Irish Association of Snowsports Instructors Manual

IASI

IRISH ASSOCIATION OF SNOWSPORTS INSTRUCTORS

Irish Association of Snowsports Instructors Manual

The Five Key Concepts

Jamie Kagan, Federico Sollini, Derek Tate, Shona Tate,
Pete Gillespie, Jordan Revah and Chris Oldaker

IASI
IRISH ASSOCIATION OF SNOWSPORTS INSTRUCTORS

CONTENTS

Foreward

It is my great pleasure to welcome the new Snowsports Instructor's manual from IASI – the Irish Association of Snowsports Instructors.

Having been a member of IASI since 2012, I have seen the Association consistently growing and developing. This manual, co-ordinated by Derek Tate, is the outcome of the evolution that the training and management teams have been able to put in place after IASI's attendance at Interski 2011 in St. Anton, Interski 2015 in Ushuaia and Interski 2019 in Pamporovo. It is a valuable and up to date tool for the development of the members and it is likely to become a milestone for the future steps of the Association.

The Manual condenses and offers the great amount of experience that the different contributors have gained over years of ski tuition, dedicating their lives to help people in the journey to learn, enjoy and eventually become passionate of a fantastic sport such as skiing: "Learn it, Love it, Live it" is the enthusiastic motto underlying the philosophy of the Association, that permeates the pages.

The five key concepts are leading the reader through a variety of subjects, giving a clear understanding of what the IASI mindset is; what the fundamentals needed for a sport such as skiing are, in terms of technical principles, biomechanics and physical preparation; how the skier develops from early stage to expert stage; how and what the instructor teaches; and very important to understand for every teacher, how the pupils are learning. .

The electronic format that the book comes in – the authors have chosen to publish the text, as a PDF eBook available to be consulted on line – is noteworthy as it makes it very easy to use and to update as the need arises. And such a choice is environment friendly as well which nowadays is an important feature to consider for every human activity including snowsports and snowsports instruction.

Derek Tate, together with the other main writers Jamie Kagan, Federico Sollini and Shona Tate, have been able to offer to IASI members a fresh and lively opera, easy to use and consult to get an overview of what skiing is, how to instruct and how to find new challenges and elaborate new teaching and learning paths, either for the pupils or for the personal development of the reader.

Such a work is meaningful not only for IASI, but also for the International Ski Instructors Association (ISIA) and for the whole ski community: skiing is a situational sport that each person is interpreting in his/her own way, depending on factors such as former experiences and cultural aspects. The new manual delivers an interesting and original view of our sport that is enriching and offering new perspectives to the teachers of the whole ISIA world: I am sure the reader – either the expert or the novice – will find inspiration going through the book.

Vittorio Caffi - IASI Member

ISIA - President

Chapter 1 - IASI's Mission, Philosophy and Concepts

Mission statement

The Irish Association of Snowsports Instructors (IASI) aims to deliver a modern and dynamic educational pathway for aspiring instructors as well as already qualified instructors. IASI's strategy has been to act as an information hub, for our members, pooling the best from the global instructional snowsport scene through building positive communication and relationships. Through this on-going strategy we are able to continually shape our philosophies and technical and teaching models adapting to the needs of the snowsport instructional world and future snowsport.

This forward thinking approach has led to considerable growth in IASI membership especially since the 2015 Interski congress in Ushuaia where the Irish Interski team gathered, collated and reported much information and presented to the IASI membership and further afield via social media, video blogs and presentations. This approach to information sharing and communication continues to form the main pillar in the IASI growth strategy going forwards.

Throughout this manual the aim has been twofold:

1) To improve your knowledge and understanding of how to do the 'job' of being a snowsport instructor - giving advice and practical tips **aimed at the guests** that you teach so that they have the best experience possible.

2) To develop **your own performance** (technical and teaching) so that you can personally get the most out of the sport and, in doing so, better equip you to successfully progress through the certification levels within the IASI system.

IASI's philosophies

Technical skiing philosophy

To develop all mountain skiers who have the ability to use a blend of the skills in such a way that the skis can be steered accurately, dictating speed and direction, on a variety of terrain and in different snow conditions, using efficient and effective movement patterns that work in harmony with the bodies anatomy.

Teaching Philosophy

To develop confident teachers who can teach to a wide range of students (demographics and abilities) in whatever conditions the mountain might throw their way! The ability to adapt and cater for the student(s) needs at any given time and focus on student-centred learning is an essential aspect of what we look for in IASI teachers.

The 3L Philosophy – Learn it, Love it, Live it

The 3L philosophy of **Learn it, Love it, Live it** was first introduced at the Interski Congress 2015, in Ushuaia, Argentina where it was presented to other nations both as a small lecture and through the e-book of the same name **(see references at the end of this manual)**. This philosophy is what underpins the IASI education system. As a philosophy it works on multiple levels: it represents the aspirations of the association and how it educates snowsport instructors, it represents the aspirations of snowsport instructors themselves and it represents what many members of the skiing public aspire to by acquiring a great skill, deriving enjoyment (hedonic pleasure) and making the sport a part of their lives (eudiamonic meaning).

Learn it is all about being open to learning and developing a mindset that promotes such openness. The term 'growth mindset' has been coined by the psychologist Carol Dweck and is all about fostering a love of learning and being prepared to make mistakes and learn from them. Talent and ability are useful but it is passion, perseverance and practice that help you to achieve great things in life and athletes who have a growth mindset develop the mental and moral attributes of good character. Passion and perseverance in the pursuit of long term goals has been called 'grit' by another very prominent psychologist Angela Duckworth and there is no doubt that in order to work through the entire IASI education system students need this quality.

Chapter 9 of this manual will cover, in detail, 'how you learn' and introduce the Diamond Model of Skill Acquisition, cover the importance of mindfulness and mindful learning and why encouraging a flow state is such a desired outcome.

Love it is essentially about learning in an environment that is enjoyable and creates a desire to practice. Without sufficient practice there is little chance of becoming skillful. The old saying that 'practice makes perfect' is somewhat misleading in that what is required is *sufficient quality practice that leads to a proficient level of skills.* Much of the enjoyment in learning skills (and improvement) comes form being suitably challenged so that you become fully engaged and immersed in the task in hand while remaining present moment focused **(see the chapters on mindfulness and flow for more on this)**. However, it should also be noted that, loving the sport also comes from a number of other factors including being in beautiful mountain resorts, being around positive people and socially interacting with others. In other words there are many reasons why people fall in love with snowsports.

Live it is about making the sport part of your life. As was highlighted earlier, this philosophy works on a number of levels hence the “becoming part of your life” and therefore living it can mean different things for different people. For some snowsport instructors this sport will become a career, perhaps even a calling where one uses the sport as a vehicle to help others find enjoyment in life. For others it may simply be a part time job, or a hobby but something that excites them and adds purpose to their life.

However, equally important is that the general public should find joy and excitement in the sport so that they too will want to continue with the sport year on year. Snowsports is a fantastic sport for keeping families enjoying holidays together and it is a sport that you can participate in very late in life so it is incumbent on you, the snowsport instructor, to ensure that your guests have the best experience possible so that they will want to keep coming back for more. Safety, enjoyment, learning (SEL) may seem rather simplistic but it is one of the most important acronyms to remember and to practice day in day out as you teach this great sport.

Introduction to the Five Key Concepts

The Five Key Concepts pull together the IASI education system into one easy to understand model (see Figure 1 below).

The Five Key Concepts

Basic Principles
The fundamentals we need
Forces, Movements, Balancing, Steering

Core Skier Development
Stages we move through
Beginner to Proficiency

PEAR Model
How we teach
Plan, Execute, Adapt, Reflect

IASI Skills Model
What we teach
Edging , Pressure Control, Rotation, Timing

Diamond Model of Skill Acquisition
How we learn
Knowledge, Movements, Performance, Flow

Figure 1

Technical content

Chapter 2

The Basic Principles

Jamie Kagan and Derek Tate

Basic Principles Model

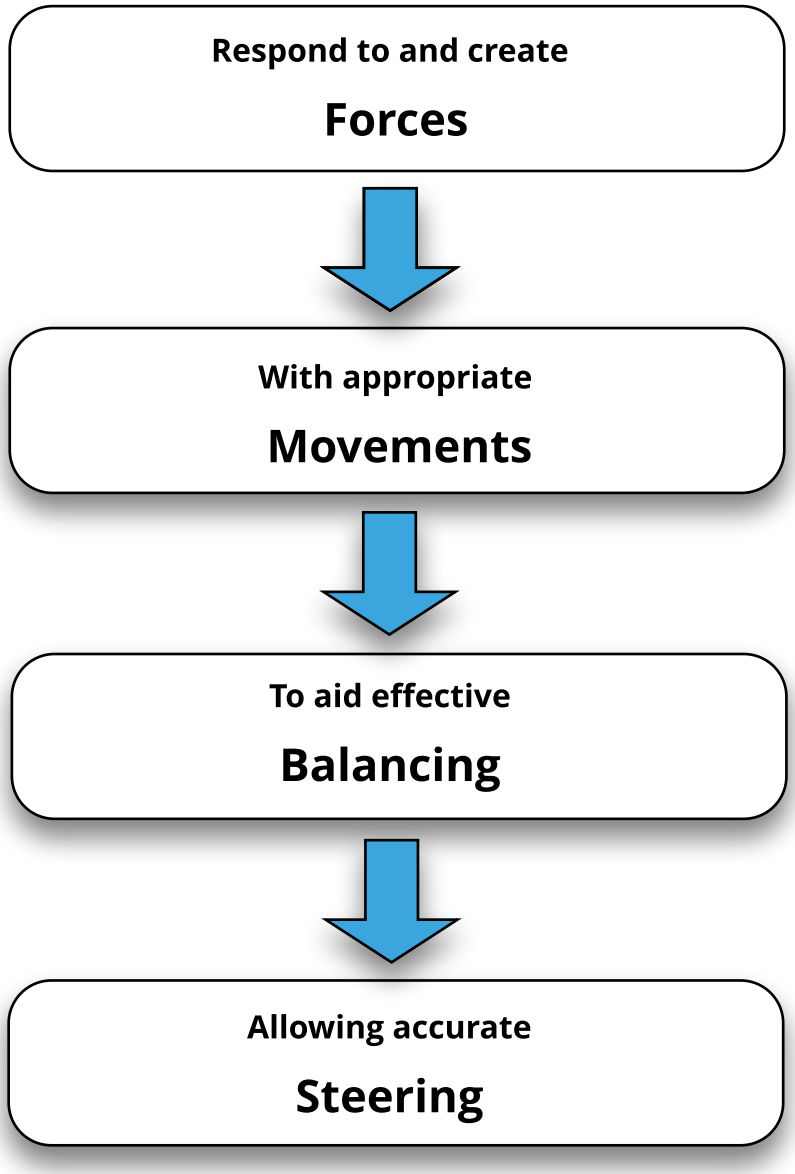


Figure 1

The Basic Principles, as presented here, are what we believe represent the core of expert skiing. In order to achieve these basic principles we teach skills to allow a skier/rider to have a range of tools so that they can tackle the ever-changing mountain environment. This approach opens up the whole mountain and all its varied terrain to both us and the guests that we teach.

Forces

Forces in skiing is a very complex topic and is something that is covered in greater detail later in the manual. In order to summarise how the forces act on us as skiers they can be separated into the following;

- Gravity
- Friction (snow resistance)
- Centripetal force
- Centrifugal force (not a "real" force as such but useful for certain aspects of ski technique)

As expert skiers we need to learn how to respond to and create these forces as we move around the mountain environment. Different terrain, snow conditions, weather and fatigue levels will all have an effect on how we deal with and create these forces. An expert skier has the necessary tools and skill to be able choose the appropriate way of skiing in these differing circumstances.

Movements

The movements that we make can affect our balance in either a positive or negative way! In skiing, it is important to remember that we are not moving or balancing in a static position but rather we have to learn to move and balance whilst in motion.

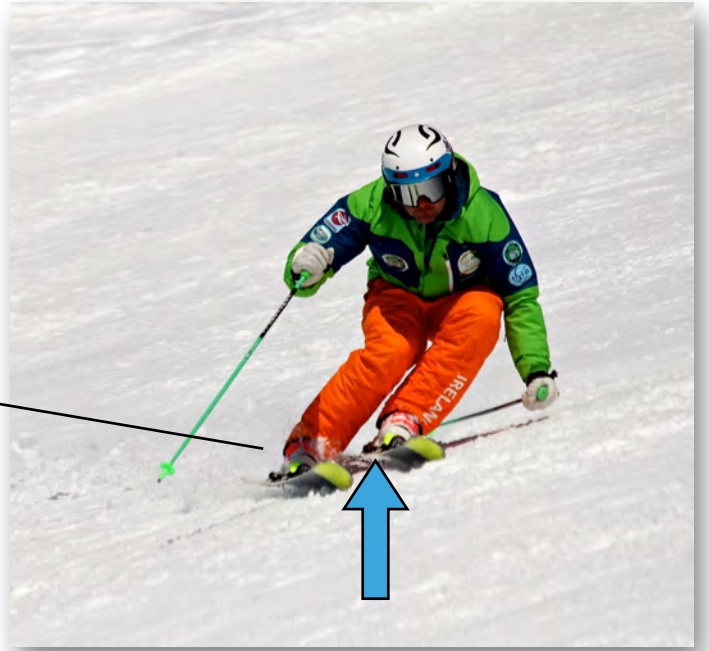
The interaction of movements and balance will be discussed in greater detail later but for now it is useful to have an understanding of the main movements that we make and their direction. These are lateral, vertical, fore/aft and rotary movements that happen about an axis. It should be noted however, that these movements are deliberately simplified for the purposes of ski instruction and are used as a framework by many snowsports instructor organisations. Nevertheless, they are related to the three planes of motion: sagittal (vertical and fore/aft), frontal (lateral) and transverse (rotational).

Lateral movement - is more simply described as 'side to side'. We can move or lean our whole body to the inside of a turn and this is often referred to as inclination and allows us to edge our skis at the top of our turns. However, if we lean the body too far or too quickly to the inside (banking) we will end up either supported on our inside ski or worse still falling over.

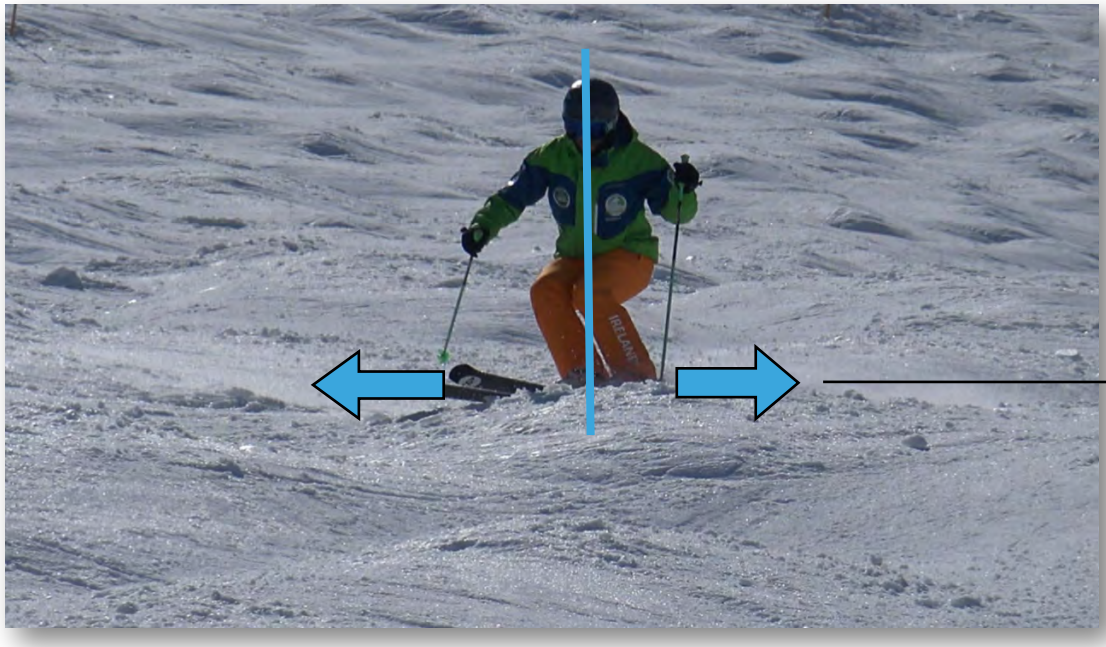
Lateral movement (side to side) creating inclination.

Vertical movements - essentially involve extending and flexing of the legs and hips. The execution of this requires a great deal of practice so that we learn to extend and flex the ankles, knees and hips in unison while maintaining a centered position. The timing of these movements is also important as this greatly effects how we control our skis and keep contact with the ground. For example a quick extension will result in the skis being unweighted at maximum extension. Conversely, a slower, more gradual extension will help to maintain the control and grip of our skis against the snow.

Vertical movement; extension and flexion of the legs and hips.



Fore/aft movements - are generally fairly subtle and are used to keep the skis working from tip to tail whilst turning. These movements become more obvious when skiing bumps, variables and steep terrain as the change in terrain requires fore/aft adjustment to help achieve ski to snow contact and remain centred.



Fore/aft movement allowing the skier to stay centred.

Rotary movements - (about an axis) in layman's terms means 'turning' and this could involve any part of the body. If for example you were to do a 360º spin, this would involve rotating the whole body. However, in alpine skiing, when referring to rotary movements we tend to focus on our ability to turn our legs within our hip socket. We use this movement so that we can pivot our legs and skis (independently of the upper body) and this is an essential component for steering our skis effectively in certain turns.

IASI educators demonstrating rotation of the legs

Balancing

As mentioned earlier. The reason for the term 'balanc**ing**' rather than balance is to highlight that the process of balancing on skis is active not static. To maintain balance we continually make little adjustments. Maintaining balance, while skiing is more complex than balancing while standing still especially when we add in gradient and changes in terrain. Balance in motion can be broken down into two distinct areas; fore/aft (forwards & backwards) and lateral (side to side) as discussed earlier in the section on movements. As we turn our skis we must maintain a relatively 'centered' position so that we are stacked and balanced above our feet. Good fore/aft balance is achieved when we are supported by our bones through good skeletal alignment. To achieve this we need appropriate flexing of our ankles, knees and hips. For example, too much flexing at the knees and hips without ankle flex will quickly lead to very tired muscles.

Steering

The ability to steer the skis effectively can only happen once the skier has developed a good sense of balance combined with appropriate movements that keep them stacked and centred whilst moving. A good way to describe skiing to our guests, in a very simplified way, would be that there are just three things that we can do to our skis; stand on them (pressure), tilt them (edging) and pivot them (rotation).

However, the complex part of this involves **blending** these three elements together.

The ability to blend the elements to create accurate steering is something that can be taught from the early stages of a skiers life and if introduced early can help to bridge the gap between the intermediate and advanced/expert skier. The teaching of skills in the IASI philosophy allow the student and teacher to focus on the individual elements of steering in different scenarios. Then, through the process of skill acquisition the student retains the necessary skills to later be able to choose how the steering elements are blended.

Chapter 3

The IASI Skills Model (SM)

Derek Tate and Jamie Kagan

The phases of a turn

Before we get into the skills and how they relate to different turn shapes that we make when skiing, it is best to first understand how a turn is broken down. With this knowledge we are able to not only identify the skills that may be required but also where in the turn certain skills may apply. **(throughout the following chapter some text will be highlighted in blue. We will explain why later on when discussing Timing).**

By simply having the turn split into sections it allows us to highlight and focus on specific movements and specific points in a turn, which in turn, allows us to be more accurate when developing our students. A great way of thinking of this when giving feedback to anyone is to relate everything to 'the part of the body and part of the turn'. If we are always accurate with the information we give using this method, we stand a very good chance of being understood, thus improving the understanding and ultimately the skill level of the person in front of us.

IASI break the turn down in to 4 phases which can be applied to all turn shapes and snow conditions.

Initiation - Fall line - Completion - Transition

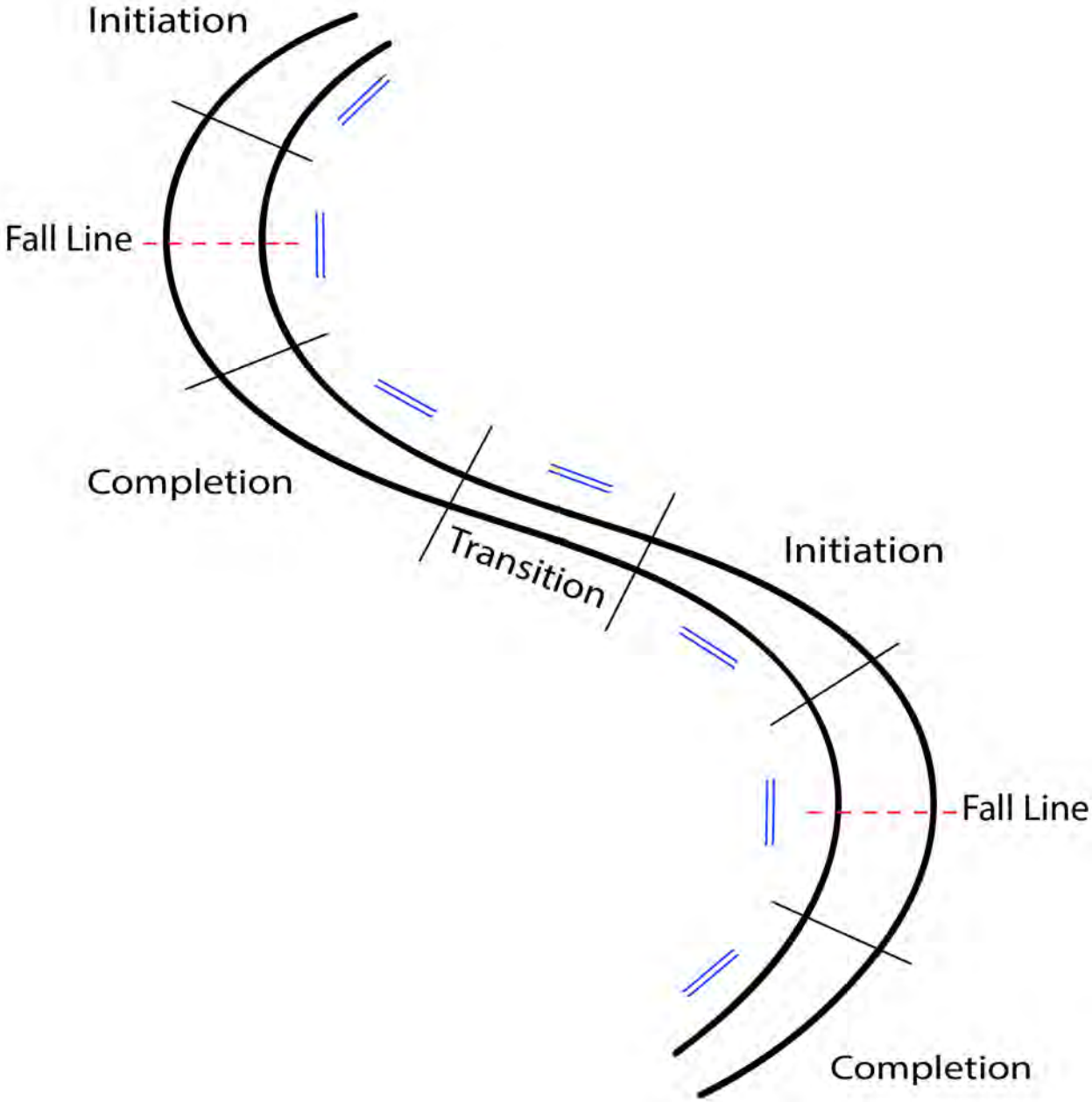
Initiation - This can be explained as the preparation phase of the turn. Our goal in the initiation is to establish balance over what will become our new outside ski. The way we achieve this varies as the skill level of the skier improves, the type of turn shape we are trying to achieve, the type of snow we are skiing and the speed at which we are going. Once balance is achieved our goal should be to start tilting or rotating the ski in order to initiate some direction change and establish some grip from the skis. Depending on the speed of the turn, inclination to the inside of the new turn can be achieved at this stage. **(See chapter 6)**

Fall line - At this part of the turn our goal is to point both skis into and then out of the fall line by continually adjusting the amount of tilt and rotation to maintain the desired directional change. The skier will continue to balance to the outside of the turn and against the forces to prevent the CoM and CoG from falling forwards, backwards or inside the turn. This is achieved by continual fore/aft and lateral balancing movements.

Completion - As speed and performance increase, so do the forces acting on us in this part of the turn. Our goal here is to achieve the desired direction to control the speed of our descent to suit our outcome. We should start to make movements that allow a smooth transition into the next turn by continuing to laterally separate (angulate) whilst at the same time flexing and using appropriate aft movement (two key movements to manage pressure) - these movements timed and blended together allow us to stay balanced and our CoM to start moving towards the new turn. **(See chapter 6)**

Transition - Our goal is to allow the skis to completely flatten and our CoM to move into the new turn. If all has worked well, in transition we should have a moment of calm to start thinking about the movements we'll be undertaking to initiate the next turn.

Turn Phases


Initiation
Fall Line
Completion
Transition
Initiation
Fall Line
Completion


Completion
Transition
Initiation
Fall line
© Grant Nakamura Photography, LLC

Introduction

It is incumbent on us to define skill or skills before delving more deeply into the IASI Skills Model itself.

Skill is simply the *ability* to do something well and is associated with some level of expertise. Skills are domain specific and in snowsports becoming proficient at using certain skills means choosing the **right skill or blend of skills, at the right time**, to the right degree, with the minimum of effort, for the specific environment, to allow the performer to successfully execute the task.

In many sports, instructors use a variety of drills (or exercises) to develop these domain specific skills. However, it is vital that the drill is only used as a tool to develop the skill, or skills, rather than being an end in itself. We are not trying to perfect the drill per se; as to do so would lead to form rather than function. This highlights the importance of a common quote in the world of skiing; "lose the drill and keep the skill" which is a mantra that all snowsport instructors should keep at the forefront of their thinking when planning and delivering lessons. In practice this means **not** finishing a lesson with a drill, but building in sufficient time to ski 'normally' towards the end of the session allowing the learner to derive benefit from the drill(s) that have been used earlier in the lesson.

Technical philosophy

The IASI technical skiing philosophy is as follows:

*To develop all mountain skiers who have the ability to use **a blend of the skills** in such a way that the skis can be steered accurately, dictating speed and direction, on a variety of terrain and in different snow conditions, using efficient and effective movement patterns that work in harmony with the bodies anatomy.*

While the statement above may, at first, seem a little long-winded it is deliberately so because there is important meaning behind the words which link to IASI's overall philosophy of Learn it, Love it, Live it and our overriding goal of looking after the instructor's (and their guests) physical, mental and emotional well-being.

So lets look at the above statement in more detail. **All mountain skiers** means being able to comfortably and skilfully ski the huge variety of terrain and snow conditions (not to mention weather conditions) that are experienced within the ski area. This would include groomed slopes, ice, crud, powder, bumps, steeper terrain, cambered terrain, rollovers, artificial surfaces etc. The IASI snowsport instructor will show a high-degree of competence in a great variety of conditions both on the mountain and at different artificial venues such as indoor snowdomes, outdoor artificial slopes (dendix, snowflex etc.) and indoor rolling carpet slopes.

Using a blend of the skills is highlighted by the inclusion, in the outcome standards of level 3 and level 4, of the *parallel variations*, which are a variety of turns that are **not** purely carved. This requires a strong ability to blend the steering elements to different degrees to produce **accurate steering** that **dictates speed and direction**. And it is the combination of blending skills to match the mountain that leads to the learner moving through to the performance and flow stages of the Diamond Model of Skill Acquisition **(see chapter 9).**

Using **effective and efficient movement patterns** is an integral part of the IASI Skills Model and our approach to teaching the skills. However, of even greater importance is that these movements **work in harmony with our bodies' anatomy** and the biomechanics of the sport **(see chapter 18)** so that we avoid undue stress and unnecessary injury. A good example of this is our approach to skiing bumps, **(see chapter 7)**, where we encourage a variety of lines and turn shapes that promote using a range of skills, while avoiding deeper rut lines that can adversely affect the performer both physically and mentally.

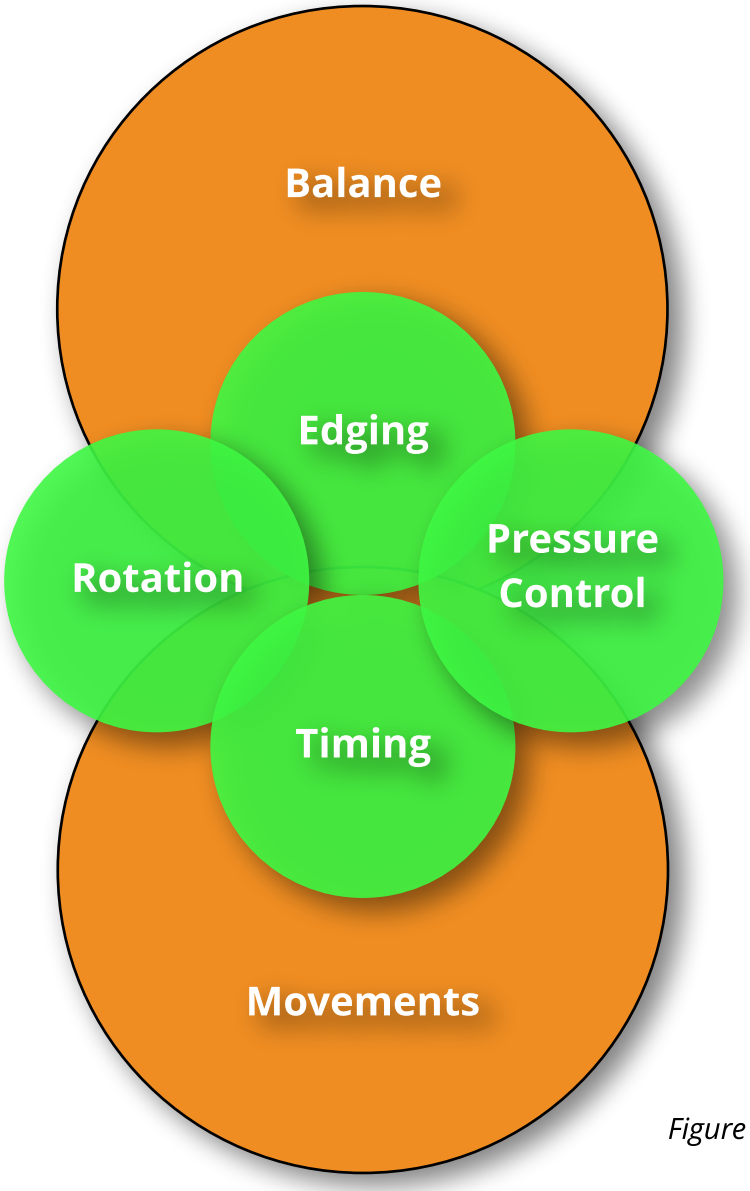


Figure 1

The IASI Skills Model (SM)

The IASI Skills Model (Figure 1 opposite) has at it's core the skills that we teach: rotation, edging, pressure control and timing. These skills are all of **equal** importance and are embodied within the overriding fundamentals of balance and movements. Reflecting back to the basic principles **(see chapter 2)** the essence of the message here is that skiing works from the snow upwards and then back to the skis! In other words, we respond to and create forces, with appropriate movements, to aid effective balancing, allowing for accurate steering of the skis. Therefore, the skills that we teach allow us to acquire the basic principles of skiing and it is the interplay between these skills, balance and movements that we will flesh out, not only in the rest of this chapter, but in the chapters that follow as the skills are applied to Core Skier Development (CSD), piste, variable terrain and bumps.

Rotation

What we are talking about here is movement about an axis and specifically the movement of the legs in order to pivot the skis. The ideal pivot point is underneath the foot where the index mark on the ski boot aligns with the index mark on the ski. The chapters that follow **(See chapters 5,6,7,8)** will focus more on the specific movements of the body while this chapter will deal more with the action of the skis and how and why that movement is so important to the process of steering the skis.

For all of these skills, the instructor can use specific drills to highlight the individual skill but ultimately the four skills of rotation, edging, pressure control and timing need to be used together and that is what makes the performance more effective and skillful. .

However, rotation needs to be **blended into the turn** so that it is **smooth** and constantly 'available' to guide and shape the turn. This also promotes the idea of "using the C rather than the V" when referring to the resulting turn shape. Even the Parallel variations mentioned earlier require a skillful application of rotation to help shape the turn.

So to use rotation skilfully, as part of the steering process, requires the ability to change the amount (how much/how little), while being able to time the where/when. And this will vary greatly on different terrain and in different conditions. Furthermore, on artificial surfaces such as dendix and snowflex, where the resistance is greater, these tasks are, to some extent, a little more difficult and certainly generate different 'feelings' and 'sensations'.

Edging

Edging refers to the angle of the ski or skis against the snow. For many of our guests, and indeed instructors, when asked, what edging is, the response would be along the lines of "increasing the angle of the ski against the snow". While this is certainly 'partly correct' **the decrease in angle is of equal importance**. To help with our understanding of 'edging' it is useful to use the word 'tilting' as this describes more accurately the movement involved in increasing and decreasing the angle of the skis against the snow. At this point, we are only referring to what is happening to the skis themselves and not to the parts of the body involved in tilting the skis which will be discussed later. **(See chapter 6)**

Misconceptions and misunderstanding are commonplace in a sport such as skiing and in relation to the skills being discussed here in the IASI Skills Model. For example, many of our guests believe that increased edge results in greater control, when in fact increased edge simply means increased speed. This is often seen when a learner leans into the hill, perhaps through fear, resulting in an increase of edge angle, a lack of balance and an increase of speed across the slope.

Another misconception is that ‘grip’ and edging are almost one in the same! However, **edge without balance results in an inability to use the other key components of steering namely: rotation and pressure control.** This is perhaps most apparent when recreational skiers tackle more icy conditions. A phrase that we often hear learners use is that, “I need to dig my edges in” to cope with the firmer or icy conditions on the slope. Unlike the racer, the average recreational skier does not ski at very high speeds hence, the relationship between increased angle and increased speed is not a desirable goal in this instance. Control on ice (at lower speeds) comes through modulating and often decreasing the tilt of the skis against the snow promoting good balance and allowing rotation and pressure control to be used effectively to continue dictating or guiding the skis in the desired direction.

Short turns using a good blend of edging, pressure and rotation to maintain 'grip'.

As a final point relating to the skill of edging, at this stage in the manual, and to reinforce the importance of being able to skilfully decrease the tilt of the skis against the snow it is important to understand how this movement aids a smooth transition between turns. Maximum edge angle occurs around, or just after, the apex of the curve with the skier needing to match deceleration towards the end of the turn with reduced edge angle. This allows the skier to remain balanced on the outside ski of the turn as the speed reduces and the edges are changed to begin the new turn.

Maximum edge angle around or just after the apex of the curve followed by reduced edge angle to aid smooth transition between turns.

Pressure Control

Pressure control can, at times, be misunderstood or become 'confusing' to our guests. A phrase that I (Derek) like to use is, "balancing against the ski" because it links the fact that in order to either exert pressure through the ski, or manage the pressure that is already there, the performer needs to be 'in balance' in relation to the outside ski of the turn. So, separating balance from pressure control is simply not possible!

As has been the modus operandi of this chapter so far we will focus more on pressure control in relation to the skis rather than the specific movements of the body that create and manage pressure with the exception of discussing the ankle joint. Chapters that follow will delve more into the leg movement, hips and the upper body and how the movement of these can help or hinder pressure control. **(see chapters 6,7,8**

Pressure control can therefore be categorised as ski to ski (or outside and inside ski in a turn) or fore/aft (along the length of the ski).

In this picture pressure is being exerted through the outside ski promoting good balance which is evident as the ski is in reverse camber.

In general terms, the goal is always to have the greater pressure on the outside ski of the turn. The first half of the turn, where the skis are steered to the fall line, is where pressure builds up or is 'created'. The second half of the turn is where pressure is managed and the skis are turned across the bodies' line of momentum. Once again this is where the separation of the skills becomes difficult because the interplay between creating and managing pressure is highly correlated with edge angle, which in turn is dictated by speed.

The difference between an intermediate and advanced skier and to bridging that gap largely comes down to the learner's ability to effectively use the ankle joint to influence pressure control along the length of the ski from tip to tail. The general principle, when making turns on skis, is to engage the tip at the start of the turn and then progressively move the pressure along its' length to the tail (towards the end of the turn). This can be subtle or more pronounced depending on factors such as terrain and speed. While the outcome is to move the pressure along the ski, the performer will likely feel it as a progressive movement along the inside of the foot – toes/ball of foot – arch – heel. The key to being able to achieve this is, the ability, to close and open the ankle joint. Closing the ankle joint allows the skier to engage the tip, while opening the joint allows the pressure to move aft. But, timing is crucial and this takes both practice and a heightened awareness of the intrinsic feelings and the connection between the foot and the ski. After all we ski with our feet and the ski is simply an extension of the foot.

The dolphin turn is an excellent drill for developing fore/aft pressure control and the ability to close and open the ankle joint. It is however, a drill that in itself requires a high level of skill hence, it is one of the additional activities for the level 4 certification in the IASI system. Skiing bumps and variable conditions (including powder) is where this dolphin movement pattern becomes extremely effective consequently we will revisit this in **(chapters 6,7 & 17)**

Using the ankle to manage pressure

In this photo the ankle joint is 'open' allowing the pressure to move aft and releasing the feet forward.

