

General Core Strength for Speed Skating

By Brandon Aldan

This month's tip was written by Brandon Aldan, speed skater and Director of Hockey Conditioning for St. Louis Acceleration.

Thanks for submitting this article Brandon!

“Core training” has become a popular catch-phrase among hockey strength and conditioning programs but, there is much confusion as to what it means. The core basically refers to all the muscles in the center of the body, including the hips, abdomen, and lower back. This is where most athletic movements are initiated. This area also has the greatest potential for force generation. For example, some coaches are emphasizing forward hip drive to initiate propulsion which adds to the force requirements by the core musculature. The body uses segment sequencing to execute powerful athletic movements. This is referred to as the kinetic chain in biomechanics. The larger and stronger muscles initiate the majority of the force and transfer the gained momentum to the small joints around which the small, fast-contracting muscles are located. In the push, force is initiated at the hip by the gluteus medius and maximus, transferred to the knee through the quadriceps and to the ankle where powerful plantar flexion will occur through the contraction of the gastrocnemius.

Core Musculature

Understanding the anatomy of the core helps determine appropriate exercise selection.

Rectus abdominus – This is the most well-known and most visible core muscle. This is the area known as the “six pack”. It is often thought of as several individual muscles but, it is actually a single muscle that acts to flex the torso and rotate the pelvis posteriorly (backwards).

Transversus abdominus – This muscle is less well-known than the rectus but, it is actually more important for spinal stability. This is the deepest muscle in the abdomen. It wraps around the abdomen and attaches to the thoracolumbar fascia. The fibers of the TVA run horizontally around your midsection. It's action is to contract inward pulling the belly button toward the spine like a corset. This creates a compression that increases intraabdominal pressure which helps to protect the spine. This added stability also improves the ability to produce force.

Internal obliques – These muscles are on each side of the abdomen and lie between the external obliques and the TVA. They produce a side bending motion and ipsilateral or same-side rotation.

External obliques – These are the superficial muscles on each side of the abdomen. They perform side bending and contralateral or opposite-side rotation. The obliques also function together to create intra-abdominal pressure allowing for efficient force transmission.

Erector spinae – This muscle is located around the spine on the lower back and extends the spine backwards.

Multifidus – These are small muscles in the lower back that function mainly to assist in spinal stabilization.

Quadratus lumborum – These muscles also comprise the lower back musculature and produce a side bending movement or raise the pelvis on one side.

Iliopsoas – This is actually two muscles originating on the lumbar spine and hip that work together to produce hip flexion. They function along with the rectus femoris (one of the four quadriceps) to drive the knee forward during recovery.

Gluteus maximus – This is the large muscle of the buttocks that extends the hip backwards. It is one of the most powerful muscles of the body. The maximus is very active during forward hip drive during the initiation of the push.

Gluteus medius – This is a relatively small muscle located on the side of the hip that abducts (moves away from the midline) the thigh and is extremely important in maintaining pelvis stability in unilateral (single-limb) movements.

Deep external rotators – There are many small muscles deep in the hip that can produce hip rotation and also act to stabilize the femur particularly important in single-leg movements.

Adductors – These are the muscles known as the “groin” located on the inner thigh. They perform the opposite movement of the gluteus medius and also provide unilateral stability.

Obviously, the importance of core training cannot be overstated but, there are many myths and misconceptions abound regarding exercise selection and program design for maximum effectiveness.

Myth 1

Isolation exercises such as, the floor crunch are best for developing core strength. Actually, the most effective exercises are those that coordinate many muscle groups and joint movements. However, the specific muscles of the core can be given additional work at the end of a training session by adding some of the isolation movements that produce the greatest muscular activity.

Myth 2

Core muscles such as, the rectus abdominus need to be trained using high repetitions because they are comprised mainly of slow twitch muscle fibers. It is true that these muscles contain a large percentage of slow twitch fibers but, it is primarily the fast twitch fibers that are used to produce force and stabilize the spine and pelvis during explosive movements and should be trained with fairly heavy loads.

Myth 3

There are specific exercises for training the upper and lower abs. This is a topic of much debate in the strength and conditioning community. It is likely that there is no differentiation in recruitment of lower and upper sections of the rectus abdominus. Anatomically, the rectus abdominus is one continuous muscle which would make it nearly impossible to contract different sections of the muscle separately. Electromyographical analysis (EMG) is a procedure used to determine the electrical activity of certain muscles. EMG supports the theory that upper and lower regions of the rectus abdominus must function as a single unit. However, there is a differentiation between exercises that focus on coordination of certain movement patterns and it is very important to develop this neuromuscular coordination by performing movements that focus on posterior rotation of the pelvis. Most abdominal exercises focus on bringing the torso toward a fixed pelvis.

Core Exercises

Exercise selection becomes increasingly important during the season because off-ice training time is limited so it is necessary to choose exercises with the best cost to benefit ratio.

The exercises that produce the greatest core activity are those that use multiple joints and many muscle groups to produce movement. These exercises also enhance neuromuscular coordination by training the nervous system to synergize movements while stabilizing the spine. EMG shows the greatest electrical activity of core muscles when performing squats, lunges, and deadlifts. For this reason, variations of these exercises should be included in each workout. Mild instability can increase the recruitment of the stabilizer muscles. For example, lunges performed with a weight plate overhead will increase the recruitment of the spinal stabilizers such as, the internal and external obliques. The multi-hip machine is also extremely useful for developing hip strength as well as spinal stability and should receive large emphasis in any strength program. Core recruitment can also be enhanced in upper body exercises by performing the movement standing, unilateral, and/or adding additional movements. For example, a chest press can be made more effective by performing the movement standing and adding a twisting movement on one side while pressing a band or cable with one arm. This has a much greater carryover to hockey performance than the basic bench press. The following exercises are to be added after the multi-joint exercises to provide additional development to the core muscles.

