CANSI "Skiing Your Best ” DVD

The Canadian Association of Nordic Ski Instructors (CANSI)

Established in 1976, the Canadian Association of Nordic Ski Instructors (or CANSI) owes its creation to the diverse influences of the Canadian Ski Association, the Canadian Ski Instructors Alliance, and Ski Québec.

CANSI is a non-profit organization designed to promote the sport of cross-country skiing in Canada through an instructor certification program. CANSI members participate in Interski, which is a world stage of instructor organizations with the same focus. CANSI offers four levels of certification in cross-country and three in Telemark. CANSI uses a skills and drills based pedagogy approach in its instruction.

CANSI Instructors teach basics skills and maneuvers to beginning students and assist intermediate skiers by refining their skills. A typical lesson with a CANSI Instructor includes a motion on skis activity, technical instruction with demonstrations and drills. Then there is practice time to develop skills, terrain skiing and a warm down. Ultimately, lessons with CANSI instructors are challenging and fun!

Disclaimer:

The entire content of this DVD, including the pedagogy, technical descriptions and demonstrations herein, represent the official view of the Canadian Association of Nordic Ski Instructors. All questions regarding its content should be addressed directly to CANSI.

Overview:

The CANSI 'Skiing Your Best" DVD is a marvelous instructional tool for classic, skating and downhill techniques. It is intended for instructors, coaches and beginner to intermediate students. The DVD uses many modes of presentation including audio-visual global demonstrations, progressive drills and drop-down technical checklists. Nine CANSI instructors are used to demonstrate skiing skills and individual style of Nordic skiing. The first chapter, entitled ***Fundamental Building Blocks,*** presents basic elements, which are common to both skating and classic skiing techniques. The remaining chapters present the specific skiing maneuvers, with skill improvement drills.

Content:

The presentation of Nordic Skiing in this DVD follows a logical format starting with:

- Definitions and Terminology

Then:

- Chapter 1 will cover the Fundamental Building Blocks of Nordic Skiing

Before addressing specifics in:

- Chapter 2 demonstrating Skating Maneuvers;
- Chapter 3 teaching Classic Maneuvers; and
- Chapter 4 demonstrating Downhill Maneuvers.

Definitions and Terminology

The Forward knee drive requires that the skier bring the hip forward with a flexed knee and ankle as the ski lands on the snow.

The glide ski or support ski is the ski that is supporting the body weight and where there is little active propulsion from the leg.

The Glide phase occurs when the body moving forward on a flat ski in preparation for

the next push phase.

The Heel to toe concept shows the heel landing slightly ahead of the opposite foot.

A Hip rotation, in skating, means changing the direction of the hips from square to one ski, followed by the hips moving square to the other ski.

The Pole assisted glide occurs when the propulsion is created from the upper body and poling motion.

The Leg push is referenced to the leg that creates propulsion by pushing to the side in skating or striding in classic skiing.

The Push Phase is the propulsive phase created by the upper body, the legs or both at the same time.

Conversely, the Recovery Phase is defined by a return of the body to a forward position.

The term Stance refers to a balanced position with the knees and ankles flexed and the arms are in front of the body.

A Stride is most often associated with the leg action in the diagonal stride, uphill diagonal stride or the one-step double pole.

And finally, Weight transfer is related to the lateral transfer of body weight from the push ski to the glide ski.

Chapter 1- Fundamental Building Blocks

Introduction

Cross-country skiing is one of the healthiest and invigorating winter outdoor activities.

It provides a great workout and keeps you active throughout the winter months. Ski outings may last for as long as several hours, and good skiing technique allows you to enjoy skiing to its fullest.

“Glide, Glide, Glide…….” You may have heard this from a friend, a skiing guru or read it somewhere in skiing literature, but what does this mean and is it important to me? If you have ever seen someone skiing effortlessly by you, as if you were standing still, you have just answered this question. You may have noticed that the glide was very long, for every leg push the skier took. Perhaps you wondered what is their secret and how can I achieve the same thing?

This DVD is divided into two main sections. First, you will learn the basic elements common to both skating and classic skiing techniques. Next, the various maneuvers in both styles will be presented individually with some drills. For those of you who feel shaky on descents the downhill chapter will get you going in the right direction!

Basic Elements

Balance; movement initiated from the body core; coordination and timing; forward knee drive and arm action, are basic elements common to both skating and classic techniques. Each basic element builds upon the other leading to more efficient skiing.

Basic Element #1 Balance

Of all the basic elements, balance is the most important to develop. Weight transfer on cross-country skis requires laterally transferring body weight from one ski to the other, after a leg push, and then moving the center of body-mass forward, all while gliding. A well-balanced skier will have their belly button directly over the ski just before the start of the push phase. Balancing on the glide ski enables you to use body weight. Efficient use of the leg in the push phase, results in effective propulsion. Also, in some classic technique maneuvers, it is important to have complete weight transfer to load the ski to permit the grip wax to contact the snow.

Basic Element #2 Movement Initiated from the Body Core

Cross-country skiing incorporates the legs and arms as well as the body core. When we observe a skier, we often look at the movement of the arms and legs and pay less attention to the subtle, but very important, movements of the body core. The large muscle groups in the hips, the stomach and upper back muscles contribute greatly in initiating movements in the push, recovery and glide phases.

The hips initiate movement, improve weight transfer, balance and glide and help to maximize the efficiency of the legs and torso.

The hip is a ball and socket joint that permits multidirectional movement. In the diagonal stride, the uphill diagonal stride and the one-step double pole, the forward movement of the leg in the recovery phase is initiated from the hip. From a forward hip position the sequential movements of the joints from the large hip joint, than the knee followed by the ankle creates maximal force. In addition, the foreword drive of the knee, initiated from the hip, creates a longer stride. Viewed from the front you can see the opening up of the hip each time a stride is made. Viewed from the side you can see the extra inches added when the leg moves forward.

