

Core Strengthening & Trunk Stabilization

Andrew B. Dossett, M.D.

Spinal Surgeon

Andrew L. Clavenna, M.D.

Spinal Surgeon



CARRELL CLINIC

A Division of OrthoLoneStar

Carrell Clinic Dallas

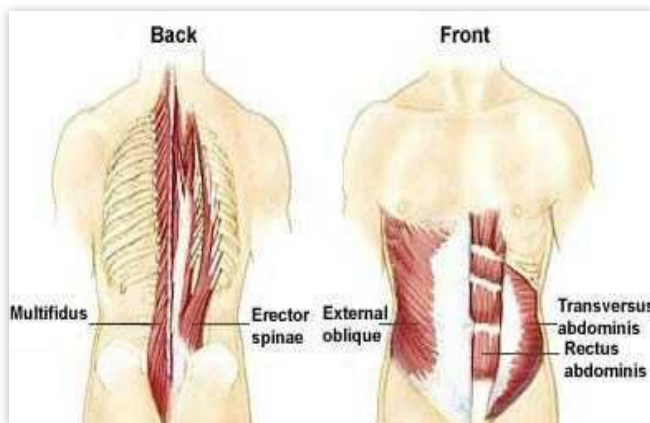
9301 North Central Expressway, Tower I, Suite 500
Dallas, TX 75231

Low-Back Pain

Why Does My Back Hurt?

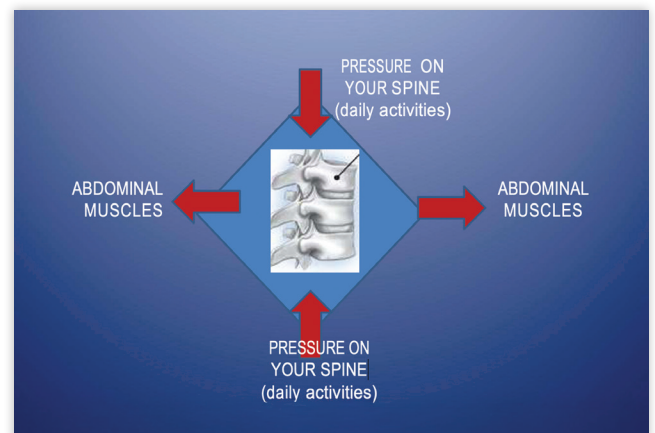
As we progress through life, we rely heavily on our backs to support us. Our bone strength, muscle elasticity, and strength will decrease. The discs that cushion our spine begin to lose fluid and flexibility, which decreases their ability to take pressure off the vertebrae.

Pain can occur from an imbalance of abdominal weakness from faulty posture or strain resulting from surgery or obesity. Other causes may include stress, for instance when someone lifts something too heavy or overstretches, causing a sprain, strain, or spasm in one of the muscles or ligaments in the back. If the spine becomes overly strained or compressed, a disc may rupture or bulge outward. This rupture may put pressure on one of the nerves. When these nerve roots become compressed or irritated, back pain results.



An important factor predisposing to back pain is the length of your muscles. The low-back muscles, particularly the erector spinae, are short and numerous and attached to bony segments. The abdominal muscles, however, are long with fascial attachments without bony support. As you contract your abdominal muscles, the fascial band that supports the trunk tightens and relieves tension on the spine. It is the body's back brace and support system for the spine.

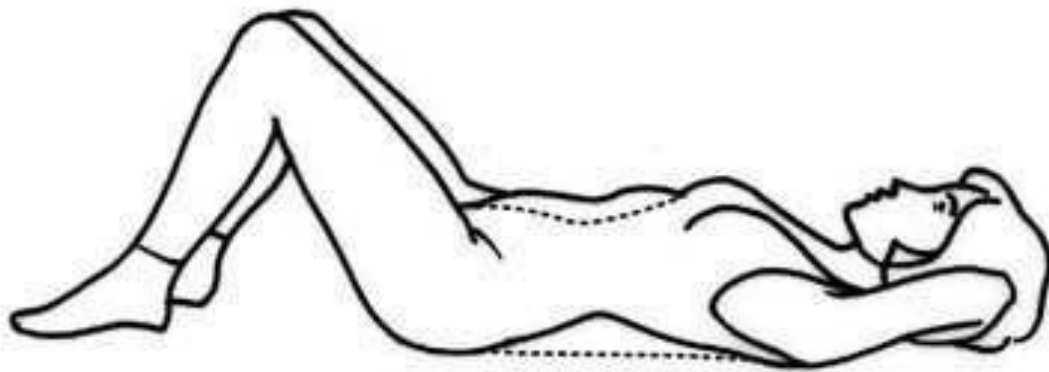
When the abdominal muscles are not engaged, the back muscles are the point of stress, which puts undue pressure on your spine. As tension and contractility increase in your abdominal region, the pressure on the spine decreases.



