominal muscles drawn in (“Ab Hollowing” or “Ab Bracing”) and rock your pelvis so you are pressing your hips into the ball. Also, do not lift chin. Keep head in neutral with ears between your upper arms.
4. Make sure to pinch your shoulder blades together with arm raises. Release the band. Relax your shoulders forward. Reset, and repeat exercise. Relax to starting position, reset, and repeat exercise.

**Recommendations:** 2 Sets x 15 repetitions (Hold repetitions for 3-5 seconds).



*Step 1*



*Step 2 – 3*



## I. Parachuter on a Ball

1. Place feet against the bottom of a wall with a body-ball under your hips.
2. Straighten your legs while you slightly raise your chest and extend your arms out to the side, thumbs facing up.
3. Keep lower abdominal muscles drawn in (“Ab Hollowing” or “Ab Bracing”) and rock your pelvis so you are pressing your hips into the ball. Also, do not lift chin. Keep head and neck in a neutral position.
4. Make sure to pinch your shoulder blades together with arm raises and hold for 3-5 seconds before returning to starting position.

**Recommendations:** 2 Sets x 15 repetitions.



*Step 1*



*Step 2 – 3*

## Posture and Proprioception

### A. Short Foot

The following are exercises to help strengthen the arch muscles of the foot.

1. In a relaxed position, the foot and middle arch are flat against the floor (Photo 1).
2. To strengthen the arch muscles, “grip the ground” with your foot by slightly pulling up on the middle arch without curling any toes under. Do this by gliding the big toe back toward your heel, creating space between the floor and the middle arch of the foot (Photo 2).

**Recommendations:** 2 Sets x 15 repetitions.



*Photo 1*



*Photo 2*

## B. Short Foot Strengthening

1. “Marbles” (shown): practice by picking up marbles with your feet and dropping them in a container.
2. “Towel Scrunches” (not shown): lay a hand-towel on the ground and grip one edge with your toes. Practice “scrunching” the towel underneath your foot.
3. “ABC’s” (not shown): At the ankle, trace the alphabet with your toe.

**Recommendations:** 2 Sets x 15 repetitions.



*Example 1a*



*Example 1b*

### C. Alexandrian Posture (Brugger's Posture)

1. Begin with your feet hip-width apart and toes pointing forward.
2. Hold the "Short Foot" movement and slightly bend your knees.
3. Draw in your lower abdominal muscles ("Ab Hollowing" or "Ab Bracing"), rock your hips back, tucking your rear end under you ("Pelvic Tilt"), and squeeze both glute muscles together ("Glute Squeeze").
4. Drop your shoulders down, and pinch your shoulder blades back and together with palms open.
5. Hold "Neck Retraction" by gliding your ears back over your shoulders and keeping your chin parallel to the floor. (Do not tuck chin under or tilt chin up.)