The hips initiate movement in skating, similar to classic technique. The hips move forward in recovery so that they can be actively used in the push phase. For many novice to intermediate skiers, rotating the hips to face the glide ski assists in weight transfer and enhances balance. Hip rotation is much more evident and required at slower speeds when the 'V' is wider, than it is at higher speeds.

The stomach and upper back muscles are responsible for the majority of the propulsion in the upper body. In double poling, the stomach muscles 'crunch' to load the poles followed by the upper back muscles contracting to extend the arms behind the skier. The elbows are 'locked' in the first half of double poling, with their role being to transmit muscular force from the body core to the poles. The stomach muscles also function as a stabilizer between the upper and lower body, and they control body position.

Basic Element #3 Coordination and Timing

The sequential use of the joints from larger to smaller improves forward propulsion and prevents premature muscle fatigue. In the diagonal stride, the force created in the poling motion is initiated from the torso, then the back, shoulders and finally the arms and wrists. The leg push phase starts from the hip, then the upper leg, followed by the lower leg.

The upper and lower body movements are coordinated for optimal performance. The Pole assisted glide refers to the slight timing difference in the push phase of the torso and the push phase of the leg. In maneuvers such as diagonal stride and one-skate for a beginner to intermediate skier, the torso starts to load the poles momentarily before the start of leg push. This slight timing difference is beneficial in maximizing the use of the upper body and in maintaining momentum. In recovery, the arms move forward in a linear motion and are planted quickly in front of the body. Once planted the torso loads the pole(s) followed by the start of the leg push. This timing difference is a fraction of a second and is sometimes difficult to see without observing the skier in slow motion. Skiing consists of well-coordinated movements that are smooth, powerful and complete, even as terrain and tempo change.

Basic Element # 4 Forward Knee Drive

In most skiing maneuvers, the left and right leg move opposite to one another. Starting at the feet together position, the push leg is extending down and back in classic; or extending to the side in skating. The forward moving leg leads with the hip and as the ski contacts the snow the ankle and knee are bent. This leg position is advantageous for a number of reasons, such as:

- Increasing maximal force during the push phase and follow through;

- Allowing for a greater extension;

- Resulting in an extended push phase. In classic skiing the foot moves forward to come in line with or ahead of the supporting leg foot. In skating the foot is projected forward so that the heel of the recovery foot lands in front of the toes of the supporting leg foot;

- The hips are moved forward and incorporated with the largest and strongest muscles in the leg push; and

- The forward hip position allows the torso to move forward to weight the poles when the poling phase begins.

In uphill skating maneuvers, there is less emphasis on projecting the feet forward to avoid stalling and excessive loading of the legs. In this situation, the recovery foot moves forward equal to the supporting leg, and a higher tempo is used.

Basic Element #5 Arm Action

The main function of the arms is to assist in transmitting force created from the weight of the upper body, a strong torso and back muscles. Arm action also assists in controlling the skier's tempo. At the time of the pole plant, the shoulder is slightly extended permitting a forward reach with the arms. The hand is directly in front of the shoulder and does not come above shoulder level in classic skiing and no higher than head level in skate skiing. The poles are planted with the arms approximately shoulder width apart and the elbows are bent between 90-120 degrees. Depending on the maneuver, the pole is positioned leaning forward with the pole basket planted ahead or behind the front of the ski binding. The elbow remains flexed from the time that the pole plants to when the elbow approaches the hip. Afterwards, the forearm extends and there is a relaxed handgrip as the arm moves behind the body.

As a result of this powerful poling motion of the torso and back, the pole is naturally extended in a straight line behind the body. The arm recovers linearly without any lateral movement. The arm action sets the tempo of the legs. To maintain momentum while climbing hills, the tempo is increased and the arms will have a quick front to back motion. A skier's tempo will be faster up hills and slower on flat sections. Depending on the maneuver used, the arm and hips or the arm and opposite hip will recover forward at the same time.

Chapter 2 - Skating Technique

Introduction

Skate skiing has evolved considerably since its beginnings in the early 1980's. Skate skis are waxed only for glide and there is a longer push phase resulting in higher average speeds compared to classic skiing. Skating and classic technique equipment differs considerably. Skating equipment poles are longer; skis are shorter and have a stiffer camber while ski boots have a higher more supportive ankle cuff and a more rigid sole.

To understand skating technique, it is helpful to be aware that each of the various

maneuvers used in both skating and classic techniques can be divided into 3 phases. The push phase, the recovery phase and the glide phase.

Free Skate

Introduction

The free skate is a primary skill, which has application to all skating maneuvers. This skill uses only the legs for propulsion and assists in developing an overall more efficient leg push. Free skating can also be used when speed is too fast to employ poles.

Mechanics

When the feet are close together body weight is completely balanced over to one ski. The weighted leg flexes at the hip, knee and ankle and pushes the ski to the side and extends the leg. The torso and hips start to rotate in the new direction of travel towards the new glide ski. The non-weighted ski is stepping forward at the same time and creates a 'V' alignment. The ski is placed flat on the snow and body weight is gradually transferred fully to this ski.

Progressive Drills

Some progressive drills that you can use include:

Step, stand tall and glide;
The waiter drill
Heel tap
High beam

Key Technical Points

The key technical points for the free-skate are:

- A complete weight transfer onto a flat ski.
- The hip, knee and ankle flex and push the ski to the side.
- Hips and torso pivot to face the glide ski.
- Force is first exerted first through the center of the foot and then to the mid-section of the foot at the end of the push phase.

- The push leg ski fully extends.
- The push ski rolls onto its inside edge as the body rotates into the new direction of travel.
- The leg push projects the skier's body into the new direction of travel.
- Each leg should apply the same amount of force during the push phase.
- The body remains relatively upright during the recovery phase.
- Hips move forward during the recovery-glide phase and should be ahead of the ankle by the feet-together position.
- The arm swing - without poles - is gentle and rhythmic, thus helping the body move in the new direction of travel. The arm action is similar to that of the diagonal stride - as the glide ski moves forward during the push phase, so does the opposite arm. The arm and glide ski move in the same direction.