While in this photo the both skiers have 'closed' ankles with the skier in front about to release the feet forward and 'open' the ankles to aid the turn transition.

Using flexion/extension to manage pressure

In order for the skier to stay balanced and continue interacting with the forces effectively, extension and flexion movements must be used at appropriate points in the turn. At turn initiation we begin to apply extension to the outside leg to create force and balance against the outside ski. As the force builds from the fall line to turn completion we use flexion to manage this build up of pressure. On **non-pisted** terrain where we will often find ourselves having to engage forces at various different points in a turn this is different **(see chapter 9)**

IASI Interski Demo Team showing flexion in transition of the turn.

IASI Interski Demo Team showing extension at the start of the turn.

Timing - bringing it all together

Timing is what brings all the skills together and often what will be the difference between skillful skiers and those still acquiring skill. Like so many sports the learner can become technically competent in the component skills (in this case rotation, edge and pressure control) but if the timing is not right then the whole performance breaks down.

So how do we teach timing? In many ways timing is more challenging to teach than the three steering elements, that have already been discussed, as it involves the where and when of the movements used in rotation, edging and pressure control. For this reason the language we use when talking and teaching skiing is very important, the more we incorporate timing and words relating to the timing of movements or the timing within a turn into everything else we teach, the more we include the skill of timing in everything else rather than as it's own stand alone skill. **In this chapter we have highlighted text that relates in some way to timing in blue so the reader can clearly see how it is involved in many aspects of other skills and such an essential aspect of all skiing**. If you read the chapter back you'll notice how timing is involved in all the other skills discussed. Throughout the manual we will continue talking about timing and using words related to timing in how we discuss skiing. We will stop highlighting this in blue from now on.

While many of these movements themselves are more intrinsic, timing itself is often achieved through a more extrinsic focus. For example, getting your learners to ski around markers gives them an external focus that promotes better timing (provided the markers are set in a way that develops rhythmic turns). Skiing a defined corridor width, funnels and hourglasses are all good examples of extrinsic focuses that can promote better timing. While using counting or mantras (e.g. extend and rotate, bend and rotate) can help with movement patterns (the timing and sequencing of the movements) involved in a more intrinsic and cognitive way.

Below we will discuss timing in it's own section for those interested, but to discuss it in such a fashion can be quite hard to read and not necessarily the easiest way to take on board the information. We include this section as, in skiing timing is often talked about in abstract ways as being essential to create good turns and achieve good outputs but rarely is it expressly explained what we mean by timing and how to actually achieve accurately timed movements or good timing. This section will remove this ambiguity so you can understand how to time movements well in relation to the phase of the turn and/or in relation to other movements to achieve the outcome you're trying to create.

Timing can be broken down into 2 areas which can be overlayed:

Timing of the movements (often referred to as blending of the movements)

Timing of movements in relation to the phase of the turn

We will talk about these aspects of timing separately for ease of understanding but in practical application both aspects of timing will always be essential to create the best turns possible.

How we manipulate the timing has a huge affect on the turn we end up creating. For this reason we need to define what we are aiming for as we discuss timing. We will largely be focusing on a non-racing turn, sometimes referred to as an instructor turn. To define what we wish to achieve in this type of turn; **our aim is to have the maximum deflection of the skis in a controlled decent.** If we were thinking along the lines of racing the decent would not be defined as controlled as by its nature racing is aiming to go as fast as possible. Given this definition:

Timing of the movements in relation to each other (for pisted terrain):

Maximum edge angle/maximum lateral movement should always be linked to maximum extension.

Minimum edge angle/no lateral movement should always be linked to maximum flexion.

Fore movement (engaging the tip of the skis) should be linked to increasing edge angle so as to engage the edge as the tips of the skis that are being pressured.

Aft movement (engaging the tail of the skis) should be linked to decreasing edge angle so as to disengage the edge of the tails of the skis as the pressure is being dissipated to the tails.

Fore and aft movement should always be used and timed equal to each other. If there is no fore movement there should be no aft movement and vice a versa. If there is quick fore movement there should be quick aft movement, etc.

Rotational movements are there to provide direction and control to your turns and decent. There is no hard a fast rule with how to link rotational movements to the other movements as this is totally dependent on the turn form and outcome you are trying to achieve.

Timing of particular movement in relation to the phases of the turn (for pisted terrain):

Flexion should always be applied as the force comes on in the turn. This happens once the skis start turning across the fall line into turn completion and leading into the transition but not into the following initiation. Certain turn forms have more force so will require a larger amount of flexion.

Extension can be used at turn initiation (at the same time as edging/lateral movement as discussed earlier) to create a platform we can stand and press against to create some force at this point in the turn. This is not essential in all turn forms and specifically in forms where edging/lateral movement is relatively low so too should the amount of extension.

Fore movement can be used at turn initiation (at the same time as edging/lateral movement as discussed earlier) to begin to bend and load the ski earlier in the turn. Again, this is not essential in all turn forms and specifically in forms where edging/lateral movement is relatively low so too should fore movement. Additionally at high speeds the amount of fore movement should be limited to avoid possible accidents and over bending of the ski tips at these speeds.

Aft movement can be used at turn completion to help release the skis into the next transition/new turn and dissipate the energy built up earlier in the turn. Again, this is not essential in all turns, specifically when there isn't much energy built up in the turn or the force we're dealing with is relatively low this isn't necessary. Additionally at high speeds the amount of aft movement should be limited to avoid possible accidents and over bending of the ski tails and losses of balance at these speeds.

Rotational movement, whenever applied and wherever possible, should be smooth and progressive throughout the turn. If rotation is rushed in a particular part of the turn this gives the skier less time in this section of the turn and we need as much time as possible to ensure we can be accurate with whatever movements we are trying to do when we're trying to do them! Even if the net effect of rotation is fast the rotational movement should be spread equally throughout the turn not quickly applied in one phase.

Non pisted terrain

These general aims apply to pisted terrain but not all terrain. In later chapters we will discuss terrain where the force equation is changed (bumps and variables) and go into detail about how this may change the way we time certain movements. As long as the force equation isn't changed and our aim is as described above, these aims for timing hold true.

Terminology and specifically trying to add timing into words that often have “static” connotations.

Angulation is often referred to as the position a skier achieves when they have on tilted angle from feet to hips and then another more upright/vertical angle from hip to head. This is the true end outcome and picture of angulation but the same position is also achieved if you achieve maximum edge angle/lateral movement (in whatever way you want) and then as you decrease the edge angle you increase the flexion in your legs. Timing how these two movements interact with each other well helps release the CoM into the new turn and also brings the skis back toward (and eventually underneath your body) and at moments during turn completion the position of angulation will be achieved. For a skillful skier, the picture of angulation will be the same in both but trying to think about angulation as a by-product of how we time decreasing edge angle and flexing our legs should lead to a better end outcome with these two movements working together to release the CoM into the new turn as decribed above.

Inclination can be thought of as the best position to achieve maximum edge angle and maximum extension at the same time.

Rotational separation is the by-product of effective well timed leg rotation and leg flexion in turn completion. Again this way of thinking emphasises the timing of movement working together and specific points in the turn rather than “faking” a position which can happen when one movement is applied disconnected to other movements or at a point in the turn it isn’t necessary/achieving anything.

Chapter 4

Core Skier Development (CSD)

Shona Tate, Jamie Kagan and Derek Tate

Introduction

Skiing is such an exhilarating sport for complete beginners to advanced skiers, taking our guests through many emotions, physical challenges and personal achievements. Learners can progress very quickly and we want them to experience the "now I've tried it I don't want to stop" buzz that we, as instructors, are reminded of every day we put our skis on.

So, to help achieve this buzz and set our guests on the right path we introduce new guests and/or further develop our learners using a progression, which we call Core Skier Development (CSD). The principles are the same no matter what surface we are working on (snow, dry slope, rolling carpet) however, we do adapt our drills to the surface and environment, taking into consideration friction, gradient and texture of the surfaces. **We will cover this in more depth from chapter 5 onward.**

CSD allows first-time skiers to start on a journey from initially sliding on snow, on flat terrain, to skiing parallel on a variety of slopes. And using it (CSD) in conjunction with the Skills Model gives the learners the ability to use terrain effectively to control their speed and therefore negotiate **safely** around the mountain, experiencing the **enjoyment** that **learning** such skills can provide.

Many use the phrase "Safety, Enjoyment, Learning" (SEL). If the guests are SAFE, they will ENJOY the experience and are more open to LEARNING new skills.

CSD is not only for beginners however; proficient skiers can benefit by revisiting stages within CSD to practice specific movement patterns and improve their motor learning through slowing the movements down thus becoming more efficient and effective with how to use the skills.

Before looking at each of these stages, in turn, it is worth appreciating that journeys are very seldom linear and while the CSD stages model (Figure 1 below) is presented in such a way the reality is that our learners will move through these stages at different rates, with some spending more time at a particular stage while others may even miss out a stage and then revisit it later on. This reminds us that the overriding goal is not to perfect any one stage of CSD but to use the stages as a way of developing the skills.

Core Skier Development model

The Core Skier Development Model is a progression showing the stages of development from beginner to parallel. This provides a simple structure that allows us to see where our learners are in their progression to parallel skiing. This model is taken from the book "Parallel Dreams Alpine Skiing" and used with permission.

Straight running

Sliding and balancing with flat skis

Ploughing

Gliding at a constant speed with the tips close

Plough turning

Using turn shape to control speed

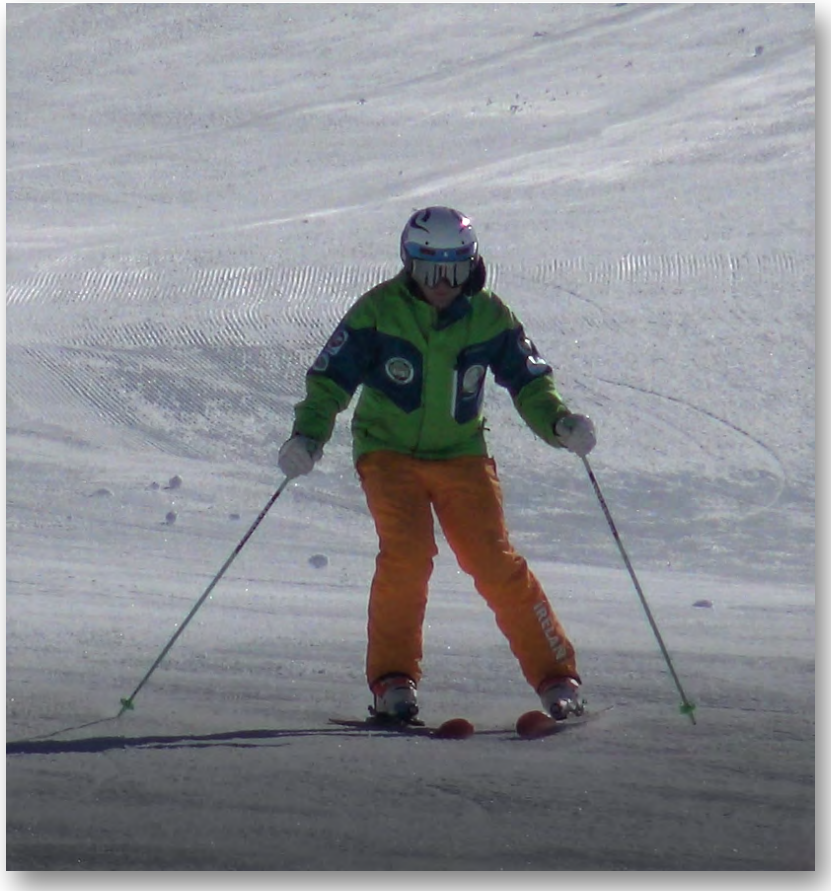


Figure 1

Plough parallel

Matching and continuing the curve

Basic parallel

Turning both legs and feet at the same time

Parallel using poles

Pole touch and pole plant for rhythm and timing

Figure 1 continued

Core Skier Development stages explained

Straight Running

The goal here is to develop confidence and balance while sliding. Instructors must choose appropriate terrain (ideally almost flat with a run out) as the control of speed, at this point, is determined by terrain. Our learners should be encouraged to balance equally on both skis keeping them as flat as possible. Lots of drills can be used at this stage to aid and challenge their balance but remember the goal is to instill confidence.

Flat skis and terrain with a run out.

Ploughing

Ploughing is when the learner begins to control speed through using the skis in a plough shape (V). Choice of terrain is again crucial at this stage. Too steep a pitch will force the learner to make a large plough shape, which will result in poor stance and posture and a defensive approach to skiing. The movements required from straight running to a plough are the turning of both legs and feet, whilst displacing the feet slightly wider than the hips in a comfortable stance. The turning effort or rotation of the legs/feet should be happening from underneath the foot rather than pushing the tails of the skis out. As this move is made a slight flexion of the ankles, knees and hips should be encouraged.

The plough shape can initially be practiced on flat terrain before using it to control the descent.

Plough Turning

Having established a good gliding plough the learner is ready to control their speed by using the plough shape to change direction. Carrying forwards the good stance created in the ploughing stage helps the learner maintain balance while sliding and turning the whole plough shape around the arc. Control, at this stage, is very important, so that the learner uses the “C (shape of their turn) not the V (larger defensive plough shape)” to control their speed. Focusing on the tips of the skis is useful, at this point, with the goal being to move both tips in the desired direction. In practice, this means that the inside ski of the plough is slightly flatter than the outside ski allowing the inner ski to be steered easily. Once this is mastered, on shallow terrain, our guests will feel confident keeping control in both directions and regulating their rate of decent.

As our learners' plough turning ability is developed their stance should remain centered and relaxed with appropriate bending in all joints (ankles, knees and hips). Choice of terrain remains crucial: too steep and the learner will adopt a defensive position. The plough will become too large and the tails of the skis will grip too much in the snow resulting in the inability to steer both skis.

Here a small plough shape is used with the tips of the skis fairly close together. The inside ski is flatter than the outside making it easier to steer both skis in the desired direction.

Plough Parallel

Now that the learner is able to steer the skis accurately in both directions and keep their speed under control through their turn shape, they can be taken a step closer to becoming parallel. As the pitch and/or speed of the learner increases, more pressure builds up on the outside ski in the second half of the turn. At this stage, and as long as the learner effectively balances against the outside ski, the inside ski can be released to allow it to rotate to **match parallel** to the outside ski more easily. A simple way of describing this move is to roll the inside knee uphill towards the little toe of that foot and rotate the foot to match the skis parallel. This will result in the inside ski tip opening and moving away from the outside tip (as shown in Figure 2 opposite). As long as the terrain does not become too steep or variable our learners will become competent quite quickly at plough parallel.

The choice of the word 'matching' is very important as the goal is to allow the inside ski to copy the outside one so that **both skis are steered in a curve**. This is often a potential blockage to moving toward parallel turns as the learner is so intent on getting the inside ski parallel that once this is achieved they stop steering the skis and therefore end up traversing rather than learning to steer both skis/feet through the end of the curve.

Another important point, at this stage in the 'progression', is to ensure that the learner maintains a small plough shape at the initiation of the turn. This encourages the hips to move forwards and across the feet, which at the parallel stage becomes known as the 'crossover'.

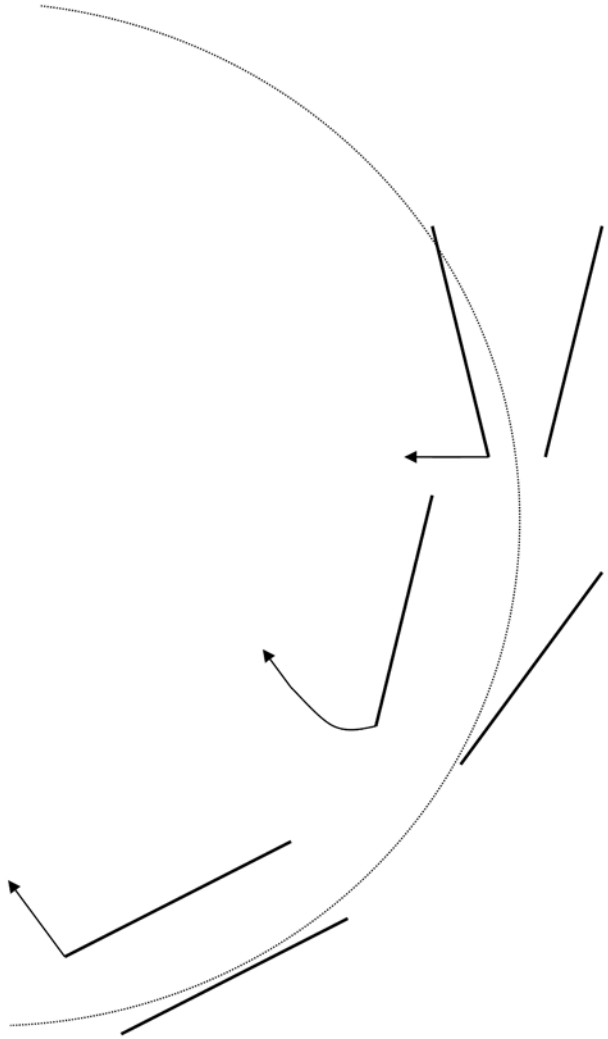


Figure 2

Basic Parallel

The learner now allows both skis to turn at the same time, by the same amount in the same direction. All the previously learned skills need to be practiced with revision on balance, steering and controlled skidding. The key factors to a parallel turn are increased speed through the arc and an increase in gradient (but not necessarily both at the same time!). The definition of a parallel turn is that the skis remain a similar distance apart from tip to tail and both skis are steered from the top of the arc to completion. At this stage, a blending of the 'skills' is required in order to achieve and maintain effective balance over the outside ski and to be able to steer the skis efficiently. A good combination of rotation, edging and pressure control is needed in order to make the turns flow from one to the other. Once this task is more accurately achieved a **pole touch** or **plant** can be added to aid timing and co-ordination to the turns.

The terms pole touch and pole plant are used deliberately, as a pole touch is more about the timing of the edge change process, while a pole 'plant' suggests a firmer action that offers support as well as timing. The corridor being skied and how much the turn is rounded off, or finished, will determine whether a light touch or a firm plant is more appropriate.

Both skis remain parallel throughout the turn with both skis being actively steered.

Additional Activities/Drills

As part of the learner's journey through the CSD stages there are a number of additional activities or drills that can be used and practiced to help develop the skills but also to make it easier to cope with the varied terrain that is encountered especially for those in a more mountainous environment. Those that are assessed as part of the instructor pathway we'll refer to as additional activities and we'll call any others drills. In all other ways, the names are interchangeable. Lots of these drills when taught well and at the correct time are useful for our guests when helping them to progress and develop. They include **traversing**, **side-slipping**, **falling leaf** side slip, **garlands** and **swing to the hill**. **(More detailed descriptions of these can be found in chapter 17).**

Conclusion

As skiers progress through the stages of Core Skier Development we, as instructors, must aid them to understand how simple the process is rather than putting blockages in their way. It is a journey from sliding to parallel turning. We use appropriate drills, based on the Skills Model, to aid them to stand well over their skis and through our knowledge box of anatomy and biomechanics we can help them to manoeuvre their skis to achieve the required outcomes to progress through the CSD stages. **(Further reading of chapter 5 – using the skills in CSD),** will provide you with more insight into the various facilities/slopes we teach on and give you appropriate drills to use to help your guests achieve their goals.

Chapter 5

Using the skills in the Core Skier Development Model

Jamie Kagan and Derek Tate, Federico Sollini, Sara Jones

Using the skills in the Core Skier Development (CSD)

As mentioned earlier in this manual, the IASI skills model can be described as what we teach, this in turn allows us to achieve the basic principles in skiing. Our goal as ski teachers is to teach the necessary skills at the right point in the turn to achieve a certain goal. The CSD is a progression which we can use as a guide to assist us to identify the appropriate skills necessary for a student to progress from a beginner to an intermediate skier.

We use all the skills within the CSD, however, the focus on various skills differs depending the stage of CSD.

A new skier must first develop a solid foundation often referred to as **posture or stance**. This means there is more emphasis made on where we stand on our skis and where we balance on our feet. A centred and mobile stance, in which all the joints are equally used, allows us to react and deal with the forces that build up.

The beginning part of the CSD has the skier in the fall line phase of the turn with equal weight over both feet with their COM in the middle between their two skis.

As a new skier starts to glide for the first time their balance will be challenged. At this stage the skills of **Balance and Movement** are introduced using flexion and extension drills and exercises to explore fore/aft balance and movement.

As the plough is introduced in the next stage of CSD, the skill of **Rotation** becomes more prominent. The sensation we are looking for here is a pivoting of the ski/foot rather than a pushing out of the heels. If done correctly and without skis on, the effect from the boots when rotating a single leg is the creation of a bow tie in the snow. This can be a great way to show the student the movement required before doing it on skis.

The focus at this stage is to let the learner experiment with this rotation of the skis and subsequently the size of plough they can create and how that affects their speed.

Lots of repetition of this skill on easy terrain is vital so that the skill is performed correctly.

The next stage of the CSD is the introduction of **turning** to the student. At this stage the 3 skills of ***balance, movement and rotation*** are used in conjunction with each other.

Our goal in this part of the progression is for the student to start feeling the skis turning underneath them. As the skis start to cross the fall line the ski design will help to direct the turn.

At this stage we can challenge the student with different turn shapes, forcing them to adapt the amount of **rotation** they use according to the task that has been set.

We are working on the completion phase of the turn at this point ensuring the skier remains well balanced over the outside ski whilst maintaining a rounded turn shape.

The skill of **Rotation** is the ability to turn the legs/femurs in the hip socket which as a result creates some upper and lower body separation. As speed, pitch, turn shape and performance increases, this separation allows us to remain balanced over the outside ski but we will come on to this more in **(chapter 5).**

As we start to introduce turn linking, the phases of the turn are all involved from initiation to completion. At this stage the ***timing*** of movements becomes important and all the skills have a role to play to ensure turns are linked and flowing. We can at this point start to introduce the initiation *phase* of the turn and the movements required. At slower speeds the crossing of the CoM over the feet is limited (if at all) so the focus at this stage is simply releasing the old outside ski with the focus of **balancing** against and **rotating** the new outside ski. Depending on the turn shape and the pitch, the release of the outside ski allows the skis to start finding the fall line of their own accord, thus making this initiation phase easier for the student to understand and learn. If you are lucky enough to have the right terrain available, a method called terrain assisted learning can be used. This is where we find natural berms or slopes that roll in a certain direction to help the skier feel the skis find the fall line when released.

Rotation of the outside ski against the slope creating grip (edging).

As the pitch increases and the skier becomes more parallel the skills of ***edging*** *and* ***pressure control*** become more involved. The slope itself will create an edge angle as the skier makes their turn across the hill. The outside ski at this point can be tilted more to increase grip or just as importantly released to allow a smooth transition in to the next turn. As the pitch increases the forces acting on the skis and skier will build. At this point if the student is static and rigid this will block them from being able to steer the skis back underneath them to complete the turn. The IASI philosophy of creating all mountain skiers encourages the skill of steering the skis. This uses a combination of ***edging and rotation*** but is also aided by the use of ***pressure control, balance and the timing of all our movements****.* These movements should be consolidated at the early stages of a student's learning experience to minimise problems in their development at a later stage.

Chapter 6

Using the skills for piste performance

Federico Sollini, Jordan Revah and Jamie Kagan, reviewed by Sara Jones

Introduction

This chapter, and the three that follow, are aimed more at developing your own performance as they are deliberately technical so that you gain an in-depth knowledge of the sport as you continue to train and take exams. This allows you to draw on that knowledge and translate it into a more user friendly language for the guests that you teach. Lots of the information conveyed in these chapters is included in the **IASI outcome standard videos online** with videos in addition to descriptions and we highly recommend watching these to understand some of the concepts and topics discussed.

The **IASI Skills Model chapter**, focused heavily on the four skills of rotation, edging, pressure control and timing in relation to the skis and less on the actual movements that the body makes to influence this outcome. The following chapters will delve deeper into the movements and movement patterns required to create skillful skiers in different areas (piste, moguls and variables).

In this chapter, we will define the types of turns (forms) we perform on piste and focus on within IASI - **carving, short turns and parallel variations** - and we will explain what we aim for and call "expert skiing" for piste performance specifically

While the turn forms form part of the assessment criteria at different levels within the system, it is important to remember that the overall goal is to develop the skills rather than any particular manoeuvre or drill.

What is "expert skiing" on piste

The IASI technical philosophy that we've discussed already covers a lot of aspects of what IASI look for and call expert skiing. Much of this philosophy applies to skiing the whole mountain not only or explicitly the piste. There is of course a huge cross over and much of what we look for in piste performance is specifically aimed to be transferable to many areas on the whole mountain and in a multitude of conditions and snow types. For these reasons, our specific aims for expert skiing on piste are:

1. **Adaptability**. Lots of this is covered by the different turn forms we train, assess and discuss within the system. We don't focus on just one type of turn or a few types of turn that involve a combination of the skills in similar ways. We want skiers to be as adaptable as possible and the piste is one area where you can risk over training a specific type of turn and losing that adaptability.

2. **Control**. Specifically: (once at speed) not hugely accelerating or decelerating down the hill (control of downhill speed) and having consistency in the shape of your turns (control of line) through the decent. There can be and often we desire acceleration at points in the turn itself which leads us to the next point...

3. **Deflection**. This point relates to ski performance and is something we look for more so on piste although it is still relevant for developing feelings and movement patterns in other areas and can be applied in other areas too just not as prescriptively as on piste. By deflection we specifically mean loading the ski (making it bend) and releasing this energy to move your CoM in a specific direction. Most often (when combined with point 2 about control) we are looking for deflection across the hill instead of down the hill. A very high degree of deflection will result in your CoM accelerating in the direction you desire. A very low degree of deflection will result in your CoM remaining fairly static and not accelerating. Deflection is quite easy to observe when watching the overall image of a skier descending but comes down to multiple movements working well and timed excellently.

Types of turns (forms) that we perform on piste

In IASI we discuss piste skiing in relation to 3 turn forms some of which have sub-forms within them. The 3 turn forms are:

1. Carved turns

2. Short turns. Split into the sub-forms of a. regular (or steered) b. narrow corridor (or quick) and c. wide corridor (or highly deflected).

3. Parallel Variations. Split into the sub-forms of a. Intermediate Parallel (IP) and b. Advanced Parallel (AP).

Skills that remain the same throughout all forms

Numerous aspects of skillful piste skiing remain the same throughout all turn forms. Rather than go over these each time for each different turn form we will explain these separately in their own section. Each of these is hugely important as they apply everywhere on piste and often in other non-pisted areas too (read all about that in the following chapters). If one or some of these aspects are lost or applied inappropriately the knock on effect to all your skiing will often be very detrimental.

These sections will be broken into:

1. centered position

2. hip width stance

3. upper body management/arms

4. use of poles

5. lateral movement, angulation and inclination

6. rotational movement

7. pressure control

1. Centered position Our neutral or ready position is one of equal flexion in the ankles, knees and hips. At stand still this should be a comfortable position leaving large amounts of range to bend and flex further and also to stretch and extend further. The set up of our boots is essential to allow this position to work for you and be one you can move in and out of as we interact with and experience force and master skiing. This position offers bio-mechanically the best/strongest position whilst not hindering any other ranges of movement we will be using to ski.

2. Hip width stance In addition to being centred, once parallel skiing is learnt, we aim to have as close to a hip width stance as possible. Having a hip width stance will offer the best possibility to use our range of lateral movement, flexion/extension movements, fore/aft movements and rotational movements without any problems occurring. We should naturally develop the feelings and timings of our CoM moving freely from turn to turn if we can have a functional hip width stance. All people have marginally different widths of their hips so from person to person a hip width stance will vary. The easiest way to find your perfect stance is to feel for your hip bones (the two pointy parts of your pelvis) and aim for your skis to lie directly under them. The outside of our hips is NOT a hip width stance.

3. Upper body management and arms Our upper body has little to do with how the skis themselves function but can have a very detrimental effect on our balance which in turn will make all movements and steering difficult! We can and should control our upper body and have it as a point of stability that stays constant whilst we perform the many varying movements within skiing. Our core muscles should be active to not let our body crumple under force but we should not have extreme tension in all our stomach muscles which can restrict our freedom to move. Our arms should generally 1. be held ahead of our body (elbows ahead of body) to help with fore/aft balance and maintaining a centred position and 2. be held out from our body (elbows away from our body) to help with lateral balance. Aside from this, as long as an arm movement has a positive impact on another movement or our balance and doesn't block any other movements or negatively affect our balance it is no problem and can be applied. Once it blocks or has a detrimental effect on any other movements or our balance it should be calmed down, refined or removed!

4. Use of poles Our poles can have huge positive affects on all the movements we make during skiing. There are many secondary uses for poles but their primary use is to allow us to move laterally at slower speeds. By having a pole plant at slower speeds we momentarily support ourselves allowing us to move our CoM over our skis at speeds where this is often more challenging. The slower the speed the more important the pole plant can be to help us and vice a versa with a gentle tap, touch or movement being enough at higher speeds (where our CoM is able to move relatively freely because of the forces acting upon us). Pole plant, tap, touch or movement will always take place in transition at the same moment we allow our CoM to move out of the old turn into the new turn. If this timing is off the fundamental use of the pole will not work! If pole use is introduced too early in a skier's skill development, it can interfere with the other movements that are essential as the building blocks for allowing our CoM to move out of one turn into the next. A quicker use of the pole can help trigger an increase in the speed of other movements that follow in the turn.

Lateral Movement (Angulation & Inclination)

It is possible to move laterally from the following parts of our body: ankles, knees, hips, shoulders and neck. Although each of these body parts can move laterally, some have much more usefulness when aiming to have a positive effect on edging/tilting the ski which is the reason we use lateral movement. For example, we very rarely discuss moving our neck laterally - it has little or no effect on the ski edges and additionally isn't a particular safe way to move with regard to skeletal alignment and bio-mechanics! Depending on the speed and forces involved and the desired outcome; which parts of our body we move laterally will vary.

At **slower downhill speeds**, **when balancing is difficult** or **if we desire a quick edge change**: we focus on the joints closer to the skis - ankles, knees and hips - but won't use the shoulders much if at all. Very simply if we did we would likely topple over or topple to the inside ski and lose balance and therefore grip over our outside ski. The slower the speed the more we have to work the lower joints (ankles and knees) first to engage the edges without losing balance and then we will allow our hips (and CoM) to move inside the turn as much as the speed and slope allow. The result of moving like this would be a turn that is predominantly using **angulation** as at almost all points in the turn we have two distinct lines from ski to hip and hip to head creating an angle in our body (see figure below). For the same reasons relating to balancing mentioned above, if we are skiing a piste where our balance is going to be challenged (for example an off-cambered piste or a piste with a ridge) we will want to use angulation to help create our turns, that are affected by the slope challenge, whilst remaining in balance. When trying to change edges quickly angulation is also appropriate as the lower limbs are closer to the skis and can be moved quicker than the entire body allowing for a quicker edge change.

IASI Educator showing angulation/lateral separation in a long turn

Angle created by the skier from ski to hip and hip to head

Centre of Mass (CoM) inside the arc of the turn

At **higher downhill speeds** and **if we wish to create maximum edge angle** whilst managing the forces we will allow the whole body (shoulders, hips, knees and ankles) to move laterally at turn initiation. This is called **inclination**.

When discussing inclination we often talk about moving the whole body instead of moving just the shoulders. This is to highlight that skillful use of inclination involves the shoulders moving in unison with the hips, knees and ankles NOT just moving our shoulders laterally. If we were to just move our shoulders laterally this would result in a loss of balance and inaccuracy with how the edges are engaged (as the shoulder's are very far away from the skis). The term applied for this is **banking** and describes what happens if you move your shoulders laterally first and then try and move other parts of your body afterward, if ever using these terms within IASI banking will be a negative term (unskillful application) and inclination a positive term (skilful application).

Allowing our whole body to move laterally (inclination) creates the best position to get our skis as far away from us as possible and therefore create as high an edge angle as possible. When inclining we also have very strong skeletal alignment allowing us to extend our outside leg as much as possible and press the ski edge into the ground creating force whilst being in an excellent position to do so.

At higher speeds when we have enough forces acted on us we can incline at the initiation of the turn to create maximum edge angle and spread the lateral movement throughout the turn allowing us to deal with the build up of force through the fall line and into completion more effectively than if just angulating. As the speeds are higher and pitches steeper, to manage the increase of force while continuing to perform we need a higher edge angle and better mechanism to deal with the force build up. Under these conditions (and if nothing else overwrites this such as challenging terrain or the need to turn quickly, etc.) we incline from turn initiation to fall line and then from fall line to completion we angulate. Breaking this down into how our body moves;

Coming out of transition and into turn initiation to fall line - whole body moves laterally (shoulders, hips, knees and ankles all working together)

fall line into completion - hips, knees and ankles continue moving laterally whilst legs flex. These movements allow us to finish the turn whilst managing the force and begin the process of allowing our CoM to move into the new turn.

Completion and coming into transition - we begin to move to release our edges/flatten our skis whilst flexing our legs allowing our CoM to freely move into the new turn. The action of flexing our legs is essential to allow us to move our ankles/knees and hips out of the turn or more accurately let our skis and legs move closer to our CoM.

IASI Educator showing inclination at the initiation of the turn

Line of Inclination from the outside ski up through the skiers CoM

Rotational movement

When discussing rotational movement we break the body in two and can talk about rotation of our legs (femur rotating in the hip socket) and rotation of our upper body (everything above our hips rotating)

Many positions we achieve when applying rotation have names and terms, specifically -

1. When the upper body faces more down the hill compared to the skis and this is achieved by the legs rotating we call this **rotational separation**.

2. When the upper body faces more down the hill compared to the skis and this is achieved by the upper body rotating to face down the hill we call this **counter-rotating**

3. when the upper body is rotating at the same time and in the same direction as the skis we say it is **co-rotating**.

4. When the upper body is rotating ahead of the direction of the skis we call this **leading the rotation with our body**.

Within IASI, if ever rotation is being prescribed or required in a turn form we will expect a degree of rotational separation (number 1 above). There may be times and places where some of the other ways of rotating are applicable but for our technical philosophy and what we call expert skiing we always want the movement of rotation to be from the legs whilst the upper body stays calm and doesn't actively counter rotate - this will result in a functional amount of rotational separation that suits the turn form and individual.

IASI Educator showing rotational separation in a short turn

Pressure Control

Managing and controlling pressure as we ski is one of the hardest skills to master and most important skills to ensure we have a run which feels good and allows for maximum performance and deflection of the skis. When we don't manage the pressure in a turn we know about it as this will often be the cause of negative sensations, big mistakes or even crashes.

In simple terms, when talking about managing pressure in relation to skiing we want to try and prevent pressure building on one part of the ski for a large part of the turn as this will result in an overload of pressure against the ski which can cause a multitude of knock on problems to occur. Some problems that arise as a result of an overload of pressure and this not being managed well are:

1. loss of grip against the skis edges or outside ski edge.

2. having to make inefficient and/or forceful movements to force the ski to grip rather than working with the ski and forces that exist in skiing.

3. blocking other desired movements - often when we make a forceful movement (point 2 above) to compensate and try and fix the overloading of pressure and possible loss of grip we manage to keep the skis gripping but the way we have had to move to do so blocks other movements and usually won't allow our CoM to move into the new turn as smoothly and freely as desired.

4. numerous other much more negative effects that can lead to losing balance, crashing or falling over.

Many of the faults we see with skiers are the result of them compensating for a misunderstanding of how to control pressure or subconsciously (or consciously) trying to fix the problem of the pressure building and effectively adding more pressure at this point when they should be aiming to manage the already large amount of pressure at that point in the turn.

To prevent pressure building for a large part of the turn the key is well timed, accurate, progressive movements. Going into this in more detail and explaining how our body needs to move to control pressure:

1. Progressive flexion and extension movements are the easiest way we can grasp how to manage and control pressure and we should begin to appreciate this as soon as we start to introduce these movements in the CSD. As we feel the pressure come on in the turn (from fall line to completion) allow our legs to flex and bend to absorb the pressure. The higher the force the more we should flex our legs to absorb it. Entering the new turn (from initiation to the fall line) use functional outside leg extension/elongating of our outside leg and flexing/shortening our inside leg (linked to lateral movement and fore movement) to press the outside ski into the ground creating some pressure and grip early in the turn.

2. Progressive lateral movements (discussed earlier) help prevent the pressure building against a static edge as the edge is constantly increasing or decreasing throughout the turn. If we find ourselves holding a static edge (of any angle) this will allow the pressure to build on this unchanging edge and challenge how effectively that edge can grip and work. Additionally, to ensure leg extension (discussed just above) creates grip against the snow instead of slipping we need lateral movement at the same time and rate.

3. Progressive rotational movements, where applicable (and also discussed earlier), should be spread throughout the turn so as to maximise the potential for grip and application of pressure/force at turn initiation. If we find ourselves rotating quickly to turn completion and holding in that phase we will find the pressure build more than necessary and we will need to manage it more than necessary.

4. Effective, progressive fore and aft movements help work the whole length of the ski avoiding the pressure building through just the centre and being harder to manage. Allow the hips to move ahead of the feet (or feet to be retracted) at turn initiation to pressure the tips of the skis and allow the hips to move behind the feet (or feet to move ahead of the hips) at turn completion to dissipate pressure through the tails of the skis.