A Neutral Spine Position

The initial phase of stabilization training begins with isolated muscle contractions. Stabilization training is initiated with the patient being instructed in the *neutral spine position*. The neutral spine position is where the spine is in ideal alignment and is found by envisioning the face of a clock on the abdomen, with 12:00 at the belly button and 6:00 at the pubic bone. The pelvis is then alternately tilted so that 12:00 rocks toward the floor and then 6:00 rocks toward the floor. This is done repeatedly, 10 times in each direction, gently and slowly. The neutral position within that range is the point where you identify as the most comfortable. This position is emphasized and should be maintained for all movements performed during stabilization activities as well as all daily activities.

As awareness of the neutral position is demonstrated, isolated transversus abdominus contraction is then initiated. This muscle is trained by simply pulling your navel into your spine, and/or exhaling thoroughly, while maintaining the neutral spine position.



Progressive Exercise Program

To begin this program and follow it correctly, you must consult with your doctor to see if you are safe to begin exercises. Physical therapy is a great start, as it allows a safe environment with exercises that are appropriate for each individual. Therapy will include stretches, strengthening, and education on proper positioning and posture. This exercise program is designed to guide a patient through a progressive regimen of safe and effective therapeutic exercises to relieve back pain. However, the exercises provided will not relieve all symptoms of back pain, aerobic exercise and proper stretching must also be used.

Lumbar Stabilization Protocol & Test

Exercise	Level I	Level II	Level III	Level IV	Level V
Partial Sit-Ups <i>Forwards & Diagonal</i>	3 x 10 each	2 x 20 each	3 x 30 each 2.5#	3 x 30 each 5#	3 x 50 each 5#
Dying Bug	2 minutes Slow pace One foot on ground	2 minutes Moderate pace Heel taps	3 minutes Moderate pace Heel taps	5 minutes Moderate pace 3# arms, legs	10 minutes Moderate pace 5# arms, legs
Bridge <i>On Floor</i>	3 minutes Both feet on floor Hold 10 seconds	3 minutes Alternating legs Hold 10 seconds	4 minutes Alternating legs Hold 10 seconds	5 minutes Alternating legs Hold 10 seconds	7 minutes Alternating legs Hold 10 seconds
Superman <i>Prone Extension</i>	2 minutes Alternate arms/ opposite leg	2 minutes Arms/legs up Elbows bent	3 minutes Arms/legs up Elbows bent 2# legs	4 minutes Arms/legs up 3# legs	5 minutes Arms/legs up 5# legs
Quadruped <i>Alternating Arms/Legs</i>	2 minutes Slow reps	2 minutes Hold 15 seconds	3 minutes Hold 15 seconds 5# legs	4 minutes Hold 15 seconds 3# arm, 5# legs	5 minutes Hold 30 seconds 3# arms, 5# legs
Wall Squat <i>90 Degrees Back Flat, No Hands</i>	1-minute hold	1.5-minute hold	2-minute hold	3-minute hold	5-minute hold
Lunges <i>Alternating Legs</i>	1-minute Slow reps Partial dips Slow transition	2-minutes 5-second hold Partial dips Moderate transition	3-minutes 15-second hold 90 degrees Quick transition	3-minutes 15-second hold 90 degrees Quick transition 3# arms	5-minutes 15-second hold 90 degrees Quick transition 5# arms
Prone Plank <i>On Forearms</i>	30 seconds	1 minute	2 minutes	3 minutes	5 minutes