Double Poling

Double poling is a fundamental skill and is used in 1-skate, 2-skate and offset maneuvers. The double poling upper body motion is symmetrical in 1-skate and 2-skate and slightly asymmetrical in offset maneuvers. Body weight is balanced over each ski during double poling. In the double poling action, the upper body crunches to load the poles, the elbows are locked initially and the skier should feel the force originating from the body core and back muscles.

Body Mechanics

The skier is balanced over the skis and assumes an athletic stance to set up for double poling. While keeping the heel flat on the weighted ski, the knees are slightly flexed and the hips are ahead of the ankles. The elbows are bent close to 90 degrees and the pole shaft is leaned forward so that the pole baskets are placed in the snow in line with or 2-3 inches ahead of the front of the binding.

At the start of the poling motion, the torso compresses to load both ski poles simultaneously. The torso compression is initiated first from the upper abdominals, followed by the middle, lower abdominals and upper back. The elbows are kept in a slightly flexed position until the hands reach the skiers side. The torso compresses to a maximum of 60 degrees from the vertical. Once the hands pass the hips, the

forearms extend behind the skier. At the end of the poling motion when the arms are completely extended, the hips and the arms begin to move forward simultaneously.

Progressive Drills

Try this drill for engaging the abdominals:

'Crunching' by keeping your *elbows locked* throughout this phase and crunch with your upper abdominals followed by your lower abs. Think of curling your torso, as you would use an abdominizer apparatus. The shoulders compress towards the knees.

Double Poling Key Maneuver Points

Key points to remember for double poling include:

- The body moves forward so that the hips are ahead of the ankle joint at the initiation of the poling motion.
- The poles are planted with flexed arms, parallel and shoulder width apart.
- The upper body loads the poles.
- Compression of the torso occurs through contraction of the abdominals and upper back muscles.
- The forearms extend as the hands approach the hips.
- Follow through with the arms until the ski pole forms a straight line with the shoulder.
- The arms move in a straight-line front to back; and
- The overall movement is continuous and fluid.

Offset Skate

Introduction

The offset skate is used on uphill sections of a trail or on flat terrain when the glide is slow. The name of the maneuver comes from the asymmetrical placement of poles due to the wider 'V' in the skis and because one pole is planted further ahead than the other. Offset has one double poling action occurring with every two-leg pushes. The skier assumes an active forward lean from the ankle to the shoulder and the leg action in the offset is very similar to that of the free skate.

Body Mechanics

Offset poling is parallel, although slightly 'offset' or leaning to one side. The lead hand is higher than the lag hand. Both pole tips and the new glide ski touch the snow at the same time, hence, a three-point touch - thus initiating the pole assisted glide. Through the poling motion the skier is initially directed towards the push ski. Both elbows remain flexed until the hands approach the hips followed by the arms extending behind the body. Both poles are pulling and pushing in the same direction, down and back and both arms complete the poling motion at the same time.

The leg push occurs very soon after the pole assisted glide is initiated. The leg pushes to the side extending the hip, knee and ankle. When the hands approach the hips the hips and the torso rotates to face the new glide ski. This assists in facilitating weight transfer and helps to develop more power. On steeper terrain a quicker tempo is used to maintain uphill glide.

Progressive Drills

Some progressions that you can use include:

Three point touch by picking up both poles and one ski at the same time and place down together. You can say out loud "3" and "1" indicating a three point touch and then 1 point touch with the lag ski.

Walk up hill and tap poles into the ground in the offset form; and

Penguin walk with skis removed walk like a penguin emphasizing rotation of the hips.

Key Technical Points

The key technical points for offset are:

- Complete weight transfer before each leg push.
- Double poling on each second leg push.
- Skier uses a forward knee drive.

- There is an equal push from each leg.
- Direction of the body in the first half of the maneuver is toward that of the lead ski while in the second half is toward the new direction of travel.
- During the leg push the hip, knee and ankle extend; and
- In order to maintain momentum the skier adopts a quick tempo.

1- Skate

Introduction

The one-skate is a moderate to high-speed skiing maneuver and is used in various terrain conditions including accelerating on the flats or cresting a hill. One-skate is the most powerful skating maneuver and racers often use it on moderate inclines. This maneuver is characterized by double poling on each leg stride. This technique sometimes challenges skiers since the long glide phase requires good balance to do it effectively.

Body Mechanics

The skier completely transfers body weight to one ski, balances and glides while moving forward to a relatively upright body position. At the start of the poling action the skier is facing the glide ski and both hands are in front of the body and the poles are ready to be planted in the snow. Upper body weight is applied to the poles and the torso compresses. The first half of the poling motion projects the skier in the direction the glide ski is travelling. As the hands approach the hips the torso rotates toward the new direction of travel. The final half of the poling action occurs in combination with the leg push and projects the skier into the new direction. Head movement during double poling should be over each glide ski.

Progressive Drills

Some progressive drills that may help include:

With skis parallel and weight on one ski double pole in a balanced position using a classic track.

Include double poling 3 consecutive times on each ski, while ensuring that the weight is over the ankle to mid foot and that the knee is in alignment with the ski; and

With skis parallel, double pole 2 times with the weight on both skis. On the second double pole, step and rotate the hips.

Key Technical Points

The key technical points to remember about one-skate are:

- The Body weight is fully transferred to the glide ski.
- The Skier moves forward on a balanced ski.
- The push phase begins at the legs together position and is initiated by the double poling action.
- The first of the poling action directs the skier in the direction that the push ski is pointing.
- The poles are planted with hands at approximately shoulder height and in front of the body.
- The Compression of the torso loads the poles and initiates the double poling motion.
- The elbows remain flexed early in the poling motion.
- As the hands approach the hips, torso and glide ski turn to face forward.
- The leg pushes sideways and fully extends.
- Both legs push with equal force.
- The arm action is down and back.
- The Poling action finishes at the same time the push leg finishes; and
- The faster the tempo, the less the torso compresses.