**Recommendations:** Hold for 30-90 seconds, 5 times per day.



*Step 1 – 5*

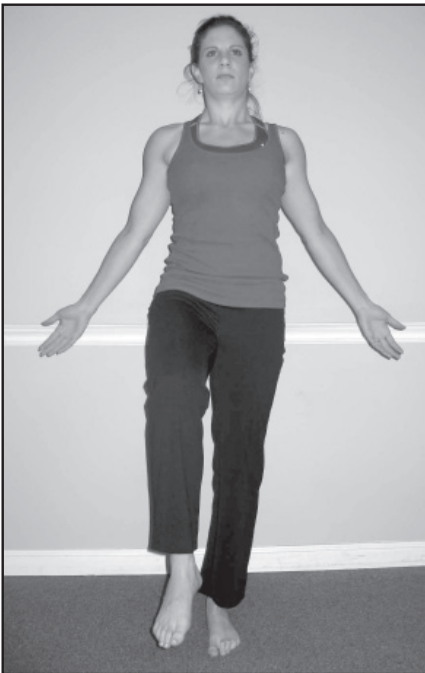


*Step 1 – 5*

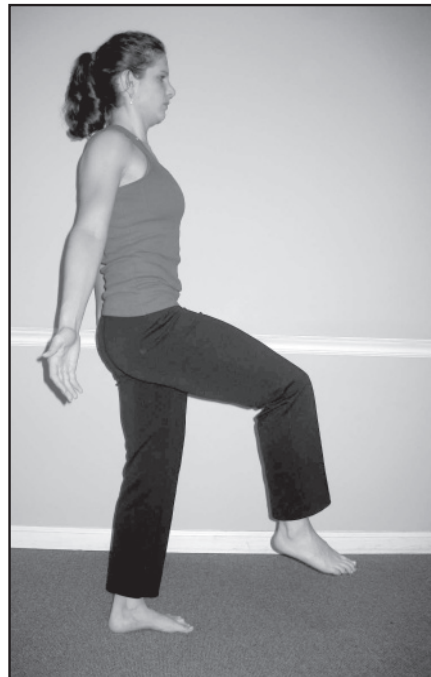
## D. Single Leg Balance

1. Begin with your feet hip-width apart and toes pointing forward. Lift one foot off the ground and hold the foot and knee in front of your body.
2. Hold the “Short Foot” movement and slightly bend your knee.
3. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”), rock your hips back, tucking your rear end under you (“Pelvic Tilt”), and squeeze both glute muscles together (“Glute Squeeze”).
4. Drop your shoulders down, and pinch your shoulder blades back and together with palms open.
5. Hold “Neck Retraction” by gliding your ears back over your shoulders and keeping your chin parallel to the floor. (Do not tuck chin under or tilt chin up.)

**Recommendations:** Hold for 30-90 seconds (each leg) 3-5 times per day.



*Step 1 – 5 (front view)*



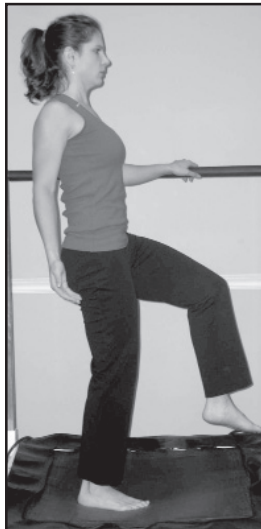
*Step 1 – 5 (side view)*

**Alexandrian Posture and Single Leg Balance can be made more difficult by adding the following challenges:**

1. Performing with eyes closed.
2. Performing on a trampoline.
3. Holding posture while using a body blade (at side, front, or above head).
4. Performing on a rocker board.
5. Performing on a wobble board.
6. Holding posture while adding ball tosses on one of the above (not shown).
7. Holding posture while adding head turns on one of the above (not shown).



*Step 1*



*Step 2*



*Step 3*



*Step 4*



*Step 5*

These are just examples and can be modified according to patient ability.

## Body-Ball Therapeutic Exercises

### Fitting For a Ball:

Begin by sitting on a ball.

Knees and hips should be in 90 degree angles when ball is properly sized.

If the hips are in an angle greater than 90 degrees of flexion, the diameter of the ball is too large. (If the angle is considerably less than 90 degrees, the ball is too small.)



Proper Fit

### Ball Warm-up

#### A. Ab Brace + Pelvic Tilts

1. Begin by sitting on a ball (knees and hips at 90 degree angles.)
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”).
3. Gently rotate your pelvis forward and backward.
4. Also rotate pelvis in clockwise and counter-clockwise circles.

#### Recommendations:

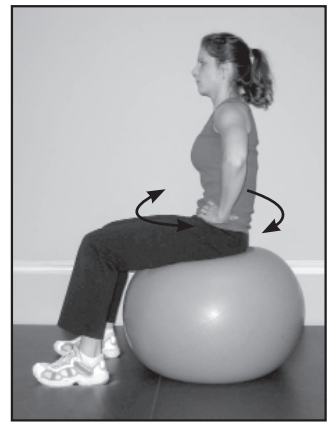
1 Set x 25 repetitions (forward/backward); 1 Set x 25 repetitions (counterclockwise).



