

THE FUNDAMENTALS OF CROSS COUNTRY SKI TECHNIQUE BY XCZONE

The XCZONE Technique video presents the fundamentals of cross country ski technique through visual cues, narration and generous tips by elite athletes and coaches. A video is best used with sufficient practice and under the guidance of a qualified instructor.

"Ski every race and every workout like it is your last." - Erich Wilbrecht - Olympian, US Masters Champion, Subaru Factory Team

The aide memoire "Tao of Skiing" on CD and DVD-ROM provides an in depth explanation of the principles shown on this video.

"It is easy to go out there and train day after day.

The difficulty lies in making every day count."

-Philippe Villeneuve, xNational Team

INTRODUCTION

It may take a lifetime to master cross-country skiing technique, refining nuances, while always returning to certain fundamentals.

"Understand the fundamental technical concepts and mechanics."

- Tom Silletta, NCCP Level 4 Cross-Country Skiing, Level 2 Biathlon

All the answers are out there.

CONTENTS

The format of this video follows that of the XCZONE Master's Ski Camps.

Let's start at the beginning, with some basics: falling down, getting up and turning around. When you are ready, just say go.

"Learn how to ski well at slow speeds." - Tom Silletta, NCCP Level 4 Cross-Country Skiing, Level 2 Biathlon

We will take you on a classic experience skiing in the track before introducing ski skating; initially on rudimentary flats then climbing and descending in the vertical realities segment of the video.

Finally, we will put it all together in skiing sequences that apply technique to terrain and music.

THE BASICS

FALLING 101 AND GETTING UP

Before you go, it is best to learn how to stop.

Falling is all part of the experience. Stay relaxed when it happens. Sort out your polls and skis so that they are perpendicular with the slope of the hill. Slide your hips and weight over your skis in a low crouched position, then stand up.

STAR TURN

You are up now, but you do not want to go this way.

The star turn is the most common means of reorientating yourself from a static position. Lift the tip of the ski, and step around until you are facing where you want to go. Keep the tail end of the skis and a least one pole in the snow, especially when you are turning on a hill.

KICK TURN

Imagine that you are in thick woods

or deep snow.

The kick turn is used on a single track trail, where there is little room to manoeuvre. This turn requires a little more balance. Place one pole behind the ski tip and the other behind the tails. Raise, turn and lower the front ski. Followed by the other ski placed in parallel position with the first ski. Re-plant the poles beside the feet. And off you go.

TECHNIQUES

Technique in cross-country skiing is the efficient means by which you apply your effort to moving yourself forward, over the snow.

All skiing techniques share the same fundamentals. The differences in the skiing techniques are primarily that of variations in the timing relationship between the arms and the legs. It is easy to think of techniques as different gears for varied terrain and conditions. Let's start in the groomed track.

CLASSIC EXPERIENCE

Classic or traditional technique is adapted for single track trails. The ski glide in parallel down the tracks and a special wax is used under the middle cambered section of the ski to grip the snow when required. A different glide wax on the tips and tails of the

skis allows the skis to glide under the weight of the skier.

"Clean and wax your skis after every workout." - Dave Chamberlain, NCAA All American, Subaru Factory Team

We have chosen to begin skiing with double poling.

DOUBLE POLE

Double poling is one of the fundamental upperbody movements and as a technique on its own. It is not strictly a classic technique, because it is used in all skating techniques. Propulsion is achieved by applying your weight onto the polls and not by straining your triceps. By itself, double poling is used on flats and slight hills. Some World Loppet Cup races have been won using this technique exclusively.



"Always make the most of your upper body in double-poling and skating." - Beckie Scott, Olympian, World Cup Bronze Medalist

The components or phases within double poll are: the Planting of the poles, the Pull, Follow-Through, glide and Recovery.

Begin at the ready upright position with a slight lean forward from the hip. Arms are shoulder width apart and are bent 90 to 120 degrees. The poles are near vertical. The hands remain relaxed on the pole grip. Movement is initiated from the hips with the force of the abdominals which bring the poles down to the snow, just ahead of the ski bindings. Your body position is far more important than the position of your polls. The arms and shoulder joints remain locked through the first phase of the motion.