2 - Skate

Introduction

The 2-skate is a high-speed maneuver used on flat or slight downhill sections when glide is good. This maneuver is characterized by one double pole for every two-leg pushes. The skier has a poling, leg push phase on one side of the body, but a leg-push-arm-recovery phase on the other side.

Body Mechanics

As with the 1-skate, the skier completely transfers body weight to one ski, balances and glides, while moving forward to relatively upright body position. At the start of the poling action the skier is facing the glide ski and both hands are in front of the body. The upper body loads the ski poles and the torso compresses using the core muscle groups. The first half of the poling force projects the skier into the direction the glide ski is travelling. As the hands approach the hips, the torso turns slightly to the new direction of travel. The final half of the poling action occurs in combination with the leg push and projects the skier into the new direction. Body weight is transferred to the non-poling side and the leg-push-arm-recovery phase begins.

Progressive Drills

A progression of drills for 2-skate may include:

Having the instructor following the student and holding their poles to introduce the timing of the arms.

Key Technical Points

The key technical points for the 2-skate are that:

- The Body weight is transferred fully to the glide ski.
- The Skier moves forward on a balanced ski.
- The Leg push is equal on both sides.
- The Direction of poling is initially directed towards the push ski while in the second half of the push the poling is directed towards the new direction of travel.
- Use the same leg action as the free skate; and
- The arm recovery is smooth, relaxed and is typically slower than 1 skate.

Half Skate (Marathon Skate)

Introduction

The half skate or marathon skate created the skating frenzy and revolutionized cross-country skiing in the 1980's. In this maneuver, one ski is placed in a classic track while the other ski is placed at an angle to the track, followed by the leg pushing to the side. The half skate can be used in a variety of conditions such as when the classic

tracks are glazed and provide better glide than skating tracks, cornering, passing and when the tracks are too narrow for other skating maneuvers. Finally, the half skate can be used as a learning tool by isolating the skating movement to one side of the body at a time.

Body Mechanics

In the half skate, the skier positions the skating ski at an angle to the track ski. The feet are in a heel-to-toe alignment and body weight is completely transferred to the glide ski. At the start of the poling action, the skier is facing the glide ski and both hands are in front of the body. The upper body weight is applied to the poles and the torso compresses. The first half of the poling motion projects the skier in the direction the glide ski is travelling. As the hands approach the hips, the torso rotates toward the track ski. At the end of the poling motion and leg push, the body weight is transferred to the 'track' ski.

Progressive Drills

For a half-skate includes: 'jumping' the classic track on each next stride

Key Technical Points

The key technical points for half-skate are:

- The ankle, knee, and hip of the glide leg straighten as the body moves to balance over the glide ski.
- The skier starts from the heel-to-toe position.
- The hands plant the poles at shoulder height and in front of the body.
- The phase begins with a 3-point touch of the skating leg and both poles.
- The torso and hips are initially facing the direction of the skating ski.
- The torso weights the poles.
- The first part of the poling action directs the skier in the direction the skating ski is pointing.
- The torso compresses and force is transmitted to the poles.
- The elbows remain flexed early in the poling motion.

- The push leg extends fully at the end of the push.
- As the hands approach the hips, the head and torso turn to face the direction the ‘track’ ski is pointing.
- The final part of the poling action propels the skier in this direction.
- The arm action is down and back until the arms fully extend behind the skier's body.
- The body weight is transferred to the ‘track’ leg at the end of the poling motion; and
- As the body recovers forward the ‘track’ ski hip is positioned directly over the ski.

Diagonal Skate

Introduction

The diagonal skate is used on very steep uphill terrain where snow conditions or the skier's fatigue prevents the skier from performing the offset skate. This maneuver resembles a herringbone with glide.

Body mechanics

As in the diagonal stride, the arm returns to the front of the body at the same time the opposite ski moves forward. The pole basket is planted in the snow on the outside of the ski and behind the foot, or beside bindings for stronger skiers. The hand of the pole being planted is in *front* of the skier. The elbow is flexed when the skier applies force to the pole. The pull is straight down and back, and it finishes as a push behind the skier with a noticeable and powerful roll of the shoulder. As the hand passes the hip, the elbow and wrist fully extend, and the hand opens; as a result, there is an imaginary straight line from the snow to the skier's shoulder. As one pole finishes its push action, the other pole is ready to be planted.

As the hand passes the hip, the opposite glide leg begins to flex, thus preloading the muscles for the upcoming push phase. At the same time, the head and torso start to turn toward the new direction of travel. A powerful compression of the torso will create a strong poling action.

The skier transfers his or her weight to a flat push ski. The steeper the hill, the wider the V will be. Steep hills will require an active forward lean at the hips and a lowered center of gravity to facilitate stepping up the hill rather than standing too upright.

Progressive Drills

Drills for the diagonal-skate include a herringbone walk and glide.

Key Technical points

Key technical points for the diagonal skate include:

- At touch down, the ski is placed flat on the snow.
- The arms swing rhythmically, helping the body move up the hill.
- The torso compression exerts downward and backward force on the poles.
- The recovery foot returns flexed - to the heel-to-toe position.
- The leg push is to the side.
- The skier maintains glide, thus ensuring that full extension of the push leg occurs.
- The ankle, knee, and hip of the glide leg straighten as the body moves to balance over the glide ski.
- The first half of the push phase is along the direction the left glide ski is pointing.
- The skier keeps his or her hips forward with the ankles as much as possible.
- The recovery foot is projected forward and up the hill; and
- The speed of recovery of the opposite arm and leg establishes the tempo.