Progressive Exercise Program

Trunk Stabilization Progression

	A	B	C	D	E	F	G
<i>Introduction</i>							
1	Pelvic Tilts	Bridges	Straight Leg Raise	Basic Crunch	Sidelying Abduction	Overhead Flexion	Single-Leg Bridge With Knee Bent
2	Heel Walks	Dead Bugs	Advanced SLR	Quadruped Arm Flexion	Single-Leg Bridge With Straight Leg	Quadruped Unilateral Leg Extension	Swiss Ball Bridge
<i>Beginner</i>							
3	Planks (Phase I)	Quadruped Arm Flexion & Leg Extension	Swiss Ball Leg Curls	Swiss Ball Wall Squats	Swiss Ball Marching	Side Planks (Phase I)	High-Kneeling Overhead Flexion
4	Pike (Phase I)	High-Kneeling Diagonals	Planks (Phase II)	Swiss Ball Leg Raises	Side Planks (Phase 2)	Swiss Ball Outs (Phase I)	Swiss Ball Alternating Leg/Arm Marching
<i>Intermediate</i>							
5	Swiss Ball Marching With Arm & Hip Flexion	Supine Swiss Ball Balancing	Pikes (Phase II)	Swiss Ball Wall Sits	Swiss Ball Unilateral Arm Flexion	Swiss Ball Planks (Phase I)	Swiss Ball Crunches
6	Pikes (Phase III)	Planks (Phase III)	Swiss Ball Planks (Phase II)	Swiss Ball Balance With Unilateral Leg Lift	Single-Leg Wall Squats	Swiss Unilateral Leg Curl	Swiss Ball Planks (Phase III)
<i>Advanced</i>							
7	Single-Leg Wall Sit With Swiss Ball	Supine Swiss Ball Unilateral Arm/ Leg Flexion	Pikes (Phase IV)	Side Planks (Phase III)	Planks (Phase IV)	Swiss Ball Roll Outs (Phase II)	Side Planks (Phase IV)

Progression of Exercises & Phases

- When you can complete Phase 1 without difficulty and with the proper technique, move to Phase 2. Follow the table from left to right.
- Phase 2 begins with exercise 2A, add each exercise of Phase 2 dropping the exercise from Phase 1. (For instance, when you add 2A, you will drop 1A, add 2B, drop 1B, and so forth until all phases have been progressed through.)

Progressive Exercise Program



Posterior Pelvic Tilts (1A)

Draw your belly button inwards toward your spine and rotate your hips backwards as your back flattens. Keep your back flat against the surface.



Bridges (1B)

Perform posterior pelvic tilt and lift your hips off the surface, keeping both your feet and head on surface. Hold position for 3 seconds.



Straight Leg Raises (1C)

Lie on your back while maintaining a flat back and abdominals contracted. Lift one leg 6 inches off the surface and hold for 3 seconds.



Basic Crunch (1D)

Perform posterior pelvic tilt. Then reach straight to the ceiling, lifting your shoulders off the surface. Hold for 3 seconds. Keep your head looking up.

DO NOT CURL NECK FORWARD

Progressive Exercise Program



Side Lying: Abduction (1E)

Lie on your side and bend both legs straight. Slowly lift the top leg off of lower leg 6 inches from the bottom leg. Hold for 2 seconds.

Shoulders, hips, and feet should all be in a straight line.



Overhead Flexion (1F)

Starting Position

Obtain a 5 to 10 lb weight and hold with both hands directly above chest.

Motion

Bring the weight slowly overhead until you cannot keep your back flat and abdominals contracted. Hold this position for 2 seconds, then return to starting position.



Single-Leg Bridge With Knee Bend (1G)

Perform previous bridge and bring one leg up with the knee bent to 90 degrees. Hold for 3 seconds and repeat with the opposite leg.

Progressive Exercise Program



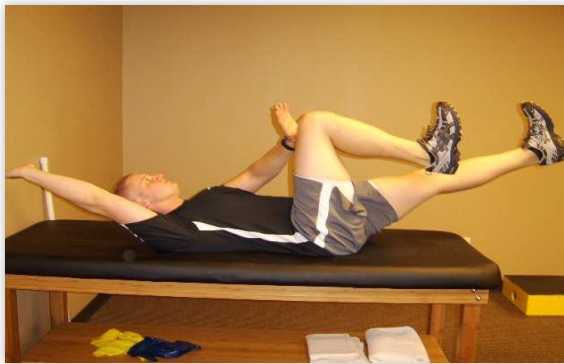
Heel Walks (2A)

Position 1

Perform a bridge while on heels.

Position 2

Keeping a bridge position, slowly walk your heels as far as possible without your hips rotating sideways. Hold at the end position for 3 seconds and walk your heels back slowly.



Dead Bugs (2B)

Starting Position

The opposite arm is touching the opposite knee while the other extremities are fully straight.