"Emphasize falling forward in double poling with and without skis on." - Chris Waller - CANSI 3

Apply your body weight onto the poles, using first your stomach then back muscles to drive the pulling motion. Rotate forward and down at

the mid-section keeping your legs nearly straight. All the time respect the angle of your arms. You should feel as though your lats are being stretched as you hang on the poles.

"A skier uses ski poles to produce propulsive forces when skiing efficiently and not as balance sticks." - Tom Silletta, NCCP Level 4 Cross-Country Skiing, Level 2 Biathlon

The abdominal muscles contract and the skier feels the power come from the mid-section and radiate from the larger muscles in the upper body to the shoulders and arms. Keeping the hand grip relaxed will help focus the power to come from the core. The poles take the most direct and simple line, along the body and for a full double pole will end up passing beside the knees. Drive down and back with your elbows by rotating at the shoulder, only when your torso has completed the majority of the work. The poles go straight back, parallel to the skis. Your back may be parallel to the ground. Finish the movement by extending and relaxing the arms, hands, and the fingers. The duration of the glide and tempo may vary depending on snow conditions.

The timing is such that the upper

body finishes its downward arc just as the arms have extended. The body starts and finishes one cycle of movement one position to another - as one unit. All motion originates from the centre and progresses outwards; from big joints to smaller joints; starting with big muscles and finishing with smaller ones. All upper body movement in skiing follow this rule. The polling action is a pull, not a push.

To recover, you reverse the order of the movements. First, the hips drive forward and the body begins to extend upright to make room for the hips. The arms bend back to approximately 90 degrees and the elbows drive forward directly with little to no swing.

DIAGONAL STRIDE

Diagonal stride is the only technique unique to classic technique and is used on the greatest variety of single track terrain.

The basic mechanics at the early stages can look a lot like walking with a glide, aided by poles. The diagonal stride technique is easy to do poorly. Power efficiency, and glide come with practice.

"Practice diagonal stride

without poles. Start by walking with skis on to get the feel. Progress to a glide with each stride. This develops balance and weight shift." - Chris Waller - CANSI 3

The movement involves into a push from one ski, weight transfer and glide onto glide onto the other ski. The motion is supported by opposite arm polling. This poling action is similar to double poling except the arms work individually and alternately with the legs.



The components of the diagonal stride are the Kick, the Weight shift, the Glide and Leg Recovery.

The kick referred to in diagonal stride is not a kick in the strict sense of word. In skiing you want to momentarily compress your ski onto

the snow so that you get sufficient grip to pull back with your ski and move your body forward of that position. You will want the snow to remain on the ground and your body to glide over it.

Good grip under a properly cambered ski in the kick zone is essential to achieve traction. The wax's job is to adhere to the snow for a moment in time, stopping long enough to use it as a platform to be able to transfer the weight forward on to the other ski.

The ski 's camber is compressed by bending at the hip, knee and ankle, and pushing off. The skier feels the weight and compression on the heel and rolls to the ball of the foot during the kick. The maximum compression occurs when the ski passes underneath your hips. By the time, the weight is on the ball of the foot, the kick is over. Pushing off the toes is often too late and results in backslip.

The kick and poling actions occur together. It is important to use as much upper body as possible; do not rely on the arms to do the work.

The arms travel front to back and return by the most direct means.

"Weight shift is the key to skiing well.. focus on

perfect balance, so that you can move your weight over your ski with confidence" - Gordon Jewett - 4x National team, 9x Canadian Junior Champion.

The skier must commit their body weight from the pushing ski to the glide ski. A fully weighted kick will provide the power for good weight transfer. The position of the centre of gravity plays an important role. The hips move forward onto the glide ski. As the hip aligns over the glide ski, it rotates towards the trajectory of the glide ski. The power comes from the hips and assures full weight transfer.

The now trailing leg can extend when the weight shift onto the new glide leg has taken place. While one leg is gliding and carrying all the body weight the other leg extends back and relaxes. The trailing leg recovers forward at the moment that the front glide leg begins to compress down onto the snow and pull back.

KICK OR STEP DOUBLE POLE

The kick double poll fills in the gap between double poling and diagonal stride. In step double pole a skier can extend their reach past that which they could get in a double poll

technique because they are counterbalanced by their extended trailing leg. A skier can use step double poll as change from double poling or extend it into a steeper hill. Kick double pole can also substitute for diagonal stride on many hills. It is best if you have practised both diagonal stride and double poling before trying to coordinate the movements of step double poll.