Skating Changeovers

Changeovers are the movements made in the transition from one maneuver to another. The analogy of maneuver changeovers is that of changing gears in a motor vehicle. The lowest gears are maneuvers such as the diagonal skate and the offset skate. Higher gear maneuvers include the half skate, free skate, one-skate and two-skate. Maneuver changeovers assist in increasing or decreasing acceleration, energy efficiency, or terrain changes.

Mechanics of Skating Changeovers

Changeovers are usually performed in the "gear box" sequence when terrain transitions are gradual.

When the terrain or acceleration needs are rapidly different, the skier may jump steps in the " gear box".

The key focus in changeovers is maintaining speed and efficiency when changing maneuvers. Retaining efficiency and rhythm in the leg action is often the key to smooth transitions.

Chapter 3 - Classic Technique

Introduction to Classic Skiing

Classic technique is the traditional method of cross-country skiing and can be done on a wide range of terrain and settings from backcountry to groomed set tracks.

To understand classic technique, it is helpful to be aware that each of the various maneuvers in classic techniques can be divided into 3 phases. The push phase, the recovery phase and the glide phase.

Diagonal Stride

Introduction

The diagonal stride is used on both flat terrain and moderate up-hills. The overall striding action is similar to walking; in that the diagonally opposite limbs move forward at the same time and back at the same time. For example, as the left arm swings forward, so does the right leg. The torso maintains a forward lean throughout the stride. The striding action, weight transfer, and dynamic balance of the diagonal stride form the basis for all classic skiing maneuvers. The movement of the arms, legs, and torso are coordinated, fluid, and rhythmic.

Arm/Poling Action

The arms move opposite to one another. Each arm is coordinated with the opposite leg. In preparation for the pole plant, the shoulder extends slightly forward with a slight bend at the elbow. The hand is directly in front of the shoulder and just below shoulder height; the ski pole leans forward and the basket is planted slightly ahead of the binding of the opposite ski. At the initiation of the pole plant, the torso compresses slightly to load the poles. The elbow remains flexed from pole plant, to when the arm approaches the hip. As the hand passes the side of the body, the elbow extends into a pushing action. At the end of arm extension, an imaginary straight line is formed from the shoulder to the pole basket.

Once the pole has passed the hip, the skier gradually releases the pole handle. The handle stays wedged between the thumb and index finger, and the strap holds the pole in place.

A forward movement of the shoulder is followed by the arm and initiates the arm recovery. As the hand passes the hip, the elbow flexes and continues to move forward no further than shoulder height - at which point the hand is ready to plant the pole again. The skier minimizes lateral movements in the arms by making straightforward and back movement.

Leg Action

In the feet together position, the hips and shoulders are ahead of the ankles and the body weight is balanced over one ski. Just before the start of the stride, there is flexion at the knee and ankle joints of the push leg, followed by extension of those joints. Force in the stride is directed down and back and the ‘push’ is quick and explosive. When the foot leaves the snow at the end of the stride, the leg and torso form a straight line from the shoulder to the toe. In this extended position, the skier's weight has been transferred onto the new glide ski.

At the start of the leg recovery, the skier’s body is moving forward over the gliding ski. The skier forcefully drives the leg forward by leading with the hip and the recovery foot

moves in line with the gliding ski foot, before touching the snow. In the gliding phase, the skier's body weight is distributed equally throughout the glide foot. The support leg straightens slightly as the skier's body moves forward and over the ski, in preparation for the next stride.

Timing and Coordination

The arm push starts slightly before the leg push. As soon as the arm is in front of the skier's body, the pole is quickly planted and the upper body push phase is initiated. The start of the leg push occurs as the hand reaches the hip. This is termed 'pole assisted' glide and the slight offset motion of the leg and arm maintains the momentum of the skier throughout the stride.

Progressive Drills

Some helpful drills for diagonal stride begin without poles:

Walk with skis emphasizing weight transfer

Then Walk with a glide

Single scooter

Pole in track

Stick man

Now some drills with poles:

Stride while holding poles at balance point.

Key Technical Points

The key points to remember about the diagonal stride are:

- The arms and legs are coordinated to move in continuous and fluid motion.

- There should be a straight front to back motion; keeping the hand below shoulder height in front when planting the pole.
- A complete weight transfer is essential for effective forward motion, minimum expenditure of energy, and maximum effectiveness of the grip wax.
- The hips are ahead of the ankle joint, at the legs together position.
- Maintain a fairly consistent forward lean of the torso, throughout the stride.
- The recovery foot contacts the snow, after it passes the glide foot.
- Flex the elbow joint to provide power to the first half of the poling push.
- The push phase is initiated with a slight torso compression to load the poles.
- Flex the push leg to enhance the power of muscle contraction.
- The Push-off of the foot begins from the whole foot.
- There ought to be a straight-line extension from the shoulder through to the toe
- Return the recovery leg forward as quickly and forcefully as possible.
- Return the torso to its original forward lean position once poling action is finished completed.
- The body moves forward and completely across from one ski to the other; and
- Make precise and coordinated body movements given the terrain and tempo .

One-Step Double Poling

Introduction

One-step double poling is a combination of a single diagonal stride and a double-pole action. It is an alternative to the diagonal stride in fast conditions and an alternative to double poling when the conditions are slow. It can also be used as a transition from diagonal stride to double poling and vice versa.

Stance

From the ‘glide’ position of double poling there is a forward lean from the ankles to the shoulders. With the hands just ahead of the hips the knees and ankles are flexed.

Mechanics

In the feet together position the body is balanced over one ski and weight is distributed throughout the foot. Just before the start of the stride, there is flexion at the knee and ankle joints followed by extension of those joints. Force in the stride is directed down and back and the ‘kick’ is quick and explosive. During the leg push both arms come forward to shoulder height. At the end of the stride the push leg and torso form a straight line from the shoulder to the toe just as the foot is leaving the snow.

In this extended position the skier's weight has been transferred to the support leg. The body moves forward and the support leg straightens slightly at the knee. With the body in a forward position, the upper body weight and torso load both ski poles. While the double poling action occurs, the recovery leg moves forward to a position beside the support foot. Through the final poling action, the skier’s weight moves over both heels, which are then projected forward of the knees to maximize glide.