Motion

Bring your left arm to your right knee while the other arm/leg is straight. Alternate sides. Keep a 3-minute clock and stop the clock when you cannot hold your back down firmly on the surface. Restart timer when ready.



Advanced Straight Leg Raises (2C)

Lie on your back while maintaining a flat back and abdominals contracted.

Bend one leg up toward your chest and keep your hip and knee at 90-degree angles.

Lift your opposite leg 6 inches off the surface and hold for 3 seconds.

Progressive Exercise Program



Quadruped Unilateral Arm Flexion (Phase I) (2D)

Go onto your hands and knees without arching your back. Stabilize your hips by contracting your abdominals and rotating your hips into the posterior pelvic tilt position (See exercise 1.). Lift one arm out in front without arching your back.



Single-Leg Bridge With Straight Leg (2E)

Perform a bridge. Then raise one leg straight out and hold for 3 seconds. Repeat with your opposite leg.



Quadruped Unilateral Leg Extension (Phase II) (2F)

Go onto your hands and knees without arching your back. Stabilize your hips by contracting abdominals and rotating hips into posterior pelvic tilt position (See exercise 1.). Lift one up and kick behind you. Keep your leg straight without arching your back or letting your torso twist.



Swiss Ball Bridges (2G)

Lie on your back with both feet on the Swiss ball. Contract abdominals. Perform posterior pelvic tilt and lift your hips off the surface. Hold position for 3 seconds. Repeat 10 times.

Progressive Exercise Program



Planks (Phase I) (3A)

Get into a kneeling position and go onto your elbows. Keeping your abdominals tight. Position your back/buttocks so that both are in a straight line. Hold for 30 seconds. Repeat 3 times.



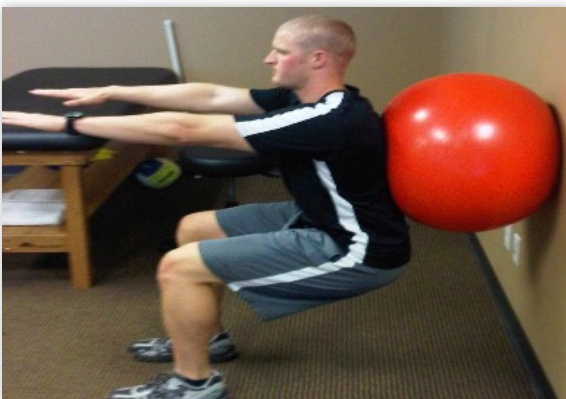
Quadruped Unilateral Arm Flexion & Leg Extension (Phase III) (3B)

Go onto your hands and knees without arching your back. Stabilize your hips by contracting your abdominals and rotating your hips into the posterior pelvic tilt position (See exercise 1.). Lift one arm out in front and the opposite leg behind you without arching your back or letting your torso twist.



Swiss Ball Bilateral Leg Curls (3C)

Lie on your back with both feet on the Swiss ball. Contract abdominals. Perform posterior pelvic tilt and lift your hips off the surface. Pull the ball toward your buttocks and hold for 2 seconds and push the ball outward. Repeat 15 times.



Wall Squats (3D)

Stand upright with the center of the ball on your lower back. Walk both your feet outward and put both feet flat on the ground. Squat to a 45- to 90-degree angle with your arms straight out. Squat up/down, driving pressure through your heels. **DO NOT LET YOUR KNEES GO OVER YOUR TOES WHEN SQUATTING.**

Progressive Exercise Program



Swiss Ball Marching (3E)

Sitting on a Swiss ball. Keeping an upright posture and both your feet flat on the floor. Lift one leg 6 inches off of the surface and hold for 2 seconds. Repeat on the opposite side. Start with 30 seconds and progress to 2 minutes before next phase.



Side Planks (Phase I) (3F)

Go onto your side with knees slightly bent. Go onto your elbow, keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift your hips off the surface and hold for 30 seconds. Work up to a minute before progressing to next phase.



High-Kneeling Overhead Flexion (3G)

Get into a kneeling position with a 5 lb dumbbell. Keeping your abdominals tight. Raise the weight overhead without arching your back. Stop when you feel like you are arching your lower back.

Progressive Exercise Program



Pike (Phase I) (4A)

Sit upright with your legs out and arms by your side. Bring your knees up so they are bent and lift up off the surface with your feet about 6 inches off the surface. Lean back slightly without rolling backwards. Hold for 10 seconds.