A quick way to learn the timing of this technique is to start with a double pole. At the end of the recovery phase, perform a kick as the poles and arms are extended forward in preparation for the double pole plant. Meanwhile the other non-kicking leg, extends to the back in a recovery and relaxed position. The legs come back together to prepare for the next kick, during the double pole pull.

The kick and pole recovery occur in one motion.

The kicking kick foot starts the pull slightly ahead of the other foot.

The hips should be forward to bring the centre of gravity up and forward.

Glide on the heels to mid foot.

CLASSIC ON VARIED TERRAIN TRANSITIONS

Variations in terrain and snow conditions dictate technique. Change tempo and techniques to match the resistance you feel under your ski. Diagonal stride works in the majority of single track conditions. In fast conditions double pole. As the resistance increases transfer to step double pole and then to diagonal stride. As the hill gets steeper, the compression and push phase in diagonal stride becomes more aggressive and shortened. Emphasis is given to higher tempo and stepping up the hill.

HERRINGBONE

As the hill steepens even more, the diagonal stride is widened and the skis are edged enough to prevent back slip. Keep the weight mostly on the heels. At a certain point there is no more glide left in the technique and it is all about climbing. One step at a time. The power in herringbone comes mostly from the legs. The poles assist the motion. The baskets are placed beside and behind the bindings. The tempo for herringbone can vary from a walk to a run.

S K A T I N G

Ski Skating can be decomposed into free skating (legs only) and double poling. These drills are the fundamental building blocks for the

more advanced skating techniques as well as being useful techniques on their own.

LEGS ONLY (FREE SKATE)

Free skating (legs-only) is used as both a drill and where conditions are too fast for polls, but still not fast enough to go into a tuck.

Propulsion in the legs comes from a decisive weight transfer on to a flat gliding ski while driving down and forward with the heel. Edging at the end of the phase aids the motion but does not drive it.

To begin, step forward onto the centre line and glide forward. Project your hips forward maintaining the same height and keep your heel on the glide ski pressed forward of your knee and centre of gravity. You may wish to emphasize stepping on an outside edge to coax the ski flat.

At the moment your weight is committed to the front glide leg, raise your trailing ski a minimal distance over the snow surface and recover it forward directly along the centre line. During which, remember to keep the front weighted glide ski pressing forward heel first. Feel the acceleration of the ski as the weight is transferred on to the ski through the heels. The recovered ski moved

underneath and is placed forward of your centre of gravity along the direction of travel. The hips must be engaged or pressed forward. Repeat the cycle maintaining a balance between left and right legs. As with all skiing techniques, the hips and shoulders should be squared with the direction of travel. Avoid twisting. Motion should be linear with minimal rotational elements. The motion with the legs should always take the shortest path.

As the hill gets steeper lower your centre of gravity to achieve greater step length. Climbing also requires more forward body lean, this is done from the hips. Maintain a consistent height over the surface (avoid bobbing up and down)

Do not persist in weighting a ski or pushing off if it has pass behind your body.

Disengage foot from snow as soon as weight is transferred to new glide leg, recover the free trailing leg forward by the most direct route.

The majority of the work done by the legs is done with the skis forward of the centre of gravity.

Ski skating has more in common with hiking than it does with hockey skating and you should avoid placing weight on the toes, onto an edged ski

or pushing back.

ARMS ONLY (DOUBLE POLING)

All skating techniques uses the same basic double poling action. Small concessions may have to be made to accommodate a wider stance, but the skier should always strive to incorporate textbook double poling into a full skating technique.

“I'm a big believer in focus on arms, as I feel they control the legs and what they will do when it comes to tempo and stride length.” - Marty Hall, former Head National Team Coach

The three most common upper body errors in skating are:

1. Recovering upright before the arms have completed a polling action;
2. Wide or high elbows; and
3. Allowing the arms to work independently.

The whole upper body has to act and recover together as one unit, in all skating techniques.

MARATHON SKATE

Marathon skating technique, when used as a drill, re-enforces correct weight transfer and follow-through with the leg push. It also introduces upper body double poling motion into coordinated skating technique.