Carved Turns

EDGING

Maximum edge angle and lateral movement are desirable in carved turns. How much this angle is and how you go about creating it (see lateral movement section earlier) will largely be dictated by the slope angle and therefore downhill speed you can generate.

PRESSURE CONTROL

As carved turns take place at higher speeds pressure control and dealing with the forces we encounter is especially important. Ranges of fore/aft movements and flexion/extension movements should only be used in so much as they are functional and don't put the body in a dangerous position for the speeds and forces involved. Often the ranges of these movements will not be 100% (especially fore/aft movement).

Progressive lateral movement will dramatically help manage the pressure through the turn.

ROTATION

Pure carved turns have no rotation of our skis as this would cause the ski to no longer carve and leave two clean lines in the snow.

TIMING

As edging/lateral movement is the most essential element in carved turns all other movements should be timed to maximise the potential to create big edge angles throughout the run and deflect the ski as much as possible across the hill allowing you to accelerate across the hill whilst remaining in control through your choice of turn shape.

Short turns

Short turns encompass a large area of piste skiing with extensive application to being an adaptable skier and being able to ski the whole mountain (not just the piste) . For this reason we have three sub forms, each of equal importance, to try and develop skiers who have great skill and adaptability in how they perform short turns.

The three sub-forms are: a. regular short turn (or steered short turn), b. narrow corridor short turn (or quick short turn) and c. wide short turn (or highly deflected short turn). They have double names to help reflect the corridor width (their first name) and fundamentally what makes them different from each other and how to create them (the name in brackets).

Short turns - generic

EDGING

Good edge angles and a high degree of lateral movement are desirable in short turns to create grip on the snow and help deflect the skis.

The slope angle and range of rotation you use will dictate the downhill speed you travel at which will have an impact on how much lateral movement and edge angle is possible in the turns and run itself.

PRESSURE CONTROL

Pressure control is regular/normal and as described earlier. As the downhill speed is not exceptionally high more risk can be taken with fore/aft movement to help deflect the ski and generate some acceleration whilst continuing to maintain a high degree of leg rotation required by these forms of turn.

ROTATION

Rotation of the legs is essential to dictate and control the size of the turn and corridor. If we can't rotate the legs effectively we won't be able to consistently maintain a desired corridor when performing short turns.

Rotational movement should come from the legs (as always) and be progressive through the turn to an appropriate range for the slope steepness and desired type of short turn.

TIMING

Although rotation is a very important skill to creating these turns, as with all skiing we need to move laterally to engage our edges and use effective flexion/extension and fore/aft movements to manage pressure. If prescribing a movement pattern from stand still it would be: tilt/edge the skis, rotate our skis and legs, flex and move aft functionally to absorb pressure whilst edging to un-tilt the skis, extend and move fore whilst tilting the skis, repeat.

Short turns - Specific

REGULAR/STEERED

We call these regular as they are the middle ground between the other sub forms and often the foundation for developing and building our skill in short turns. They are called steered as, although all short turns are steered, these combine the steering elements in the most equal way out of the 3 short turn forms with the other two having a certain elements amplified to create them.

NARROW /QUICK

The narrow corridor short turn is created by speeding up all movements used to create the turn and lessening the range of rotation. The added speed of movement means the skis are in the fall line for a shorter period and therefore accelerate down the hill less meaning we can decrease the rate of rotation without issue. When performed badly the only movement sped up is rotation leading to very late grip in the turn, no deflection and turns that aren't linked or consistent - all of this is undesirable.

WIDE/HIGHLY DEFLECTED

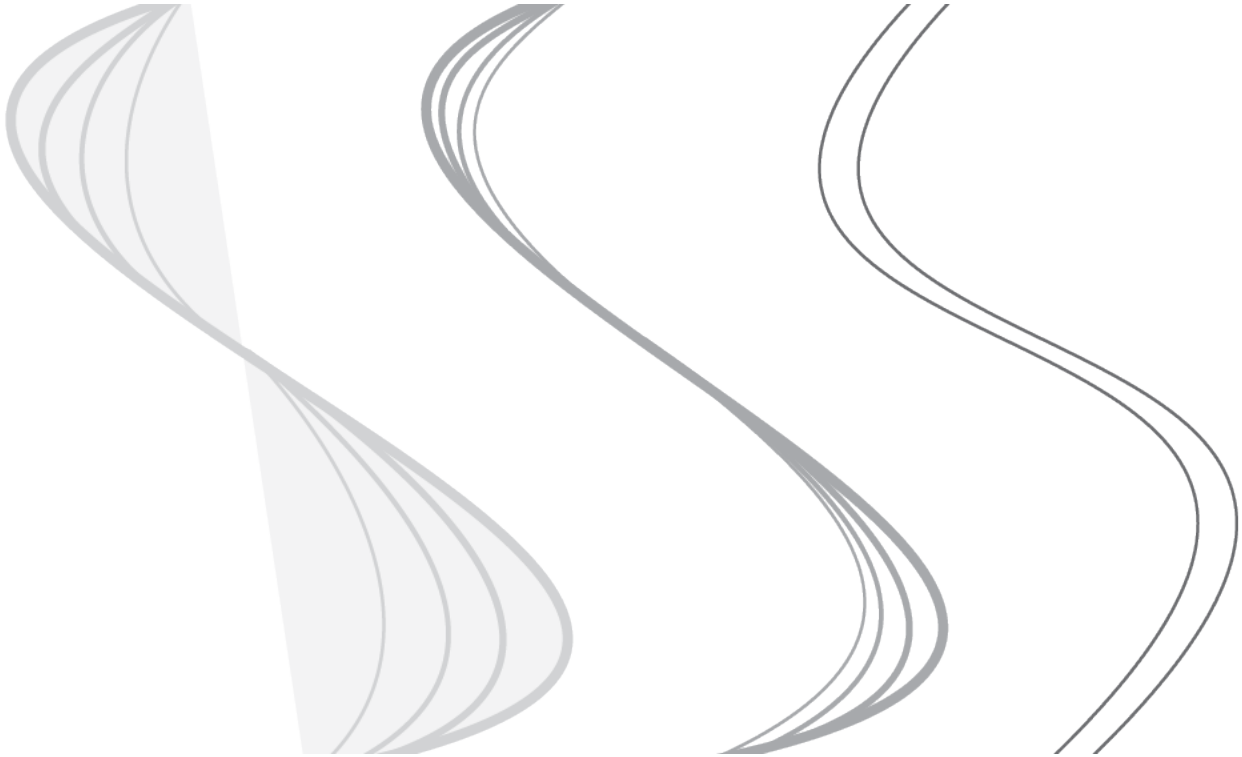
The wide corridor short turn is created by having a higher degree of deflection across the hill stretching our corridor. To achieve this we amplify lateral movement and reduce rotational movement. The skis we use have a big part to play in how well we can achieve these (radius, length and stiffness specifically) but they are possible on all skis. Having slightly more downhill speed will help us attempt to create more lateral movement and bigger edge angles . When performed badly the corridor is widened by changing nothing and just traversing or skidding across the hill in a static position in transition - this is undesirable

Parallel Variations

On snow, a skidded turn is an arc that shows a wide brushed line. A carved turn will consist of only two thin lines. In between these two, are the ***Parallel Variations***. These will produce lines in the snow with a wider width then a carved one, but thinner than a skidded one (**Intermediate Parallel/IP**) or a wider width than a carved line at specific points in the turn and a carved line at specific points in the turn (**Advanced Parallel/AP**).

In order to obtain this result the skier will need a lot of lateral movement/high edge angle, similar to carved turns, along with the ability to engage and disengage an active rotation of the legs depending on the sub form - AP or IP.

This form follows many of the same movements of the carved turn, but adds an extra challenge of skill and accuracy to be able to add in rotation as and when requested in the turn. Performing these turn forms well shows a great deal of control of the technical movements required in skiing.



Ski tracks - more skidded (left)
to carved (right)

Picture taken from the skierlab.com

Parallel Variations

EDGING

Good edge angles and a high degree of lateral movement are desirable in both parallel variations. If the amount of lateral movement is too low or applied without skill the turn will end up skidding instead of gripping or gripping at points you don't desire.

As Advanced Parallel turns are faster than Intermediate Parallel turns the degree of lateral movement will be even higher, very close to that of a carved turn

PRESSURE CONTROL

Pressure control is regular/normal and as described earlier. As the downhill speed increases our range of fore/aft movement can be reduced (as with carving).

In Advanced Parallel turns, as the skis enter the second half of the turn and carves the force and speed will come on quickly requiring good flexion and lateral separation to manage this and allow the CoM to move into the new turn.

ROTATION

Rotation is essential for creating the different parallel variations.

Intermediate Parallel turns have progressive rotation from the legs throughout the entire turn.

Advanced Parallel turns have rotation from the legs for the initiation of the turn up to the fall line but this is then stopped from the fall line onward to allow the skis to carve.

TIMING

Timing how the movements involved in the turn work and interact with each other is the hardest skill in parallel variations and as you improve your proficiency in these turn forms so too will you improve your skill of timing in general. Intermediate Parallel turns combine rotation and edging throughout the turn (just like regular short turns) whilst making appropriate movements to manage pressure. Advanced Parallels have a specific point in the turn (fall line) where we stop using rotation and therefore allow the skis to carve from around this point onward. Edging is still applied in the first half of the turn in combination with rotation.

Chapter 7

Using the skills in bumps

Andy Bennett

Using the Skills for Mogul Skiing

Introduction

Moguls can be great fun and an advantageous challenge to skiers. However they can also quickly become a skier's nemesis. This chapter goes through the techniques and tactics to help make moguls fun.

The great thing about a natural bump field is the simple fact that no turn is the same. Bumps vary in shape, size and spacing depending on a number of factors. Gradient, aspect, snow type, skier ability, slope width, camber, temperature/time of year and skier traffic flow for example can all play a part in influencing the general shape of a mogul field.

Part 1: Techniques

(Competition mogul skiers)

Although competition mogul skiers at the top level of the sport compete on artificial mogul fields we can take a look at their general body posture and movements they are making and apply them to our needs in an appropriate way. Take a look at some of the basic observations below.

Basic posture

Width of stance:

This is much closer than usual. This is because it is simply faster from edge to edge with the feet closer allowing for a quick turn in a short space. Competition mogul skiers are generally not trying to create big lateral angles so having the feet close for the type of turn they are doing shouldn't affect the grip or performance of the ski too much.

Tilting/edging:

This needs to be fast so any edging or tilting generally comes from the feet and knees. The hips tend to stay centred and the feet move underneath. Again this is to enable a fast edge change.

Middle of the body:

The hips are generally held a little higher than in the skier's neutral position so the angle at the knee is reduced. Essentially by standing tall the skier is enabling a full range of movement for the legs when it comes to absorbing the moguls.

Chest/upper body:

The chest is held high for the same reason as the hips. If the chest is pitched too far forwards the range of movement to allow for absorption can be blocked.

Arm carriage:

This is usually a little higher and further forward than normal. The pole plant needs to hit the top or backside of the mogul to allow the skier to descend the course quickly. The hands and pole plants are very important because they are the timers that determine when the feet move. The pole plant needs to be extremely quick and efficient so a minimal amount of movement is required.

Head:

The competition mogul skier will try to hold the head level to help with balance. This also enables the skier to look further ahead to plan the route they are going to take. Ideally they will be looking several moguls ahead at all times. Keeping the head level and vision ahead also helps when the skier comes to the jumps in the course. You can look at many other sports outside of skiing requiring balance and fast reactions where the athlete will have a level head and focus their vision ahead. Gymnastics and trampolining are good examples.

4 planes of movement

Rotation:

The skis rotate by the leg turning in the hip socket. The upper body is facing down the hill allowing for quicker turns

Tilting/Edging:

The skis tilt from side to side on the edges (lateral movement)

Fore/aft*:*

The hips move forward as the feet are pulled back. (This gets the tips of the skis to dive down the back of the mogul) Or, the feet are pushed forwards and the hips drop back. (This is to allow for appropriate absorption).

Flexion/Extension*.*

We will call absorption in relation to mogul specific movements:

The knees are allowed to rise as the front side of the mogul is reached to absorb the mogul and then the feet will be extended into the hollow/trough.

In reality when we ski moguls we apply a blend of the above movements to achieve the desired route.
Competitive mogul skiers will descend in a very direct route, which would require more fore/aft, absorption and tilt with less rotation. This however doesn't necessarily mean that we need to do exactly the same. We can apply a different blend to the above movements to achieve a more rounded and slower descent if we like.
The ability to have total control of the speed of descent and the route we choose shows a great level of skill in the moguls and is applied more when skiing a natural mogul field. For example if we increase the amount of rotation we will be able to descend at a slower rate.

To understand how to apply a different blend of the 4 planes of movement to suit our needs as instructors we need to look more into the tactical side of mogul skiing shown in the next section and link it back to the technical movements we use.

Part 2: Tactics

Mogul shape

One of the hardest things in mogul skiing is being able to see and choose the appropriate route from point A to point B based on the terrain ahead. Before we try to learn about routes and lines we need to fully understand how moguls are formed and how they are shaped.

Skiers turning in approximately the same place repeatedly form a mogul run. The snow is pushed down the hill and to the side and depending on how far across the hill the skier turns affects the shape and size of the mogul. This is usually dictated by the steepness of the slope.

Although every mogul will be a slightly different shape and size we can see a general trend in the shape and this isn't necessarily perfectly round. See the drawing below.

Key:

Tail/snow wall: The wall of snow formed between the rut and the front side of the mogul.

Front-side: The uphill side of the mogul between the rut and the top of the mogul.

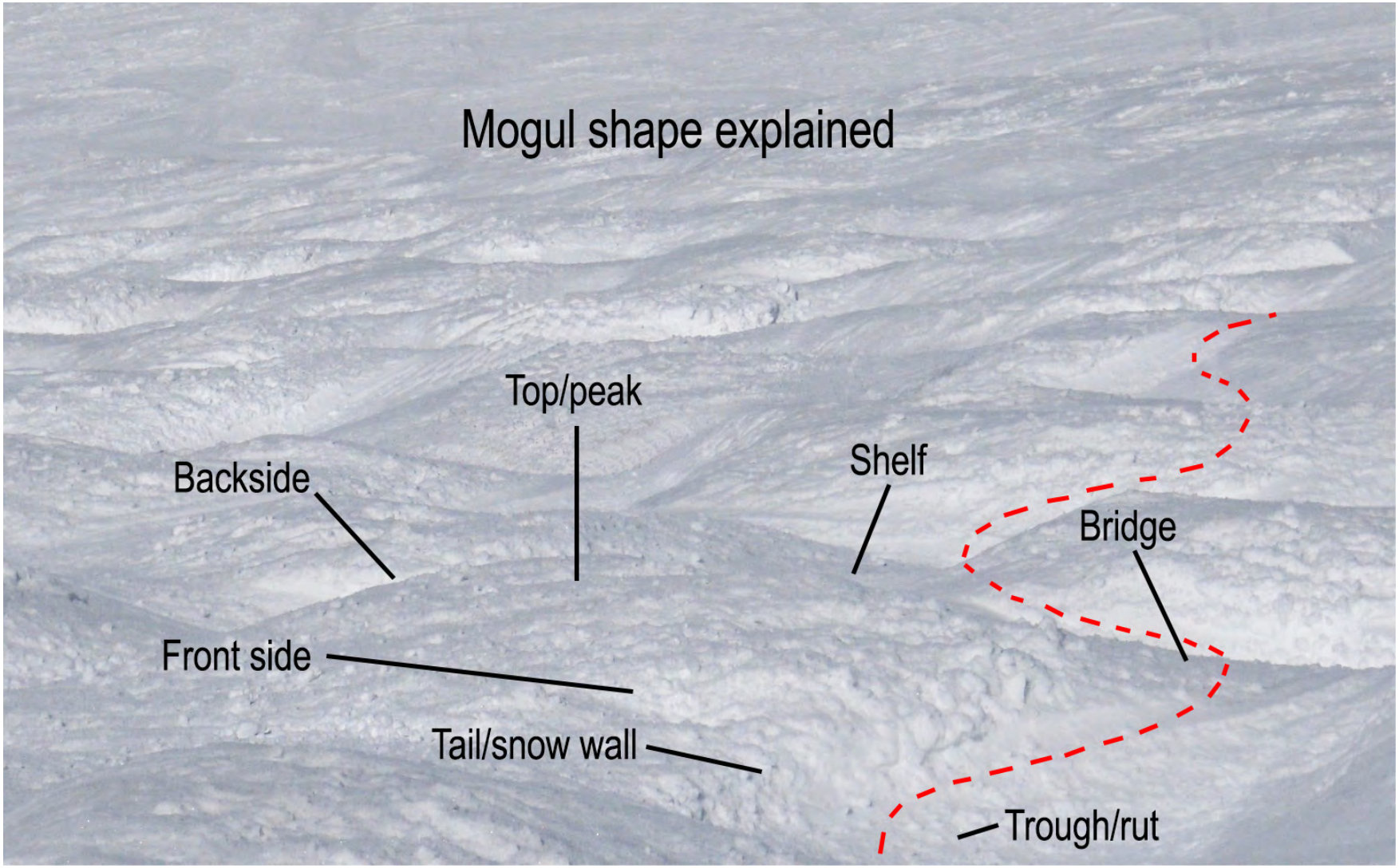
Backside : The downhill side of the mogul leading toward the shelf.

Top/peak: The highest point of the mogul.

Trough/rut: The deepest/lowest point of the mogul also known as "the hollow".

Shelf : Often a sheer drop off on the backside of the mogul.

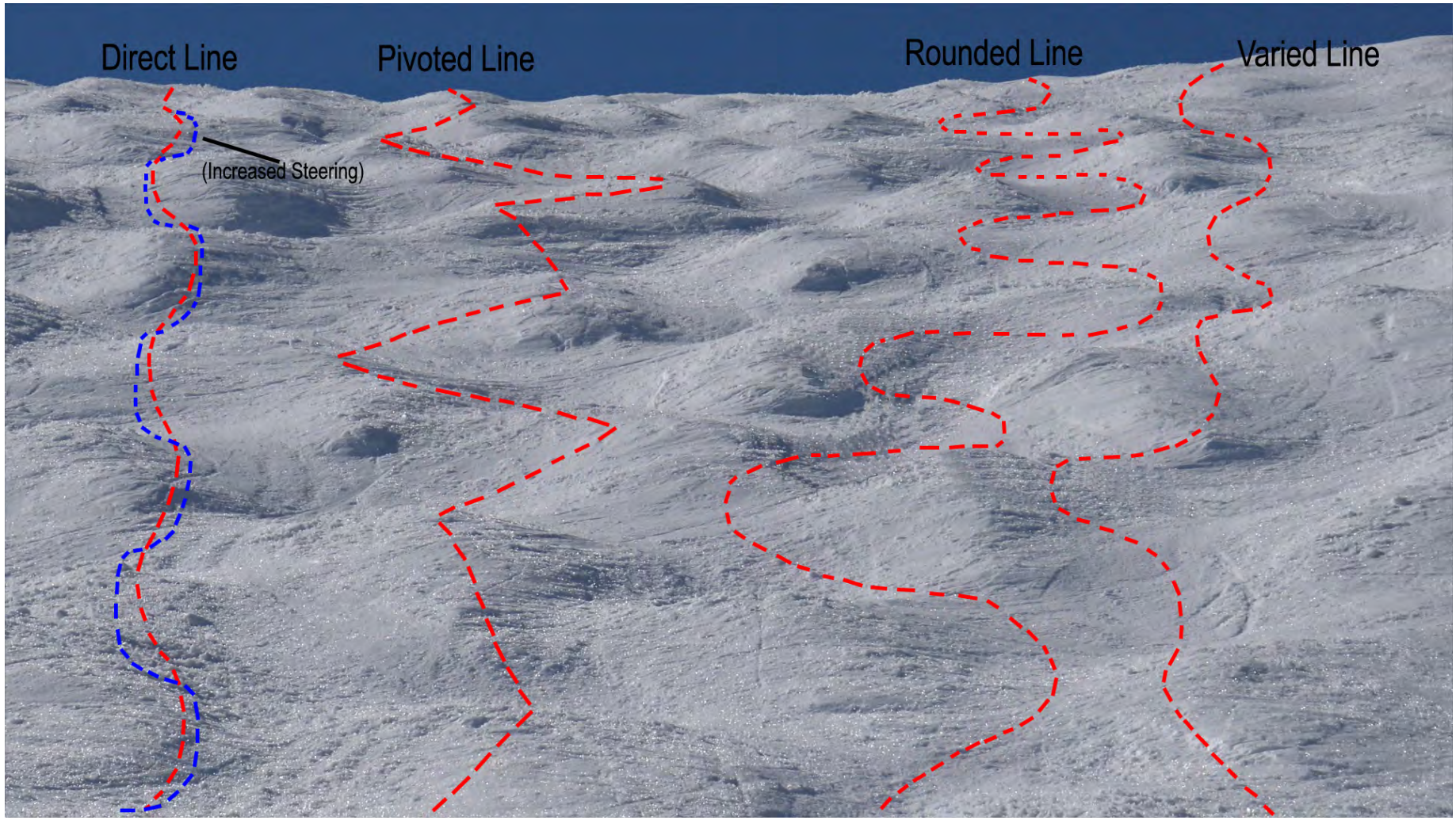
Bridge: High point between the backside and front-side of two linking moguls.


Mogul shape explained
Top/peak
Backside
Shelf
Bridge
Front side
Tail/snow wall
Trough/rut

Routes and lines:

The route taken depends on many factors. Mogul size, and shape, gradient, general conditions and levels of fatigue can all play an important role in deciding how to negotiate a mogul run. Take a look at the drawing below for different ways of skiing the fall line within a mogul run.

The routes and lines in the image here are only a brief look into ways to ski the fall line. No one route or line is necessarily better than another. We can blend any route or line and mix up the way we ski to help make a fluid run. Below is a brief explanation of each line shown above.



Routes and lines explained:

Pivot/top to top line–

Traveling from the top of one mogul to the next is a good way to ski slowly. This might be more useful on a steeper run where speed control is more essential. The skis are easier to pivot because whilst on the top of the mogul there's only a small area of the ski in contact with the snow. Having a good strong pole plant can really help with the pivoting action at low speeds. When skiing this line more rotation and absorption is usually required.

Rounded/high line –

Using a more rounded line can be useful when the moguls are big/deep or widely spaced. The ski has a chance to do some more of the work making the turn easier and more efficient. More angulation is usually required and less absorption is needed because the skis don't really have to go over the mogul too much.

Direct/fast line –

The direct line is faster and more in line with competition mogul skiing. It requires very fast movements with lots of absorption and fore/aft to keep the skis in contact with the snow.

Direct line with increased steering –

Still quite a direct route but using the "front-side" the of mogul at the end of the turn with steering a little more to slow down the overall speed of the descent.

Varied line -

Choosing to use a combination of techniques to descend the mogul field with optimal flow and fluidity. The more competent a bump skier is the more they will be able to apply different techniques and styles regardless of the shape or size of the moguls.

Conclusion - key points from this chapter

- There isn't a single best way to ski moguls, only different ones.
- One of the hardest parts of mogul skiing is planning the route. Practise mogul tactics just as much, if not more than techniques.
- Don't be afraid to experiment, usually the biggest breakthroughs we have are when we try something different.
- Remember the poles are the timers for the feet/skis to move. Good pole plants practised both on piste and in the moguls will help to encourage a successful run.
- Keep the head up and look ahead to help with route planning and balance.
- Start with shallow moguls and short pitches and work your way up to more difficult runs. It's important to keep it fun as well as challenging.

CHAPTER 8

Using the Skills in Variables Terrain

Jordan Revah and Jamie Kagan

One of the greatest challenges of skiing variable terrain is the wide range of snow types that you will encounter. These can include deep untracked snow which could range from champagne powder to densely packed windblown snow, breakable crust, chopped up tracked snow and many more.

Every aspect of the IASI technical content we've covered up until this point is designed to create skiers that have sound foundations, a good understanding of how the forces at play in skiing affect everything else and the ability to adapt. This should already stand you in good stead for transferring your skills into variable terrain. Skiing variables is one of the best ways to put your skills to the test and see how adaptable your skiing truly is. This adaptability is one of the most important technical aspects of skiing variable terrain as, unlike skiing on groomed pistes, the way we interact with force changes as we move through different snow conditions. The more we feel and manage these forces, the stronger appreciation we gain for why this is such an integral part of skiing.

This chapter won't re-iterate technical aspects of skiing that we've already discussed in detail in previous chapters. Instead, we will identify a few different snow types that people often find challenging and for each snow type we will explain how the forces have been affected, what skills we should adjust as a result of this change to the forces and why.

Finally, we will go into some common misconceptions that, unfortunately, have proliferated the subject of how to ski off-piste terrain but have little or no actual logic or reasoning behind them and should therefore be dispelled.

POWDER SNOW

Powder snow can be described as soft snow that has fallen relatively recently and is generally light and dusty. Because of the texture of the snow, when not moving, the skis will sink into the snow rather than stay on the surface.

<u>How the Force equation is affected</u>

1. As a result of the skis being immersed in the snowpack; the skis and lower legs (to the depth of the snowpack) will encounter a much higher degree of friction/snow resistance. When this force is encountered the skis and lower legs will decelerate considerably compared to how this is felt on a groomed piste. The lighter the snow (e.g. champagne powder) the lesser this friction will be, the heavier the snow (e.g. deep slush) the stronger this resistance will be. All powder snow will have more resistance compared to a groomed piste. (see point 1a and 1b below for what skills to adjust to help deal with this).

2. As we stand on the snow it compresses under our weight and what was powder becomes compacted (in physics terms – ground reaction force gets stronger the harder we press against the powder). The stronger we press against a smaller contact point the more extreme we experience this change in force (so pressing all your weight through one leg whilst tilting the ski onto a very severe edge angle you would feel this much more than standing on flat skis with equal pressure between them). (see point 2a and 2b below for what skills to adjust to help deal with this).

What skills should we adjust?

1a. Accurate fore and aft movements that begin from the lower joints are essential to ensure we manage the stronger decelerating forces from the friction of the snow that our skis and lower joints are encountering. As the powder snow builds up against our skis and boots (causing resistance and slowing our skis and feet down) if we don't react to this our body will be forced to move ahead of our skis and feet causing us to become unbalanced (because our skis and feet are decelerating but our body is not). By actively moving aft and allowing our feet slightly ahead of our hips as the resistance builds up in the completion phase of the turn and then retracting them back underneath our hips as we transition to the next turn, we anticipate this deceleration effectively allowing our body to remain over our feet and balanced over our skis. This fore aft pressure control is crucial for dealing with the way we interact with force in powder.

However, we need to be careful that we do not overload the front of the skis at turn initiation as this could cause the skis to dig into the snow resulting in an over the handlebars type fall. We don't need to work a huge range to effectively manage the pressure but do need the movements to be accurate and progressive through the turn. In addition to accurate fore/aft movements; using leg flexion specifically to manage the stronger build up of force at turn completion will help equal out the force equation. This pressure control and making small adjustments as you feel the force build is vital to success in powder.

1b. As we are experiencing more decelerating forces we don’t have to use rotation as much or as quickly as we would on piste. The snow will slow us down already so, often, we can rotate the skis at a much slower rate than on an equivalent pisted gradient and not as far across the fall line. If we keep the rate and range of rotation the same we’ll end up going too slow and struggle to move laterally and effectively change edges as a result. Additionally, rotating our legs and skis in powder is physically more demanding so slowing this movement down and rotating less will be more efficient.

2. To deal with the change in ground reaction force we have two options. As much as possible, aim to apply the first technique mentioned below (“new powder technique”) as it allows you the best opportunity to work the skis in a fore/aft plane, it matches the movements we are aiming to do on piste, it works the ski itself more and utilizes the shape of the ski and it tends to be more effective in more snow conditions. The second technique mentioned below ("old powder technique") we still want to reference and explain so you understand why it existed and that it can still have a place in skiing. Be open to playing and experimenting with both techniques:

2a. “new powder technique” – we use this term purely as this technique wasn’t possible until parabolic skis existed. For this reason, it is the newer way of skiing powder. One benefit of this way of skiing powder is that it is in all ways the same as what you will be doing on piste with refined timing in how you blend movements. We move laterally and press against the outside ski edge much as we would on piste. As long as the timing of these movements is accurate, and we are controlling the pressure as mentioned in point 1 above, as we press against the tilted ski the snow compacts until a point at which it can support you, at that point the turn works identical to piste as the compacted snow has the same physical qualities of a piste (just softer) and we can aim to deflect the ski from apex to apex.

2b. “old powder technique”. The original way to ski powder, still super fun and can be effective. The downside – it’s quite physical and as a result more tiring and in certain snow types your accuracy has to be extremely good to not fall over! It also is largely not what we’re trying to do in other areas of our skiing (piste/bumps) and limits certain movements we want to do to help deal with the forces in powder. You stand much more equally on your skis (often referred to as 50/50). You press down against the skis using strong leg extension to compact the snow. Ground reaction force gets stronger and you get pushed upward effectively jumping or bouncing (you may not come out of the actual snow depending on the depth of snow). You do your turn, for the most part, unweighted and then land as balanced as possible back on both skis ready to finish the turn and repeat the process. These turns will always be small/short and quick leaving minimal time for error and minimal time to work the fore/aft plane of movement or use flexion to control the build up of pressure at turn completion. They’re still super fun and good to play with and can be effective when skiing very flat powder or crust layers where an up-unweighting (as described here) makes life easier!

CHOPPED UP OR TRACKED SNOW

Tracked or chopped up snow can be described as powder snow that has already been skied enough to have many tracks in it but not enough to form bumps.

<u>How the Force equation is affected</u>

1. Skiing tracked or chopped up snow we experience the same decelerating forces mentioned in relation to powder snow interspersed with moments of dramatically decreased frictional force when we go through a track or section of tracks. This makes for a constantly changing interaction with resistance.

What skills should we adjust?

1a. Edge accuracy needs to be very good. As we are constantly experiencing changes in resistance from the snow, in a very unpredictable fashion, we need to make sure both skis keep working together, cutting through the snow and tracking on the same path. Small in-inaccuracies in the tilt on the skis can easily result in them deviating from each other and this causing problems!

1b. We should aim to keep the skis, legs and hips level (often referred to as “square”) throughout the majority of the turn. As with the point on edge accuracy, the more we can aim to be level from the hips down the better the skis will track and work together through the snow.

These two points working together will allow us to have a strong, stable stance that doesn’t get knocked or bounced around as we ski the chopped/tracked snow. This is what should be referred to as skiing more two footed and is essential for variable terrain. Unfortunately the same term (two footed) is often used to describe a more equal weighting on the skis (50/50) which is misleading and in no way related to points 1a and 1b above.

New powder technique is much more beneficial for skiing this terrain as it allows the ski edges to cut through the snow. Old style powder technique will result in getting bounced and pushed around by the snow and terrain as the ski remains flatter in the turn and the edges don't cut into the snow. Playing with longer turns (more akin to carving) is a good tactic as it leads itself to the above modifications in the skills you use.

2. With lateral movement (edging) and fore/aft movement - decreasing the amount will be a safer choice. The further away our skis are from our CoM (laterally or fore/aft) the harder it will be to regain balance if one of them gets dramatically knocked out of position by meeting a weaker or stronger resistive force. Don’t play things too safe though as skiing a completely flat ski will cause far more problems (mentioned above). As your skill increases keep pushing and experimenting with the amount you allow your CoM to to travel away from your skis to find your limit.

3. As with powder snow be sure to allow the legs to flex and absorb force at any point in the turn as and when needed. The resistive forces can come on at any point in the turn so we need to constantly be ready to absorb these forces and keep our legs supple. For this reason and the points above often cross-under style turns are more beneficial in this terrain than risking a cross-over style turn and possibly fully extending your legs and blocking the ability for your legs to absorb force at that moment or even worse extending your legs into a force you couldn't anticipate and crashing.

STEEPS

Steeps represent the ultimate challenge for every skier. Here we will discuss explicitly what changes as the gradient increases but bare in mind steeps can also come in any snow condition so you'll have to think about and deal with the snow type too!

<u>How the Force equation is affected</u>

The steeper the gradient, the stronger gravity will exert it's pull on us accelerating us down the hill.

<u>What skills should we adjust?</u>

1. The stronger pull of gravity will constantly challenge the amount of time we have during a turn as the minute our skis turn to begin facing the fall line we will accelerate quickly! For this reason, the biggest change we need to make is to speed up our movements to account for the lack of time we're going to have. The movements themselves are no different to what's already been discussed but with less time to perform them we will have much less chance to correct problems meaning our degree of accuracy will have to be much higher.

2. Rotating our skis and legs further across the hill will allow us to control our speed and gain precious time at turn completion and transition to start preparing for the next initiation. As a result of turning further across the hill, we will experience stronger friction/snow resistance which in turn will require very accurate pressure control movements (discussed earlier in the powder section) to manage. Depending on the consistency of the snow this won't be necessary (see section 1b in POWDER SNOW).

One of the hardest aspects of steep skiing is that we have to master it whilst skiing it. It's very challenging to practice the speed of movement required without the steepness of gradient that results in gravity exerting it's pull on us as it does when skiing steeps. Specific drills are the best way we can practice on piste to try and mimic the conditions and be prepared to move quicker than we "need" to on piste. Any drill focusing on speed would be a good place to start (see tic-tac, speiss/hop turn, jump turn variations, etc.)

MISCONCEPTIONS

This section is included as, unfortunately, off-piste skiing has been taught badly by many for a long time. As a result many false techniques have proliferated this area of skiing causing confusion and blocking what should be an enjoyable experience with development no different to piste skiing. Many of the reasons people struggle to conquer variables and develop psychological blocks when skiing them come down to trying to apply something that is fundamentally incorrect and naturally getting a bad result, bad feelings and generally a bad experience. We don't want this to be the case so hope this section will shed light on why some aspects of variable skiing that are commonly taught and prescribed are incorrect:

1. Lean back. We've already covered and explained the importance and reasoning why fore/aft movement is essential for skiing variables. When taught badly or lazily this is often referred to as "leaning back" or "lean back to keep your tips up". If you actively lean back and stay back all you will do is put your body out of alignment and into a non-biomechancially sound position which will firstly endanger you, secondly cause much more fatigue as your muscles will be instantly used to support your body **(see chapter 18)** and thirdly block natural movements you are trying to make. If ever you are asked to move aft it should only be for a specific reason and never for the entire turn as we've described in depth earlier in this chapter.

2. Have your weight more 50/50. We have slightly touched upon this already. The idea and term 50/50 (sometimes incorrectly called two-footed) originates from "old powder technique" where the skis didn't have enough shape to effect the turn by tilting. This is no longer the case and modern powder technique has come a long way since then. As discussed previously, old powder technique can work but is limited to what it achieves and will never allow us to use much lateral movement, fore/aft movement, flexion or the shape of the ski to help shape the turn. For these reasons we should move away from aiming to ski with equal weight on our feet/skis. The more accurate aim instead of skiing 50/50 would be to ski more two footed as previously discussed (skis level and edge accuracy very good) and not commit your CoM very far away from your skis if you don't trust the snow type or your equipment for any reason.

3. Widen/open your stance. Widening our stance creates more stability - this is a fact and almost always what will be used to justify the reasoning behind advising this. The downside is that even though it would create more stability the problems it creates far outweigh the gains from this! Specifically, the minute our stance goes wider than hip width it becomes much harder to control 2 edges simultaneously, we block our natural movement of our CoM across our skis, the ability to flex our legs becomes harder, the ability to rotate our legs becomes harder and we allow more snow between our legs making skiing much more physical. Instead of resorting to widening your stance and surviving powder; spend more time developing your foundations and ingraining good movements into your skiing that you will be able to transfer into variables.

4. Narrow/close your stance. Narrowing your stance creates a smaller platform that's easier to balance on. This is true and often a quick fix for helping people to get skiing powder. Unfortunately the problems that arise will again cause blocks to movements and as a result blocks to how we progress in varied terrain. Specifically - as your stance narrows (to closer than hip width) it becomes harder to accurately control your edges and ensure both skis track together, we block independent leg movement (flexion/extension), our balance point becomes quite small to the point that toppling and falling sideways can easily happen and we block the ability to rotate our legs inside the hip socket. As with all skiing prescribed throughout the manual - a hip width stance is bio-mechanically the best position to ski with! Train it on piste well, apply the advice expressed earlier in this chapter to deal with the change in the force equation and trust what is hopefully a strong foundation in your stance that will allow for functional, effective movements that work in varied terrain as they do in all other areas of your skiing.

5.Don’t use your edges/ski a flatter ski. Hopefully through the previous sections you will already understand why this isn't good advice. Modern, shaped skis, are designed to be tilted and stood against - if we intentionally don't do this we aren't making the most of the equipment we're standing on and therefore choosing a less efficient way to turn. Wherever possible we should always aim to make the skis do as much work for us as we can! The other reasons behind this we have covered in great detail earlier in this chapter.

.

EQUIPMENT ADVICE

No chapter on variables could be complete without talking about equipment! Here is some brief advice on this topic:

Skis –

1. Wider skis are much more forgiving than skinnier skis. All skis can work in powder but the skinnier you go the further you'll sink into the snow and experience the changes in force and the more accurate all your movements will have to be to deal with these. If you go very wide, controlling both edges will require more physical effort and moving your CoM across your skis will require more effort and as a result you may find yourself tricked into skiing a flatter ski - something we don't want to do.