When the arms are completely extended behind the body, the hips and the arms begin to move forward simultaneously. The skier's body returns to the upright gliding position with the hands passing even with the hips. A slight shuffle of one foot forward of the other occurs to prepare for the next leg push. The skier is now ready to initiate the next stride on the opposite leg.

Progressive Drills

Some good drills for one-step-double-pole, start without the poles:

From a standing position with the hands slightly ahead of the hips transfer all of their weight onto one ski.

Now focus arms coming forward at the same time as the leg push occurs

Hold the poles at mid-shaft

Key Technical Points

Key points to keep in mind when you practice the one-step-double-pole include:

- Start in the gliding position with the hips forward and the hands just ahead of the hips.
- The Body weight is completely transferred to one ski.
- The weighted leg foot is slightly ahead of the other foot prior to the start of the push phase.
- The Push-off begins from the whole foot.
- As the leg push occurs, both arms move forward in preparation for the double pole.
- The poles are planted with flexed arms.
- The weight of the upper body and the compression in the torso loads the poles.
- The Flex finishes with the torso 60 to 90 degrees from the vertical.
- When the pole push is complete, recover to the upright position as for double poling; and
- The body moves forward during the recovery phase so that the hips are over the ankle joint at the initiation of the push phase.

Uphill Diagonal Stride

Introduction

The uphill diagonal stride is a modified diagonal stride with the main objective of maintaining glide and momentum on up-hills. The glide phase in the uphill diagonal stride is shortened and the tempo is increased compared to the diagonal stride on flat terrain.

Mechanics

Leg Action

The mechanics of the uphill diagonal stride are very similar to the diagonal stride. The skier's stance is the same relative to the terrain. The skier begins the uphill with a fluid diagonal stride, and, as glide decreases, the skier increases tempo. The hips are kept low to the ground and the leg is projected up the hill as far as possible. By the

time the glide ski supports the body weight, the ankle is well ahead of the knee.

At the beginning of the push phase, where one leg just passes the other, the hips and shoulders are ahead of the ankles. There is noticeable flexing at the knee and ankle of the push leg. The leg extends from the hip, knee, ankle and the ball of the foot. Force in the stride is directed down and back and the ‘kick’ is quick and explosive. At the end of the leg push the ankle and torso form a straight line from the shoulder to the toe just as the foot is leaving the snow. In this extended position the skier's weight has been transferred onto the new glide ski.

Arm/Poling Action

The poling action is the same as in the diagonal stride except that in order to maintain correct timing with the legs the poling motion is shortened and there is a greater bend in the elbow at pole plant. At the initiation of the pole plant, the torso is over the pole and compresses slightly to load the poles**.**

Timing and Coordination

The torso push starts before the leg push. As soon as the arm is in front of the skiers body the pole is quickly planted with a bent elbow and the poling phase initiated. The start of the leg push occurs as the hand nears the hip. This slight offset timing of the arms and legs maintains the momentum of the skier throughout the stride.

Good technique in the diagonal stride is characterized by clear transitions from a fluid, extended diagonal stride on the flats, to the shortened, higher tempo diagonal stride on the up-hills and back to the extended movements of the diagonal stride as the hill becomes less steep.

Progressive Drills

Drills for uphill diagonal stride start by:

Running uphill, emphasizing projecting foot forward.

Add leg pre-load and arm tempo

Key Technical Points

Key technical points for the uphill diagonal stride are:

- The skier assumes the same body position relative to the ground similar to the diagonal stride.
- The Arms and legs move in continuous and fluid motion opposite one another.
- The Hips remain low as the body moves forward and completely across to balance on a flexed leg over the gliding ski.
- The ankle joint is ahead of the knee joint when the foot is projected forward.
- There is Complete weight transfer to the push leg heel.
- The hips are ahead of the ankle joint at the legs together position.
- As the hip and leg drive forward, the skier keeps the hips low to the ground.
- The push is initiated from a flat foot with the heel down on the ski.
- There is a straight-line extension with the leg and the torso occurs at the end of the push phase.
- As the pole is planted, there is slight compression of the torso to load the pole.
- The Arms are slightly flexed when the poles are planted.
- Tempo is appropriate to maintain speed and prevent stalling on the uphill.
- As the terrain steepens, the skier tends to glide less and so stride tempo and pole action quicken; and
- The recovery foot is projected forward so that it contacts the snow after it passes the gliding foot.

Herringbone

Introduction

The herringbone is a modification of the diagonal stride when a hill is too steep for the uphill diagonal stride. This maneuver gets its name from the distinctive pattern it leaves in the snow.

The Basic Herringbone

When a hill becomes too steep the skier gradually pivots the ski tips outward to form a V and uses the inside edges of the skis to maintain grip. The skier steps off one ski, transfers weight to the other ski and lands in a 'V'. Throughout the herringbone the skier's shoulders, hips and knees are ahead of the ankles. The pole is planted behind the foot with the pole leaning forward up the hill so that the skier may effectively push with the arm. Similar to uphill diagonal stride the diagonally opposite limbs move forward at the same time and back at the same time. The skier's feet are far enough apart to prevent the tails of the skis from pinning each other.

Progressive Drills

Some progressive drills for the herringbone are:

Walk normally with poles and skis

Open skis into a 'V''.

Then Use a steeper incline; and

Emphasize the poling action.

Key Technical Points

Key technical points to remember for the herringbone:

- maintain both the angle between the skis and the edging on the insides of the skis.
- The size of the 'V' and the amount of edging are only enough to maintain grip.
- Maintain the stance/ balance, weight transfer, arm action, and rhythm of the uphill diagonal stride.
- The legs move straight up the hill.
- Throughout the herringbone, the skier's knees, hips, and shoulders are in front of the ankle.