Marathon skate remains a legitimate technique even in races when the classic track is faster, or passing on narrow skating trails.

Marathon skate is essentially a double poling action coordinated with a single skate push on one side. The glide ski remains the same and usually in the tracks

To start, both poles and one ski hit the snow simultaneously. The poles do a double poling motion, while one ski presses forward at 45 degrees with most weight committed on to the heel. The hips project forward to remain square with the primary direction of travel. The glide ski remains in the track.

The weight is transferred back to the track gliding ski by the end of the push phase, and the ski is fully extended to the side.

During the recovery, the poles return just like in double poling, and recover just forward of the centre of gravity ready for the next step and push.

ONE SKATE

Let's combine legs and arms only drills into a full ski skating technique. All of the principles of free skating and double poling should be respected.

In one-skate the skier performs a double pole and recovery first on one glide leg then the other. Most alpine skiers already have done this technique to get to the lift line.

One skate is great for accelerating, sprinting or cruising the flats and moderate uphill. The technique requires good balance and upper body work.

Propulsion comes from a decisive weight transfer on to a flat glide ski assisted by the first phase of the double poling motion.

The second propulsive phase occurs when the hips, arms and trailing free leg recover forward to centre together.

Then we repeat the sequence on the other side.

The poles plant simultaneously beside the bindings as the weighted leg compresses at the hip, knee and ankle, and pushes off onto the other ski which is now moving forward.

"Imagine that the the

finish is just in front of you. Try to keep the angle between your skis as narrow as possible" -

Gudrun Pflueger, World Loppet Champion and 4x World Mountain Running Champion

The path of the glide ski should start at the centre line and continue as close to the intended direction of travel. The glide ski should track straight ahead, in the case of one-skating on the flats in fast conditions. In slower conditions or on steeper terrain, you may concede a wider stance and the skis will have to track more to the outside. In all cases the head, shoulders and hips should remain squared off with the direction of travel.

Here it is important to make sure the hip, and centre of gravity, is over the glide ski - as if it were attached to the ski so that the whole body tracks with the glide ski together.

Weight is committed forcefully onto the new glide ski creating forward momentum that is encouraged by a double poling action.

The upper body motion within one-skate is the same as it is in double poling. Your weight drives the poles through the motion with the stomach, back, shoulder and arm

muscles progressively. To catch the correct timing of the next cycle, recover both the arms and the trailing leg forward, back to centre together. The foot of the unweighted free leg should recover to a point just ahead of the binding on its way to the snow.

TWO-SKATE

Combine free skating equally with double poling and you have two-skate.

This technique is often used on flats, gradual uphill and downhill. It is a cruising and smooth technique, gliders love it.

You can think of it simplistically as the upper body going down over one leg and coming up over the other.



The initial propulsion, again, comes from a decisive weight transfer on to a flat glide ski assisted by the first phase of the double poling motion,

and a unweighted push of the free leg.

The second propulsive phase occurs when the hips, arms and trailing free leg recover forward together. Your weight is shifted onto the free leg as it continues past your centre of gravity and forward onto the snow.

The skier uses the pole recovery in a dynamic way along with a flexion of the glide leg.

The upper body motion within two-skate is the same as it is in double poling. Your weight drives the poles through the motion with the stomach, back, shoulder and arm muscles progressively.

GREAT LEARNING PROGRESSION FOR SKATING

A great drill to re-enforce the ski skating fundamentals is to use a progression of free skating, and double poling with a full skating technique such as: one-skate, two-skate or offset.

The secret is to alternate between free skating, a full skating technique, double poling and back to a full skating technique. Do a few minutes of each and repeat.

These drills help to isolate basics and

is so doing identify errors, achieve proper timing, balance and biomechanics with legs or arms only before incorporating them into a full ski skating technique. This is the way to teach yourself to ski. With time the skier actually transfers the skills from a more basic technique to a more complex one.

DIAGONAL-V SKATE

Diagonal-V can best be described as herringbone with a glide. This technique can be used as a drill to balance left-right leg movement before fully integrating a double poling action, or when negotiating steep terrain especially for the novice skier.