2. Longer skis make fore/aft balance easier. If you ski a very short ski in powder, managing fore/aft balance is much harder as you have less of a ski to work with. A longer ski will make this easier.

3. A stiffer ski will get bounced around less in choppy snow and offer more support to move fore/aft and generally feel more solid and stable in variable snow.

4. Skis with tip rocker will make you feel more confident moving forward on the ski, when appropriate, and make you feel safer maintaining a normal neutral/central position (not leaning back!)

5. Binding position - A more centrally mounted binding will make things harder as fore/aft balance will be harder. Linked to point 2 above, if we have slightly more ski in front of our binding than behind we should feel happy having a relatively neutral/central position and working the fore/aft plane along the length of the ski as the forces dictate. If you have quite a small amount of ski in front of your binding this can make you feel like you need to lean back to avoid the tips diving in (something we don't want to do!).

6. Pole baskets - Powder or freeride baskets will give your pole plant more support and purchase in the deep snow and avoid the pole going too deep in the snowpack and pulling your arm/body back with it. This will allow you to have a much more regular pole plant that should instill confidence and help transfer feelings you have skiing and pole planting on piste into varied terrain.

Often through training in variables you'll develop and consolidate your understanding, movements, performance and flow and when you take this back to the piste you'll hopefully be able to transfer this back over! Variables are a challenging area to master but also one of the most enjoyable and rewarding so get out into the variable snow and get practicing!

Chapter 9

The Diamond Model of Skill Acquisition (DMSA)

Derek Tate

Developing your skill with flow and mindfulness

Learning new skills is one of life's greatest joys. This chapter presents a new integrated model of skill acquisition that draws upon the work of Ellen Langer (1998, 2000) and her approach to mindfulness and mindful learning and also the work of Mihaly Csikszentmihalyi (1975, 1990, 1997) and his construct of flow or optimal experience. These ideas are combined with Fitts and Posner's (1967) original stages of skill acquisition to provide an innovative approach to acquiring skill that will lead to enhanced learning and enjoyment. The **Diamond Model of Skill Acquisition** (DMSA; see Figure 1 on the next page) is noteworthy because it places importance on fostering the student's well-being alongside the acquisition of skill.

Diamond Model of Skill Acquisition

Teacher role		Student experience
Facilitation and creation of conditions	**Flow** Optimal experience	Being in the zone Creating a beam of energy
Challenge and stretch available skills	**Performance** Expansion of and creating variation	Learning mindfully Expanding one's range and repertoire of skills Active engagement Varied target of attention
Feedback, questioning and reorientation	**Movements** Motor learning	
Telling, showing, questioning	**Knowledge** Cognition	Develop awareness and understanding

Figure 1

The significance of the diamond shape is an important step in the development of this conceptual model, which emphasises that as the learner moves through the first three stages of skill acquisition there is an increase in mental and physical abilities in relation to knowledge, movements and performance. During the third stage performance is honed and if conditions are optimal then the performer may enter the flow state and hence narrow their focus towards the desired goal. By using a mindful learning approach throughout a retraining of the learner's attention takes place allowing for better focus on the task at hand.

An explanation of each stage

Knowledge

This is the cognitive learning phase of skill acquisition. The brain begins to acquire knowledge and the breadth and depth of that understanding gradually expands. The mechanisms for learning here are through reading, seeing and hearing. It is vital, therefore, that the learner sees visual demonstrations (showing) and receives clear explanations (telling) in order to build up a mental picture and assist with early attempts. In effect, the brain is being warmed up to new activity in preparation for learning new movement patterns.

Movements

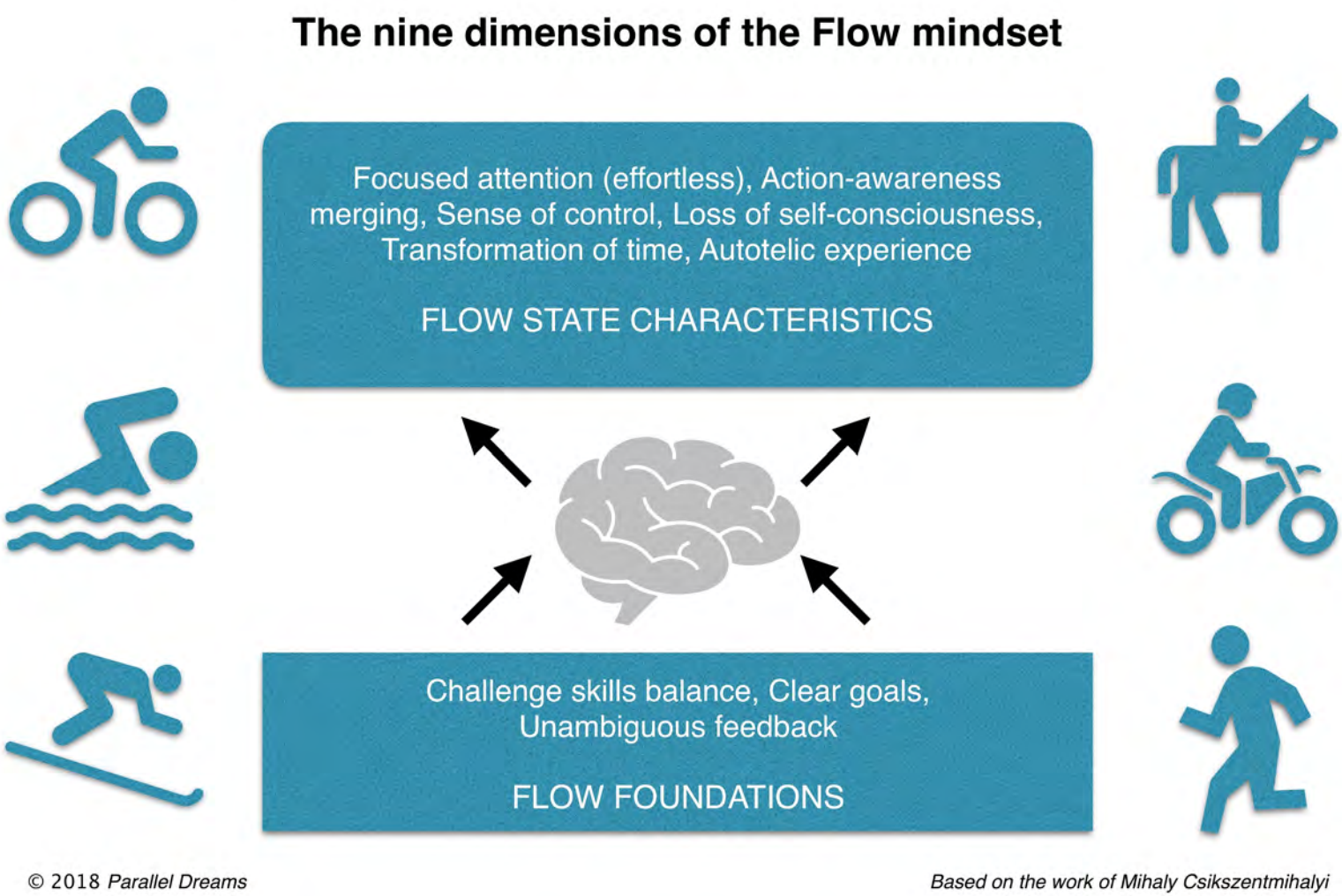
During the second stage, the learner develops a range and repertoire of movement patterns that gradually become more complex, allowing the required skills to be executed both efficiently and effectively. This is where motor learning takes place requiring exploration, repetition and practice of the movements needed to perform (see the article Purposeful Practice; Tate, 2017b). In the original Fitts and Posner model this is called the associative phase however, the mindful learning approach suggests that the learner should keep their mind actively involved in the present noticing new and novel distinctions as they practice. This will promote greater adaptability of the skill, which, for sports that take place in an open environment, such as skiing and snowboarding, is an essential quality for coping with the ever-changing conditions.

Performance

This is the stage where the skills become autonomous and thinking becomes more effortless. The brain, at this stage, could be said to be quieter or less busy than the previous stage. The training focus now moves to creating variation in the execution of the skills. As in the previous stage, from a mindful learning perspective, it is important for the learner to remain present moment focused, noticing new and novel distinctions as they perform. A more external focus is beneficial in terms of the activities chosen by the teacher and this is the stage where the learner can be challenged in order to make the performance more robust and set up the likelihood of moving into the next phase of achieving optimal experience (see the article Challenge Yourself; Tate, 2017c).

Flow

Optimal experience is the more accurate terminology for the 'mental state' that performers enter when some or all of its nine dimensions are met. Figure 2 (on the next page) illustrates the nine dimensions of the flow mindset and how they are divided into flow foundations and flow state characteristics **(see the Flowing with Mindfulness website for more info on flow).**



Flow has become a more popular, mainstream, name for this experience. One of the most important dimensions of flow is the ability, of the learner, to focus attention effortlessly so that there is full engagement on the task or performance in hand (see the article Focus Your Attention; Tate, 2017a). Csikszentmihalyi describes attention as being a kind of 'psychic energy' that helps bring order to consciousness.

The concept of the DMSA is that as the learner enters the flow state their attention flows in the direction of the intended goal narrowing towards that target. One question that is often asked is; does flow = peak performance? The answer is; maybe and in many cases yes. However, optimal experience is a pleasurable experience, both during and after the activity, and leads to greater enjoyment of the overall learning process thus it is a desirable state in its own right in that it can lead to greater well being of the individual concerned.

The student experience

The **student experience** helps clarify what should actually be happening, for the learner, at each stage of the model. During the first stage; **knowledge**, the learner is engaged in developing awareness and beginning to execute and understand how a skill is to be performed. When learning a new skill this means starting from zero or unconscious incompetence. In the second stage; **movements**, the learner's brain is busy. Engagement should be active and full while remaining present moment focused. Attention should be focused in such a way that it is not 'fixed' on the stimulus but rather a varied target of attention so that the learner notices every detail. This is what Langer describes as mindful learning. In stage three; **performance**, the learner should experience the opportunity to expand their repertoire of skills while retaining the mindful learning approach of the previous stage. During the final stage; **flow**, the learner may experience a number of things but one of the most common expressions relating to this stage is "being in the zone". Attention is so focused, yet effortless, it is like a beam of energy.

The role of the teacher

Understanding the role of the teacher is crucial for helping students to progress through this model when learning and acquiring skill. During the **knowledge** stage the learner needs to gather and process information as they attempt the task, hence the teacher needs to use a good mix of showing, telling and questioning. The latter is vital for checking understanding, while depending on the student's learning style, the mix of explanation and demonstration may need to vary. The **movement** stage is all about doing, from the learner's perspective, but the teacher needs to ensure that the learner receives sufficient feedback through a variety of sources aided by the use of different teaching styles (Mosston & Ashworth, 2002). Questioning is again an important part of the process and an integral part of successfully using teaching styles such as reciprocal, self check and the discovery styles. If the practice goes 'off course' at this point then the teacher needs to re-orientate the learner to the desired movement pattern. The teacher's main task, during the **performance** stage, is to provide sufficient challenge for the learner so as to really consolidate their learning while also getting them to use their available skills. This is referred to as the challenge/skills balance within the flow construct and leads nicely to the final stage. It is not possible to teach someone to experience **flow**, or for a learner to experience it at will, but if the right conditions are created, or facilitated, by the teacher, then the chances of the learner experiencing it go up considerably.

Teaching content - Practical

Chapter 10

IASI PEAR model

Jordan Revah, Chris Oldaker, Jamie kagan, Ali Smith & Federico Sollini

Teaching Philosophy

The IASI teaching philosophy is as follows:

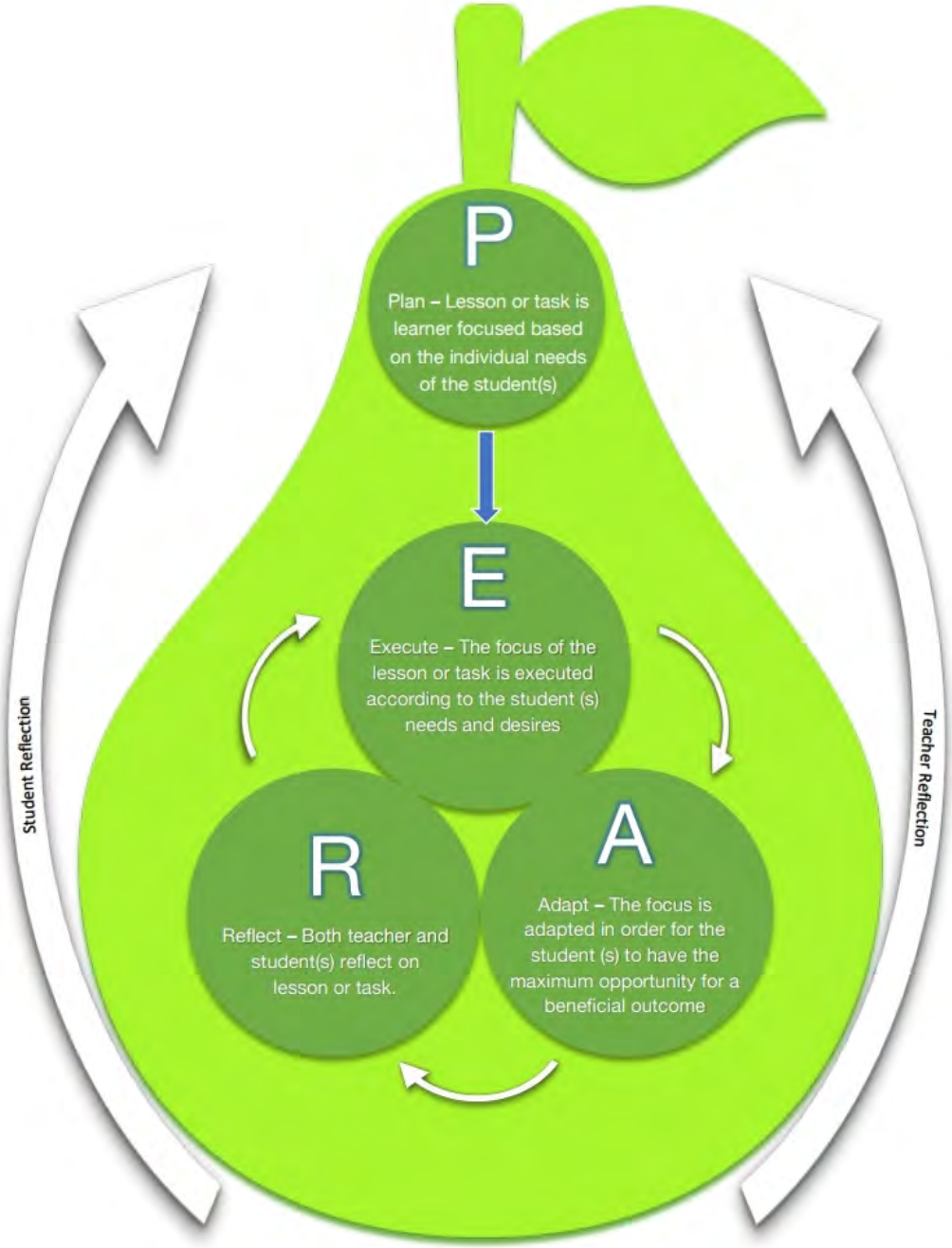
To develop confident teachers who can teach a wide range of students (variety of demographic and ability) in whatever conditions the mountain might throw their way! The ability to adapt to cater for the student(s) needs at the given time and focus on student-centred learning is an essential aspect of what we look for in IASI teachers.

Why student-centred?

At the heart of our teaching philosophy and throughout the PEAR model we put the student at the centre of the equation. Not only do we feel this is appropriate to the real-world job of ski instruction, it is also essential for delivering safe, enjoyable lessons. Additionally, it has been proven to have a higher impact on students' development in a sporting environment.

A note on simplicity

We created the PEAR model as it is a simple, effective model that encompasses most of the elements we feel are necessary to teach well. It also offers the opportunity to learn from your previous teaching experience which will help you to continually grow and develop as a teacher.
There are many other great teaching models out there and plenty of reading available on the subject too. For those interested there are references and links to some further reading later, but in this chapter we've tried to keep the information as simple and easy to follow as possible to make sure it is easy to digest and put into practice. A large amount of development as a teacher comes from the real-world experience gained whilst actually teaching so be sure to practice real life teaching whenever and wherever possible!



The importance of the pear shape – any good lesson starts with a good plan but a great lesson and teacher will fluidly adapt their plan whilst executing it and continually reflect on how things could be improved to better the student. The shape of a pear emphasises that the planning phase is only a small aspect of what makes a good lesson and teacher and there should be a larger emphasis on the execution, adaption and reflection that should constantly be taking place within a good lesson.

Planning

Teaching skiing has many unpredictable factors and variables we must consider. Planning beforehand helps us to prepare for the lesson that we're intending to teach and in turn should help the lesson be student centred resulting in the best chance for the student(s) to develop.

With good planning, we get an idea of possible directions the lesson may go in and possible levels of understanding the student(s) may have. This helps us to identify appropriate activities/drills/tasks and terrain that are suitable for the student(s) needs. Thus, creating a safe learning environment with effective decision making enabling optimal conditions to achieve our goals.

Planning helps to put in place the first steps before adaptions may need to be made, as well as giving us a logical structure to help prevent the lesson having no focus. This in turn allows the student(s) to know what is required of them.

Engaging in planning is also crucial in the development of a teacher as it encourages deep thinking on your personal approach to teaching. This foundation will then later on act as a template from which thoughtful reflection can occur to aid future development as a teacher (the rationale behind the PEAR model). Without the initial building block of a plan it would be difficult to execute, adapt or reflect particularly effectively.

How to plan/Pre-planning

First gather all the available information. Sometimes in our working environment some of the information might not be available until you meet the student(s), but collect as much information as possible. Some useful questions that can help plan the lesson:

1) How many students will you be teaching?

2) What is the demographic of the student(s)?

3) How long will the lesson be? How many potential lessons will there be?

4) What experience does the student have?

At this stage, take a bit of time to reflect on any previous experiences and approaches that gave you success with the demographic you are about to teach. There might be common issues that you can be ready for and you may be able to make a list of potential activities/drills/tasks that will be useful for the lesson.

Once you have as much information as possible you can start to make a provisional plan for the lesson.

What to plan

A plan can be as simple or complex as you wish. We all have different learning needs and learning styles, we also have different teaching needs and styles.

The next step is to meet the student(s) and talk to them which will help you develop your provisional plan into something workable. The important part of planning is that it needs to work for you and your student and you should find it a useful resource.

Here are some useful questions to help guide you through the process of what to plan in the lesson:

1) What is the aim and desired outcome of the session for your student(s)?

2) What safety considerations need to be taken into account?

3) Are there any other external factors that may be an issue? Ie. Snow conditions, weather, lifts etc.

4) What are appropriate activities/tasks/drills and terrain to achieve the intended outcomes of the session?

5) Do you have a great enough understanding of the topic you are wanting to teach?

Once you've gone through the questions and process above you should have the beginnings of a good plan. At this point it's a good time to have a bit of a pause, come back later and re-assess your plan before you have to execute it on snow. (In a real-life teaching situation this may only be the time it takes to go up the lift!)

In the following section we'll discuss the execution phase of the lesson.

Execution

During the execution phase of the lesson you should start to implement your plan. In this chapter we will give you clear direction on how to practically do this whilst teaching and also link to some of the more theoretical content that some teachers may find useful and interesting for further reading.

Some useful elements for a good execution include, but are not limited to:

1) Having a clear mental image and understanding of your plan to ensure that you stay on track.

2) Conveying any information to the students in a simple concise way using language appropriate to them (auditory learners).

3) Demonstrating what's required for learners who respond better with visual cues (visual learners).

4) Giving internal or external focuses and/or feelings, if at all possible, for learners that are better with kinesthetic cues (kinesthetic learners).

5) Observing, gathering information and getting to know your student(s). As your students are gaining an understanding and appreciation of what you're asking of them you should be constantly observing and gathering information. This can be used to help their development and to provide feedback. It is also useful to decide whether the lesson needs any adaptation. **(read more – Chapter 14 Learning styles)**

This observation and evaluation should not only be looking at their technical performance but getting a feel for the students' emotional state. In many cases this is as, if not more, important than their technical ability. Students who are removed too far from the learning zone and become scared (danger zone) or bored (comfort zone) will often not be able to perform to their true ability. There is then a risk of either endangering them or them losing interest and not enjoying the lesson. **(read more SEL – see Chapter 11)**

6) Feedback. Students require time to understand and attempt activities or tasks. Feedback should be provided when appropriate and when beneficial to the student(s). This can be gauged as you get to know your student. For some they will require feedback often, others will need stimulation and encouragement but benefit from less frequent feedback. If for any reason you aren't in a position to give feedback (such as you missed the run or couldn't tell from what you saw) don't fake it, just be honest and watch at the next opportunity!

Videos and/or photos (augmented feedback) can be a super tool for helping the student(s) development and to reinforce verbal feedback. When appropriate feel free to use videography and/or photography to help. Especially with modern phones it can be very easy to film with minimal interference and time taken out from the lesson.

7) Communication and discussion. Having an open discourse between student(s) and teacher can be productive and useful to gauge the student(s) understanding, feelings and awareness. However, be sure to retain control of the lesson and always be the teacher when engaging your students in conversation. Having open lines of communication between teacher and student is the first stage of effective goal setting and creating a longer-term working relationship between student and teacher to aid their development. **(read more – Chapter 12 Goal Setting)**

Adapting

Plans are meant to help, focus and guide but even the best plans often will require changing for various reasons! The nature of teaching skiing is dealing with real people with varying energy levels, feelings and needs in an ever-changing environment. This means adapting and altering the plan is essential to ensure successful and beneficial outcomes for the student(s). If we are not adaptable, we run the risk of creating a negative learning environment which isn't enjoyable and possibly even dangerous.

In this section we will give you a better understanding of the adapting process – what it can be, if and when it's required and how to make changes.

What can be adapted?

Adaptions can be big or small, depending on what is needed at the time. We can literally adapt every part of a lesson and the more experience you gain as a teacher the more adaptable variables you will identify. Adapting can be broken down into 3 different categories: the content, the process or the activity.

Content: Changing the topic or focus of what you are delivering.

Process: Changing how you are teaching the lesson. This can be changing the teaching style to best suit the learning styles **(read more chapter 14)**, changing the language you use to explain something or how you deliver the information.

Activity: Changing the specifics of what you are doing and wanting the student(s) to do/achieve (i.e. making it more or less challenging, changing the phase of the turn you're focusing on, etc.)

Is adaption necessary?

As mentioned in the Execution section (point 5, 6 and 7) you should be gaining a good awareness of your student(s) needs. Throughout the lesson we should be constantly questioning if we are meeting those needs. Ask yourself questions to determine if this is the case and if the lesson is working:

1) Is the lesson achieving what we, the teacher and student, were hoping to achieve?

2) Are the students enjoying it?

3) Does the plan allow for optimal continued learning?

If all or some of answer are no, don't worry – you've identified it's time to adapt and make some changes. The following questions will help you identify why a plan needs to be changed and, with this information, what to change and how to change it.

1) Have the student(s) needs been identified?

2) Are the goals/aims of the lesson appropriate to the student(s) needs?

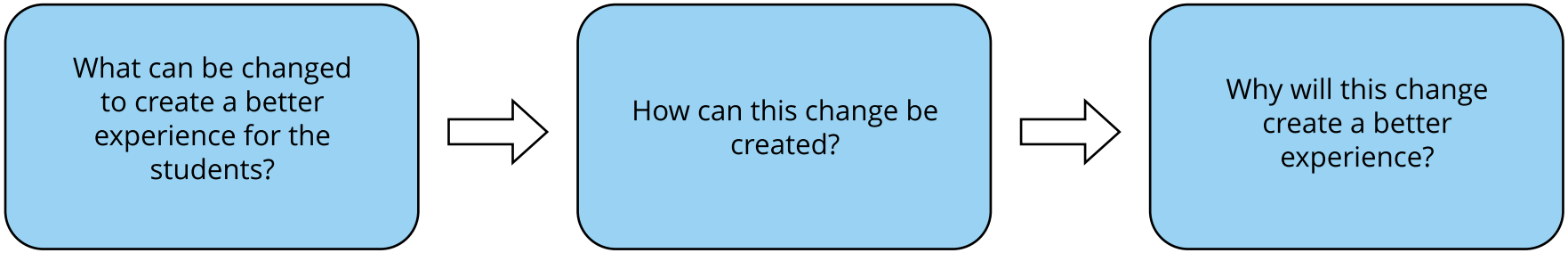
3) Are the activities/drills/tasks appropriate to support and encourage learning?

4) Are you assessing the student(s) performance effectively? Are they changing? i.e. improving or regressing?

5) Is there a positive learning environment?

6) Have the students had enough time?

You should now be in a position to decide if you need to adapt and know what aspect(s) of your lesson could be adapted. From here it's up to you to decide the best way(s) to make these changes that will have the most beneficial outcome for your student(s). Here's a simple diagram to help guide this process



How we fluidly adapt during our lessons will improve with experience, and it will be easier to recognise areas that need to be adapted earlier and before issues arise. Trust yourself, keep it simple and make the appropriate adaptions to create the best outcome for the student(s). If you can mentally justify why the change will create a better experience for your student(s) you're on the right path!

In the final section we'll discuss the reflection process. It has taken place several times already in this process and hopefully on reading the following section and re-reading the previous sections this will be clear.

REFLECTION

In this section we will be discussing the reflection that should take place between the student and teacher at the end of the lesson(s). In reality, constant reflection and evaluation should be taking place in a good teacher's mind during the execution phase of their lessons. This provides the basis for how and when they choose to adapt their plan. The focus of this section will be on the post-lesson reflection as the more you, as a teacher, start to do this the more it will become natural and fluid during the lesson itself. To allow you to develop this aspect of your teaching it's often easier to start with it as post lesson reflection where there is more time to mull things over!

Teacher reflection:

Questions for the teacher to consider:

1) Were the aims and intended outcomes of the plan achieved? If not, was there reason to deviate? If there was deviation – what was changed and why?

2) What worked well? What do you feel could be improved upon in your teaching e.g. delivery, choice of activities, identifying what and how to adapt, feedback and analysis…?

3) What have you learnt about your student(s)? Technical ability? Emotional threshold? Physical threshold? Desires? Aims? Do they respond better to certain teaching methods? Etc. etc.

4) What would you change, if anything, if you had the chance to repeat the lesson and why?

Future lessons to reflect toward – starting the PEAR cycle again

Start planning for your student(s) continued development (future planning):

1. Future lessons/next lesson – think about the next steps.

2. Identify targeted practice that student(s) can do independently. Ideally skills, tasks or activities that were covered during the lesson where they require more practice before introducing new ideas.

3. Theory/off-snow if appropriate and relevant. Anything that may help the student(s) develop between the end of this lesson and the next lesson.

Student reflection:

Depending on the experience, awareness and understanding level of the student, the teacher will still be crucial in guiding this process.

Questions for the student to consider

1) What have you taken from the lesson?

2) Were there any aspects of the lesson that you feel could further develop your understanding?

3) Is there anything you can do to practice and continue your development in relation to the lesson and any feedback given?

4) Do you have a clearer idea of your goals/desires with your skiing?

A note on reflection during the lesson itself

When there are spare moments take the time to reflect and consider how the lesson is going. This can be on lift journeys, after you've given any information necessary to the students and you're doing a demonstration, when moving from area to area, whilst the students are attempting new tasks or practicing new movements, at a coffee break or lunch break, etc. etc. In general, you should find yourself having moments to reflect during any lesson which gives you time to consider what to do next.

Closing statement

Throughout this chapter you have hopefully been able to gain a clearer understanding of the PEAR model. It should be clear that the more you use this teaching model the more you will develop yourself as a teacher delivering lessons that are well thought out and offering the best opportunity for your student(s) to enjoy, develop and progress with their skiing in general. No matter what stage you currently are as a teacher, through practice and use of the PEAR model you will be able to continually evolve and improve!

Chapter 11

Safety on piste

Derek Tate and Jamie Kagan

Introduction

This chapter covers the very important subject of safety both on piste e.g. marked runs within the boundaries of the ski area (or other environments/facilities). Keeping our guests safe is of paramount importance but it is also of great importance that we look after our own safety and that of other users of the environments in which we work and play. Later in the manual in **(chapter 20)** we will discuss safety off-piste. This first part covering safety on piste, which is relevant to all snowsports instructors, no matter what level of qualification or whichever environment we are operating in, be it artificial, indoor, mountain environment etc. The latter part that covers safety off piste is, in reality, only an overview of some of the most relevant topics, in part, because it is beyond the scope of this manual and because there are some great texts available by leading experts in this field, which we highly recommend and in part because it is not relevant or advisable for all our readers to be skiing off-piste without expert guidance.

So, the suggestion is that this chapter be seen as a 'starting point' or 'reminder' of some of the most pertinent information regarding safety on piste. And as was pointed out way back in **(chapter 1)**, a manual is in no way a replacement for education on courses or practical experience, it is simply 'part' of the overall education process.

Pisted terrain in Hintertux, Austria

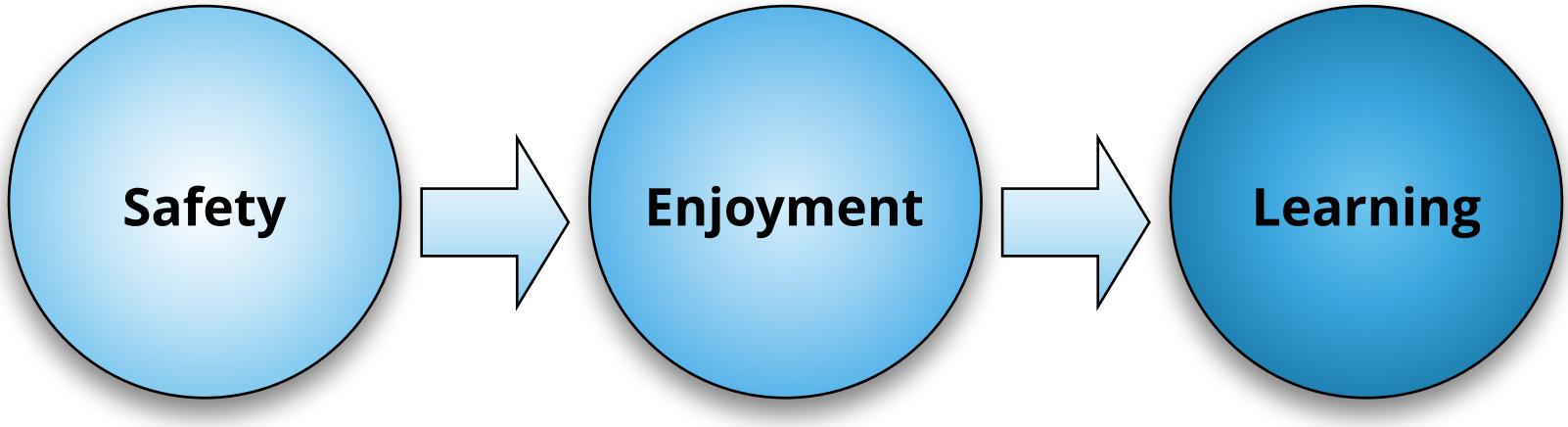
Skiing off piste in Courmayeur, Italy

Part 1 – Safety on piste

Why SEL?

The acronym SEL has been around for a long time and for us, in IASI, it is the foundation of how we approach teaching our guests both on and off piste. In fact, we are so passionate about this that we have structured our teaching assessment criteria for instructors under the three headings of **safety**, **enjoyment** and **learning (see the documents section on the IASI website).**

The order of these three principles is also important as was alluded to earlier earlier in the manual. Our guests, first and foremost, need to 'feel' safe and 'be' safe. They need to have confidence that we will look after them. This means that we are constantly aware of potential dangers and are making good decisions regarding the content of our sessions and how we manage the group (more on this in effective group management). The next priority is that our guests have a great experience and enjoyable time and this is covered brilliantly, by Pete Gillespie, in **(chapter 13 – the guest experience)**. Once these two factors are in place the stage is set for learning to take place. Of course, making progress and successfully acquiring new skills goes hand in hand with enjoyment. If our learners are succeeding then they are far more likely to enjoy themselves.



Effective group management – The Triple 'A' Approach

Managing our guests safely in the various environments, in which we work, is one of the most important aspects of being a snowsport instructor. And when this involves a 'group' of guests the challenge is even greater. In IASI we have what is called, The Triple 'A' approach: Authority, Awareness and Activity. Rather like SEL the order of these is very important as can be seen from the explanation that follows.

For each of the 'A's we, as snowsport instructors, need to ask ourselves a series of questions to ascertain if we are dealing effectively with our groups and to allow us to reflect on our practice.

A1 – Authority

Reflective questions

- Can our learners hear us?
- Do we know their names?
- Do we set the ground rules?
- Do we have a presence?
- Do they know whose boss?

While some of these questions may seem somewhat autocratic, that is exactly the point. Once we develop trust and get to know our guests it is much easier to relax the degree of *authority* that is required to maintain safe control. This follows a similar pattern to Mosston and Ashworth's Teaching Styles, **(as covered in chapter 14)**, where the decision making process between teacher and learner gradually shifts more to the learner as we move along the spectrum from Command to Inclusion and beyond.

A2 – Awareness

Reflective questions

- Are we aware of what is going on around us?
- Are our guests in the most suitable places?
- Are we keeping tight enough control over our guests?
- Are we constantly aware of potential dangers?

When we have several people in a group it is very easy for us to focus our attention on individual learners and indeed, this is a good thing. However, we need to be able to do this while maintaining a good level of awareness of what the rest of our group are doing, where they are positioned on the run and if there are any potential dangers. So, our attention needs to constantly switch from, and move between, the narrow focus of an individual, to the whole group, to the environment and so on.

A4 – Activity

Reflective questions

- Is everyone doing enough?
- Are we including enough variety in the session?
- As activity increases does our level of awareness increase to match the requirements?

The acronym MCA is often used and means – maximum class activity. This is certainly a desirable goal for the sessions that we run but we must be able to increase our level of awareness to match the amount of activity. The more skilful instructor is able to readily use the inclusion teaching style **(see chapter 14)** in order to deal effectively with mixed ability levels but this requires a heightened sense of awareness to effectively manage all of the learners.

So, to sum up, effective safe group management requires The Triple 'A' approach. Sufficient **'authority'** to keep control, heightened **'awareness'** of all activity and enough **'activity'** to avoid boredom.

Leadership

Leadership is a huge topic and could easily warrant a chapter of it's own even in relation to snowsports. However, for the purposes of this chapter we are more interested in the safety side of 'leadership' and how as a snowsports instructor being a good leader is all about sound *decision making* in the different environments that we operate. Each of these environments provides their own unique challenges. The 'artificial' environments that we are talking about include outdoor dry slopes (dendix, snowflex etc.), indoor rolling carpet slopes and indoor snowdomes. These are all largely **'closed environment'** where there are fewer variables to contend with than their counterpart: the **'open environment'**, which includes on piste and off piste in mountain resorts. In one sense closed environment and open environment can be seen as being on a continuum with more and more variables needing to be contended with the more *open* that environment is e.g. weather, visibility, snow conditions, busy slopes, obstacles (rocks, trees) etc. Through experience we learn to cope better with these variables and how best to make decisions and to what extent we can allow others to be involved in the decision making process.

As part of the Alpine and Snowboard Level 2 qualifications leadership in a mountainous environment is an assessable element. Two models are considered in terms of helping student instructors identify and understand their preferred leadership style. These are the **Action Centred Leadership** model and the **Decision Centred Leadership** model (as show in Figure 1 and 2 on the next page).