- The skier maintains the stride rhythm of the diagonal stride and plants the poles outside of the skis; and
- The arm action is the same as in the uphill diagonal.

Classic Changeovers

Introduction

Changeovers in classic skiing are the movements made when in transition from one maneuver to another. The analogy of maneuver transitions is that of changing gears in a motor vehicle. The lowest gears are maneuvers like the herringbone, and uphill diagonal stride. Mid-range maneuvers are the diagonal stride and the one-step double poling. Double poling is the second highest gear in classic skiing.

Changeovers are generally performed in the "gear box" sequence when the terrain transitions are gradual. When the terrain or acceleration needs are rapidly different, the skier may jump steps in the "gear box". For example, the skier may switch from diagonal stride to double poling without using the one-step double pole. The key focus in changeovers is maintaining speed and efficiency while changing maneuvers. Maintaining efficiency and rhythm in the leg action is often the key to smooth transitions.

Mechanics - Double Pole to One-Step Double Pole

The transition from double pole to one-step double pole occurs as speed is lessened owing to terrain changes or slower snow conditions. Instead of keeping the weight centered over both skis during the recovery of the double poling motion, the skier transfers their weight onto one ski to begin the leg push in order to initiate the one-step double poling motion to maintain speed.

Chapter 4 - Nordic Downhill

Introduction

Whether straight running on a trail, step turning, or executing a rhythmic series of parallel turns on an open slope, downhill skiing requires that you safely control your speed and direction. Downhill skiing requires the use of the following five fundamental skills:

Stance & Balance
Timing/Coordination
Pivoting
Edging
Pressure Control

These skills can be developed through a progression of downhill maneuvers. For example, entry-level skiers who ski on relatively gentle slopes and at slow speeds need to develop balance, timing and coordination from an effective stance before attempting to turn the skis. Once you develop these skills, the next step is to correctly apply balance, timing and coordination so that you can pivot, edge and apply pressure control to perform smooth, balanced and controlled directional changes. At a basic level, edging and pressure control are used minimally. By contrast, advanced skiers must develop more edging and pressure control, while coordinating their movements to effectively negotiate steeper terrain.

Alpine Stance

Introduction

The alpine stance is the foundation of all alpine maneuvers. It is a stable athletic stance in which the skier's feet are side-by-side, hip-width apart and equally weighted.

Body Mechanics

The skier's center of mass is midway between the feet and body weight is evenly distributed over both feet. The ankles, knees and hips are slightly flexed and the arms and elbows are held in front of the body and apart, with the back and shoulders rolled slightly forward. The skier's head is up and looking forward while the rest of the body is relaxed and comfortable especially in the upper body.

Straight Running

Introduction

Straight running refers to gliding forward in a straight line down the fall line while in an alpine stance. Skiers use straight running to get from one point to another down a hill, either in or out of the groomed tracks. Beginning skiers can also practice straight running on a gentle slope to familiarize themselves with the sensation of gliding.

Mechanics

In straight running the skier assumes the alpine stance throughout. It is important to stay well balanced, relaxed and look in the direction of travel. The ankle, knee and hip joints are slightly flexed to absorb bumps, and the skier keeps a smooth path of motion while moving down the fall line. The poles are held loosely with the baskets pointing behind the body. To maximize glide the skis are kept flat on the snow, knees shoulder width apart.

Key Technical Points

Key Technical points about straight running include:

The skis are parallel and hip width apart.
The ankles, knees, and hips are slightly flexed.
The arms are forward and apart.
The body is relaxed, and the shoulders rolled slightly forward.

Basic Step Turn

Introduction

The basic step turn while skiing is a stepping movement used to change direction on a downhill corner, to change tracks, or to avoid an obstacle. The step turn is also useful for direction changes in difficult, heavy deep snow.

Mechanics

As you approach the turn look toward the new direction. Transfer your weight to the outside ski and lift the inside ski pointing the tip in the direction of the turn. Lift the

outside ski and place it parallel to the inside ski. Take as many small steps in this way, as are needed to make the turn. Move your hands and arms in the new direction, while looking in the new direction. Use your uphill edges of both skis to prevent skidding and to provide a stable stepping platform. As your step turns improve, flex more at the ankles, knees and hips, which further projects your arms and body in the new direction with each step. After the final step required completing the turn, the weight can again be balanced evenly over both skis.

Progressive Drills

Some drills to help you with the step turn are:

Stepping in a circle demonstrating weight transfer, pivoting by keeping tails of skis in the same place.

Follow the leader figure 8 step turns

Key Technical Points

Key technical points for step turning are:

Weight transfer and balance on the outside ski.
Initiate the turn by pivoting with the inside ski.
Move the arms in the new direction, and look in the new direction.
Transfer the body weight to the inside ski, and bring the outside ski parallel.
Use uphill edges as needed to provide stability.
Take small, well-balanced steps.
As gliding speed and turn radius increases, the take faster steps.

Braking Snowplow

Introduction

The braking snowplow incorporates the alpine stance and uses a wedge position of the skis to create a stable platform enabling the skier to control their downhill speed.

Mechanics

From an alpine stance, with your knees over the toes, pivot your heels apart to create a wedge. Keep your ski tips 6 inches apart and center your body weight between the feet. The wedge should be narrow at first and then wider as braking action is initiated. As the wedge widens, the lower the stance with the knees and ankles flexed and the more the skis are on their inside edges.

Progressive Drills

The snow plow progression is:

Start with a normal snow plow

Snowplow with a wider V and no edge; then

Snow plow with a narrow V but more edging; and

Snow plow stop

Key Technique Points

Key points to consider for the snow plow include:

Pivoting on the heels and forcing apart in a wedge.

Keep the tips of the skis about 6 inches apart.

The degree of braking is controlled by the width of the wedge and the use of the inside edges.

Flex knees and ankles as the wedge widens so that the skier finishes in a "low" stance.