Pelvic tilt – The pelvic tilt is the first progression in learning to contract the abdominals to control the pelvis. Lie on your back with knees bent to a position where the feet are flat on the floor. Alternately, arch and round the back by focusing on rotating the pelvis toward your back and then toward your chest. The rounded position resembles the position of the pelvis while skating known as, the butt tuck. This position is also known as posterior rotation. This should also be the starting position for all abdominal exercises.

Butt tuck – Beginning from basic skating position, perform the previous exercise while keeping the lower body position constant.

Basic crunch – Beginning from the rounded back or butt tucked position with the feet flat on the floor, raise the shoulder blades off the floor by bringing the chest toward the knees.

Bench press crunch – Begin in the same starting position as a regular bench press with the arms extended and perform a crunching movement while trying to push the bar up directly toward the ceiling. This exercise allows for great strength development because large loads can be safely handled in this movement.

Serratus crunch – This movement is very similar to bench press crunch except a dumbbell is held in each hand with a neutral grip (palms facing inward). Crunch up to the final position and execute a final squeeze by pushing the dumbbells up toward the ceiling. This final protraction of the shoulders allows for additional emphasis on the serratus anterior muscles on the sides of the abdomen.

Leg raise iso. – One of the most effective exercises for learning how to contract the abdominal muscles to control the pelvis. The typical leg raise exercise where the legs are lowered to the floor and back up toward the ceiling actually places more emphasis on the iliopsoas which receives sufficient work from other exercises. It can also place excessive stress on the lumbar spine. The leg raise iso. begins in the same position with the legs straight up in the air. Now press the lower back into the floor by contracting the rectus abdominus. The legs are then lowered to the lowest point that can be held with the lower back still in contact with the floor. If the pelvis rotates or the lower back comes off the floor, the mechanical advantage will shift from the rectus abdominus to the iliopsoas.

One leg raise – Keeping one foot flat on the floor continuously raise and lower the other leg while keeping the knee straight.

Twisting crunch – Starting in basic crunch position with hands lightly touching the sides of the head, crunch up and twist toward the opposite side.

Bicycle crunch – Perform a twisting crunch and drive the opposite knee toward the elbow while extending the other leg.

Two leg raise – Beginning with both legs extended in the air, slowly lower both legs toward the ground as low as possible while keeping the lower back pressed in to the floor.

Hanging knee raise – While hanging from an arms-extended position on a pullup bar, bring the knees toward the chest by contracting the abdominal muscles rather than the hip flexors.

Medball slam – This is an explosive crunching movement done by slamming a medball down into the ground using the rectus abdominus.

Stability ball crunch – This is simply a crunch with the back on a stability ball. The stability ball increases abdominal movement by creating instability and increasing the range of motion by allowing the back to extend around the ball.

Plank hold – This is a static movement that trains the rectus abdominus to be used isometrically. Begin in the same starting position as a pushup except, with the hips tucked under (posteriorly rotated) with the lower back slightly rounded. This is done by actively contracting the rectus. Hold this position for 15-30 seconds. To increase difficulty, walk the hands forward further away from the body.

Side plank – The side plank is similar to the previous movement and is used to train the internal and external obliques isometrically. Begin in a pushup position and turn directly to the side holding the body up with one arm. Contract the obliques that are closer to the floor and push the hips toward the ceiling. Hold this position for 15-30 seconds.

Side lean – This is more of a coordination exercise to learn how to contract the obliques properly to attain the position resembling “left shoulder in the corner.”

Dumbbell side bend – Hold a dumbbell in one hand and lean as far as possible to the other side.

Cable twist – Hold a cable with arms extended and rotate while moving the hips minimally.

Medball side toss – This trains the same muscles as the cable twist but with a more explosive movement. Stand sideways to a partner and powerfully toss a medball to the partner.

Back extension – The back extension is done on a back extension apparatus or table with feet held down. The athlete bends forward at the waist then extend the back until the body is parallel to the floor.

Reverse hyper – This is the reverse movement of the back extension where the legs hang off the table and are raised up to parallel.

Multi-hip – The multi-hip machine is a versatile piece of equipment used to train all the muscles of the hips which are the most powerful core muscles. It also demands strong contraction of the abdominal musculature. It is important to perform equal sets for agonist/antagonist muscle groups such as adduction (moving the leg inward toward the midline of the body)/abduction (moving the leg away from the midline) to ensure muscle balance. The other coupling is flexion (moving the leg forward in the sagittal plane) and extension (moving the leg backward).

Implementing Core Training

Core exercises should be included every workout. As stated earlier, the most effective exercises for activating the core muscles are squats, lunges, and deadlifts. The following program integrates multi-joint movements with movements that directly work the core.

Sample Program

One-leg squat	3x6
Hip flexion	2x8
Twisting cable press	2x8
Twisting cable row	2x8
Romanian deadlift	3x6
Hip adduction	2x8
Hip abduction	2x8
Bench press crunch	3x8
Low ab iso.	2x30sec
Side bend	2x8
Cable twist	2x6

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