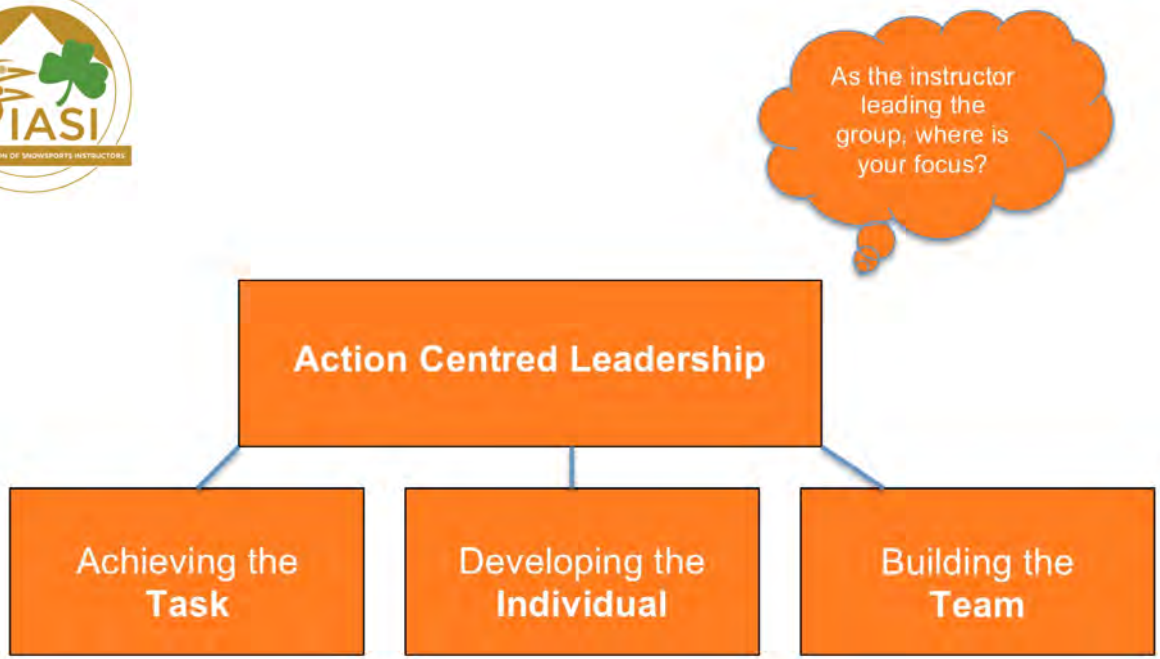


Figure 1

Developing the individual

Group democracy

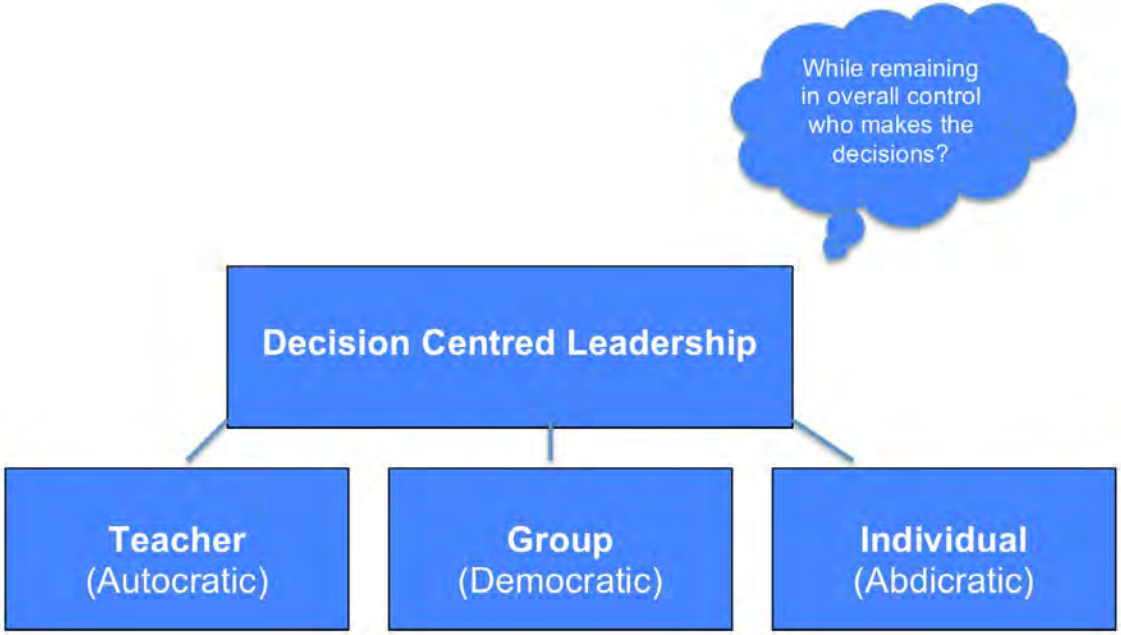


Figure 2

Specific 'leadership' challenge

One of the greatest challenges we face as snowsport instructors, which requires sound decision-making, is leading in poor visibility and **whiteout** conditions. A whiteout means that it is difficult to differentiate the snow from the sky and everything literally seems 'white'. As will be discussed, when talking about off piste and avalanche safety, in **(chapter 19)**, prevention is better than cure so, if we have checked the weather forecast then it may have been possible to pre-empt the poor visibility and move to a better location, such as tree-lined runs that increase definition and make navigation much easier. But, it is not always possible to avoid whiteout conditions and dealing with the situation effectively and safely is made easier if we have knowledge of and carry out the following:

- We have a good knowledge of the resort, the pistes, various landmarks etc.
- We are aware of how the pistes are marked e.g. in France the pole on the skiers/snowboarders right has luminous orange on the top part of the pole while on the left there is no luminous marking. This is different in some other countries such as Switzerland where there is a larger luminous marking on the pole on the right and a small luminous marking on the pole on the left. However, the important reason for this is so that we know if we are on or off piste!
- And following on from the point above, we should be aware that different countries number and name their runs differently. Again using France as the first example, the runs are named and go from a higher number down to '1' on each successive piste marker or 'panneau', whereas in Austria the run is numbered and each marker has the same number all the way down.
- We ski/ride for shorter distances than we would in good visibility.
- We assign one of the stronger skiers to the back of the group.
- We have some agreed signals or audible shouts to be used if someone falls or loses visible contact with the person in front.

FIS Rules for the conduct of skiers and snowboarders

The Federation International de Ski (FIS) is the world governing body for winter sports and, as such, sets the rules including the 10 rules relating to the conduct of skiers and snowboarders. In essence, these rules are like the 'rules of the road' for skiers and snowboarders. As instructors, it is our responsibility to both teach these rules to our guests and lead by example so that we continually show good practice both when teaching and in our free time skiing/riding. What follows is a list of the 10 rules followed by additional author comment.

Rules of Conduct

1

Respect for others

A skier or snowboarder must behave in such a way that he/she does not endanger or prejudice others.

R1 - Author comment

This first rule is really an all-encompassing rule with the rules that follow giving more detail of exactly what this means. However, common courtesy to others is certainly an important element of this rule.

Rules of Conduct

2

Control of speed

A skier or snowboarder must move in control. He/she must adapt his/her speed and manner of skiing or snowboarding to his/her personal ability and to the prevailing conditions of terrain, snow and weather as well as to the density of traffic.

R2 - Author comment

This rule is so fundamental to the safety of oneself and others. Collisions between people often result in greater injury than simply falling over by oneself. Our guests need to be constantly reminded about this and the need to be continually aware of other slope users.

Rules of Conduct

3

Choice of route

A skier or snowboarder coming from behind must choose his/her route in such a way that he/she does not endanger skiers or snowboarders ahead.

R3 - Author comment

This emphasises the need for us to help our learners understand how to choose a good route when skiing or snowboarding and the need for us to give them a good balance of following others and choosing their own line during lessons.

Rules of Conduct

4

Overtaking

A skier or snowboarder may overtake another skier or snowboarder above or below and to the right or to the left provided that he/she leaves enough space for the overtaken skier or snowboarder to make any voluntary or involuntary movement.

R4 - Author comment

The emphasis here is that the skier/snowboarder in front always has the right of way and when overtaking a slower skier or snowboarder, particularly in a 'learning zone', to not only give plenty of space but to also reduce one's speed.

Rules of Conduct

5

Entering, starting & moving upwards

A skier or snowboarder entering a marked run, starting again after stopping or moving upwards on the slopes must look up and down the slopes that he/she can do so without endangering himself/herself or others.

R5 - Author comment

This is all about getting your guest to develop the 'habit' of always checking up and down the slope before starting off.

Rules of Conduct

6

Stopping on the piste

Unless absolutely necessary, a skier or snowboarder must avoid stopping on the piste in narrow places or where visibility is restricted. After a fall in such a place, a skier or snowboarder must move clear of the piste as soon as possible.

R6 - Author comment

This is certainly one of those rules where leading by example is of paramount importance and is very much part of effective group management discussed earlier. An additional point worth mentioning here, which is not covered specifically in the rules is the importance of moving away from the top of lifts to a safe waiting point. This is typically further away than our guests tend to move!

R7 - Author comment

There can be a number reasons why skiers or snowboarders may need to climb or descend the slope 'on foot' but it is worth emphasising to our guests that taking skis off should be a last resort as it is much easier to grip with skis on. The majority of plastic ski boots do not have good grip (unless they have a vibram sole such as those on touring boots) so, taking skis off to walk up or down can be very dangerous especially if conditions are icy.

Climbing & descending on foot

A skier or snowboarder either climbing or descending on foot must keep to the side of the piste

Rules of Conduct

7

R8 - Author comment

What is important here is that our guests understand what all the different signs and makings mean and this is something we can cover during lessons. Our guests have so much to 'focus on' that sometimes they do not even notice some of the signs. For example, on draglifts it is common to see signs, on the pylons, reminding users not to turn on the lift track! Rather than simply make your guests aware of these signs, tell them that reason is to avoid straining the lift cable or possibly derailing it! People tend to be more understanding when they understand the why.

Rules of Conduct

8

Respect for signs & markings

A skier or snowboarder must respect all signs and markings.

Rules of Conduct

9

Assistance

At accidents, every skier or snowboarder is duty bound to assist.

R9 - Author comment

While this is completely correct, our guests should be reminded that safety of oneself comes first and that one should always assess the scene before rushing in to help and perhaps ending up as another casualty.

Rules of Conduct

10

Identification

Every skier or snowboarder and witness, whether a responsible party or not, must exchange names and addresses following an accident.

R10 - Author comment

This is perhaps a timely reminder of the need to have adequate insurance which covers winter sports and includes off piste if you intend to ski outside of the markers.

Specific snowsport instructor rules

In addition to the 10 FIS Rules for the conduct of skiers and snowboarders there are an additional four rules that the snowsport instructor must follow:

1) The Snowsport School (and it's instructors) are responsible for placing their guests into classes according to their ability.

2) The instructor should not allow their guests to take risks beyond their ability while taking into account the weather and snow conditions.

3) The instructor must remind guests that during lessons that they do not have priority on the piste and the should respect the rules of conduct (as set out earlier).

4) The instructor must teach their guests the aforementioned 10 FIS rules of conduct.

Chapter 12
Goal Setting

Jordan Revah & Chris Oldaker

Goal setting

Goal setting is an essential ingredient to help build and establish a good relationship between the teacher and student(s) and a major element in the student centered learning approach. It should help motivate and guide you and/or your students toward long term and short-term goals. It is a major component in both personal-development and professional-development. Without some consideration and discussion on goal setting it will prove difficult to try and create plans and much harder for both the teacher and student to reflect on the lesson.

In this chapter we'll briefly go over some key points for simple, effective goal setting that take place between the teacher and student.

It is the role of the teacher to help guide and frame the goals of the student when appropriate. Both the teacher and student can set goals and discussion between the two should take place to create a learning contract that binds and encourages both to achieve the goals set out.

There are three types of goals: process, performance and outcome goals.

- Process goals are specific actions or 'processes' of performing. For example, aiming to study or ski for 2 hours every day. Process goals are 100% controllable by the individual (as long as the goal is realistic).
- Performance goals are based on personal standard. For example, aiming to achieve Level 3 Ski Instructor, ISIA Stamp etc. Personal performance goals are mostly controllable.
- Outcome goals are goals that are not under your control, but they are often your big picture of where you want to be going. An example being you want to earn "x" per year.

Some students will naturally gravitate to one type of goal or another, so it's good to know the different types of goals there are. We can then recognise the student(s) preference and help encourage them in what motivates them. Some people enjoy the journey/process and some are more motivated by the end and achieving the goal. Understanding the motivations behind goals will help you have a higher success rate in achieving them for your student(s).

There are 5 specific ways goals can be set, all of which can be useful for skiing and should be considered when planning and reflecting with your student(s). Often, depending on the individual student, some of the ways of goal setting will be more beneficial than others for that student at that time. Here are the 5 ways to set goals followed by a description of each. The mnemonic SMART can help you remember them:

- **S**pecific (simple, sensible, significant).
- **M**easurable (meaningful, motivating).
- **A**chievable (agreed, attainable).
- **R**elevant (reasonable, realistic and resourced, results-based).
- **T**ime bound (time-based, time limited, time/cost limited, timely, time-sensitive).

1. Specific

Your goal should be clear and specific, otherwise you won't be able to focus your efforts or feel truly motivated to achieve it. When writing your goal, try to answer the five "W" questions:

- **What** do I want to accomplish?
- **Why** is this goal important?
- **Who** is involved?
- **Where** will this goal be achieved?
- **Which** resources do I need to achieve my goal?

2. Measurable

It is important to have measurable goals, so that you can track your progress and stay motivated. Assessing progress helps you to stay focused and feel the excitement of getting closer to achieving your goal.

The big question is: How will I know when it is accomplished?

3. Achievable

Your goal also needs to be realistic and attainable to be successful. In other words, it should stretch your abilities but still remain possible. When you set an achievable goal, you may be able to identify previously overlooked opportunities or resources that can bring you closer to it.

An achievable goal will usually answer questions such as:

- How can I accomplish this goal?
- How realistic is the goal, based on other constraints, such as financial factors?

4. Relevant

Your goal needs to matter to you! If it is not relevant for you, who you are, what you want and where you want to be, then it has no meaning. Without that, you won't want to achieve it and all the other points are void. Make sure that your goal drives you forward.

A relevant goal can answer "yes" to these questions:

- Does this seem worthwhile?
- Is this the right time?
- Am I ready?

5. Time-bound

Every goal needs a target date, so that you have a deadline to focus on and something to work toward. This part of the SMART goal criteria helps to prevent everyday tasks from taking priority over your longer-term goals.

Hopefully the knowledge of the possible ways you help your student(s) set goals will give you something to think about when you reflect with them on their desires and aims.

Chapter 13
The Guest Experience

Pete Gillespie

Introduction

At the centre of all our actions as snowsport instructors are our guests. The decisions we make for them, guide them through and help them shape are centred on their desire to have an experience. In this chapter we will help you better understand how to achieve this wherever you work and in the lessons that you deliver.

A world of options

Over the last 5 years it has been apparent in the leisure sector that people are looking for a series of 'life experiences' in their precious time away from the hectic work life. This can almost be seen as a bucket list of things that must be done during one's lifetime.

Along with the big life goals, like world travel, to amazing locations there is also the high quality but short duration experiences. It could be said that some time spent with a snowsports instructor could fall into this category. As snowsport instructors we are competing with lots of other offers. What is more challenging is almost anything is now available with a few clicks on a smart device. Gone are the days of visiting your travel agent to book a flight. Now this can be done to any location in the world within seconds. Barriers to some of the most exciting things in life have simply gone!

If we, as snowsport instructors, want to be towards the top of our guest's choice list then we too must reduce any barriers to access the experience that we can offer. This starts well before we meet our guests and can be through our marketing material, booking platforms, recommendations from previous guests and so on. As committed fans of snowsports we, as instructors, do not always see the barriers. However, on observing from another view, quite quickly, we can see snowsports is not perceived as 'convenient'. You need warm and somewhat specialist clothing and heavy bits of equipment and snowsports often takes place in resorts requiring buses and other mechanised forms of transport and hotels are not always near slopes. We need to work hard to shape our guest's decisions between choosing a snowsports experience or some time on the beach. We need to make it easier for them to choose our offer. The great news is that once you are with a guest you have a great opportunity to deliver an amazing experience. You can create a fan and influence a retention loop.

Creating fans

As snowsport instructors we are only as good as our guests choose to rate us. We may be high-end performers, have a huge depth of knowledge and work in an amazing environment but if we do not inspire people we will not retain them.

Different people will have a different desire to engage with an instructor so an obvious starting point is to ask them what they want to achieve or experience. The guest's expectations may be well within your capability to deliver, however, sometimes the expectation may be unrealistic or not achievable in the time frame or environment you have available. In these situations, the skillful instructor will reshape the expectations and help set new goals through positive influence.

Being a great instructor is more than just the technical skills. It includes being a mentor, an entertainer, and a fountain of knowledge regarding the local area or facility and an organiser to name a few. Ultimately people will need to enjoy spending time with you for you to create a fan. Fans keep coming back and tell other people about the great experiences they have enjoyed with you.

So you need to:

- Reduce barriers for your guests to access your product or service.
- Give people an amazing time with lots of 'Moments of Magic'.
- Listen to your guests and shape their expectations with them.
- Advise on 'what's next' in the journey. That is just simply great service.
- Surpass expectations whenever you can.

The loop

With so many 'experiences' on offer in the modern world once we are with a guest we need to work hard to retain them. There are positive distractions everywhere. It has been indicated that once a learner in a new sport has some ownership of their performance they are likely to make the new sport a regular form of recreation. They have switched the 'experience' into a new skill. In snowsports ownership can begin within around 5 hours of instruction.

We need to consider the following:

Never experienced snowsports and no real goal

Curiosity has led the guest to trying the new experience. Maybe it is a bucket list activity. There could be no intention of returning despite their outcome (good or bad). They just wanted to give it a try. This does, however, give the snowsports instructor a great opportunity to create a reason to come back. There is a chance to create a fan.

Conscious decision to learn a new skill

This guest has made the decision they want to learn snowsports. Maybe they have a holiday planned, or are looking for a new way to spend their recreation time. The seed is already sewn in this situation as the guest has mentally and financially already made a commitment.

A one-off experience

A corporate day out with work, a stag or hen party or a celebration with friends. A fun and memorable 'experience' but with no conscious plan to continue. This may be an opportunity for the snowsports instructor, nevertheless, if not it still requires the same level and energy input as the guest may never return but still may promote the experience to others as a worthwhile activity.

We can see that with different guest desires there are opportunities to create a 'loop' where the guest returns to snowsport and preferably with you, or your product offer, as their first choice.

Snowsport instructors working in the 'non mountainous' regions or environments have a great opportunity to create fans and *'stick-ability'* on a regular basis as the facilities are normally open all year round and are in urban areas.

These instructors are often the first touch point for people outside of traditional snowsports areas in delivering a snowsports experience. Before a trip to the mountains many people take their first steps in learning a snowsport at an artificial facility. The surface may be man manufactured however, the snowsport activity is as real as anywhere. This provides a great opportunity to create more snowsport enthusiasts, which is great for the industry globally. Equally, it provides a loop where people can experience snowsports in an urban environment in a non-mountain facility; take their skill to a mountain facility (vacation) but return to regular participation in their domestic environment. We have created the 'stick-ability' in participation through providing a loop from mountain to non-mountain participation. **This loop is continuous provided both parts continue to deliver a desirable experience for the guest.**

Measuring our guest's satisfaction

Quite simply, any service provider that fails to respond or deliver a high-quality experience to their customers has a short terminal life in the modern world. As already discussed our guests have so many options in where and how to spend their precious leisure time and money. Guest service has never been as important as it is now. Attention to detail, retention and guest recovery will determine the winners from the losers.

We can place our guests into the following three categories:

- Detractors.
- Passives.
- Promoters.

Detractors

Detractors are very unimpressed and unsatisfied with the service you have provided. They aim to physically create a detraction force by themselves and other people away from your service. They will openly tell people in their circle of influence NOT to use your service. They will put their feelings on every forum and social networking platform they can.

One positive, in all this negative action, is that you can respond and recover them as their very actions have likely made them visible to you (via a social network platform as an example). An example of this could be Trip Advisor or Facebook. You have an option now to get them back and reverse their negative opinion of your service.

These people will often complain face to face. Fix it fast if you are fortunate to be given this opportunity.

Incidentally, if you fix a detractor's issue fast they often become 'super promoters' as they are so impressed with your recovery actions. They had not been expecting that. You can recover the loop.

Passives

Passives have not been blown away with your service. They have been left with NO lasting fond memories and rate the experience rather neutrally. “It was ok”, “probably will not go back”. Maybe if there is an offer in the future they may return but more likely they are looking for another experience in the future.

What is dangerous about passives is they don’t really tell you either. They just drift off and don’t return. You lose a potential fan forever and nobody wins. There is no ongoing loop.

Promoters

They simply love your service and you have surpassed their expectations. Like the detractors they are straight on the forums and social media platforms but to report the polar opposite experience. These people are your extended marketing team. The loop has longevity and they will try to influence other people in to the loop.

Guest satisfaction metrics

There are many guest satisfaction metrics in place and one of the simplest is a rating by scoring. One to five or one to ten tends to be the most common. The further up the scale the more likely you will find your promoters.

In a 1 to 5 rating detractors score 1 to 2, passives 3 and promoters 4 and 5.

In a 1 to 10 rating detractors score 1 to 5, passives 6 to 8 and promoters 9 and 10.

In developing the loop respond to any feedback you can be it poor or great. People respect that you appreciate they have taken the time to give feedback. It is an indication you value them.

Take time to place yourself in their shoes and see the issues they are raising from their point of view.

First aim to understand, then you can be understood.

It is worth remembering the iceberg theory. Only people who like filling out your surveys or writing on social media platforms will be visible to you through these methods, which is likely to be a tiny percentage of your guests and others will go unseen below the iceberg. The best way to gauge guest satisfaction is to talk directly to them. Keep seeking ways to stay in touch with your guests.

Finally, service will be the energy between successful and unsuccessful service providers in the future.
Pay attention to your guests and they will keep coming back, and in turn promote your services.

Teaching Content - Theoretical

Chapter 14

Learning Styles

Derek Tate

Introduction

As was highlighted earlier in this section of the manual, learning is one of the best things about life and if the **experience** of learning is positive and one where the learner is able to use styles that really work for them then there is a good chance that lifelong learning will be the result in whatever domain is chosen. For snowsports instructors this is both a great responsibility and challenge as it calls for an understanding of different learning styles and a recognition that individuals will have a preferred or dominant style. This, in turn, will require instructors to use different teaching styles that match individual learner needs.

This chapter will begin by looking at the four learning styles or preferences as identified by Peter Honey and Alan Mumford: Activist, Reflector, Theorist, and Pragmatist. This will then be followed by looking at David Kolb's learning cycle: Experiencing, Reflecting, Conceptualisation, Experimentation.

The next section will look at Muska Mosston's spectrum of teaching styles: The **reproductive styles** where the learner reproduces known knowledge, imitates demonstrations, recalls information and practices skills and drills, and the **production styles** where the learner has the opportunity to discover new knowledge, new ways of achieving the task and problem solving. Essentially these styles allow the instructor to cater for different learners both in terms of their preferred style and their level of skill **(see the Diamond Model of Skill Acquisition, chapter 9).**

The chapter will then conclude by bringing it all together and seeing how the learning cycle integrates with the learning styles and what the most relevant teaching styles would be to match the learner's style.

It is important to point out that the information presented here is just an overview of these theories and should the reader wish they can seek a more in depth knowledge by following up on the suggested reading and resources highlighted towards the end of this chapter.

Honey and Mumford's four learning styles

Peter Honey and Alan Mumford's 'learning styles' were developed in the 1980's and based on the earlier work of David Kolb. These four distinct styles: Activist, Reflector, Theorist and Pragmatist, have been widely used in sporting contexts as part of coach education.

The suggestion here is that individual learners will have a preferred or dominant style and in order to maximise their learning, and the experience, each learner should seek out opportunities to use that approach.

Activist: The activist will want a learning experience that is hands-on where they get a chance to practice the activity and have lots of repetition. Learning here happens through trial and error. Activists tend to naturally immerse themselves in the present and become fully engaged in the task in hand which links nicely to some of the elements discussed earlier in the chapters on mindful learning and flow. Activists also tend to be open minded, flexible and full of enthusiasm. However, a potential downside is the susceptibility to act before thinking.

SUGGESTION FOR INSTRUCTORS

Keep explanations short and succinct.

Reflector: The reflector likes to observe and listen weighing up all the options before doing. They want clear demonstrations and full explanations so that they have all of the information. They are inclined to be more cautious learners who reach conclusions slowly. They will often want to observe other learners, within their peer group, having a go so that they can determine how successful they are before committing themselves.

SUGGESTION FOR INSTRUCTORS

Explanations should be clear and thorough with demonstrations to aid understanding. Using other learners who are 'getting it' as further demos can be useful.

Theorist: The theorist is a logical thinker who needs to understand what and why they are been asked to do something before they are happy to give it a go. They like to know the principles and concepts that underpin what you are telling them and would therefore be interested in how different skills work and impact on each other.

SUGGESTION FOR INSTRUCTORS

Give clear explanations that cover the 'why' they should do something and 'how' it will improve their performance. In other words, prove it.

Pragmatist: The pragmatist tends to be confident and once they hear or see something that interests them they will want to experiment and see if it works. They like to take the theory and put it into practice. They are practical people who look for the quickest ways to problem solve. They respond well to those whom they perceive as an expert.

SUGGESTION FOR INSTRUCTORS

Clear explanation and accurate demonstration.

Kolb’s experiential learning cycle

David Kolb suggests that there are four steps in the process of learning: **concrete experience**, **reflective observation**, **abstract conceptualisation** and **active experimentation**. Using all four steps of this experiential learning cycle leads to a fuller and more fulfilling learning experience. However, as we shall see these four steps overlap with the Honey and Mumford learning styles, identified earlier, so the suggestion is that individuals will favour particular steps in the process over others. But, it is important to note that your preferred learning style is not a fixed trait and can therefore evolve over time.

Concrete experience: This is where the learner encounters a new experience or situation or a reinterpretation of an existing experience. At this point the learner is having an experience, engaged in the activity and aware.

Reflective observation: This is where the learner reviews and reflects on that experience and determines if there are any inconsistencies between the experience and their understanding.

Abstract conceptualisation: This is where the learner thinks and makes conclusions about the experience leading to new ideas or a modification of an existing concept.

Active experimentation: This is where the learner experiments, applies and tries out what they have learned.

The cycle can be summarised as: Experience - Reflection - Conceptualise - Test

Teaching styles

In the 1960's Muska Mosston developed the spectrum of teaching styles. These eleven styles, or landmarks, have continued to be developed over the years most notably in conjunction with Sara Ashworth after she met Muska Mosston in 1969.

The idea behind the spectrum is that the decision making process between teacher and learner begins with the teacher making all the decisions (command) and this then gradually shifts, more and more, to the learner with each subsequent style. The first five styles, A-E are clustered into what is known as **reproduction styles** where the learner has the ability in varying degrees to reproduce known knowledge, copy demonstrations, recall technical information and to practice these skills. The second cluster of styles, F-K are the **production styles** where learner has the opportunity to discover new knowledge, which is new to the learner and may or may not be new to the teacher.

What follows is a brief description of styles A-H with a comment on how each style might relate to the previously mentioned learning styles.

Command – Style A: In this style the teacher makes all the decisions. The learner reproduces the tasks or exercises in a precise manner following the instructions, examples and demonstrations by the teacher. This style is useful if the teacher wants to cover a lot of content and is looking for uniformity of performance amongst learners. It can also be useful where there are safety concerns and the teacher wants to keep tighter control. However, from the learners' perspective there is not much opportunity to reflect, conceptualise or experiment.

Practice – Style B: In this style the learner has the opportunity to reproduce and practice a task that was previously set by the teacher. Using this style is a vital part of skill acquisition and in terms of motor learning and developing sound movement patterns repetition is essential. This is probably the most important style for the **activist** as they enjoy doing rather than talking about it.

It is worth noting that the three styles that follow, C-E are ALL in reality a form of practice style or if you like practice with a twist!

Reciprocal – Style C: In this style the primary goal is for the learner to gain greater understanding through observation of performance in their peer group and then have the opportunity to practice. The 'operation' of the style can be done in pairs where each person swaps roles of being observer and doer. However, it works equally well where the teacher asks the learner to comment on the performance of a peer and give feedback to their peer based on the task that was previously set by the teacher. What is vitally important here is that the teacher monitors the feedback that is given, peer to peer, to ensure that it is accurate. Should it not be accurate then the teacher would direct questions to the learner who gave the feedback rather than the person who did the performance. This style is particularly suited to the **reflector** who is a more cautious learner and wants to gather all the information. They will benefit from seeing demonstrations from their peer group as well as the teacher.

Self-Check – Style D: In this style the leaner has the opportunity to practice a previously done task and to evaluate their own performance either through internal cues (feelings, sensations, awareness) or external cues (sounds, tracks in the snow). Feedback from the teacher will often come in the form of questioning to help the learner understand if his or her own perception of the performance is accurate. This fits very well with the learning cycle steps of reflective observation and abstract conceptualisation and therefore is well suited to the **theorist**.

Inclusion – Style E: In this style learners of varying skill level are given the opportunity to practice at their own level. It is a particularly good style for teachers to use where they have mixed ability levels. So, in essence, the teacher is setting a task with multiple levels of difficulty. The style has sometimes been called the 'slanty rope style' because if the task were to jump over a rope that is higher at one end and lower at the other (on a slant) then each learner could choose where to jump over the rope based on their ability e.g. same task, different degrees of difficulty. Using this style will allow the teacher to cater for a number of different learners and learning styles but it is especially useful if there are **activists** in the group.

Guided Discovery – Style F: In this style the teacher designs or uses a series of sequential questions that lead the learner to discover a new idea, concept or movement that was previously unknown to them. Each question is used to, in effect, set the next task allowing the learner to experiment and then come back with the answer. The teacher should have an overall goal/task and an ideal way of achieving it. However, the goal is not stated to the learner, as the idea is that they discover and are guided to the answer through the series of questions. Again this style will particularly suit the **activist** but will also be relevant to the **pragmatist** as there is lots of doing, experimenting and being engaged in each task.

Convergent Discovery – Style G: While having some similarity to the previous style, this type of discovery is all about producing the anticipated answer to a single question. This style presents the learner with a problem to be solved hence it is very relevant to the **pragmatist**.

Divergent Discovery – Style H: In this third discovery style the learner has the opportunity to discover and design multiple solutions to a problem posed by the teacher. This style is also commonly called 'Divergent Production' as it produces a number of ways of addressing a problem. Like the previous discovery styles the 'problem solving' nature of this style very much suits the **pragmatist**.

In addition to the styles covered in this chapter there are three further styles in the spectrum: Learner Designed Individual Program – Style I, Learner Initiated – Style J and Self Teaching – Style K. **Please refer to the suggested reading and resources towards the end of this manual if you would like more information on these.**

Bringing it all together

As with all theories it is vital that the reader can understand how to apply it and can also reflect on their own practice and see how it matches up to the information contained in this chapter. In an attempt to pull all this information together the following model (Figure 1 on the following page) shows the learning cycle, the learning styles and suggested teaching styles to match the steps in the process.

Learning Styles, Learning Cycle & Teaching Styles

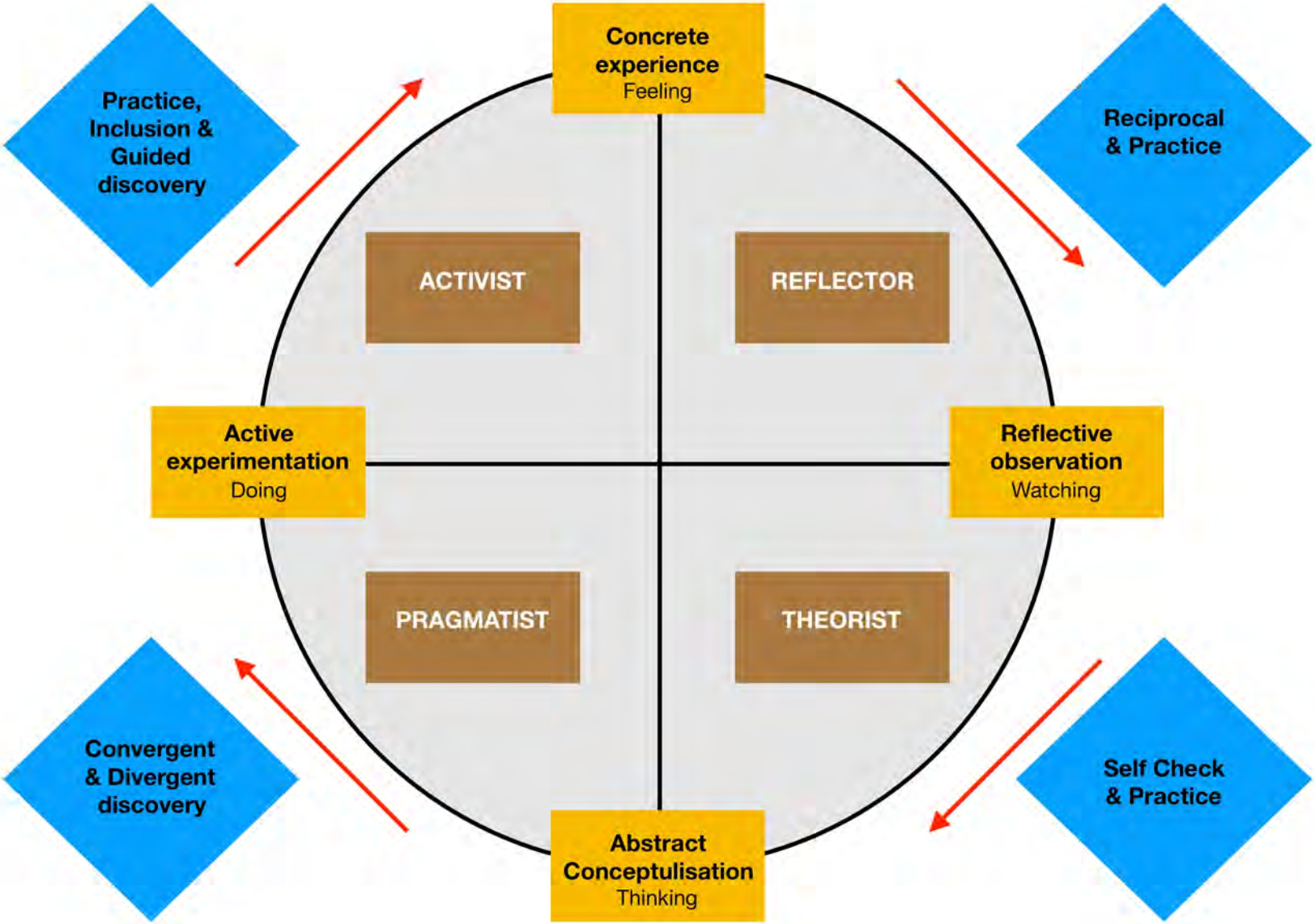


Figure 1

Chapter 15

Mindfulness and Mindful Learning

Derek Tate

Defining mindfulness

While the overall goal of this chapter is to understand how mindfulness can help improve sport performance, and in the context of this manual snowsport performance, it is important to start with understanding what mindfulness is and what it is not. The terms mindfulness and mindful are very common in todays society and it would be fair to say that these terms are very much buzzwords.

However, like many heavily used expressions there is not always a clear understanding of their meaning. So lets start with a definition from Jon Kabat-Zinn (2004), "mindfulness means paying attention in a particular way: on purpose, in the present moment and non-judgmentally" **(p.4)**. So mindfulness is not about emptying the mind, as I have heard some people say, but rather it is about intentionally paying attention to particular cues. These could be bodily sensations, emotions, feelings, sounds or thoughts but the real challenge is to learn to do this in a non-judgmental way so that one simply observes whatever comes into consciousness without chasing after it.

Jon Kabat-Zinn is largely credited with bringing mindfulness to the west in the 1970's and his mindfulness based stress reduction (MBSR) program has been widely used as a complementary treatment for chronic pain and other illnesses with the aim of reducing and relieving physical and psychological ailments. This program has led to many more mindfulness-based interventions being developed and researched including those that enhance performance across a wide range of domains (Baltzell, 2016). The world of sport has also seen an increase in such interventions, which are now used to compliment the more traditional cognitive based sport psychology approaches (more on this later).

Another important perspective on mindfulness comes from the Harvard psychologist and researcher Ellen Langer. Her approach almost builds on the previous definition in that once the mind has been 'controlled' and one has learnt to focus attention intentionally she suggests that mindfulness "is a process of actively making novel distinctions about objects in one's awareness" (Langer, Cohen, & Djikic, 2012, p. 1114). This has important implications on 'learning' and will be covered later in this chapter under the heading: automaticity vs. awareness.

Finally, for this opening section on defining mindfulness is a definition offered from more of a sporting (yet academic) viewpoint from Blatzell and Summers (2017), “mindfulness is a quality of awareness that objectifies the contents of experience, internally and externally, promoting greater tolerance, interest, and clarity towards one’s experience” **(p. 39)**. This definition highlights the Kabat-Zinn idea of being present while also embracing Ellen Langer’s idea of noticing novelty.

Mindfulness vs. meditation

This is another area of confusion when it comes to understanding mindfulness. Meditation was created five thousands years ago, originates from the East and is rooted in religion and spirituality. Whereas, mindfulness has been around for about 50 years and is a Western creation for living and managing life in our modern fast paced world.

There are many forms of meditation practice, of which one is mindfulness. Meditation practices commonly use *one* thing to anchor ones attention such as the breath, an object or a mantra (word/phrase). Mindfulness, in its more formal practice, is a type of meditation and this is often referred to as ‘open monitoring’ meditation. This involves simply observing moment to moment anything that arises in consciousness be it thoughts, feelings, emotions, sensations or sounds. As highlighted earlier, in defining mindfulness, this practice involves observing these stimuli without being taken away on a whole train of thought about what you have observed. Formal practice of *open monitoring* meditation will help with preparation for real life and snowsports specific situations. For example, when waiting for your turn to ski a run of short turns in a technical exam, you may observe the feeling of nervousness. However, if this then leads to a whole series of thoughts about whether you will perform well and perhaps reflecting on negative past experiences, or worrying about future outcomes, then your present moment focus has been lost and your ability to perform in the here and now adversely affected.

Thus, mindfulness is simply the non-judgmental, moment-to-moment awareness that can be brought into everyday life while meditation is a more formal practice that can include mindfulness.

Being vs. doing

We are human beings not human doings! However, that said being and doing are both of equal importance. **Doing** is about getting things done, achieving goals, and problem solving. Thinking about past, present and future. While **being** is about focusing on moment-to-moment experience, being fully present, aware and engaged in the task in hand (whatever that might be).

