

## SECTION B - A TECHNICAL UNDERSTANDING OF SNOWBOARDING

## 6

# The Snowboard Turn

TURN SIZE AND SHAPE



TURN PHASES



TURN TYPES



TURN FORCES



## IN THIS CHAPTER WE WILL EXPLORE...

How snowboarders can alter their path down the mountain by making turns of different shapes and sizes. Alongside this, we will look at the different phases of the turn which are particularly useful when communicating the sequence of events throughout a turn to your students. We will also explain the variety of turn types that can be used and consider the forces that impact the turn.

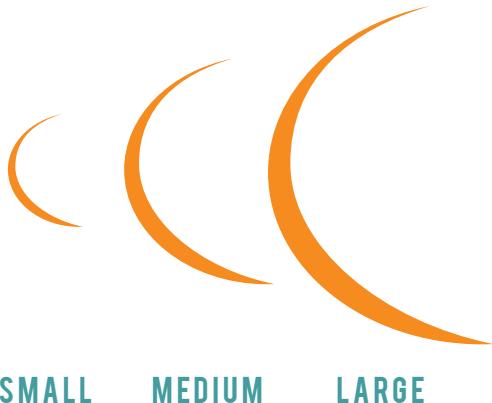


## TURN SIZE AND SHAPE



Put simply, the longer the board spends in the fall line or the more gradually a rider applies movements, the larger the turn becomes. When we define the size of the turn we consider the length and radius of the arc: small, medium or large.

The size of your turn will vary depending on terrain, snow conditions and the type of turn you choose to make.



A rider's rate of descent down the mountain is controlled mainly by the shape of their turns relative to the fall line.

The shape of these turns can be described as open (unfinished) and closed (finished). A closed turn is where the rider completes the turn across the hill, steering the snowboard perpendicular to the fall line. This type of turn will easily allow the rider to control both their forward momentum and rate of descent. Closed turns are used on steeper pitches, or firmer snow conditions, to keep forward momentum down.



OPEN

CLOSED

An open turn is where the rider chooses to use less completion in their turn, where the snowboard does not steer perpendicular to the fall line. Open turns are used on flatter pitches, or slower conditions, to maintain forward momentum. Open turns are a handy technique that snowboarders use on cat tracks or through flat areas.

## TURN PHASES



In order to develop an understanding of how a snowboard turn is comprised, it's best to break the turn down into three main phases: the initiation (or beginning); the control (or body); and the completion (or end) phase. We will also consider the point at which the snowboard changes edge and when a rider should prepare for the following turn.

Note that the different turn phases are very apparent in slower, low level turns but become very blended and more difficult to see as the turns become smaller and speed increases.

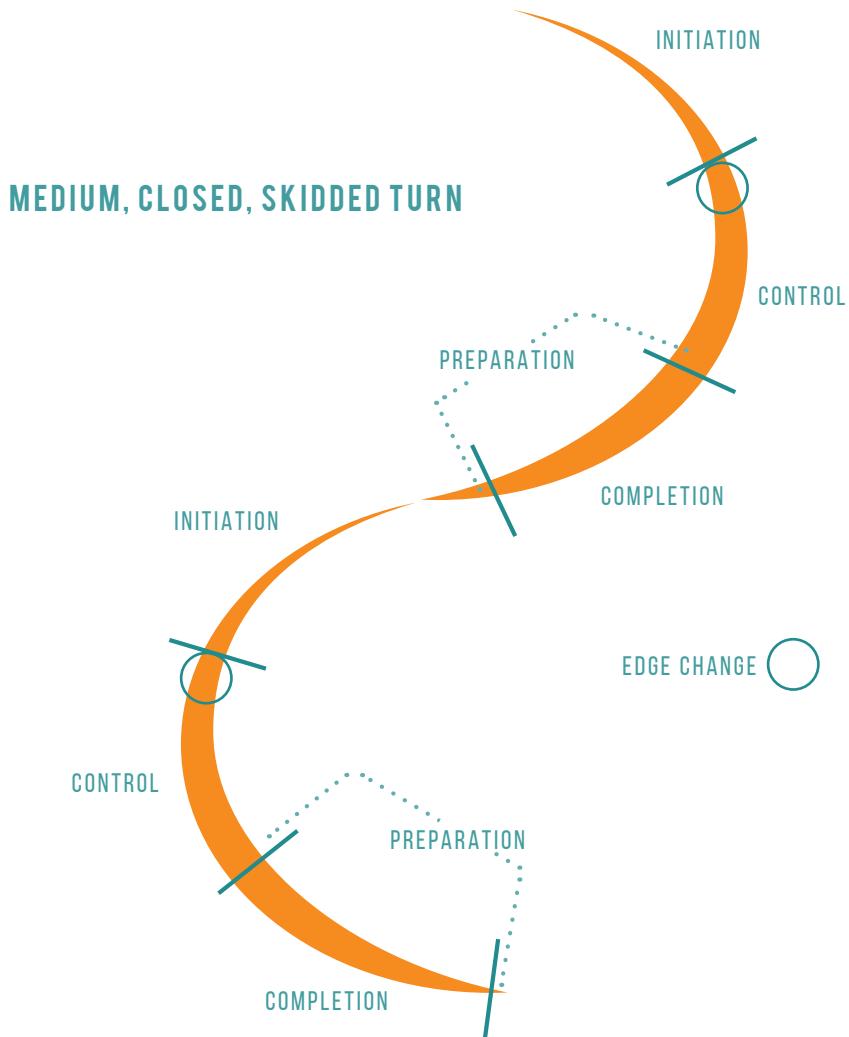
**The Initiation Phase** is at the beginning of the turn. Here, the uphill edge is released and gravity pulls the rider into the fall line. There will always be a lateral movement here to allow edge release, whether this is a direct movement straight across the board or a sequential movement to create torsional twist. Using smaller levers closer to the board is a more efficient and faster method of doing this; conversely, using larger levers is slower but can be more powerful. Other movements that may or may not occur here include extending or flexing to aid unweighting, and rotational movements to aid steering (see Chapter 7 for more understanding on the different movements).