High-Kneeling Diagonals (4B)

Get into a kneeling position with a 5 lb dumbbell at the right side of your waist. Keeping your abdominals tight. Raise the weight in a diagonal pattern without arching your back. Stop when you feel like you are arching your lower back. Repeat on the opposite side.



Planks (Phase II) (4C)

Get onto your toes and forearms. Keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your lower back or dropping your hips. Hold for 30 seconds.



Swiss Ball Leg Raises (4D)

Lie on your back with both feet on the Swiss ball. Contract abdominals. Perform posterior pelvic tilt and lift your hips off the surface. Alternate lifting each leg at a time 6 to 10 inches off the ball. Hold the position for 3 seconds. Repeat 10 times on each leg.

Progressive Exercise Program



Side Planks (Phase II) (4E)

Go onto your side with both legs straight and one on top of each other. Go onto your elbow, keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift your hips off the surface and hold for 30 seconds. Work up to a minute before progressing to the next phase.



Swiss Ball Roll Outs (Phase I) (4F)

Go onto your knees with both feet off the surface. Put both forearms onto the Swiss ball. Keeping your abdominals tight and a neutral spine position. Roll the ball out as far as you can without arching your low back. You should be on your elbows at the end range of the exercise. Hold for 3 seconds. Roll the ball slowly back without moving your hips and repeat 15 times.



Swiss Ball Alternating Arm/Leg Marching (4G)

Sitting on a Swiss ball. Keeping an upright posture and both feet flat on the floor. Lift one leg 6 inches off the surface and bring the opposite arm straight overhead and hold for 2 seconds. Repeat on the opposite side. Start with 30 seconds and progress to 2 minutes before the next phase.

Progressive Exercise Program



Swiss Ball Marching With Bilateral Arm, Hip Flexion (5A)

Sitting on a Swiss ball. Keeping an upright posture and both feet flat on the floor. Lift one leg 6 inches off of the surface and bring both arms straight overhead and hold for 2 seconds. Repeat on the opposite side. Start with 30 seconds and progress to 2 minutes before the next phase.



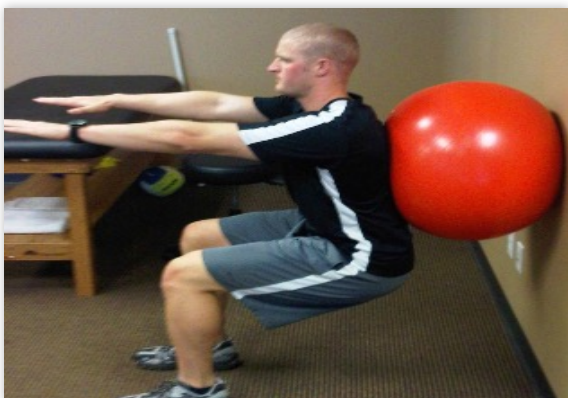
Swiss Ball Supine Balancing (5B)

Lie on the exercise ball with your low back on the center of the ball, keeping your hips off the ball. Bring both arms straight to the ceiling. Hold this position for 1 minute before moving to the next step. DO NOT LET YOUR HIPS DROP, keep them level.



Pikes (Phase II) (5C)

Sit upright with your legs out and arms by your side. Bring your legs up so they are straight and lift up off the surface with your feet about 6 inches above the surface. Lean back slightly without rolling backwards. Hold for 10 seconds.



Wall Sits (5D)

Stand upright with the center of the ball on your lower back. Walk both your feet outward and keep your feet flat. Squat to a 45- to 90-degree angle with your arms straight out and hold for 20 to 30 seconds. DO NOT LET YOUR KNEES GO OVER YOUR TOES WHEN SQUATTING.

Progressive Exercise Program



Swiss Ball Unilateral Arm Flexion (5E)

Lie on the Swiss ball with your low back on the center of the ball, keeping your hips off the ball. Bring one arm overhead and hold for 3 seconds. Repeat on each side. Keep your hips straight. DO NOT LET YOUR HIPS DROP, keep them level. Perform for 1 minute.



Swiss Ball Planks (Phase I) (5F)

Go onto your toes while lifting your hips/back off the surface. Put both forearms onto a Swiss ball. Keeping your abdominals tight and holding a neutral spine position. Hold for 20 seconds. Work up to a minute before proceeding to the next phase.



Swiss Ball Crunches (5G)

1. Lie on the exercise ball with your low back on the center of the ball. Keep your arms straight to the ceiling. Keep your eyes toward the ceiling also.
2. Using your abdominals, reach for the ceiling, coming into a half-sitting position with your back straight and your abdominals tight.