So, how can one strike the right balance? In our modern world there is a great deal of pressure to get things done, so quite often the balance is tipped toward doing more than being. Practicing meditation can help redress that balance and allow the mind to regain some order with thoughts becoming more intentional. Uninvited thoughts, rumination and worrying can end up creating a very busy 'monkey mind' and this can easily lead to unwanted stress. Through meditation there is often a realisation of just how busy the mind can be!

In the sporting arena there is a need for both mental states. Goal setting, planning for the future and learning from past experience are all very important for athletes and for snowsport instructors working their way through the certification system. However, when engaged in the activity itself what is important is the quality of attention that is brought to that activity with full engagement and concentration on the task in hand helping to facilitate optimal experiences (flow). So, in order to perform to a very high level *being* in the moment is crucial.

Mindfulness in sport

In the last 10 to 15 years there has been a lot more research carried out on how mindfulness can improve sport performance. Many of the mindfulness-based interventions that have been developed have a common aim, which is to develop the skill of focused attention in both practice and competition. Other benefits may include reduced stress, a reduction in negative thoughts, greater acceptance and ability to tolerate feelings and emotions and an increased frequency of flow.

It is beyond the scope of this chapter to go through all these different interventions but one of the more recent interventions is the Mindfulness Meditation Training in Sport (MMTS) and it's successor MMTS 2.0 (Baltzell & Summers, 2017). This particular program is based on previous interventions like the Mindfulness-Acceptance-Commitment (MAC; Gardner & Moore, 2004) approach. MMTS 2.0 has 6 modules, using a series of mindfulness exercises that help to establish new habits of attention and emotion regulation.

There is both a need and an opportunity to develop specific interventions for snowsports and the author is currently engaged in such a process through his studies on the MSc Applied Positive Psychology course at Bucks New University. Publication and results of this study should be available towards the end of 2019.

One final point, that was eluded to earlier in this chapter, is that using mindfulness in sport to enhance performance is a useful addition to the more traditional cognitive based approaches such as thought stopping, visualisation, imagery, pre-performance routines, positive self talk etc. With the recognition that having a range of techniques available helps to accommodate for individual needs.

Mindful learning – automaticity vs. awareness

Because every performance is unique this has profound implications for how we practice and perform. Recreating best past performance may be helpful but being present and open to what we encounter, right here, right now is vital if we are to create the best performance today.

The statement above was the opening quote at the beginning of this chapter and links to both the Ellen Langer approach to mindfulness and mindful learning and how they integrate into the Diamond Model of Skill Acquisition, which was explained in the **(chapter 9)**. The final part of this chapter will unpack what that statement means and how both automaticity and awareness are vital parts of a successful and on-going learning experience.

Automaticity is akin to being able to perform skills without having to think through the process because they are pre-programmed movement patterns. In other words, motor learning has taken place and the skill is *mostly* autonomous as detailed in the Fitts and Posner (1979) model. This is, indeed, an important part of learning and it is entirely desirable to learn movement patterns so that they are automatic and attention becomes more effortless (Tate, 2017).

However, being on *automatic pilot* has its limitations. Lets take an example form skiing and in particular imagine skiing bumps. Due to the open environment where snowsports take place the performer is required to be continuously aware of what is happening around them: changes in terrain, snow texture/depth, weather/visibility not to mention other people. If the performer were to simply rely on pre-programming, from previous learned skills, then they are relying on what has occurred in the past (Baltzell & Summers, 2017) and not open to noticing new and novel stimuli in the present (Langer, 2000).

In snowsports, as in many sports, it is important to be constantly aware of slight changes and variations to what is happening both inside and outside of the body. That way the performer can be more adaptable and capable of making on-going adjustments. Perhaps this helps to answer one of the questions posed earlier, in this chapter, as to whether attention should be directed inwardly or outwardly? The performer needs a heightened sense of awareness to *everything* that is happening. Langer (1998) sums this up perfectly by stating that, “In a truly great performance all technical skills are transformed into a unique, context-sensitive, one of a kind experience”

Chapter 16

Flow (Optimal Experience)

Derek Tate

The origins of flow

Flow is the popular name for 'optimal experience' and the construct originates from the 1970s with the term being coined by the eminent psychologist Mihaly Csikszentmihalyi (1975) within his book "Beyond Boredom and Anxiety". Flow is a mental state that is experienced when some, or all, of its nine dimensions are met (contained within flow foundations and flow characteristics). Flow can be experienced in almost any area of life with the workplace paradoxically often providing the right conditions: such as challenging activities and full engagement on the task.

Over the years Csikszentmihalyi and others have researched both people's disposition to experiencing flow and the depth to which they experience it. This research has included questionnaires, interviews and what was known as the Experiencing Sampling Method (ESM: Csikszentmihalyi, 1997) which used a pager to prompt people to fill out pages of a booklet, that they carried around with them, answering questions about their activity and state of mind throughout each day.

As was mentioned in **chapter 15,** flow is a pleasurable experience both during and after the activity and this has linked it to the state of 'happiness' leading to it becoming one of the pillars of positive psychology (Seligman & Csikszentmihalyi, 2000). Flow is also, often associated with peak performance, although it should be noted that being in flow will not always lead to 'best' performance. However, it is for these two reasons: happiness and high level performance that makes it such a desirable state in the world of sport.

Flow in sport

In the 1990s Susan Jackson was the psychologist who led the way with researching flow in sport. This culminated with her writing the book **"Flow in Sports"** with Mihaly Csikszentmihalyi (1999) which covers a wide range of sports including cycling, rock climbing, swimming, tennis, alpine skiing and many others. The book not only covers in detail the nine dimensions of flow but also has many first hand accounts from athletes about their flow experiences. One of the most recent books on the subject of flow in sport is **"Running Flow"** (Csikszentmihalyi, Latter, & Duranso, 2017) and this book not only includes the most recent thinking and research but also makes many references to the importance of mindfulness as a potential way to fostering flow experiences.

Flow in snowsports

There has been very little research done, to date, on flow in snowsports yet as a sport, due to the 'open' environment where it takes place and the need to match skills to an ever-changing challenge the sport really lends itself to this experience. The remainder of this chapter will look at each of the nine dimensions of flow: 3 x flow foundations and 6 x flow state characteristics and as they are examined it should become apparent to the reader why flow and snowsports are so aligned to each other.

Flow foundations

The first of the flow foundations is what is known as the **challenge skills balance** or CS balance.
This is a crucial element in how flow occurs. Referring back to the **(Diamond Model of Skill Acquisition (DMSA), in chapter 9),** it is during the 'performance' stage that the learner can be challenged with the goal of making the performance more robust but also to begin to create the necessary conditions for flow. So the teacher's role, at this point, is to carefully choose tasks that are more challenging for the learner. In snowsports, typically this may involve asking the learner to repeat the same task but asking them to do it at a higher speed or on more challenging terrain (steeper, more variable etc). However, it could also involve increasing the difficulty through requiring the skill to be executed with a higher degree of accuracy e.g. when balancing on the outside ski the learner would have to steer the skis further past the fall line (complete the turn) while still keeping the inside ski lifted off the snow. The magic of flow is created when the challenges *perceived* by the learner are balanced against their *perceived* skills. In reality, this often means that the learner's 'skill set' should be slightly stretched. Looking back at the quote that opened this chapter the learner is more likely to experience flow when they are at a more accomplished level of skill. That is why many elite level athletes often experience flow.

The second of the flow foundations is setting **clear goals**. The learner requires clarity of intention both prior to the task and during the performance of the task moment-to-moment. Goal setting in sport is very common and essential, especially for elite level athletes. This will involve long, medium and short-term goals with everything working towards the bigger outcome. From the perspective of experiencing flow state it is the short term and, indeed, moment-to-moment goals during the execution of the task that are vital. For example, in skiing the short-term goal might be to ski short turns, in a particular corridor width, at a constant rate of descent, while the moment-to-moment goal might be to have an awareness of the required corridor width and the desired speed to ski at.

The third of the flow foundations is **unambiguous feedback**. Unambiguous means being completely clear and this is the kind of feedback the learner needs as they are performing the task. The self-check teaching style, **(covered in chapter 14)**, requires the learner to have both intrinsic and extrinsic awareness of how they are performing so that they can evaluate their own performance on an on-going basis. So, returning to the previous example of short turns, for the learner to evaluate their own performance, while executing the task, they would need to *know* that they are keeping to the desired corridor width and be able to *judge* their speed. In a sense, there is not a great deal of distinction between moment-to-moment awareness of goals and feedback but the crucial element here is a heightened sense of awareness while actually being engaged in the activity.

This is another reason why the lower level performer is less likely to experience flow state because, as novices, they have not developed the movement patterns sufficiently to know, and have an awareness, as to whether they are being performed correctly. Again this relates to the DMSA stages: knowledge, movements, performance and flow, because at the performance level of skill acquisition the skill is becoming autonomous and the learner now has a sufficient level of awareness to know how well they are doing.

Flow state characteristics

Focused attention has been discussed in great detail already particularly in **chapter 15**, hence it is common to both mindfulness and flow. The premise is that developing the skill of focused attention can be one factor in helping to facilitate flow and mindfulness meditation can be used for this purpose. In terms of how focused attention relates to flow the suggestion is that because the task is so engaging and challenging that there is no attention left over for anything else.

There are perhaps two important points to grasp here. Firstly, that when attention is focused fully on a specific task it brings order to consciousness which has been referred to as *psychic energy* (Csikszentmihalyi, 1990). The opposite of this would be psychic entropy or disorder, which would result in an inability to invest time towards goals. So brining order to consciousness helps not only with facilitating flow but also with the ability to successfully achieve ones goals.

Secondly, and again this relates back to the DMSA, focusing attention becomes more effortless as the learner moves into the performance stage of skill acquisition. This is covered in more detail in the article titled “Focus your attention” (Tate, 2017) which explains how learning a new skill requires effortful attention while sufficient practice leads to attention becoming more effortless as there is less mental energy required. **Figure 1**, on the next page, taken from that article (and used with permission) illustrates how this process works.

Focused Attention and Skill Development

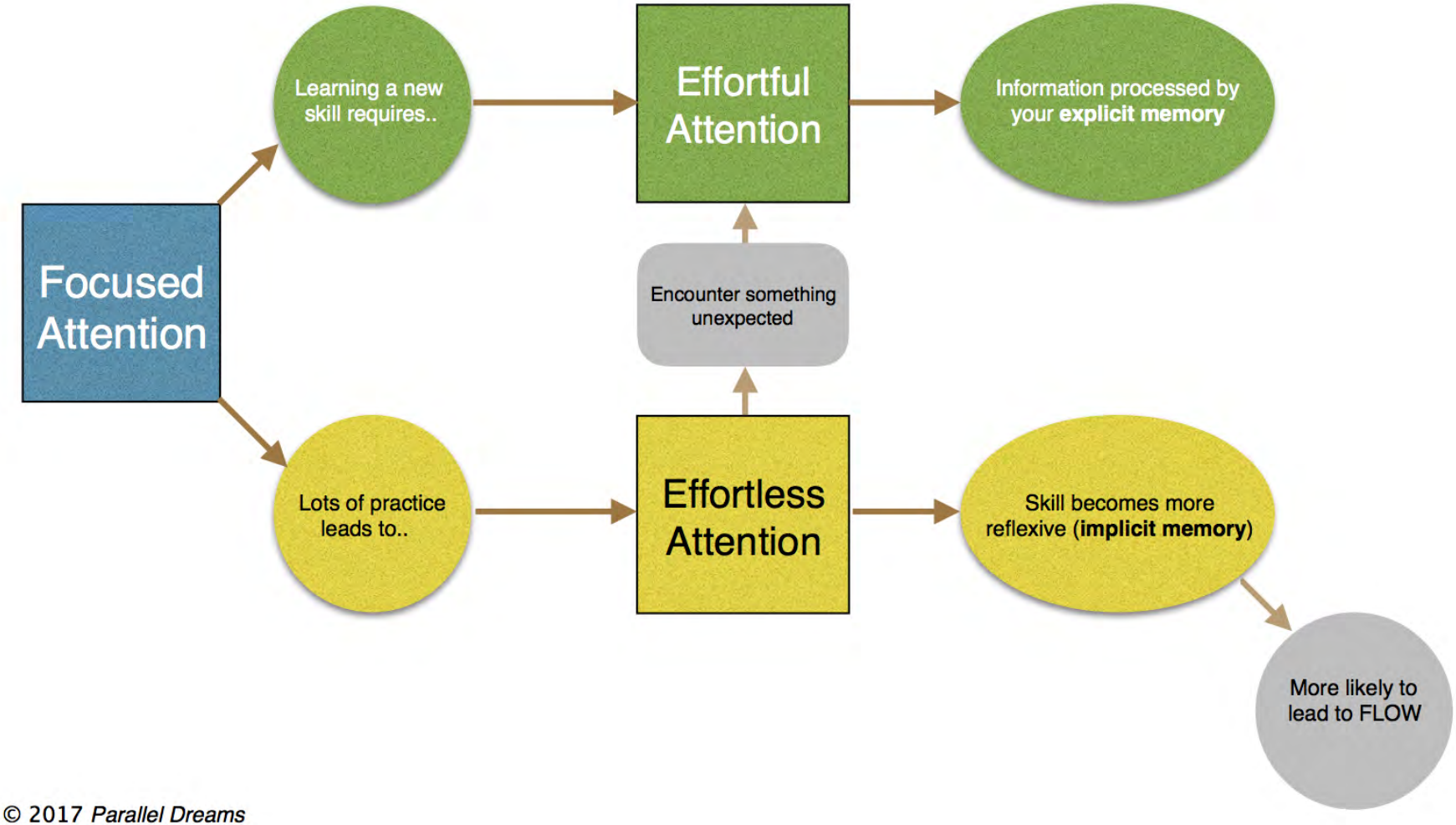


Figure 1

Action-awareness merging is when the gap between thoughts and action seems to disappear. Performing a task will often feel easy and there is a feeling of being completely at one with the movements being made. In a sense there is fusion between the mind and the body.

Sense of control and confidence go very much hand in hand. There is a belief that one has the necessary skill level to match the challenge, goals are clear, feedback is on going and immediate which in itself helps to bolster ones confidence. So, the sense of control that is felt comes from the previous dimensions of flow all being met.

Loss of self-consciousness links beautifully to the idea that when attention is so focused on the task at hand there is little or none left over for anything else hence, there is no attention available for worrying about what others think or any other potential negative thoughts. This in itself is quite empowering and can help to build ones self-esteem.

Transformation of time is perhaps one of the most interesting characteristics of the flow state. Some athletes report a sense of time shortening and because they are so absorbed in the task at hand they do not notice the time passing. This can certainly happen in a snowsports practice session where the whole session just seems to fly by or when delivering a lesson that is so much fun it is suddenly time to finish.

However, some athletes also experience a sense that they have all the time in the world as they are performing and this is something that I personally can relate to. Imagine that perfect run (skiing or riding) either in bumps or variable terrain where there is a feeling of becoming one with the mountain. On those rare occasions, where this happens, it can feel like everything slows down and is happening in slow motion and these are the runs that live in the memory for many years.

The **autotelic experience** is an experience that is FUN. It is this characteristic of flow that links back perfectly to the 'love it' part of the IASI philosophy. Simply said, if you love doing something you want to do more of it. There is a genuine intrinsic motivation with the activity being done for its own sake rather than for any reward. The cycle involves loving what you do, challenging yourself as you do more of it, and gaining greater enjoyment. This is why flow is so desirable because being in the mental state is both pleasurable during and after the activity. When you experience flow you want more of it, you want to experience it again and again. It is, in essence, a legal drug and its good for you!

Chapter 17

Drills and Additional activities

Federico Sollini, Jordan Revah and Jamie Kagan

DRILLS

In this chapter we have grouped a series of drills that we believe are helpful for learning and perfecting the skills needed in skiing. These drills help either by isolating the movements required to correctly perform the drill, or by exaggerating the RoM of a particular skill. Either way these activities are excellent training tools that we suggest you use towards personal development. Over time, we will add to this chapter when time allows to have a toolbox of useful drills to complement great teaching.

Straight Running on one leg - This is a useful exercise to practice **balancing, edge control (flat ski) and a centred position.** It is often forgotten that the ability to decrease edge angle (not only increase) forms an extremely important skill in skiing. This exercise challenges the ability of a skier to remain centred on their skis whilst controlling the tilt in order to keep the ski flat.

Edged Garlands - A great exercise to understand and practice **lateral movements and edging**. Sliding across the hill we increase the tilt/edge angle on the skis through the rolling up hill of our ankles and knees. The skis grip and leave two clean lines in the snow effectively carving, as we roll the knees and ankles back it allows the skis to release their edges and flatten causing the skis to slide on the snow. Looking back to our tracks we should be able to see alternating clean carved lines and skidded tracks.

Edged J Turns - A great exercise to help **practice the basics of carving**, creating an awareness of **lateral movements and the skill of edging.** The skier can start either with the edges already in the snow or with the skis flat, pointing towards the fall line. Releasing the skis the skier will pick up a little speed, then (similar to the **edged garlands**) the rolling of the ankles and knees towards the inside of the turn allows the skis to start carving. The skier will then continue to angulate in order to keep the skis carving until they come to a stop in balance.

Side Slipping/edge set - One of the most used exercises to teach and train **edging, lateral movement, management of stance and control of our upper body**. With the skis pointing across the fall line, on a gradient of choice, we release both edges at the same time by allowing the hips to move above the feet and our lower joints start rolling down hill, effectively decreasing the skis' edge angle on the snow. This will result in the skis flattening and starting to slide towards the fall line.

Re-engaging the lower joints by rolling them uphill will increase the edge angle again allowing skis to grip and eventually stop.

To control the direction of travel and keep the slide on the fall line we need to **maintain a good centred position and make small constant adjustments through the feet with our fore-aft movements.** The **upper body needs to remain quiet and stable.** This exercise can be practiced with either the upper body facing in the direction of the skis, with **no rotational separation**, or with the chest and shoulders facing the fall line, **with rotational separation.**

picture taken from skiracing.com By Lisa Densmore Ballard | December 30th, 2014

Diagonal side slipping - The above exercise can be taken further by challenging the skier to manage their **rotational movements and fore/aft movements** by sliding/gliding diagonally across the slope. In order to maintain the glide consistently on the same diagonal path, the skier must control their movements forward and back as well as their degree of leg rotation and rotational separation.

Too much weight towards the tip of the skis will cause the tail to start turning towards the fall line and the skier to start sliding backwards. In contrast to this, too much weight towards the tail of the ski will cause the ski tips to start finding the fall line and causing the skis to accelerate down hill. Remaining centred on the skis and balancing across the whole foot whilst controlling all rotational movements and facing he direction of the glide will allow the skier to succeed in this exercise.

Javelin Turns - This is a great exercise for practicing the combined skills of **rotation, edging and pressure control**. The skier lifts the old outside ski at the initiation of the turn, then balances and steers the new outside ski under the lifted one. When performed incorrectly, instead of the movements described above the skier just twists the inside ski across the outside ski which is totally unrelated to how this drill should be performed.

Braquage - This form challenges the control of the **edging, rotation, management of stance, maintaining a good centred position and having a disciplined upper body**. It can be initiated either by side slipping or pointing the skis directly into the fall-line. From side slipping we flatten the skis to allow them to glide and then rotate the skis progressively through the turn to face the other direction. Keeping the skis relatively flat makes it easier to rotate our skis. To aid the progressive rotation movement and not rush; a short glide in the fall-line can be useful. Depending on the gradient, rotation shoud be functional to slow down but not come to a stop or have an awkward pause between turns. Over rotating or rotating too quickly are things to be sure to avoid when practicing braquage as these aren't movements we wish to transfer to our regular skiing. Having accurate flexion and extension movements will help the releasing of the edges. Fundamentally, this movement challenges the ability of the skier to rotate their femur in the hip socket which forms an integral skill in skiing.

In both pictures the IASI Educator has pivoted his skis across the line of momentum creating rotational separation between the upper and lower body

Hop Turns/Speiss - This activity can be thought of as progression from the braquage drill, with the addition of a faster more athletic extension of the legs. With the skis facing in one direction and balancing against the edges, the skier explodes vertically and slightly towards the fall line using primarily the ankle joint.

This explosive movement allows the skis to come off the snow, at which time the skier rotates their legs so that they can land on the new edges of the skis in the opposite direction. This drill becomes particularly effective as soon as the skier can spring straight back off the ground once landing thus getting used to making quick, athletic adjustments that may be required at times in skiing such as in couloirs or moguls.

TicTacs - Tic Tacs are a great drill to help skiers develop numerous aspects of their skiing in addition to challenging their co-ordination and timing. At first the drill can seem quite complex so we'll break it down step by step, highlighting the most essential aspects of each step to get right. To facilitate the learning of what is a complex series of movements it's advised to start on a very shallow gradient and to slow everything down (it can even be practiced off-snow). Once things are working we can bring the drill up to it's true speed at which point it becomes one of the series of **airborne edge change** drills. Breaking tictacs down:

1. start in a good position (as always) ensuring you have you the key postural elements of a centred positon, functional hip width stance and disciplined upper body working from the off-set.

2. Pole plant

3. Tic movement: lift up what is going to be the new outside ski (leg flexion) and stretch it down to meet the snow slightly away from your CoM engaging the edge (active leg extension and edging with passive rotation).

4. Tac movement: lift up the inside ski (leg flexion) and place it down to meet the snow slightly away from (not underneath) your CoM engaging the edge (active edging and passive rotation)

5. If the gradient requires it; once two edges are engaged and both skis in contact with the ground you can finish the turn to control your speed. Often (especially when on a flattish gradient) this won't be required.

6. repeat the process

As you become more proficient and skillful with the movements, coordination and timing aim to speed up and specifically have the Tic and Tac movements take place directly after each other so as the outside ski is in the process of coming down the inside ski is already being lifted up making a moment when both skis are off the ground at the same time.

Once everything is working well, the tic tac drill can be used purely for the transition and initiation of the turn so the skier engages both edges, commits their CoM inside the turn, grips above the fall line and then steers the turn to completion. This can be an especially fun challenge on steeper terrain where you'll get a lot of rebound from the skis when things work.





Dolphin Turns - A great exercise to help train fore/aft movements and very helpful for developing bumps.

To initiate the exercise the skier shifts their weight towards the tail of the ski by the opening of the ankle joint. The result of doing this will load the tail of the ski and cause it to flex as the ski accelerates forward. Using the force that is generated, the skier allows the tips of the skis to get airborne. As this happens the skier retracts the skis back underneath them and actively points the tips towards the ground. As the tips contact the snow, as long as lateral movements have been continued/remained normal, the the skis will grip and begin to flex giving the skier some direction change. The process is then repeated whilst maintaining control of rotation and the use of a well timed pole plant.

White Pass Turn

White pass turns are a fantastic drill to develop **inclination** and the ability to commit the CoM as far inside the turn as possible and create the highest degree of edge angle possible. For these reasons, this drill focuses specifically on the phase of the turn from transition to initiation and culminates by the fall line at which point the drill portion of the turn is over.

To perform the drill, begin by carving to build some speed which will make it much easier. At the very least the first turn should be a normal carved turn, sometimes more depending on the slope, your confidence and skill. When ready, coming out of the old carved turn lift up your inside ski so you complete the turn solely on your outside ski. Remain in this position through transition so you have to change edges on what was your old outside ski and is about to become your new inside ski. Aim to engage your edge accurately, get your CoM inside the turn and get your ski far away from your body. The movement has to be a confident one to ensure the edge engages and grips well rather than stays relatively flat with your CoM above your skis which will have no benefit and can be dangerous.

Approaching the fall line phase of the turn, extend the outside leg so the outside ski contacts the ground and complete the turn as normal with angulation movements and skillful pressure control ready to repeat the process again.

When the movements are working well you can experiment with them in other turn forms (such as short turns, IP, etc.)

Additional content

Chapter 18

Anatomy and Biomechanics:

Fundamentals Applied to Skiing

Federico Sollini

Introduction – The reason behind this chapter

This section of the manual wants to provide a general knowledge on how the human body is made, how it moves and how this affects skiing at all ability levels.

Holding a basic knowledge of how the body works is essential to understanding how we can affect our performance, by training accordingly, as well as how the limits in our top performances can come from our own body rather than external factors.

Aware that this subject can be difficult to digest, we will try to point out cause and effect at each stage of the presentation. The aim is to provide information that can be applied to everyday life on skis.

As snowsport professionals **this knowledge is useful on two main fronts**:
- **on a personal basis**: To excel in the demonstrations performed while teaching or free skiing.
- **on a working basis**: To better guide a learner during the lesson.

Often the limits in performance, whether we are a high level skier or a beginner, are dictated by physical limitations rather than technical abilities.

This section on anatomy and biomechanics will also redirect the reader to the physical preparation section, as the two subjects are directly correlated, and one cannot be put into useful practice without the other. As well, we will try to make connections between the anatomy parts and their implications in skiing, linking an otherwise 'abstract' subject to more tangible scenarios.

Part 1

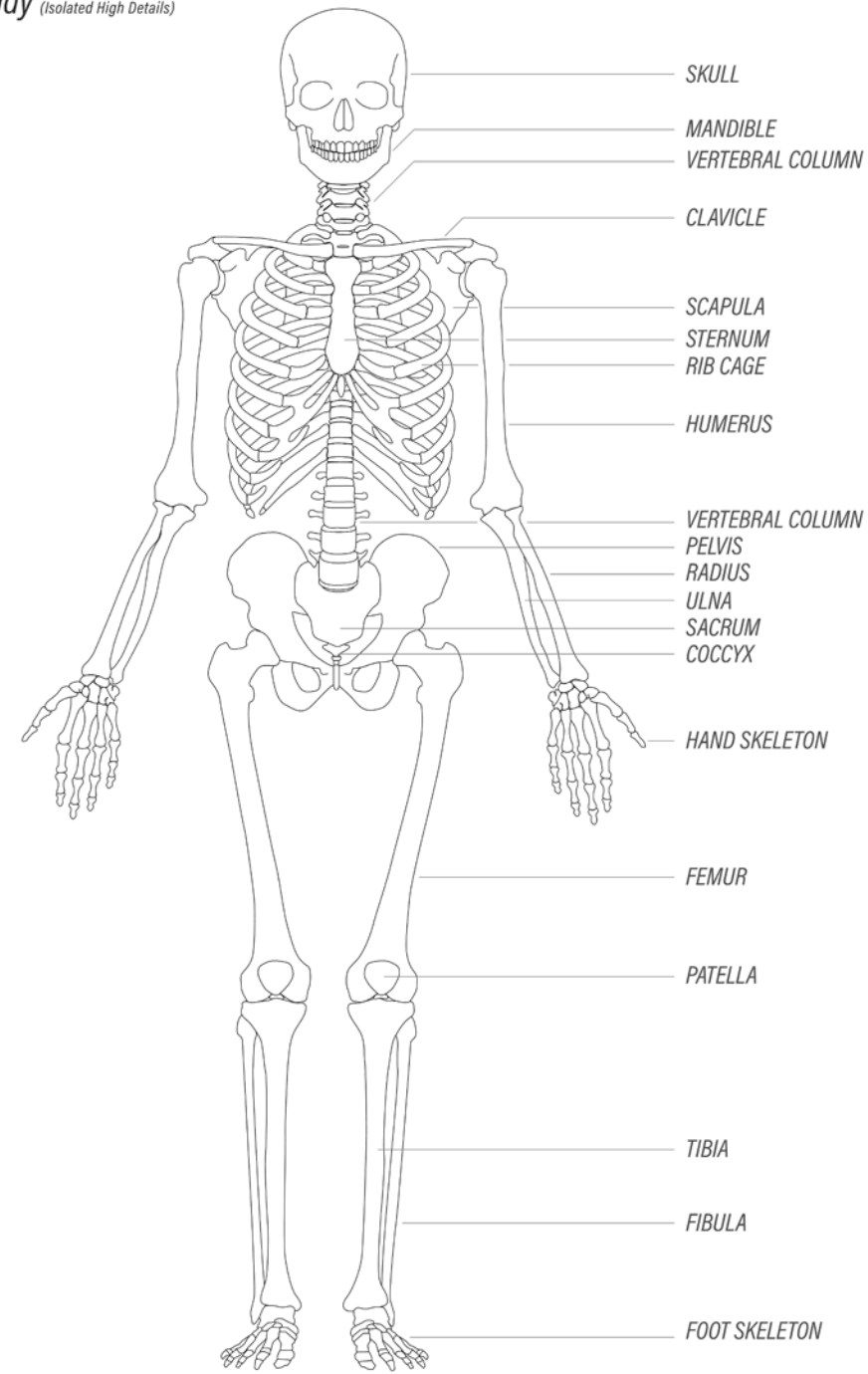
Human Anatomy

Anatomy is the science that studies how the organism is structured and what it is made of.
For the purpose of this manual we will leave behind the vital organs and concentrate on the body parts directly responsible for our stance and movements: **the musculo-skeletal system**.
This system consists of the **muscles, tendons, ligaments, joint and bones.**

Bones	the most rigid part of the structure, they constitute the skeleton system.
Joints	section of the body where the bones come together.
Ligaments	connect one bone to another bone.
Tendons	connect the muscles to the skeleton.
Muscles	tissue structure with the ability to contract, allowing the bones to move.
Nerves	channels through which the voluntary and involuntary contraction signals are sent through.

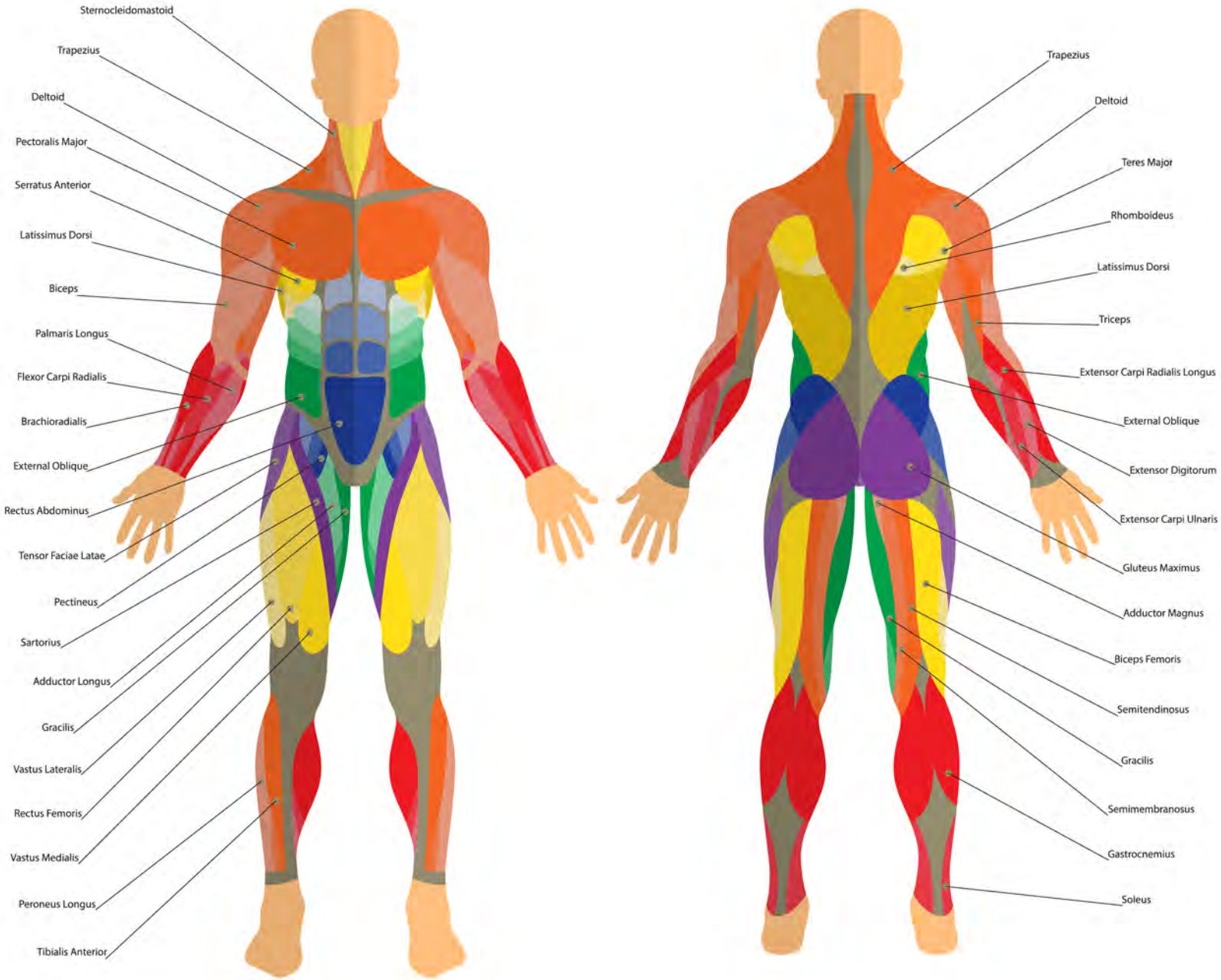
THE HUMAN SKELETON

Anatomy Study *(Isolated High Details)*

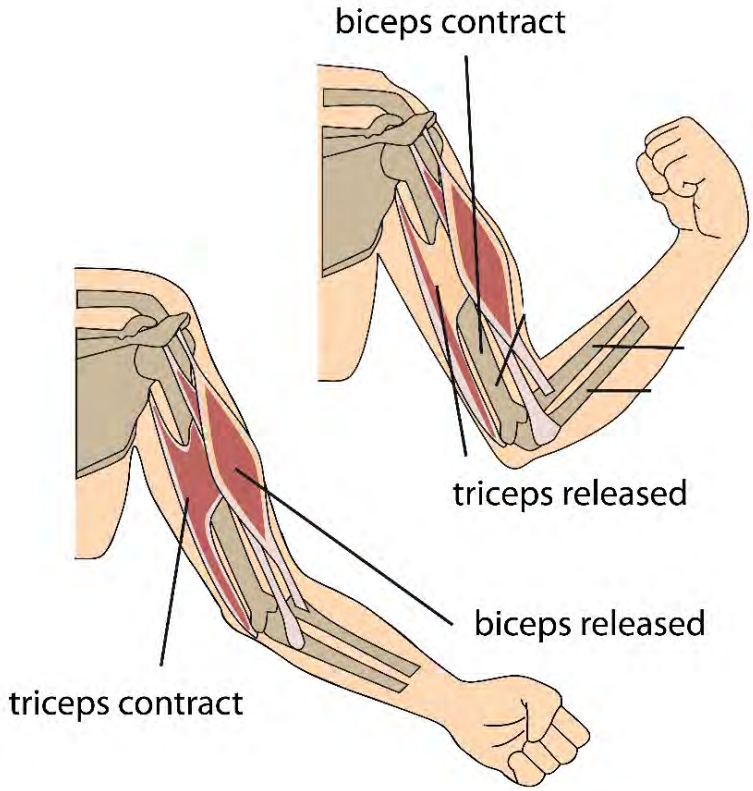


Muscular System

Anatomy Card



Through our nervous system we can only control the contraction of the muscles, all other parts move as a consequence. This is important to keep in mind when we refer to any movement as we are referring to a contraction relationship between alternated muscles, as **each muscle can only pull and not push**. To straighten our right leg while sitting down, we consciously tell the quadriceps to contract, but we are also telling (less consciously) the hamstring to relax and stretch, to allow the bones around the knee joint to move.

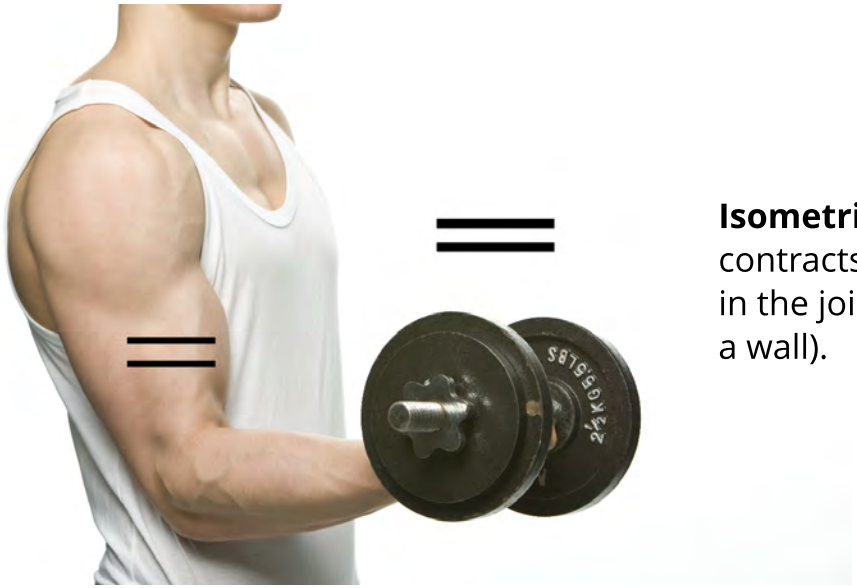


This is an important factor to remember, as **performance is dictated not just by the 'strength' in contracting but also by the ability of extending the opposite muscle** (Range of Motion (ROM) + Flexibility).
Each single muscle will have an opposite one, called **antagonistic muscle**. Keeping the correct ratio between them is of fundamental importance in reaching higher performance.