“Diagonal V Skate has the same timing as herringbone but with glide” - Chris Waller - CANSI 3

As with herring bone, the skier steps up the hill onto a flat ski. Weight is applied to the heel of the lead ski which is then used to pull the body up the slope. The trailing leg disengages from the snow and steps forward of the centre of gravity. It is important to maintain a forward leg and hip position to generate glide. Unlike, other skating techniques, an alternating poling action is used to

assist the climb.

OFF-SET

The offset technique is your lowest gear in skiing, and is used on steeper terrain or slow conditions. The emphasis here is on climbing with legs, where the upper body assists in maintaining momentum throughout the cycle. There is very little delay between positions in offset.

“The timing in offset is: three point landing on one, full extension on two.” - Chris Waller - CANSI 3

The first position starts with a three point plant involving both poles and the front leg. Step forward and up the hill along the centre line onto a flat ski. Use the front weighted ski as a platform or step. As you commit weight onto the heel of the lead ski, immediately disengage the trailing leg from the snow and move it forward. It is the front leg which will pull you up the hill and not pushing off the back leg. The poles are planted at the same time, are weighted evenly, and pull down to complete their extension together as in a double poling action.

In the end position, the weight is supported on the opposite leg, the

arms are extended to the rear and the upper body is the lowest it will be in the cycle. The upper body remains lowered until the arms, upper body and trailing leg recovers. The cycle will begin again when the body comes up to do the three point plant again, in the first position. Movement between these positions is by the most direct and efficient path. It is key that the upper body and arms go down, and recover up together.

Keep your hips pressed forward and onto hill. Head, shoulders and hips should be square with the direction of travel. Avoid twisting or rotation, especially in the torso.

As with all techniques, the steeper the hill the more climbing and less glide. Maintaining a lower centre of gravity will facilitate stepping up the hill. Naturally, you will have to concede a wider position in both your arms and legs so as not to get entangled. But you should deviate from text book double poling motion, only as much as is strictly necessary. As the hill moderates, you should try and adopt a much narrower position in both arms and legs.

The most common errors in offset are:

1. Letting the upper body and arms move in opposite directions;

2. Failure to lower centre of gravity and step forward onto a heel.
3. Letting one arm or side dominate the technique;
4. Over rotation;
5. Pushing off the back leg;
6. Skewed or unbalanced climbing by legs; and
7. Relying too much on arms to power the technique.

Try to relax the force of the arm pull if you run into timing problems. Often incorrect use of the arms do more to arrest movement than help it. Practising legs-only in a climb will help a skier use both legs equally in offset.

VARIED TERRAIN FOR SKATING

It becomes necessary to switch techniques over varied terrain to remain efficient in skiing, similar to changing gears on a bike.

"Develop efficient ski technique at high speeds."

- Tom Silletta, NCCP Level 4 Cross-Country Skiing, Level 2 Biathlon

Transitions either change the relative timing of the arms and legs for gearing, or switch sides in the case of

asymmetric techniques such as offset or 2-skate, to balance the work over a period of time.

The transition normally occurs at a position in the technique where movement starts, stops or reverses such as when the cycle of one technique passes through or ends at a common starting position for the new technique.

As a symmetric technique, a cycle of one-skate can be used to ease the transition between techniques or the change of sides in an asymmetric technique. The double-tap change-up in offset left to offset right is quick cycle of one-skate.

Here we have a typical example of technique adapting to terrain. Two skate is used in fast gliding conditions. Switch to one-skate as the slope increases. As it gets even steeper, we switch to offset. And then change sides.

"Listen to your body - self explanatory, but most people are not confident enough to do it." - Trond Nystad
- Subaru Factory Team

Transitions and change-ups are important to maintain continuous propulsion. On extremely technical

terrain at high speed, skiers may never complete a full cycle of a given technique before they have to change. In these cases, changes are made on the half or quarter periods of the cycle; in what can be referred to as broken rhythm. The necessity for change is provoked by the feeling of resistance in each step or poll plant throughout the movement.

DOWNHILL FOR XC SKIING

Everything that goes up, must come down. One third to a half of a ski course will involve downhills. The first concern is staying in control, the next will be going fast.

The technique that a cross-country skier will use to descent is nearly identical to that of a downhill racer. Nordic skis are designed to go fast and straight at three times the speed of an alpine board. The advantage they have in speed, is tempered with inherent instability and challenge to carve a turn especially through deep snow or on ice.