Step 3



Step 3



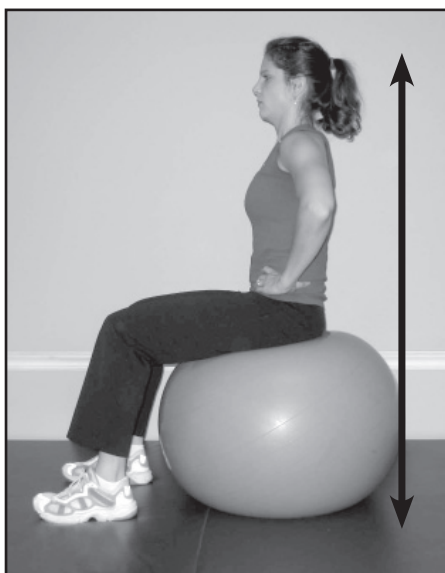
Step 4



### B. Ab Brace + Pelvic Tilt + Glute Squeezes

1. Begin by sitting on a ball (knees and hips at 90 degree angles).
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”).
3. Rock your pelvis backward as if you were tucking your rear end under you (“Pelvic Tilt”).
4. Squeeze both glute muscles in order to bounce slightly up and down on the ball.

**Recommendations:** 1 Set x 15-25 repetitions.



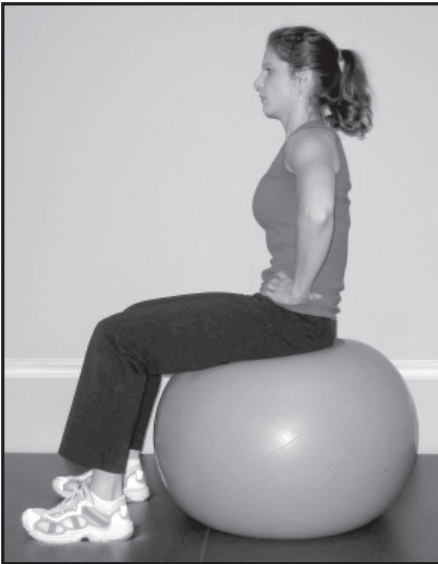


## Dead Bug Progressions (on ball)

### A. Seated Single Leg Raises

1. Begin by sitting on a ball (knees and hips at 90 degree angles). Keep hands on your abs/hips.
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”).
3. Rock your pelvis forward as if you were tucking your rear end under you (“Pelvic Tilt”).
4. Lift your left foot off the floor. Be sure to maintain Ab Brace + Pelvic Tilt. Keep ball as still as possible. Return foot to the ground and repeat on the right foot.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 1 – 3*

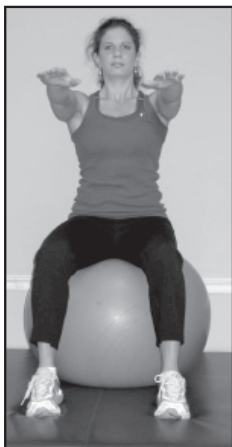


*Step 4*

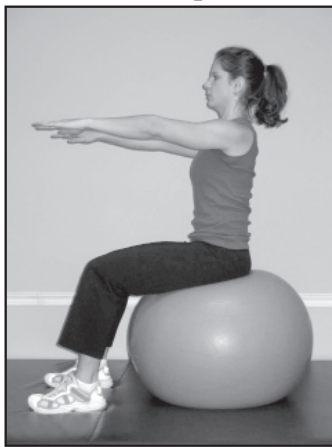
## B. Seated Single Leg/Opposite Arm Raises

1. Begin by sitting on a ball (knees and hips at 90 degree angles). Keep arms parallel to the floor.
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”).
3. Rock your pelvis forward as if you were tucking your rear end under you (“Pelvic Tilt”).
4. Lift left foot off the floor while extending right arm overhead. Be sure to maintain Ab Brace + Pelvic Tilt. Keep ball as still as possible.
5. Return foot and arm to the starting position. Alternate and repeat with right foot/left arm.