Muscular Contraction Types

Concentric contraction: When a muscle shortens its length, producing a movement in the joint.

Eccentric contraction: When a muscle extends its length, producing a movement in the joint.



Isometric contraction: When a muscle contracts without producing a movement in the joint (the effect of pushing against a wall).

Where do they fit in skiing?

Isometric contractions are used to hold a certain position, so at each given moment our body is performing an isometric contraction, sometimes so gentle that we don't even realize it (your current head position while reading). Stress and psychological tension can also provoke strong isometric contraction, any scared skier will contract more than a non-scared one, for example.

In order to hold a **static basic position** on skis we rely on isometric contractions.

Taking the legs as an example, starting from a static basic position **when standing up we perform a concentric contraction** of the quads. **When lowering down, we perform an eccentric contraction** of the quads.

Muscles are stronger in an eccentric contraction. This is one of the reasons it's easier, muscle wise, to end up in the back seat (eccentric movement) rather than coming up from it (concentric movement).

Correct training (on and off the slopes) should increase general body awareness. By either guiding the guest or through self discovery, every instructor should learn to feel the body moving and the muscles contracting. If we are aware of our body standing or moving we have greater chances of understanding how to create the correct technical gesture.

Joints

There are 6 types of joints in the body, which allow the bones to move in a certain direction. Each joint has a form of liquid (synovial) or padding (cartilage) to keep a minimal distance between the bone heads. Protecting this padding is essential to guarantee a long life of skiing, or any other movements.

Ball and Socket Joint	allows the most movement of the joint (shoulder, hip).
Hinge Joint	allows bones to move back and forth (ankle, knee, elbow).
Sliding Joint	allows small movements of the bone (vertebrae, carpals, tarsal).
Condyloid Joint	allow movements on two axis (wrist).
Pivot Joint	allows rotational movement (forearm).
Fixed Joint	does not allow any movement (skull).

Foot

In each foot alone we find 26 bones and 100+ muscles, joints, ligaments and tendons. Each movement of the foot and the toes is a result of many mobile parts collaborating with each other.

Balance starts from here and it's essential to keep this body part in health.	This also goes through a **correct placement inside the ski boots**, that needs to be adapted to the skier and should not be too constrictive.

Ankle & Foot

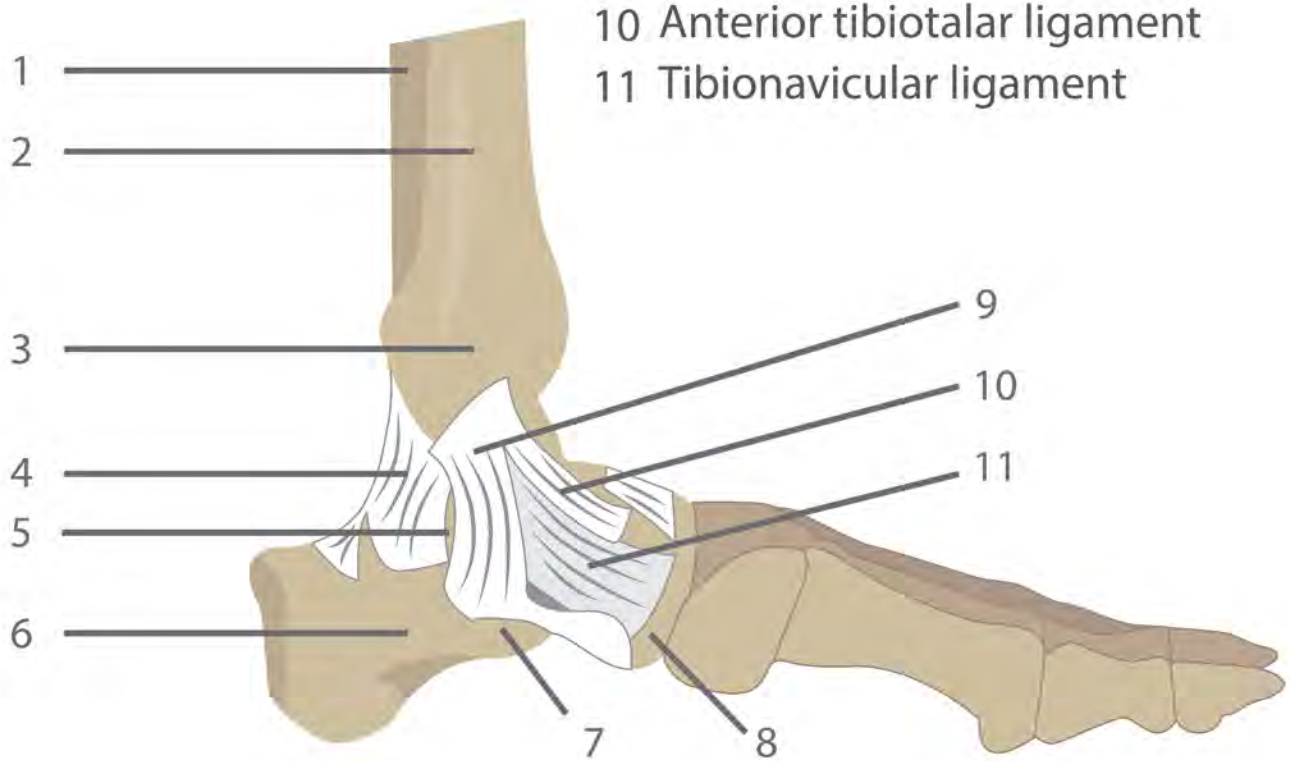
Dorsi-Plantar Flexion

The hinge joint of the ankle allows us to move the **foot upwards (dorsiflexion)** or **downwards (plantarflexion)**. Again, this movement is dictated by muscles above and below the foot as well as muscle around the shin.
- the average range of movement is between 8 and 20 degrees.
- the average forward upper cuff angle in ski boots is between 12 and 17 degrees.

Being able to find the '**neutral stance**' in ski boots is a fundamental element of ski performance. However, ski boots are still limiting the overall ROM of the joint, so specific training is advised to maintain healthy ankle mobility.

ANKLE anatomy

1 Filbula
2 Tibia
3 Medial malleolus
4 Posterios tibiotal ligament
5 Talus bone
6 Calcaneus
7 Sustentaculum tall of calcaneus
8 Navicular bone
9 Tiblocalcaneal ligament
10 Anterior tibiotalar ligament
11 Tibionavicular ligament



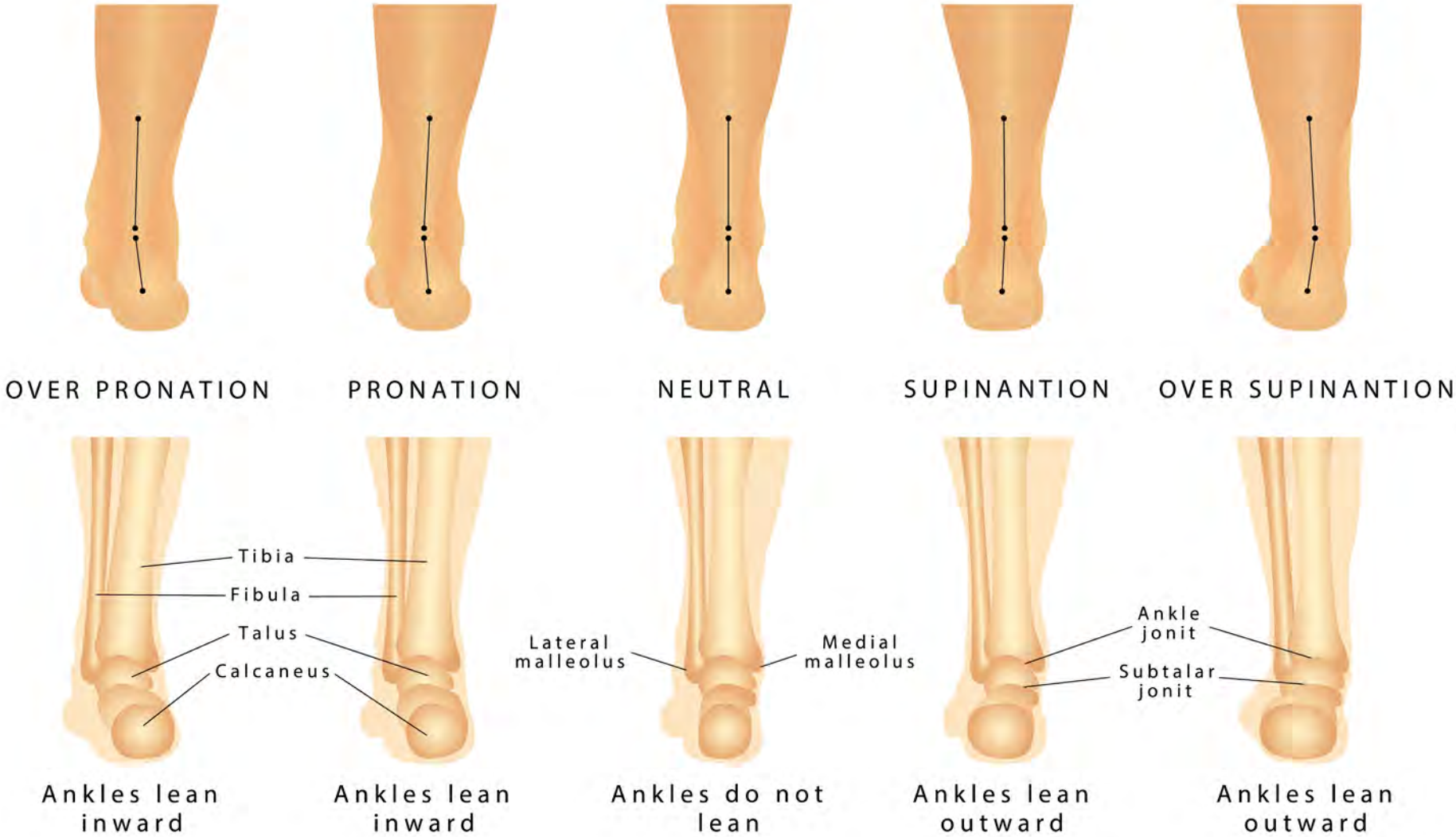
In skiing the fore-aft and tilt (edging) movements are initiated and controlled from these joints upwards

Pronation – Supination

The combination of another joint (subtalar) allows us to move the foot in two other directions:

Pronation: Turns the foot inwards, sending the big toe lower than the little toe.

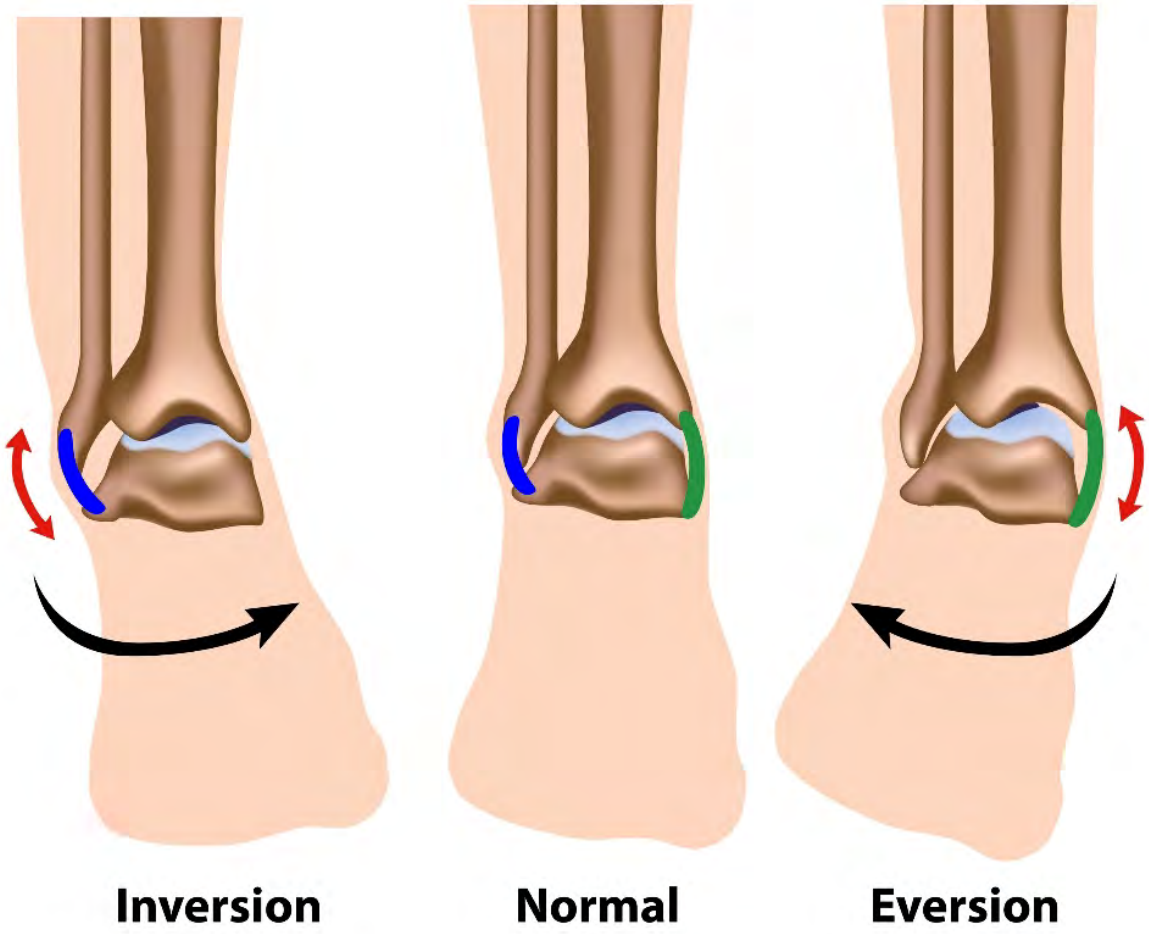
Supination: Turns the foot outwards, sending the big toe higher than the little toe.



Combining these with a rotational movement we also have:

Eversion: Foot goes outwards combined with a lateral rotation.

Inversion: Foot goes inwards, combined with a medial rotation.



These movements are required to find better contact and control edge-snow. As well as, of course, **overall balance in response to all other movements**.

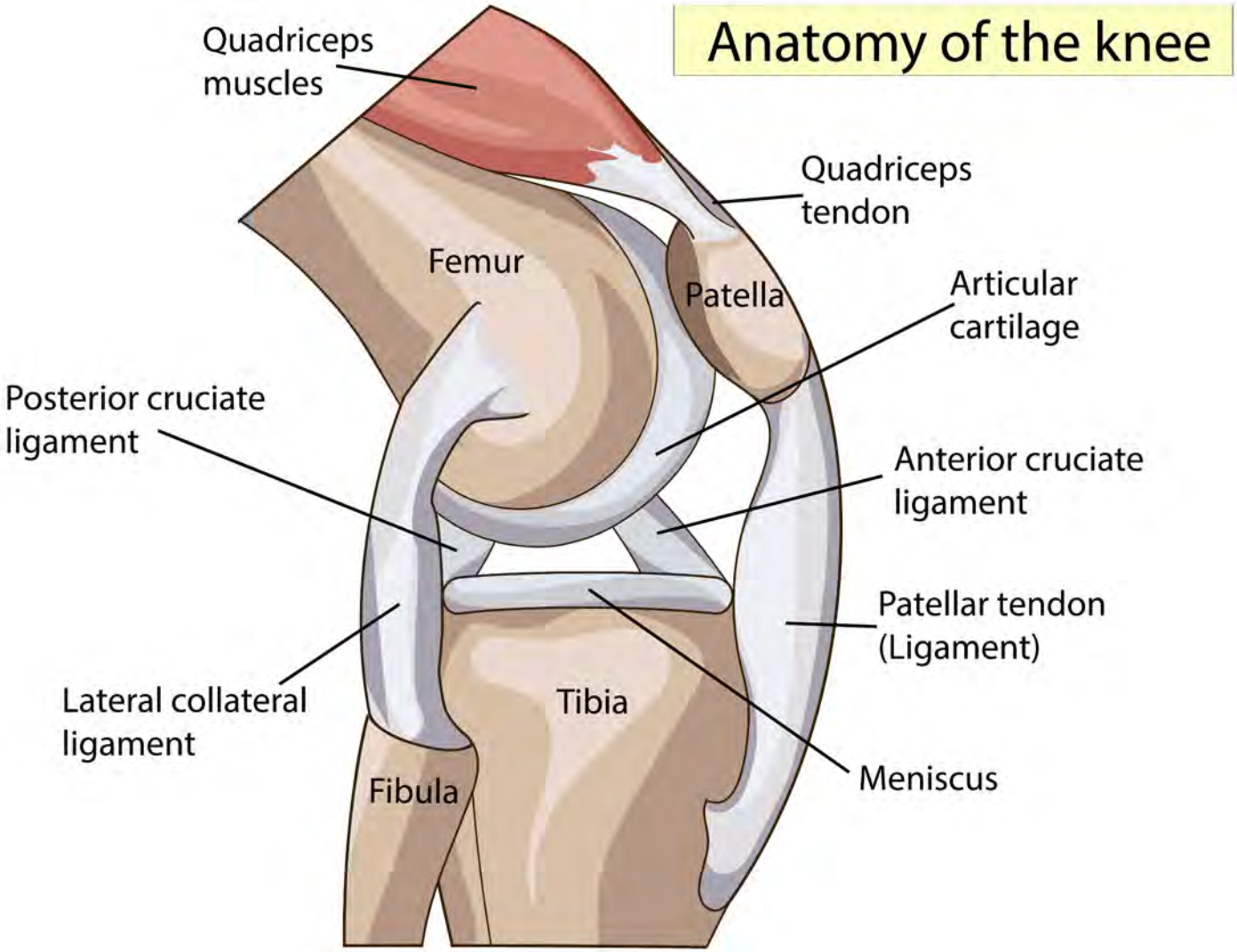
Ski boots, again, are constrictive in this ROM, so it's important to have the correct fit and correct underfoot support. In relation to this it's also important to point out that the foot works on a **tripod**:

It is over this tripod that we find balance. It is essential for every skier to be aware of these points of contact with the ground and work towards better balance from here upwards.

In terms of ski boots choice and foot support it really is up to the individual and to his/her general posture and foot set up to decide which support is more appropriate.

Knee joint

The knee is also a hinge joint, which **allows flexion and extension movements**. There is a very minimal amount of rotational and lateral movement, which is often confused with the rotation of the femur inside the hip ("point the knee in the direction of travel/inside the turn" is actually done by the femur not the knee).



In skiing the **fore-aft movement is started at the foot-ankle** and then supported by the rest of the body muscles and joints, also through the knees. Because of the flexion and extension ROM the knee and its muscles allow the upper mass of the skier to shift forward or backwards in the sagittal plane.	It is important to notice that, as well as correct technique, the knees **ligaments can be protected by tendons and muscles** of the legs. These, however, need to be maintained in the correct strength ratio, as all muscles need to balance each other off to work together in synergy (correct ratio between quads and hamstrings, for example).

Pelvis and hip joints

The hip is the **meeting point between the upper body and the legs**, playing a crucial role in the balance, health and the successful performance of the full body.
For this reason, it is important to have the correct ROM in all directions (flexion, extension, adduction, abduction, medial and lateral rotation) of the femur head inside the pelvis.

In skiing the rotational movements of the lower legs are initiated by the feet but are actually carried out, in the wider ROM, **by the rotation of the femur inside the hip**. So, it's the full length of the leg that rotates, and not just the foot or just the knee on their own.	The pelvis, sometimes confused with the hips, is the bone onto which the femur locates itself. Pelvis and femur-head find each other in the hip joint. The upper part of the pelvis is connected to the spinal column, via the sacroiliac joint. **This means that any imbalance of the spine can affect the legs and vice a versa, leg issues can affect the spine.** The spinal column has 33/34 vertebrae, connected together by discs that allow a great amount of movement. It presents three main curves, needed to absorb impact and carry the weight of the rest of the body.

Part 2

Misalignments and implications in skiing

Pelvis

Any misalignment in the pelvis or the spinal column has direct and evident consequences in skiing. These need to be taken into consideration when teaching and training as they can be the most limiting factors in the technical progression.

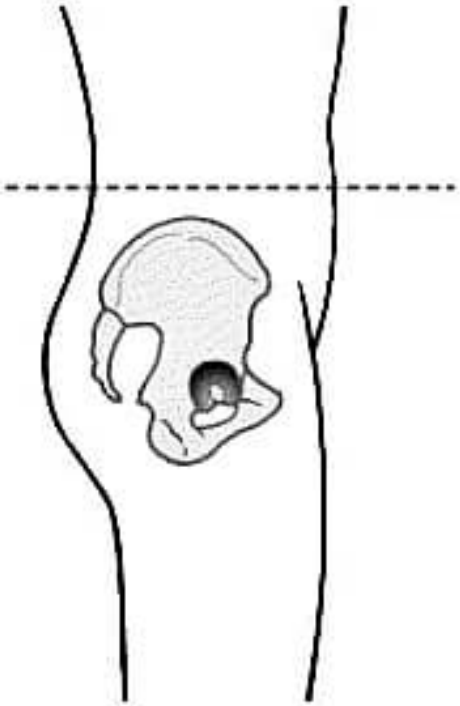
Anterior pelvic tilt:

Showing a **downwards tilt in the pelvis**. This stance is often considered to be the 'athletic' stance. An over done anterior tilt though is the first cause of lower back pain, as **the spine is forced in an excessive curve at the lumbar area**.
When this tilt becomes normal posture rather than a position, it will be a limiting factor on some terrain (moguls for example) as it limits the femur/hip ROM and can possibly cause injury.

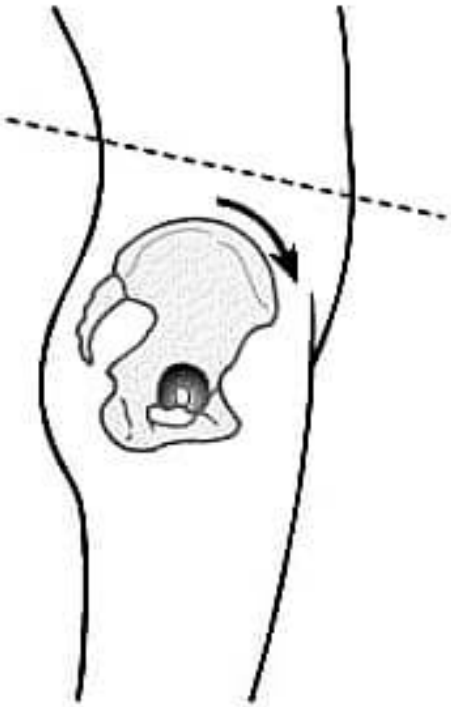
Posterior Pelvic tilt:

Showing an **upwards tilt of the pelvis**. When present in a high degree it limits the 'athletic' stance, as it forces the upper body in a vertical position. By forcing the **lumbar region of the spine to straighten excessively** it is often the cause of sciatic nerve inflammation and pain. A posterior pelvic tilt can usefully be used in moguls, as it allows easier (comparatively) ROM of the femur/hip but also exposes the spine to injury.

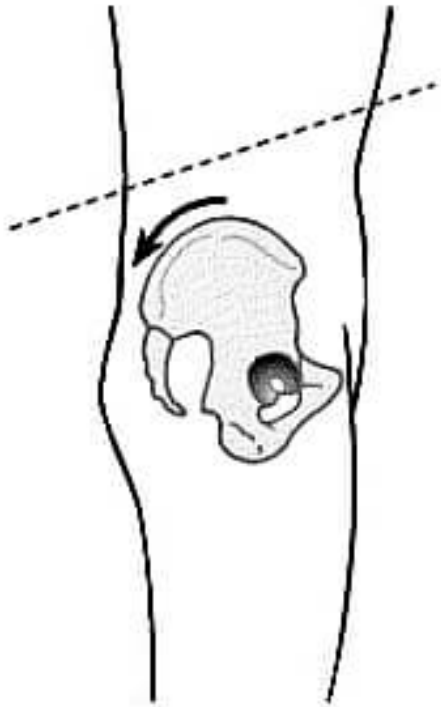
Neutral Pelvis



Anterior Pelvic Tilt



Posterior Pelvic Tilt



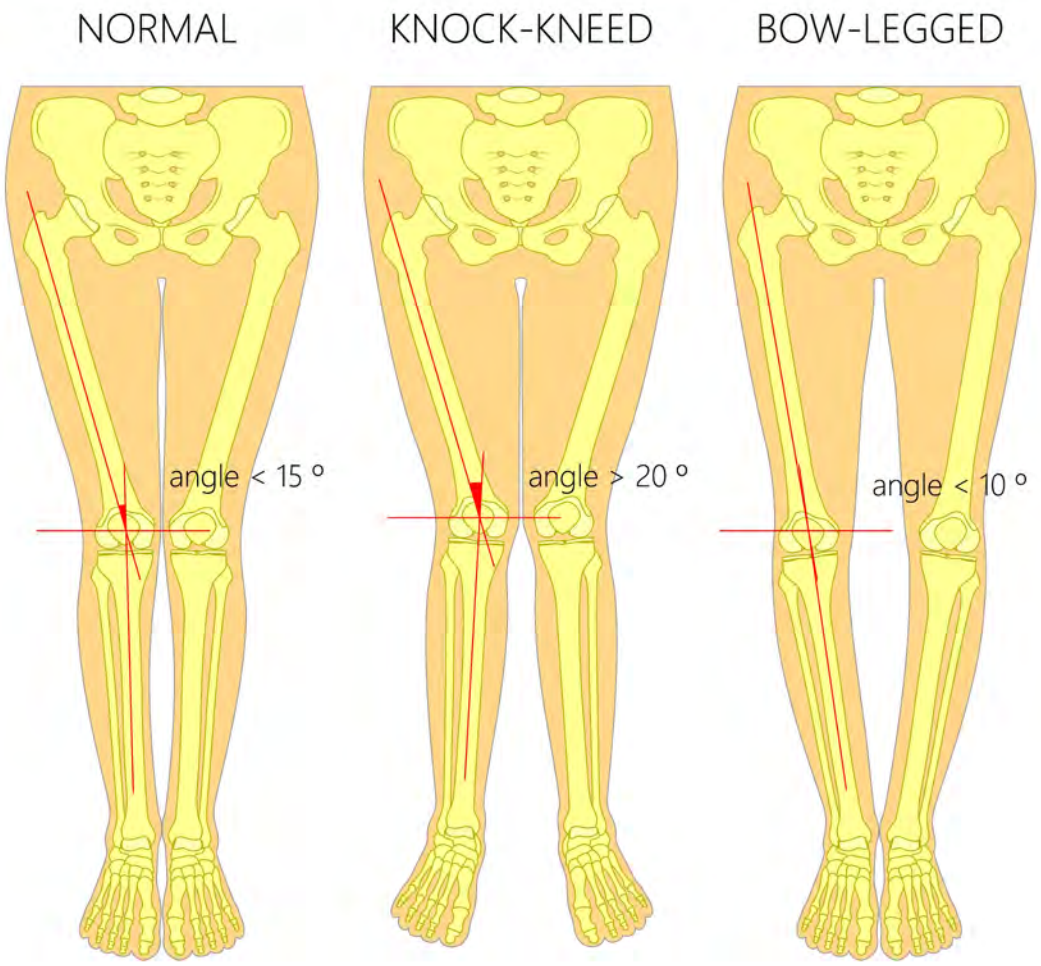
Legs alignment

Bow-legs (genu varum)

Knees are set apart from each other, creating an oval shape with the legs.

Knocked legs (genu valgus)

Knees tend to fall towards each other, creating an X shape with the legs.



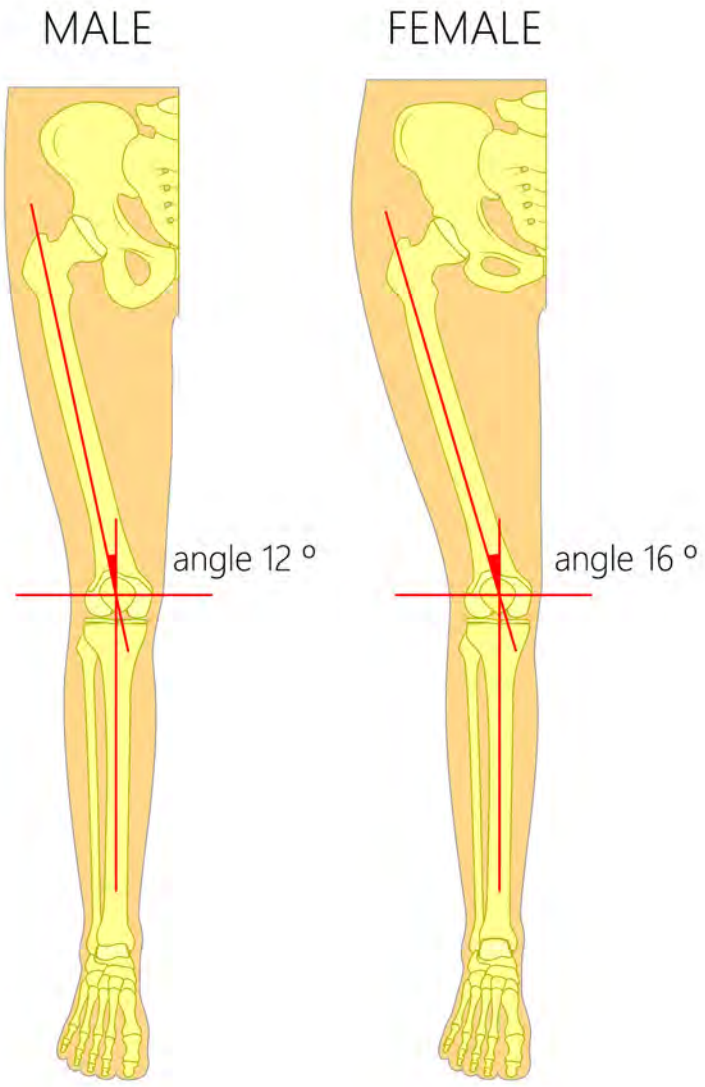
Q-Angle

Is the angle between the imaginary mid line from the thigh to the patella and the real mid line of the femur. This angle is often greater in women as they carry, in proportion, a wider pelvis than men.

Leg alignment can be helped while skiing, through the correct modification of ski boots. However, it's important to understand that ski boots are not an orthotic device and should not be used in the hope of changing the body alignment. By giving better support to the leg, customised ski boots can help the individual only in the purpose of skiing better and more comfortably.

Correct physical training and physiotherapy can greatly help the correct alignment of the legs as well as preventing the deterioration of a current misalignment.

While it is not the job of the ski instructor to correct all the above possible cases, **holding a general understanding of these postural situations can be of great help in finding the real cause of discomfort or technical limitation in the student's skiing progression**.



Part 3
Physics in skiing

Skiing is having fun with physics on snow. Physics we 'feel' even though we don't see and yet they are the reason why we enjoy the sport. We will have a look at what are the main forces and laws of physics we deal with every day on snow and how the body works in relation to them.

Forces can be:

Internal	created by the person through movement.
External	forces that act upon the skier, who will need to manage and proactively move in order to use them for their own benefit.

Gravity

We slide down the hill because earth's gravity pulls us downwards. Given all other variants fixed, the steeper the slope the more gravity can pull us down and have a pull-effect on the body.

Snow/Wind Resistance

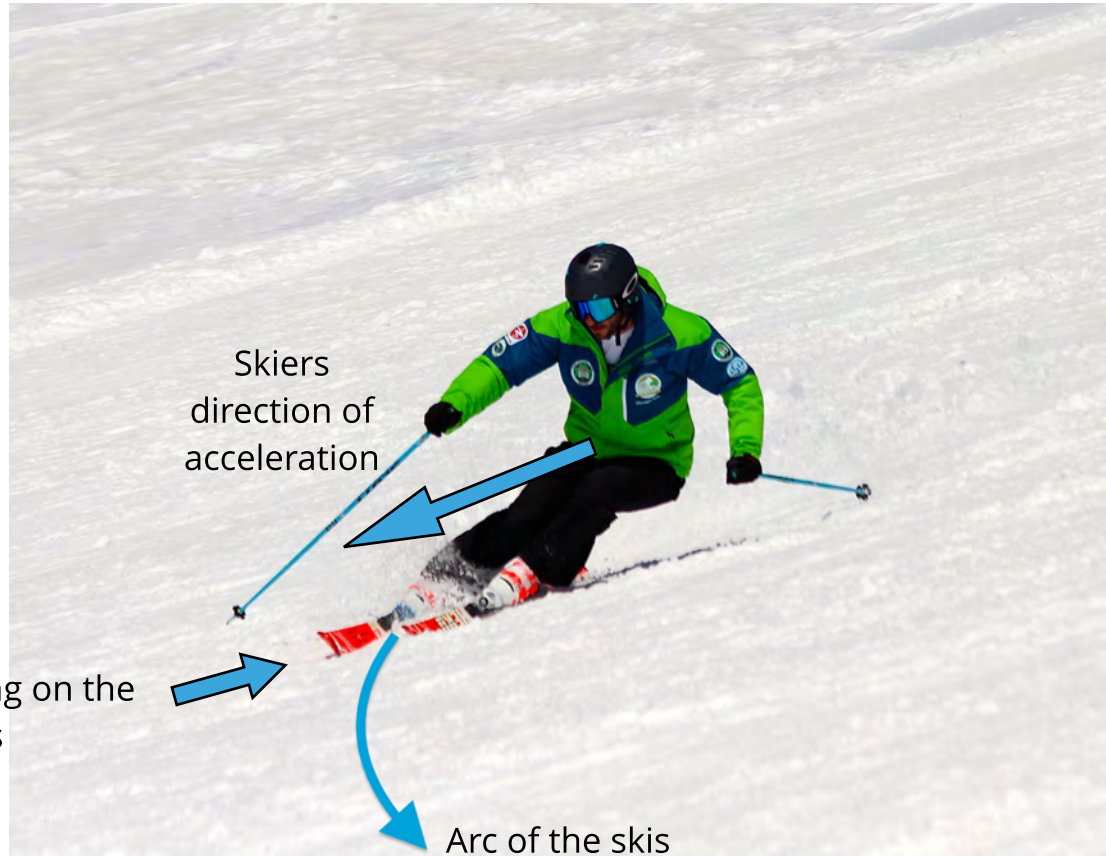
Snow is the surface we stand on and can vary in resistance, depending on its composition.
Wind is also a factor as the skier will be impacted upon by the direction of the wind as well as the air resistance while moving forward.

Newton's Laws

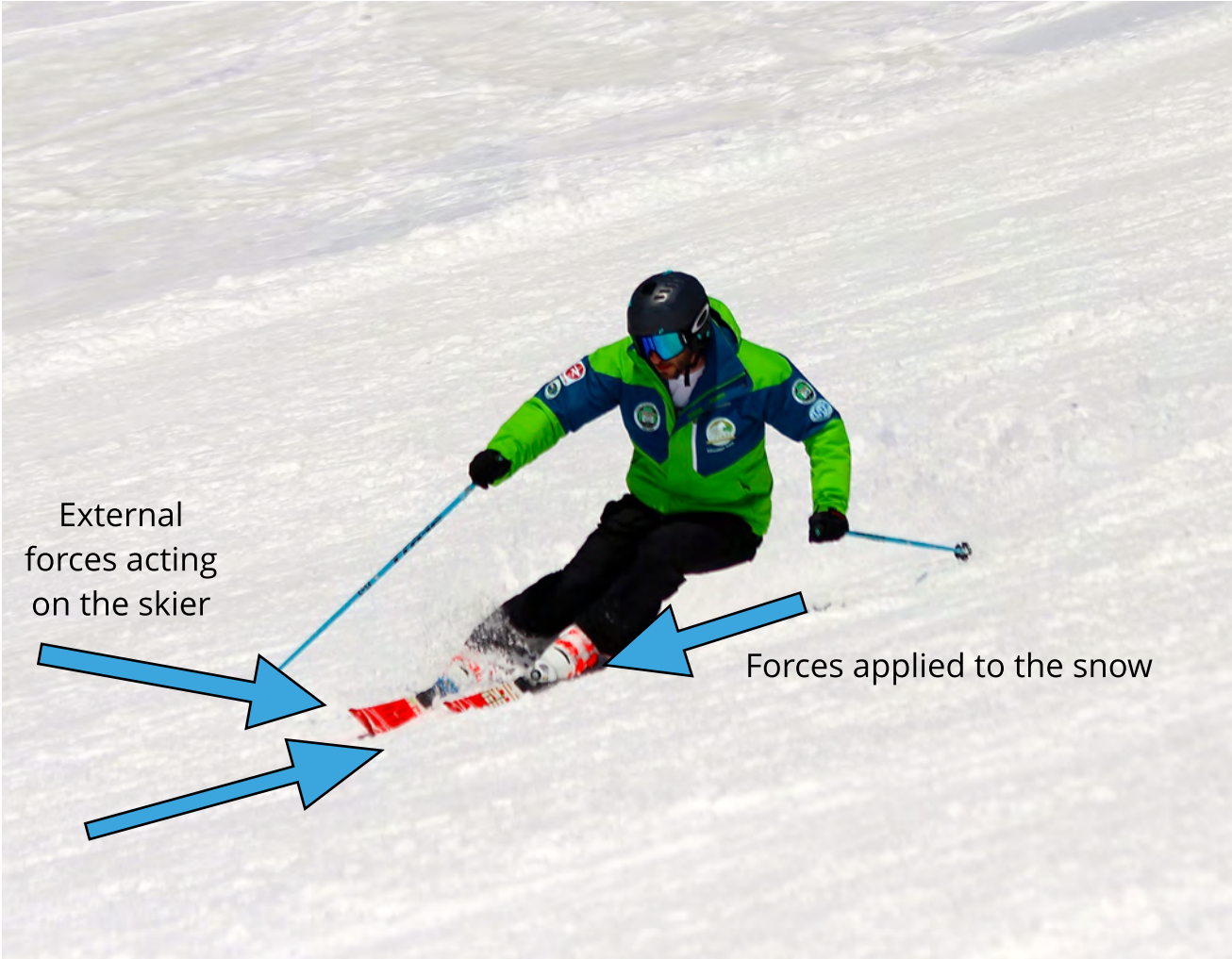
Sir Isaac Newton identified three laws of physics that rule our world. With these laws **the skier 'plays' with physics.** Understanding the laws and their application with skiing explains how skiing works.