**The Control Phase** refers to the body of the turn, where the snowboard is guided into and through the fall line. There will always be an edge change at some point during this phase. Movements here help to create progressive edging and pressuring, along with some initial steering, to resist the increasing forces acting on the rider and guide the board towards the intended direction.

**The Completion Phase** is where the rider is completing the present turn while preparing to initiate the next turn. Movements in this phase are focused on steering to help create the desired turn shape, whilst also maintaining progressive edging and regulating pressure.

**The Preparation Phase** is focused on preparing for the following turn. This can include movements to help find a neutral position from which to initiate the next turn, or it may simply be verifying the line choice and/or checking for hazards/people. Preparation movements include looking down or across the hill at the approaching terrain and potentially rotating the upper body in the new direction (see Separation and Anticipation under Rotational Movements in Chapter 7).

The edge change always occurs at the start of the control phase. It is the transition point in which we move from maintaining control on our old edge and establish some control on our new edge. The exact timing at which this happens depends on the speed of the rider and the turn size/shape.



The timing of the edge change is not the only thing that changes with different speeds, turn sizes and shapes. The exact timing and length of all the elements above are also dependent on the turn type and terrain. We will look at how these factors change once we have considered the varying turn types.

## TURN TYPES

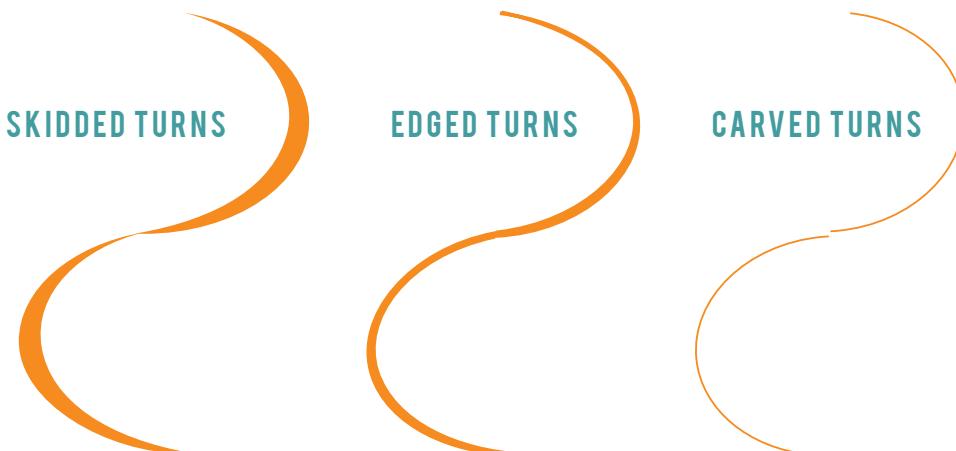


There are a number of factors we can consider when defining the type of turn being used. These include how skidded or carved the turn is, and the method in which we unweight or manage pressure under the snowboard (see Chapter 8 for more information on How the Snowboard Performs).

**Skidded Turns** refer to the amount of edge or snowboard tilt being used within a turn, in combination with the amount of pivot or steering. All turns require a degree of edging otherwise the snowboard will remain flat; however, the amount of edge a rider uses depends on the speed they are travelling and the terrain/snow they are riding on. Beginner snowboarders should be encouraged to create skidded turns, with a particularly low edge angle and smooth steering movements. Skidded turns will also be used by intermediate and advanced riders in situations where they need to keep their speed down or maintain balance.

**Edged Turns** refer to a higher degree of edge or tilt, yet still using some pivot. The resulting track left in the snow is typically narrower than a skidded turn but not pencil thin. Edged turns are often used as a stepping stone to full carving but can also be utilised to create more edge grip in forgiving snow conditions off-trail (see Understanding Steering Angle in Chapter 8 for more information on the combination of edging and steering).

**Carved Turns** refer to a higher degree of edge angle or tilt of the board, along with zero pivot or skid. The resulting track is pencil line thin throughout the turns, which allows the rider to maintain their forward momentum. Note that rotational movements are still utilised within carved turns but not necessarily to create pivot in the snowboard (see Rotational Movements in Chapter 7 for more information).