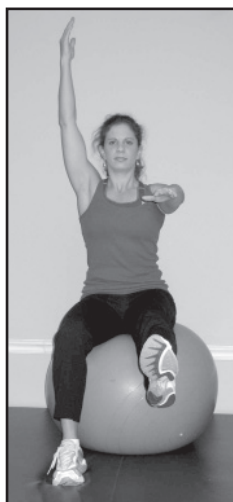
**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 1 – 3  
(front view)*



*Step 1 – 3 (side view)*



*Step 4  
(front view)*



*Step 4 (side view)*

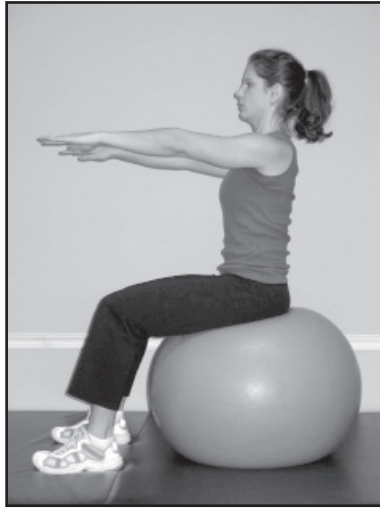
### C. Seated Single Leg/Same Arm Raises

1. Begin by sitting on a ball (knees and hips at 90 degree angles). Keep arms parallel to the floor.
2. Draw in your lower abdominal muscles to stabilize your spine (“Ab Hollowing” or “Ab Bracing”).
3. Rock your pelvis forward as if you were tucking your rear end under you (“Pelvic Tilt”).
4. Lift your left foot off the floor while extending left arm overhead. Be sure to maintain Ab Brace + Pelvic Tilt. Keep ball as still as possible.
5. Return foot and arm to the starting position. Alternate and repeat with right foot/right arm.

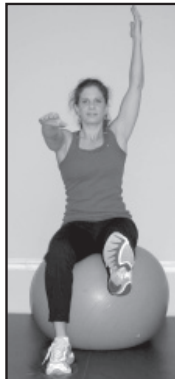
**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 1 – 3  
(front view)*



*Step 1 – 3 (side view)*



*Step 4  
(front view)*



*Step 4 (side view)*

## Bridge Progressions (on ball)

### A. Bridge with Pelvic Dips

1. Begin by sitting on a ball. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis as if you were tucking your rear end under you (“Pelvic Tilt”).
2. Slowly walk your legs out so you end in a bridge position, feet flat on the floor. Squeeze your glutes to hold you in the bridge position. Be sure to maintain the Ab Brace + Pelvic Tilt.
3. After the bridge position, relax both glutes and lower pelvis halfway down. Relax glutes only. Do not let go of Ab Brace + Pelvic Tilt.
4. Squeeze both glute muscles to return to bridge position.