Progressive Exercise Program



Pikes (Phase III) (6A)

Sit upright with your legs out, arms up overhead, and knees bent. Bring your knees up so they are bent and lift off of the surface with feet about 6 inches above the surface. Lean back slightly without rolling backwards. Hold for 10 seconds.



Planks (Phase III) (6B)

Get onto your toes and forearms. Keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift one leg 6 inches off the table without moving your hips. Hold for 3 seconds and switch to the other leg.



Swiss Ball Planks (Phase II) (6C)

Go onto your toes while lifting your hips/back off the surface. Put both your forearms onto the Swiss ball. Keeping your abdominals tight and holding a neutral spine position. Bring one knee toward your chest and hold for 3 seconds. Repeat on the opposite side. Perform 10 times on each leg.



Swiss Ball Balance With Unilateral Leg Lifts (6D)

Lie on the Swiss ball with your low back on the center of the ball, keeping your hips off the ball. Bring both arms straight to the ceiling. Lift one leg off the surface 6 inches and hold for 3 seconds. Repeat on each side. Keep your hips straight. DO NOT LET YOUR HIPS DROP, keep them level. Perform for 1 minute.

Progressive Exercise Program



Single-Leg Wall Squats (6E)

Stand upright with the center of the ball on your lower back. Walk both your feet outward and put one leg off the ground. Squat to a 45- to 90-degree angle with your arms straight out. DO NOT LET YOUR KNEES GO OVER YOUR TOES WHEN SQUATTING.



Swiss Ball Unilateral Leg Curl (6F)

Lie on your back with both feet on the Swiss ball. Contract your abdominals. Perform posterior pelvic tilt and lift your hips off the surface. Pull the ball toward your buttocks with one leg and hold for 2 seconds and push the ball outward. Alternate with the other leg. Repeat 10 times on each leg.



Swiss Ball Planks (Phase III) (6G)

Go onto your toes while lifting your hips/back off the surface. Put both forearms onto the Swiss ball. Keeping your abdominals tight and holding a neutral spine position. Lift one leg 6 inches off the surface and hold for 3 seconds. Repeat on the opposite side. Perform 10 times on each leg. DO NOT LET your low back arch or hips drop.

Progressive Exercise Program



Single-Leg Wall Sits (7A)

Stand upright with the center of the ball on your lower back. Walk both your feet outward and put one leg off the ground. Squat to a 45- to 90-degree angle with your arms straight out and hold for 20 to 30 seconds. DO NOT LET YOUR KNEES GO OVER YOUR TOES WHEN SQUATTING.



Swiss Ball Unilateral Arm/Leg Flexion (7B)

Lie on the Swiss ball with your low back on the center of the ball, keeping your hips off the ball. Bring one arm overhead and lift the opposite leg off the ground. Keep your hips straight. DO NOT LET YOUR HIPS DROP, keep them level.



Pikes (Phase IV) (7C)

Sit upright with your legs out. Bring your legs up so they are straight and lift off of the surface with your feet about 6 inches above the surface. Lean back slightly without rolling backwards. Hold for 10 seconds.



Side Planks (Phase III) (7D)

Go onto your side with both legs straight and one on top of each other. Go onto your elbow, keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift your hips off the surface and lift the top leg even with your trunk. Repeat 10 times on each side.

Progressive Exercise Program



Planks (Phase IV) (7E)

Get onto your toes and forearms. Keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift one leg off the surface 6 inches and raise the opposite leg out in front of you without rotating your hips. Hold for 3 seconds and repeat on the opposite side.



Swiss Ball Roll Outs (Phase II) (7F)

Go onto your toes while lifting your hips/back off the surface. Put both your forearms onto the Swiss ball. Keeping your abdominals tight and in a neutral spine position. Roll the ball out as far as you can without arching your low back. You should be on your elbows at the end range of the exercise. Hold for 3 seconds. Roll the ball slowly back without dropping your hips/trunk and repeat 10 times.



Side Planks (Phase IV) (7G)

Go onto your side with both legs straight and one on top of each other. Go onto your elbow, keeping your abdominals tight. Keep your buttocks/back in a straight line without arching your low back or dropping your hips. Lift your hips off the surface and maintain a steady position. Bring your top arm down toward the surface while rotating just your upper trunk and head. DO NOT rotate at your hips/low back.