A racer can often reach speeds in excess of 80kph on a course sporting tight changes in direction.

SNOWPLOW & SNOWPLOW STOP

The snowplow is useful in slowing

down and stopping, mostly in narrower trails. For the younger skier, we refer to it as a pizza slice..

Here the skis adopt an open angle at the tails. The tips must remain together, even pressure is applied to both skis. Keep the heels down on the skis with knees bent all the time with the whole inside edge of both skis edged in. The amount of pressure on the edges can be controlled with the width of the angle of the snowplow. You can slow down by applying more outward pressure to the edge underneath the. The arms should be held clearly in front of the body, like the steering wheel of a car, driving where you want to go.

SNOWPLOW TURN

Now start with a snow plow. To turn, apply more weight on to the inside edge of one ski.

SKATE TURN /STEP TURN

The skate or step turn is one of the most efficient means of changing direction at moderate speeds.

The skier takes small steps into the direction of the turn using the arms to guide the around the turn. The weight is transferred from ski to ski, always starting with the inside ski into the turn and following with the

outside ski. This can involve many small steps. Knees are always bent and relaxed, ready to react to any bumps. Lean into the turn, hips first. Sharper turns may require more edging.

SLALOM / PARALLEL TURN

Negotiating turns at fast speed requires a slalom or parallel turn. This is nearly the same as in alpine skiing except that you will have to weight the heel more and coax the skinny skis more deliberately into carving.

Learning this technique is best done on an open hill where you will not meet trees or tourists.

Edge the outside ski to initiate the turn and transfer the majority of your weight on to it. Lower your centre of gravity and bend your knees. Project with your arms and hips around the turn, looking where you want to go. Continue to weight the downhill ski. That is one that is lower on the hill. Skis should be held close together in parallel.

"Keep your body low and steer with your outside arm. Look in the direction you want to turn." - Nathan Schultz, National

Champion, Subaru Factory Team

Approaching a turn, start wide, cut the apex of the turn and carve around. Skiers frequently, start the turn too much on the inside, cut in prematurely and skid wide into the bushes.

Common mistakes in turning on downhills include:

1. Adopting too wide of a stance;
2. Not weighting edge of the downhill ski;
3. Unparalleled skis;
4. Dropping arms; and
5. Having straight legs, hips back, face first posture.

TUCK & AERODYNAMICS

Good aerodynamics are the easiest and is likely the most ignored means of maintaining speed in skiing. Not only is it faster but it is a stable position.

The skier crouches in an egg like position. The back is parallel to the ground. The poles are tucked under the arms and are also held parallel with the snow surface. Your hands should be in front of your face. Skis are parallel and the weight is held on the heels.

In a seriously aerodynamic tuck, the

elbows placed on the front the knees.

In a more relaxed tuck the elbows may rest on the knees.

A high tuck is used as in transition just before or after you are running out of gravity to do your work for you.

Keeping the hands in front at all times is essential, they are your guide and keep your direction in check.

The skier can use a wider stance for stability, if there are no set tracks

Look at a downhill racer and study the tuck position how it may open up or tighten while reacting to variations in the terrain. Feel your skis on the snow and let them ride flat, unless you are edging for a turn. The knees absorb the contours and variations terrain.

C O N C L U S I O N

Technique is the means by which you can efficiently transfer your efforts into skiing, and not just an exercise in creative snow removal. The best news is that skill is persistent; fitness may vary from year to year but the proficiency you achieve in skiing technique, you will always have.

"Never underestimate the

power of positive thinking in sport." - Scott Loomis, National Team, Subaru Factory Team

This video is meant as just one tool at your disposal to help visualize the fundamentals of skiing technique before you venture out on the trails.

"Think of XC skiing as dancing on snow. Feel the rhythm. One, two, three....one, two, three..... push, glide, glide.....push, glide, glide..... and smell the fresh air." - Jan Vopalensky, CANSI

Now let's see the technique as it is trained and applied on those trails.

"Lose with grace and rest with confidence."

-2x Olympian, Pete Vordenberg, Subaru Factory Team

"Have enough spare time to reflect, but not enough to stagnate." - Barb Jones, American Ski Series Champion, Subaru Factory Team