**Recommendations:** 2 Sets x 15 repetitions .



*Step 2*



*Step 3*

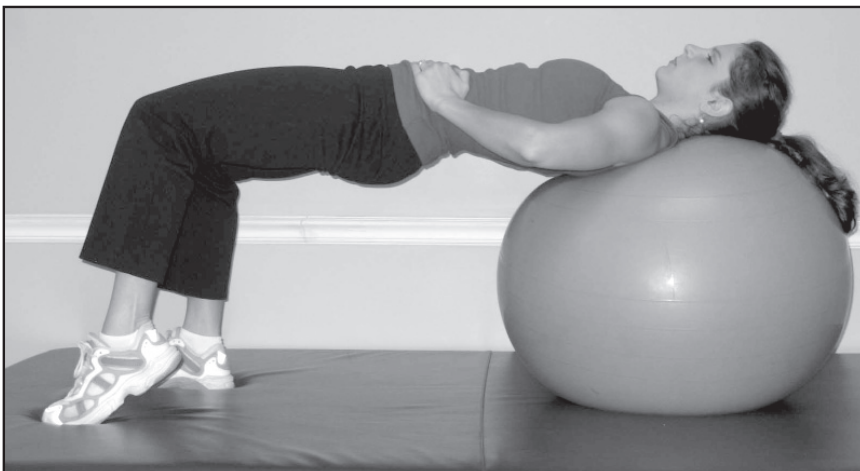
## B. Bridge with Heel Raises

1. Begin by sitting on a ball. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis as if you were tucking your rear end under you (“Pelvic Tilt”).
2. Slowly walk your legs out so you end in a bridge position, feet flat.
3. In a controlled movement, extend the left leg straight, parallel to the floor. Do not let hips drop while lifting leg.
4. Slowly lower leg to the floor and repeat with the right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*

### C. Bridge with Leg Lifts

1. Begin by sitting on a ball. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis as if you were tucking your rear end under you (“Pelvic Tilt”).
2. Slowly walk your legs out so you end in a bridge position, feet flat on the floor. Squeeze your glutes to hold you in the bridge position. Be sure to maintain the Ab Brace + Pelvic Tilt.
3. In a controlled movement, lift left foot 3-4 inches off the floor. Do not let hips drop while lifting foot.
4. Slowly lower foot to the floor and repeat with right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*

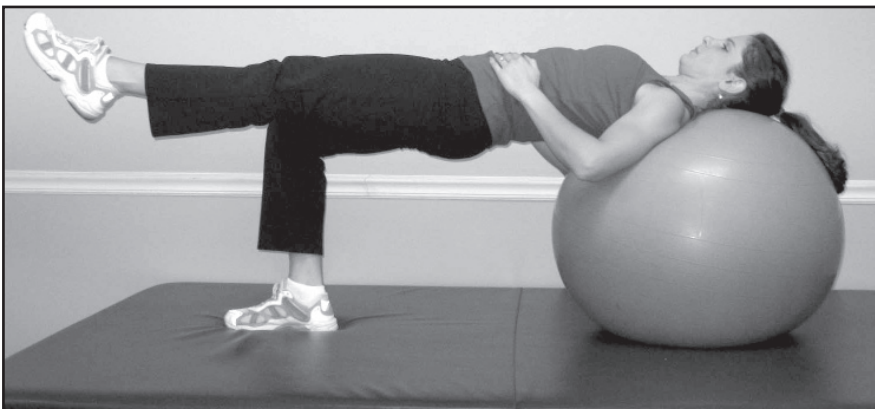
## D. Bridge with Leg Extension

1. Begin by sitting on a ball. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis as if you were tucking your rear end under you (“Pelvic Tilt”).
2. Slowly walk your legs out so you end in a bridge position, feet flat on the floor. Squeeze your glutes to hold you in the bridge position. Be sure to maintain the Ab Brace + Pelvic Tilt.
3. In a controlled movement, extend your leg straight, parallel to the floor. Do not let hip drop while lifting leg.
4. Slowly lower leg to the floor and repeat with the right leg.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*



*Step 3*



## Quadruped Progressions (on ball)

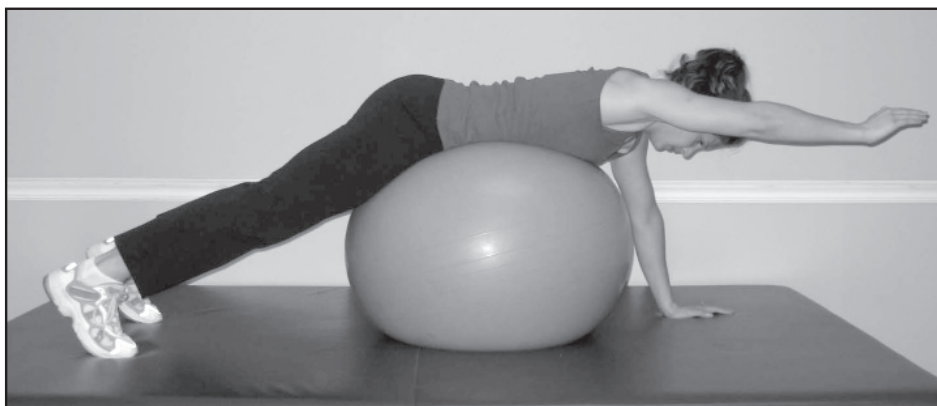
### A. Prone Alternating Single Arm Raises