During the time when the skis are slowing down, the skier's weight will have to move back by extension of the ankle joint; and

Once the deceleration is complete, the skier will return forward to the neutral position.

Snowplow Turn

Introduction

The snowplow turn is an easy turn skiers can use on gentle slopes: The skier maintains a snowplow wedge position throughout the turn. It is the first skidded turn in the alpine progression combining the fundamental skills of balance, pivoting, edge

control, pressure control, and coordination to form a turn. These five fundamental skills are developed only to a rudimentary level in the snowplow turn - with balance and pivoting being the most predominant.

Mechanics

From straight running look towards the new direction and transfer your body weight to the outside ski while extending the body. Pivot both feet apart towards the new direction with the outside ski edging more. Progressively flex your knees and ankles for most of the turn. The inside knee flexes more than the outside knee. As the turn is completed, rise gradually and adopt a narrower wedge.

Progressive Drills

Progressive drills for snow plow turning include:

Serpentine turns

Hands to knee

Drag both poles beside downhill ski

High/Low drills touching pylons

Counter Rotation by holding poles in front of body at mid shaft facing downhill

Counter rotation and paddling on downhill side.

Key Technique Points

Key technical points for snowplow turns include:

Balanced stance with more weight transferred to the outside ski.

Steer with a wedge throughout the turn.

Consistent steering action of both feet throughout the turn.

Flex the legs, press down, and slightly edge the outside ski.

The upper body and hips are slightly open to the outside of the turn.

Rise up to the alpine stance as the turn is finished with a narrow wedge.

Diagonal Side Slipping

Introduction

Diagonal side slipping is sideways skidding across the fall line with the skis parallel. Use this maneuver to develop skills of edging and pressure control. In addition, it is also useful for descending a difficult or steep hill, a narrow section of a trail or for skiing down a narrow gully.

Mechanics

Use a straight running, traversing diagonally for the approach. To initiate the sideslipping maneuver, extend at the knees and pivot your skis to point across the fall line while remaining parallel. Roll both knees in the downhill direction to flatten the skis by moving the knees away from the fall line and into the slope. Next, sink into a flexed, stable position with most your weight on the downhill ski. Your upper body turns to face the direction of travel diagonally across the slope and your arms are spread well apart with the downhill hand held lower.

Progressive Drills

Progressive drills for diagonal side slipping are:

The skier completes a snowplow turn, counter rotates and slides on a flat ski

Add extension and flexion.

Technique Key Points

Key technical points to diagonal side slipping are:

The skis are unweighted and pivoted to point across the fall line to initiate side slipping.
The knees move sideways downhill (toward the fall line).
The skis are parallel, hip-width apart.
Most of the body weight is on the downhill ski.
The upper body and hips face the direction of travel diagonally across the slope; and
Both uphill edges are used to reduce speed.

Basic Christie

Introduction

The basic Christie is a slow-to-moderate speed turn useful on trails where a downhill turn slopes away or is icy, making a full snowplow turn difficult. In the basic Christie, the skier makes a snowplow turn through the fall line and finishes with a skidded arc in which the skis are parallel.

Mechanics

Start by snowplowing with a wedge toward the fall line with speed slightly higher than for a snowplow turn. To initiate the turn transfer most of your body weight onto the outside ski. Pivot your feet apart into the new direction with the outside ski edging more. Once you pass the fall line and in the final third of the turn, pivot the uphill ski so that it is parallel to the downhill ski. Both skis continue to turn, causing a skidded arc. This skidding is accompanied by a flexion of the knees, ankles, and hips. To start the next turn, extends your joints and pivot the uphill ski to form a snowplow wedge, and steer your feet in the direction of the new turn.

Technique Key Points

Key points to consider for the basic Christie are:

Steer in a wedge through most of the turn.

Stance remains balanced with more weight transferred to the outside ski.

The upper body and hips are slightly open to the outside of the turn.

The skier flexes in the legs throughout the turn.

The uphill ski pivots parallel in the final third of the turn.

The outside ski continuously steers in a round arc, and its path does not change.

Steering continues with both skis parallel at the completion of the turn, resulting in a skidded arc.

Form round, linked turns with continuous steering effort of both feet throughout the turn; and

The skier extends to form a wedge and start next turn.

The Parallel Christie

Introduction

The parallel Christie is a moderate-to-fast-speed turn in which the skis are parallel throughout the turn. This maneuver is used on down hills where the skier wants to maintain his or her speed during the turn. In this turn, all the fundamental skills of balance, stance, pivoting, edge control, pressure control, and timing and coordination are efficiently combined. The turn is much more dynamic than the slower speed Christies, and skiers will be able to maintain a rhythm linking parallel turns.

Mechanics

From a traverse position your skis are parallel and your body is in a low, ready position. Plant your downhill side pole, extend up and turn your body to face the outside of the turn. Press most of your weight onto the outside ski and pivot both skis simultaneously towards the fall line. Both hands remain forward and slightly facing the outside of the turn. Slowly flex and edge progressively by moving your ankles, knees, and hips into the hill by angulating. Your upper body remains quiet and anticipated, and the lower body remains active and dynamic. Toward the end of the turn, plant your downhill pole and then extend upwards to apply greater pressure on the edges, thus controlling your speed and maintaining the direction of travel. Extending in this way also moves your body into the next turn.

Progressive Drills

The progressive drills to help you with the parallel Christie are:

Pole underneath both knees while turning and extend and flex at the same time; and
Exaggerate flexion and extension.

Key Technique Points

Key Technique points for the parallel Christie include:

Balance your stance with more weight transferred to the outside ski early in the turn.
Steer with both skis in a parallel stance throughout the turn.
Maintain consistent steering action to complete round, fluid turns.
Flex and edge with well-developed angulation and carving in the final two thirds of the turn.
Extend toward the end of the turn to keep pressure on the edges and to move the body into the next turn.
Anticipate turns with a quiet upper body and hips open to the outside of the turn and an active lower body; and
Pole plant to signal the start of the extension.