First Law: Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it. **Without this, a skier (or any mass) would not move**. Further, a skier in a straight run would not stop or turn if the snow didn't create the needed external force (friction).

Second Law: F = ma it's the relationship between mass, force and acceleration. The acceleration is proportional to the total force on the object. **This law gives us direction and speed: we lose acceleration and gain direction depending on friction.** A skier tilts the skis onto the left edges, the snow pushes against that edge and the direction of that force causes the skier to veer in the same direction.



Third Law: Every reaction as an equal and opposite reaction. When one body exerts a force on a second body, the second body simultaneously exerts a force equal in magnitude and opposite in direction on the first body. **In a curved motion, because the snow pushes back the skier with an equal amount and in opposite direction we can make turns** (and need muscle tension to do so, in order to counteract the generated forces).



Centripetal Force

Is a **force that makes a body follow a curved path**. It's direction is always **perpendicular** to the motion of the body and towards the fixed point of the instantaneous centre of curvature of the path.

When edging into the snow we gain a **reaction of the snow pushing the ski back**.
In a circle (steered or carved) the force acting on the skis is directed towards the centre of the turn, as it's always perpendicular to the motion of the skier.

The tighter the arc or the faster the skier, the more centripetal force is generated.

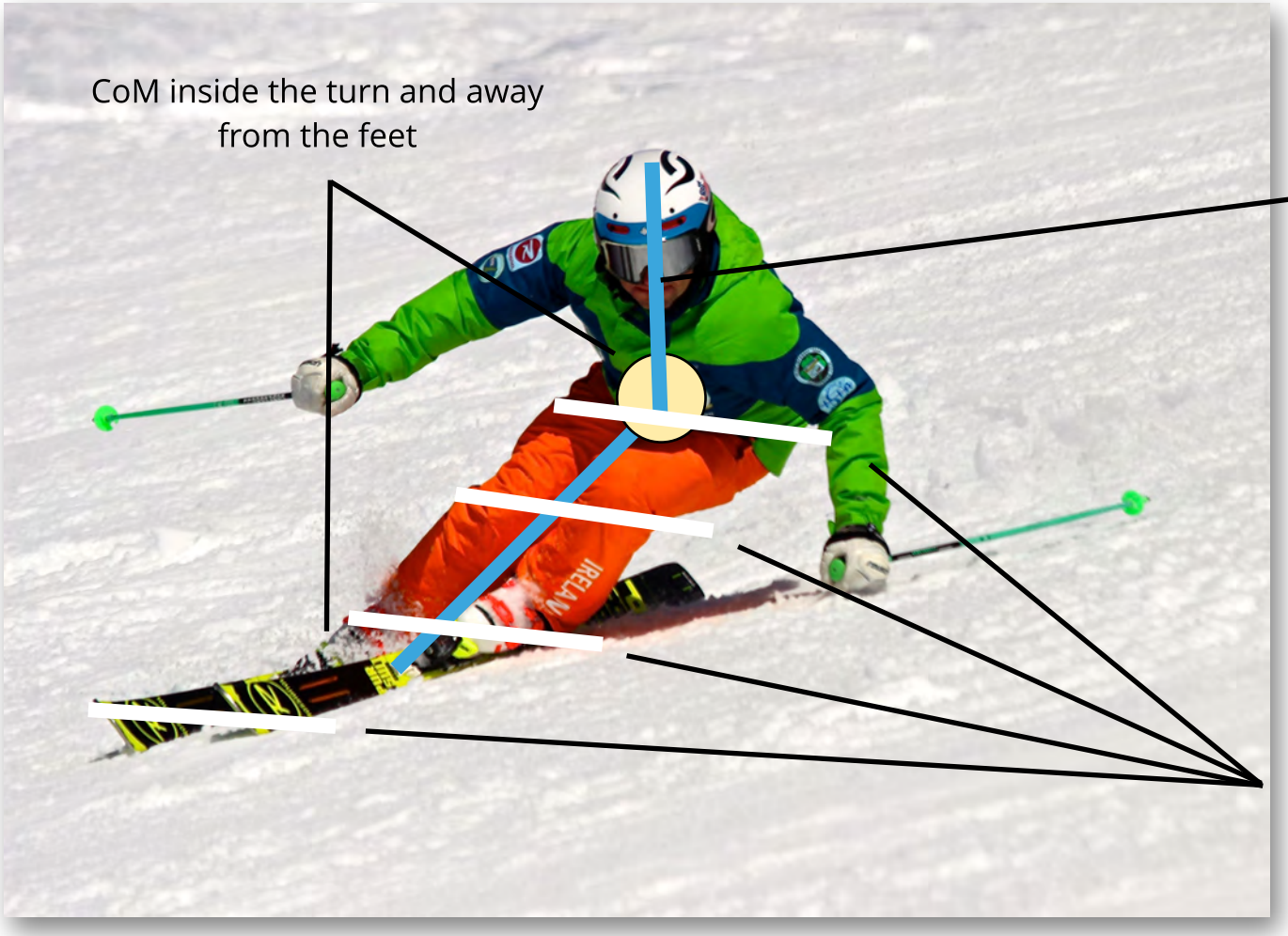
The **centrifugal force** is the feeling of being pulled towards the outside of the turn, which **is equal and opposite to the centripetal force.**

These **forces** and their combinations act on the skier and **dictate why certain technical movements are needed in skiing.**

Applications in skiing

A skier is composed by a **point of contact** with the snow (feet or skis) and it's **centre of mass (CoM)**, identifiable with a main point where the mass of a body is focused.

Because the centripetal force is present in every turn (and so the centrifugal one) **the skier needs to adapt and move to resist these forces and use them towards his/her purposes.** In order to do so he/she needs to **move the center of mass inside the turn while turning**. This implies the body of the skier will need to be inside the turn and away from the feet (point of contact).



Depending on how much centripetal force is applied, the distance between the center of mass and point of contact (body vs. feet) will change. The greater the centripetal force (increased by speed and/or tight radius) the greater the need to effectively balance away from the feet (high speed carving vs. basic parallel). The greater the forces, the greater the skier needs to work his/her body to resist these tensions.

Correct technique will help by minimising unnecessary movement, translating into higher levels of performance creating greater forces to deal with. The better a skier becomes, the more correct physical preparation can make the difference in efficiently using the laws of physics.

Notions like **angulation and inclination** were created to help the skier to understand where the body (centre of mass) is positioned above the skis (point of contact). Blending these two movements finds the ideal position to contrast yet using the forces that act upon us is one of the great challenges of skiing.
The point of contact with the snow can also vary, as we can **tilt the skis** to edge more or less. **Also by changing the way our point of contact interacts with the snow we can modulate the forces that act upon us**.
The more powerful the forces, the more precise the movements need to be. Because balance is the first goal and the feet are the closest to the point of contact, it is from there that the skier will need to gain **efficiency in his/her technical movement** (**fore-aft, edging**).
Because the majority of the mass is by definition in skiing, further away from the point of contact with the snow, the aim of the body movements is **to relocate the body mass** (from the legs up) to a convenient place (ahead of the next turn) for the skier to be able to manage the forces over and over again (**fore-aft, cross-over, cross-under, upper body separation, upper body rotational separation**).

Chapter 19

Physical Preparation

Federico Sollini

Introduction

In this chapter we will give an overall review on what the physical preparation for instructors should include. In order to do so we need to go through a brief analysis of the sport's needs, so we can track back what to train and, lastly, how to train it.

Part 1

Physical Skills

When talking about physical preparation or strength & conditioning there is the general tendency to think about pure maximum strength, as in being able to grow stronger, usually by pushing weights. We can start by saying that complete physical preparation towards skiing is not just that, as much as is it is not just 'cardio' in the off-season.

In this chapter we will try to pass on a wider view of the subject so that each individual can gain a more complete understanding on how to prepare towards the ski season. As this is a demanding sport, physical limitations can be one of the main elements that hold back the student's chance of improving.

For instructors, being able to recognise what physical skill is missing and how to improve it, will allow us to better understand the needs of the learner and address them appropriately.

Body Alignment

Impact of physical performance

Firstly snowsport professionals should start with an accurate analysis of the current body alignment. Because **how the body is structured will determine success or failure of the rest of the physical preparation**. The ability to produce strength, endurance, balance, coordination etc. are all directly related together and are better achieved with a body that is, comparatively, better aligned. It is not a coincidence that work on posture is becoming the norm in training protocols for all elite athletes.

Impact on injury prevention

It is mandatory to work on the body alignment also because it has a direct impact on **injury prevention**. Misalignment progressively exposes joints and muscles to injuries. Preventing is always more economical and time effective than rehabilitating.

Impact on technique

Ski technique is also directly affected. Efficient body alignment will give the best chance of learning and performing the accurate technical movements. It is unfortunate, but **alignment can be one of the main limitation factors to success**, just like any other physical disadvantage in sport (height in basketball or volleyball players, fast twitch vs. slow twitch fibers ratio in sprint athletes etc).

Virtually no one is immune to some misalignment, so **it's the norm to have to work on this**. It is necessary to get as close as possible to the ideal body alignment, even though it might require some time!

Misalignment consequences on skis:
- the body gets tired more quickly.
- increased muscle pain in specific muscles or areas.
- exposure to injury.
- limitation in the correct technical gesture.

Short term solutions:
- allocate some time for the body to recover (longer rests in between runs or skiing sessions).
- keep hydrated, as muscles rely on water to get rid of inflammations and distend.
- stretch the tightened muscles after skiing.

What to remember:
- assess the current body posture as soon as possible.
- neglect is not an excuse.
- consult a physiotherapist or posture educator to have the most appropriate check-up.
- include posture exercises in all training sessions.
- prioritise maximum health over maximum 'performance' (performance will actually become easier in the longer term).

Balance

Skiing is primarily a sport of balance.
Balance is the ability to stay upright or stay in control of body movement. General balance skills can be easily trained by trying to find control of the body in different situations.
Balance is improved in small and personal steps. Meaning each one of us have the possibility to improve, through a personal journey in terms of timing and progression.

Balance training rules:
- The starting point needs to be set by the current abilities of the learner.
- Each step in the progression needs to be fully achieved before proceeding with the new one.
- Each new step needs to be slightly more difficult than the previous one.

These rules can be applied to both off-snow and on-snow training sessions.

Off-snow training tips on balance:
- practice glide/slide sports (ice/roller skating, skate board etc).
- favour on-foot standing sports (football over swimming).
- recreational balance games/tools (slack line, skating).
- specific training using a variety of tools (balance boards, fit-ball etc).

On-snow training tips for balance:
- slow down or increase the speed of descent.
- increase height of COM to increase difficulty.
- decrease height of COM to decrease difficulty.
- standing on one foot is always more difficult than on two.

Coordination

Coordination is the ability to move two or more body parts under control, smoothly and efficiently. Skiing clearly needs a good dose of coordination to be successfully performed. Coordination is highly impacted during the growth of the child, as we develop different coordination skills at different ages.

Age and Skills:

Age 2 to 4
+ alternation of feet (ability to walk stairs).
+ jumping with two feet.
+ ride tricycle.

Age 5 – 6
+ run, hop, skip, jump.
+ ability to throw and kick a ball.
+ catch a ball with two hands.

Age 7 – 8
+ ride a bike.
+ spin around while standing on the spot.
+ complete multiple stages tasks (making the bed).
+ complete more complex movements (tie shoe laces).

Age 9 – 10
+ coordinate complex movements (accurate sport playing).
+ efficient use of tools.

Age 11 – 15
+ effectively perform technical sports along with team work.
+ endurance and strength spurs.

Age 16 – 18
+ improved visual-spatial coordination (ability to judge distance, speed and react quickly).
+ coordination progression completed.

Through the scheme above you can see how **different skills are developed during different times of our lives**. By the age of 18-19 we should have all the tools we need to express (or fully train towards) the maximum coordination possible.

When teaching youngsters, we also need to **keep in mind their growth rate in height**. As seen in the balance section, every time the COM rises, balance (and therefore coordination) will be more challenging. Sometimes the difficulties in improving is not so much the technical gesture itself, but the fact that the student is performing the same task at a higher distance from the ground. They are just taller!

Coordination can be improved through continuous training and progression. Each new exercise, as for balance, needs to be a bit more difficult (i.e. complex) than the previous one.

Off-snow Coordination training tips:
- practice sports that require multiple eye-body interactions (ball games vs. road cycling).
- when practicing sports work hard on movement accuracy (purposeful practice).
- challenge yourself by periodically trying/learning a new sport/technical gesture.
- use mirrors to help acknowledgement of the body in motion and their position in space.

On-snow Coordination training tips:
- don't fear failure.
- start simple and build up slowly but constantly.
- focus on movement accuracy (purposeful practice).
- practicing other snow disciplines can increase coordination awareness.
- use video recordings instead of mirrors.
- be specific when targeting an issue through video (focus on the specific movement, not the overall technique).

Part 2.1
Energy Systems Overview

Energy systems are the way our body creates the fuel for our activities. Depending on the duration and the intensity of such activities our organism will use one over the other. Understanding which ones are used in skiing will give the direction for the planning of our physical preparation.

Three Energy Systems:
Anaerobic A-lactic.
Anaerobic Lactic.
Aerobic.

Without going into the details of the chemical reactions we can highlight:

Anaerobic A-lactic system is used for efforts **under 20 seconds of duration** main source of fuel: ATP.

Anaerobic Lactic system is used for efforts **between 20 seconds and 2 minutes** main source of fuel: glucose.

Aerobic system is used for efforts **over 2 minutes of duration**
Main source of fuel: oxygen.

Primary Energy System in Skiing

Anaerobic Lactic: for the most part our descents normally last between 20 seconds and 2 minutes. As our performance needs to peak during this time frame, **we consider skiing as an Anaerobic Lactic sport (AL)**.
This implies that our training should aim at improving our performance during this time frame.

Within this time frame we can decide if we want to either:

- be **moving faster** (increase the number of repetitions per second).
in skiing: make more turns per each meter of descent – slalom turn rather than giant slalom turn.

- **for longer** (increasing the amount of time we can keep on going for).
in skiing: be able to ski 50 turns rather 20 and not feel tired.

Secondary Energy Systems in Skiing

Aerobic: Skiers also need to keep the Aerobic system (A) at a high capacity level. This is because this system is responsible for the oxygenation of the tissues. In other terms, it is the system that comes in to rescue every time we need to recover from an effort.

By strengthening the aerobic system, we can shorten the general recovery time our body needs to have between skiing sessions. Whether we are thinking about recovering between runs, between training days or throughout the length of the season, a well trained cardio-vascular system will allow efficient recovery and better overall skiing quality.

Anaerobic A-lactic: in order to train our best performance on longer time frames certain skills (like speed) need to be trained first in a short time lapse.

Training the body to perform at the fastest possible speed within the first 20 seconds of movement will increase the ability, through accurate training, to speed up the performances in the Anaerobic Lactic system (AA).

Later in this chapter we will present a few ideas on how to train the different energy systems.

Part 2.2
Energy Systems -Training Methods Towards Skiing

Training the Anaerobic Lactic System

As we mentioned before we can train the body to either move faster or for longer. Following this we can try to simplify the rationale and split the training into two: Lactic Peak (LP) and Lactic Endurance (LE).

Lactic Peak (LP)

During the LP training we try to be moving as fast as possible for limited amounts of time within the AL system. Following each set with medium long rest time, in order to help the body to get rid of the lactic acid and restore the glucose in the muscles.
Example with Jump Squat: 30 seconds jumps at highest speed possible + 3 minute rest time.

Aim	Method
- Improve speed. - Improve lactic acid production. - Improve nervous system.	- short burst of performance. - fastest speed possible. - long recovery time.

Lactic Endurance (LE)

To train the LE we will then proceed in extending the execution time going between 1 to 2 minutes, as well as shortening the rest time, in order to push the body to adapt to the new fatigue situation.
Example with Jump Squat: 1 minute jumps at highest speed possible + 1 minute rest.

Aim	Method
- Improve lactic acid endurance. - Improve overall muscle recover. - Improve speed endurance.	- Use of 'race like' time distances. - Keep the fastest speed possible. - Short recovery time.

A standard session would be between 6 to 12 sets per muscle group, with two to four weekly sessions, depending on the maturity of the athlete (which is not the age of the person but the training experience). Each training block can be between 4 to 8 weeks of duration.

Training the Anaerobic A-lactic system

Dedicating some time to train this system can be of great advantage, as under this time frame (≤20”) we can train skills like **maximum speed and maximum strength**.

In order to do so the efforts generally need to be between 5 and 20 seconds max, with **movements done at the maximum speed possible**. This speed is necessary in order to recruit the maximum number of fast twitch fibres as well as challenging the nerve system to adapt to the new situation.

This training can be done with just body weight or, very effectively with weights. In both cases the **execution** of any exercise **needs to be impeccable**. To achieve this, time needs to be dedicated to the learning of the correct movement pattern at slower speeds first.

Exercises need to be intuitive/easy to perform and enable the athlete to recruit all the systems (muscle and nerves) in the most effective way. Squats and lunges in many variations (also plyometrics) are all good examples of exercises for this stage.

Aim	Methods
- improve maximum strength to improve A.L. overall capacity. - increase nervous system capacity. - increase in muscle recruitment.	- under 20 seconds effort. - long rests. - maximum speed and load (intensity).

Training the Aerobic System

If **medium and long-distance efforts** are the athlete's preference then these lengths can be kept during the off-season. Though it would be advisable to shorten or limit the amount of sessions dedicated to long distances while getting closer to the ski season, preferring effort lengths closer to the skiing needs (lactic system).

Another way of training the aerobic system is through **Interval Training (IT)**. Even though IT has recently gained fame through the fitness world, it's a technique that has been used for quite some time in endurance training of elite athletes. It is simply alternating a phase of intense pace to a phase of active recovery. On a track field we can imagine trying to run as fast as possible for 50 meters then jog for 100, then sprint for another 50, then jog for 100 and so on. Time rather than distances can be used (and more effective for skiing) to measure the intervals.

Depending on our aim during a certain phase of the off-season programme we can plan and adjust the time of effort and recovery. In general, we can say that the shorter recovery times will help promote the body's ability to get rid of the lactic acid, while shorter 'sprints' time will promote the ability to create speed.

Aim in Skiing	Methods
- Improve muscle recovery. - Improve overall body recovery time. - Improve mental focus.	- Medium/long efforts (30 minutes+). - Interval training methods.

Conclusions

In this chapter we tried to sum up and collect a few of the **basics** of strength and conditioning. The hope of this text book is not to be a complete S & C manual, but rather to **give some pointers that everyone can take home**. Hopefully this also **stimulates curiosity** and **interest in learning more** about the subject, a very positive outcome for a manual dedicated to ski instructing!

Today we live in an era of information, it is likely that many will try to gain information on their own. When doing so it is fundamental to **always verify the source of information and maybe prefer real life communications with experts in the field.**

There is a lot of theory behind the science of movement, but just like skiing, movement can't be improved just by reading.
Like in many other professions, Strength & Conditioning coaching is really learnt through **practice**, **great attention to detail** and a full **acknowledgment that the learning process can never end**. Be willing to always seek new information and dedicating time to research and study is the only way S & C coaching can be brought to a higher level.

As athletes and sport practitioners it is important to **find a coach we trust in** and dedicate yourself to the sport year round. Training needs to be taken as part of the lifestyle we have chosen when signing up for ski instructing!

IASI today offers courses towards Alpine Strength and Conditioning Coaching, tailored around the needs of ski instructors and ski coaches interested in improving their personal knowledge on the subject.

Chapter 20 safety off-piste

Derek Tate

This chapter covers the very important subject of safety off piste so it is, perhaps, prudent to begin with some clarification as to what is meant by off piste skiing/riding. In the 2007 book Parallel Dreams Alpine Skiing, chapter 3.3.2 off piste & backcountry, Robbie Fenlon (IFMGA Mountain Guide) eluded to the fact that the terms: off piste skiing, backcountry skiing and ski touring often get confused. Indeed, since then terms like side country, referring to skiing/riding the other side of the piste markers, have been adopted. So, for clarification, based on the Wikipedia definition;

'**Backcountry** skiing is skiing in a sparsely inhabited rural region over un-groomed and unmarked slopes or pistes. More importantly, the land and the snow pack are not monitored, patrolled, or maintained. Fixed mechanical means of ascent such as ski-lifts are typically not present.'

"**Off-piste**" skiing can refer to any skiing a few metres away from marked trails and slopes, whereas "Backcountry**"** skiing refers to skiing which is not near marked slopes at all, or cannot be accessed by ski-lifts. Backcountry skiing can also involve multi-day trips through snow camping or the use of mountain huts where available.'

Off piste and backcountry skiing/riding are often talked about in terms of their risks and dangers, and while these risks are important to understand, it is equally important to emphasise the challenges and satisfaction to be gained by escaping the manufactured environment of the ski resort. Moving out of the controlled environment provides a range of new challenges, not least because there are no man made comforts, no piste maps, no route markers, no groomed tracks and no restaurants. Chair lifts and cable cars can still be used but even these can be left behind if the plan is to be more adventurous. The transition between piste skiing and off piste/backcountry skiing/riding is akin to moving from a forest park to the jungle, or from a swimming pool to the open sea. Taking on the challenge of this raw environment means being able to look after yourself. Thus extra knowledge and new skills are required beyond those that apply to pisted areas.

Limitations of this chapter

As mentioned previously, at the beginning of chapter 12, part 2 is only an overview of some of the most relevant topics relating to safety off piste and in the backcountry , in part, because it is beyond the scope of this manual and because there are some great texts, videos and other resources available from leading experts in this field, which are highly recommend.

Three basic rules

There are three basic rules that are fundamental to creating conditions that increase the risk of avalanches and while they may be 'common knowledge' they are often ignored. These are: precipitation, wind, temperature.

Avalanche risk increases if:

1. It snows or rains or there is any precipitation. The greater the precipitation generally the greater the risk.
2. It is windy and snowing OR even if it is just windy and no snow has fallen in a few days.
3. The temperature rises.

With no greater knowledge than this the safety margin is increased many times by taking the necessary precautions. Every time these conditions are experienced, during winter and spring in the Alps, avalanches occur to a greater or lesser extent. If the conditions have been fairly active, then the likelihood is that there will be an article in the local newspaper about a death or injury due to an avalanche.

Types of snow

One use of snow knowledge is to avoid getting avalanched, but another very useful by product is knowing how and where to find the best snow for skiing/riding.

Snow types can be classified as follows

- Powder.
- Spring snow.
- Crusty snow (either wind crust or rain crust).
- Hard pack.
- Crud - everything else.

- Powder- fresh powder without tracks is what everyone wants to find. The deeper the better (well that's what people think). Powder comes in different weights and textures from light, loose and cold to slightly moist and heavier. The depth of the snow and the steepness of the slope make a difference as to how enjoyable it is to ski.

- **Spring snow** is also very enjoyable to ski. You find it where the snow pack has melted and refrozen many times. Then when the hard surface has melted and softened it gives a really wonderful skiing/riding surface. Nature?s piste!

- Crust - this is hard to ride but perhaps more difficult to ski especially if it supports the rider/skier some of the time and then breaks unexpectedly. A breakable crust is like travelling over rat traps. The crust can be formed by melting and refreezing by either sun or rain. Or it can be formed by a wind deposited layer.

- **Hard pack** is snow that has been packed down either by a lot of traffic or wind action. It has a chalky surface and if it supports body weight it can be great fun to ski/ride.

- **Crud -** everything else - but generally it is snow that has already been chopped up by other skiers and riders.

Types of avalanche

Different texts will classify types of avalanches differently, but generally speaking there are 3 main types.

- Powder
- Slab
- Wet

Powder avalanche - these are perhaps what people imagine most when they think of avalanches, (see picture above), as they are certainly the most dramatic. However, they are less common than the other types. They often start from a single point and then gather more and more snow as they progress down the slope forming a snowball effect. They are most common after very heavy snowfall and can build up a great deal of speed and power, which can be very destructive for anything in its path.

Slab avalanche - this is the avalanche type that catches skiers in 90 percent of cases. The statistics are very revealing; 75 % or more of avalanche victims are caught by slab avalanches. 95% of avalanches are triggered by the people who are caught in t hem .

Being caught in a slab avalanche is similar to walking on a frozen lake. Suddenly there is a crack and everything around the person(s) starts to move.

Types of avalanche continued

The slab itself is an area of snow that has bonded together across its surface. It may be as large as a football field or the size of a mattress. Although the surface may be strong enough to support a persons weight, it may be resting on a weak layer buried in the snow. This can rupture and allow the slab to slide down the mountain? ? with the person on it - then in it.

Slabs are generally formed by wind deposited snow, either during a snowfall or, in the period after recent snowfall. The wind carries the snow and deposits it in areas sheltered from the wind (the lee ward side of the slope).

Wind slab danger areas are generally close to a ridge line or any other area where the wind slows down and deposits its load of snow.

A simple rule of thumb is that if the wind is blowing from the west it will deposit snow on the eastern side of the mountain near crests and ridges. Avoid those areas!

Types of avalanche continued

Wet snow avalanche - these avalanches are simpler to understand and easier to predict. Basically when the snow warms up it becomes sludgy and then slides down the hill. The big clue for this type of avalanche is a sharp rise in temperature. The risk is even higher if there is a sharp rise in temperature after a recent snow fall. Skiers and snowboarders should be particularly vigilant later in the day and in spring where higher temperatures are normal.

Beware - faceted crystals

Transformations that take place within the snow pack are hidden from the observer. Snow crystals transform naturally. How they transform is affected by temperatures in the snow pack.

One really dangerous crystal that can form in the snow pack is called the facet ed crystal. This forms during periods of very stable calm weather, on the shaded or cooler slopes of the mountain. One of the reasons it is so dangerous is that people become less cautious of avalanche risk when the weather is good and stable for an extended period.

Avalanche terrain

Slope angle

The statistics for avalanche accidents indicate that the majority of them occur on slopes of 35 to 45 degrees. The slope angle with the highest occurrence of avalanches is 38 degrees. However, wet snow avalanches can occur on much lower angles.

Convexity

Snow is spread on the mountain side in a big blanket. This blanket has a certain tensile strength. It tends to tear on parts of the slope that put it under tension. Tension occurs where the slope is convex.

Ridges and crests

Wind slab avalanches tend to occur near ridges on the hill side or near a crest or summit. This is because the wind tends to deposit snow as a hard or soft slab on the sheltered side of these features.

Gullies and couloirs

Although they can be very interesting and exciting places to ski/ride they also act as a natural funnel for any avalanche debris. So do not stop and stand in the middle of a gully. Move out of it, or at least move to a sheltered area at the side.

Cornices

These are dangerous over hangs of snow found on the crests and summits of mountains. It is dangerous to stand on them, or near them, as they can collapse. It is also dangerous to traverse under them for the same reason. They are especially unstable in warm weather.

Avalanche terrain continued

Cliffs

Although it has become fashionable to jump off cliffs, on skis and snowboards, most mere mortals should avoid going near cliffs. Even a small avalanche may carry an unsuspecting skier/rider over the edge, if they are above or close to them. Being near an edge and slipping can turn a minor slip into a major fall. Many skiers and riders (some very well known for tackling the extreme) have been killed in falls from cliffs in recent years.

Terrain traps

Think of an ordinary house hold bath. How much snow does it take to fill a bath?That?s how much snow it takes to bury a person! On an open flat slope a small avalanche may run around a persons ankles. The same avalanche coming down into a confined gully may bury a person!

Pay attention to the shape of the terrain around you. In the wrong area even a minor avalanche can have serious consequences.

Human factors

One of the primary reasons that people get caught in avalanches is due to what is termed 'human factors'. The WSL Institute for Snow and Avalanche (Switzerland; listed in the resources at the end of this chapter) talk in detail about the human factors, which can be categorised as pressure and heuristic traps. They produce an excellent free booklet titled "Caution Avalanches" which is available via their website.

Pressure - this includes external pressure from members of the group (guests) about expectations or wishes for skiing off piste and touring and in risky situations this can lead to poor decision making. Self-im posed pressure, on the other hand, is pressure that the leader puts on him/herself if the goals and needs of the group are unclear.

Heuristic Traps include:

Lots of people - wrongly assuming that there is less danger when in bigger groups.

Familiarity - there has never been an avalanche in this area, or on this slope before, so it must be safe.

Getting away with it - assuming that because it went well last time it will go well the next time.

Exclusivity - the opportunity to do something 'special' negatively impacting clear thinking.

Social acceptance - making risky decisions in order to maintain social status.

Blind trust - blindly trusting information from others can negatively impact proper evaluation from a range of information sources e.g., avalanche bulletin, weather forecast, local guide/instructor network etc.

In order to successfully manage these aforementioned human factors groups need to have a good decision making framework with clear communication.

Avalanche safety equipment

In addition to the following avalanche safety equipment IASI recommend that all skiers and riders wear helmets for both on and off piste skiing.

Avalanche safety equipment includes:

- Transceiver.
- Shovel.
- Probe.
- Suitable back-pack (for carrying the shovel and probe inside the bag) or Airbag.

ALL group members should have a transceiver, shovel and probe and suit able back pack. If someone is caught in an avalanche t he remaining group members

are the immediate rescue team .

Transceiver - avalanche transceivers are basically radio transmitters and receivers. All the well known manufactures make excellent ones and while they can easily be hired it is well worth investing in one if the intention is to go off piste regularly. It is also very important to practice regularly and be completely familiar with their functionality. And it is important to always check battery level and that they are sending and receiving at the beginning of each days use.

Shovel - while having lightweight equipment is the ideal the shovel should always have a metal blade. Avalanche debris can be extremely solid and plastic shovels are really only useful for making sand castles on the beach!

Probe - the probe should to be around 2.4 meters in length, with measurements clearly marked on it and it should ideally have a metal cable. It should also be 'quick' to assemble, but once again practice is important.

Airbag - airbags are becoming more and more popular and lighter as technology improves. The statistics are clear that if deployed in time the chance of survival increases dramatically.

Qualifications, remits and regulations

Qualifications - The Irish Association of Snowsports Instructors has two levels of qualification in its Mountain Safety pathway: Level 1 Off Piste Security, which is part of the Level 3 Teacher Qualification (ISIA Stamp) and the Level 2 Backcountry Security, which is part of the Level 4 Teacher, Euro Pro (ISIA Card and European Common Training Test).

Remit of awards - the Level 1 Off Piste Security is designed, and covers the necessary education, for snowsport instructors to work off piste within the boundaries of the ski resort where a ski patrol operates. The Level 2 Backcountry Security is designed, and covers the necessary education, for snowsport instructors to work off piste both within and outside of the ski area boundaries and includes touring and navigation with logged touring routes. It does NOT cover skiing off piste on glaciated terrain or the planned use of mountaineering equipment such as ropes, crampons and ice axes on any terrain.

These latter areas are the domain and skills set of the Mountain Guide. Regulations - irrespective of the design and assessed content of the aforementioned awards all snowsport instructors MUST comply with the regulations of the snowsport school that they work for and/or the regulations of the country that they are operating in (and these regulations vary considerably from one country to another).

Suggested reading and resources

IASI REFERENCES

IASI Technical Assessment Criteria – Levels 1 to 4, Documents section, www.iasisnowsports.com

IASI Outcome Standards Videos – Levels 1 to 4, www.iasisnowsports.com

IASI Strength and Conditioning Coach Level 1

BOOKS, ARTICLES and JOURNALS

Baltzell, A. (2016). Mindfulness and performance: Current perspectives in social and behavioral sciences.

Baltzell, A. & Summers J. (2017). The power of mindfulness : mindfulness meditation training in sport.

Covey, S. (1989). The 7 habits of highly effective people.

Csikszentmihalyi, M. (1975). Beyond boredom and anxiety.

Csikszentmihalyi, M. (1997). Finding flow : The psychology of engagement with everyday life.

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience.

Csikszentmihalyi, M. (1993). The evolving self : a psychology for the third millennium.

Csikszentmihalyi, M., Latter, P. & Duranso, C. (2017). Running flow: Mental immersion techniques for better running.

Duckworth, A. (2016). Grit: The power of passion and perseverance.

Dweck, C. (2012). Mindset: Changing the way you think to fulfill your potential.

Fitts, P. & Posner, M. (1979). Human performance.

Hill, V. & Andelman, B. (2012). FANS! Not customers: How to create growth companise in a NO growth world.

Honey, P. & Mumford, A. (2000). The learning styles helper's guide.

Jackson, S. & Csikszentmihalyi, M. (1999). Flow in sports: The keys to optimal experiences and performances.

Kabat-Zinn, J. (2004). Wherever you go, there you are: Mindfulness meditation for everyday life.

Gardner, F. & Moore, Z. (2004). A mindfulness-acceptance-commitment-based approach to athletic performance enhancement: Theoretical considerations. Behavior Therapy.

Goodland, B. (2019). Alpine Ski Touring: Selected Ski Tours in the European Alps.

Goodland, B. (2018). Ski Touring: A Practical Manual .

Langer, E. (2000). Mindful learning. Current Directions in Psychological Science.

Langer, E. (1998). The power of mindful learning.

Langer, E., Cohen, M. & Djikic, M. (2012). Mindfulness as a psychological attractor: The effect on children.

LeMaster, R. (1999). The Skier's Edge.

LeMaster, R. (2009). Ultimate Skiing.

Mosston and Ashworth (2008) - Teaching Physical Education.

Oden, J. (2007). Free Skiing: How to Adapt to the Mountain.

Reichheld, F. & Markey, R. (2011). The ultimate question 2.0: How net prometer companies thrive in a customer-driven world.

Tate, D. (2017). Being truly learner centred in snowsports.

Tate, D. (2017). Flowing with Mindfulness, 1–5.

Tate, D. (2020). Learn, Enjoy, Flow & Grow.

Tate, D. (2017). Learning Zones part 1 and 2.

Tate, D. (2007). Parallel Dreams Alpine Skiing: Taking your Skiing Performance to New Levels.

Tremper, B. (2018). Staying Alive in Avalanche Terrain.

Seligman, M. & Csikszentmihalyi, M. (2000). Positive psychology: An introduction.

Shedden, J. (1986) Skillful Skiing.

Shedden, J. (1986) Developing your skill.

MANUALS

Tecnico di Educazione Posturale - L. Franzon & R. Mastromauro

Pattern Abilities Training - C. Dolzan & V. Fabozzi

IASI Coaching Theory Module Presentations - F. Sollini

Swiss SnowSport – Manuale di Sci Alpino

Australian Professional Snowsport Instructors Inc. (APSI) – Alpine Teaching Manual

New Zealand Snowsports Instructors Alliance (NZSIA) – Ski Instructors Manual

Bompa, T. O., & Buzzichelli, C. (n.d.). *Periodization : theory and methodology of training*.

La Pliométrie - Gilles Cometti

Manuale di preparazione atletica - Franzon & Carlin

L'Entrainement de la Vitesse - Gilles Cometti

WEBSITES

Henry's Avalanche Talk, https://henrysavalanchetalk.com

Piste Hors, http://pistehors.com

The American Institute for Avalanche Research & Education (AIARE), https://avtraining.org WSL Institute for Snow and Avalanche SLF, https://www.slf.ch/en.html

APPLICATIONS

White Risk, https://www.slf.ch/en/services-and-products/white-risk-app.html EchoSOS App, https://echo112.com/getapp

Fat Map Navigation, https://fatmap.com/

Videos:

Avalanche Avoiding Kung Fu, episode 1, https://youtu.be/MqWNYiuZS28

Avalanche Avoiding Kung Fu, episode 2, Human Factors, https://youtu.be/aYKgd7Th68k

Avalanche Avoiding Kung Fu, episode 3, Interpreting Avalanche Bulletins, https://youtu.be/Yi0dONwITGU

CREDITS

First published 2018

Authors: Jamie Kagan, Federico Sollini, Derek Tate and Shona Tate, Jordan Revah, Chris Oldaker, Pete Gillespie and Sara Jones

The Diamond Model of Skill Acquisition, it's explanation and the technical content derived from the book Parallel Dreams Alpine Skiing: Taking Your Performance to New Levels is © Derek Tate and used with permission of the publisher Parallel Dreams. www.paralleldreams.co.uk

Skiers featured in the photos are: *Andy Bennett, Phil Brown, Dan Gillespie, Jamie Kagan, Chris Oldaker, Jordan Revah, Raphael Revah, Mark Shaxted, Fiona Revah and Shona Tate.*

Photographs are used with permission of The Snow Centre. All other photographs in the manual are used with the permission of the photographers.