1. Position yourself on your hands and toes, with a ball underneath your hips.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis so you are pressing your hips into the ball (“Pelvic Tilt”).
3. Extend right arm so your upper arm is next to your right ear. Relax arm back to ground.
4. Alternate and repeat with the right arm. Be sure to maintain the Ab Brace + Pelvic Tilt.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating arms).



*Step 1 – 2*



*Step 3*



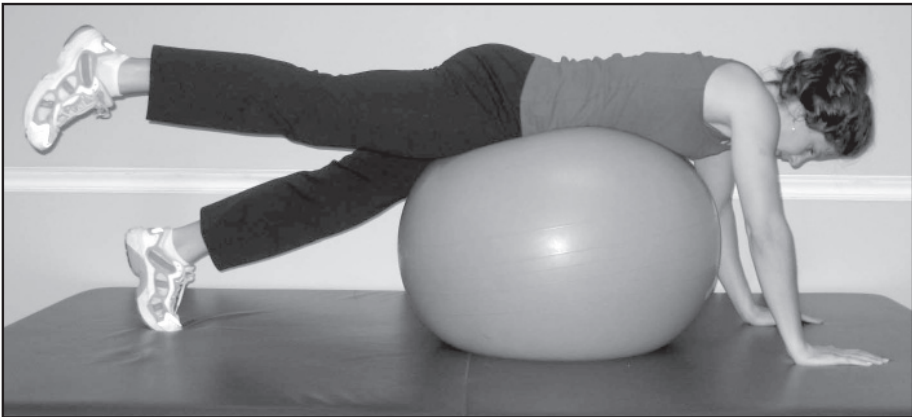
## B. Prone Alternating Single Leg Raises

1. Position yourself on your hands and toes, with a ball underneath your hips.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis so you are pressing your hips into the ball (“Pelvic Tilt”).
3. Extend your left leg straight back. Relax leg.
4. Alternate and repeat with the right leg. Do not arch back. Be sure to maintain the Ab Brace + Pelvic Tilt.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating sides).



*Step 1 – 2*



*Step 3*

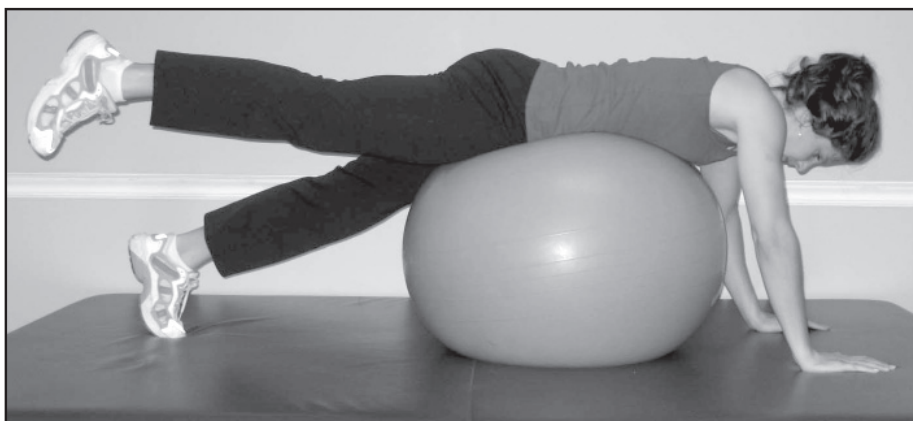
### C. Prone Leg/Opposite Arm Raises

1. Position yourself on your hands and toes, with a ball underneath your hips.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis so you are pressing your hips into the ball (“Pelvic Tilt”).
3. Extend your right leg straight back while raising your left arm next to your ear. Relax leg/arm.
4. Alternate and repeat with the left leg/right arm. Do not arch back. Be sure to maintain the Ab Brace + Pelvic Tilt.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating legs).



*Step 2*

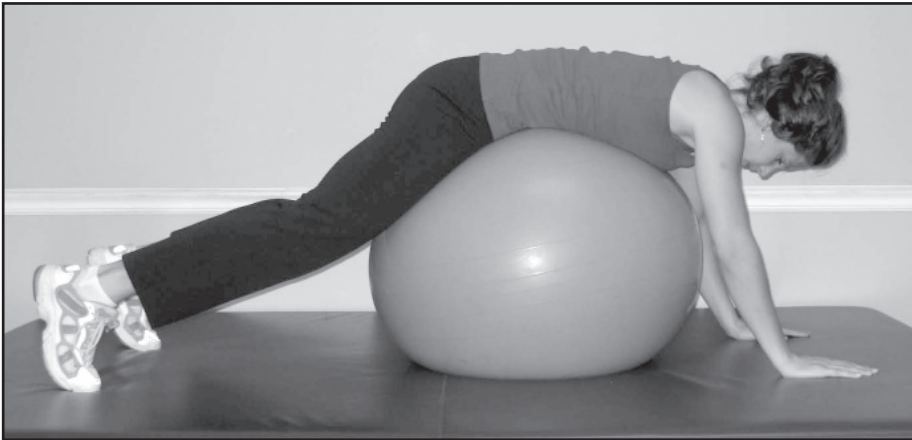


*Step 3*

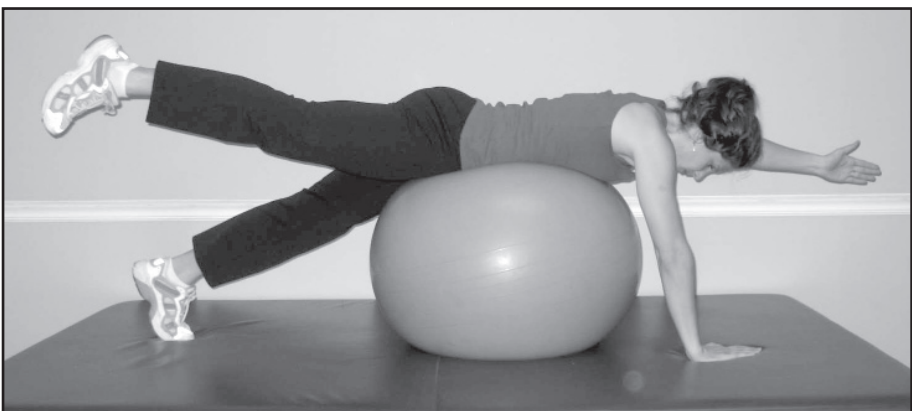
#### D. Prone Leg/Same Arm Raises

1. Position yourself on your hands and toes, with a ball underneath your hips.
2. Draw in your lower abdominal muscles (“Ab Hollowing” or “Ab Bracing”) to stabilize your spine. Then rock your pelvis so you are pressing your hips into the ball (“Pelvic Tilt”).
3. Extend your right leg straight back while raising your right arm next to your ear. Relax leg/arm.
4. Alternate and repeat with the left leg/left arm. Do not arch back. Be sure to maintain the Ab Brace + Pelvic Tilt.

**Recommendations:** 2 Sets x 15 repetitions (each/alternating sides).



*Step 2*



*Step 3*

*The guiding philosophy of a rehabilitating program (functional restoration) is to **restore** joint mobility, muscular strength endurance, and conditioning, as well as cardiovascular fitness leading to restoration of the ability to perform specific functional tasks such as lifting, bending, twisting, and tolerance to prolonged static positioning (sitting, standing)*

**TOM MAYER M.D.**

### **Review: The Goal of the Rehabilitation Program**

- Improve posture and motor control
- Increase functional strength and endurance
- Increase mobility/flexibility
- Increase overall cardiovascular fitness
- Improve coordination
- Promote tissue healing
- Promote spinal stability