When making a turn there are two general ways to release pressure as we move towards an edge change: we can either extend vertically and move laterally or flex vertically and move laterally.

The first way a rider can release edge pressure is by extending, meaning the rider will be at their most extended at edge change. This is known as up unweighting. The second way a rider can release edge pressure is by flexing, meaning the rider will be at their most flexed at the edge change. This is known as a down unweighting movement pattern but can also be in the form of retraction turns.

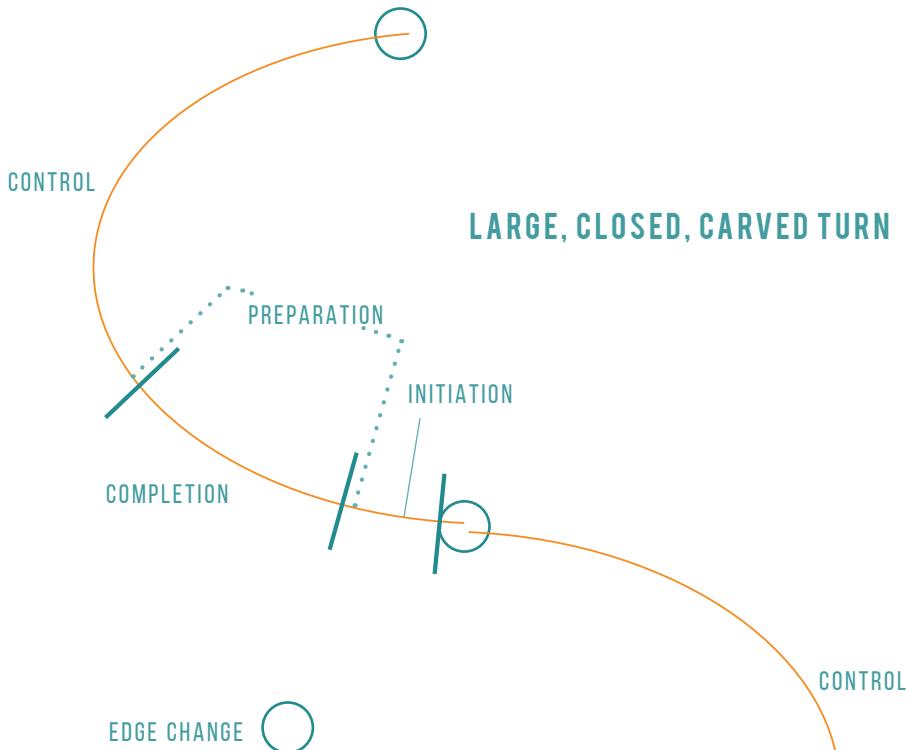
**Up Unweighted Turns** are where the rider extends to release edge grip at the initiation of the turn. The rider is at their most extended as the edge change occurs. While this turn type is commonly used to introduce turning to first time snowboarders, it can also produce and manage large amounts of pressure at high speeds. Up unweighted turns also place the rider's centre of mass (COM) low and stable at the control and completion phase of the turn. For these reasons up unweighted turns are commonly used for large high speed turns on-piste and in race disciplines. Up unweighted turns can be a variety of sizes and shapes.

**Down Unweighted Turns** are where the COM is lowered towards the board to decrease edge grip. Like the up unweighted turn, the down unweighted turn has very controlled smooth movements. However, in a down unweighted turn the rider is lower and stable at the initiation phase of the turn. These turns are often used to make turns in rough terrain that threatens the rider's balance.

**Retraction Turns** are similar to down unweighted turns, where the rider is flexed at edge change but with retraction turns the board is physically retracted towards the COM, by pulling the legs in, as opposed to bringing the COM down to the board. This turn provides a very quick and stable initiation and edge change; it is typically useful for small turns, riding powder, bumps and other terrain where quick direction changes are required.

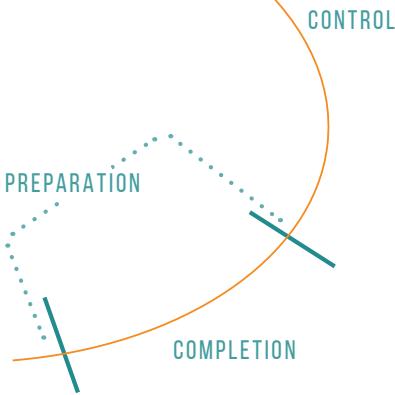
**Terrain Unweighted Turns** are when the legs are softened as terrain features are ridden (e.g. a bump), causing the legs to flex or extend under the COM. Terrain is used to decrease edge grip (and can truly unweight the snowboard) enabling the edge change to take place. It is important to note that terrain unweighting can place the rider either flexed or extended at edge change. If terrain is dropping away at initiation the rider will be extended at edge change and need to flex through the control phase. However, if the terrain is rising at the edge change then the rider can use the terrain to create a flexed position at edge change and then extend through the control phase. Terrain unweighted turns are most commonly used in the bumps but also necessary when managing any changing terrain to maintain flow down the slope like a banked slalom or a boardercross course.

When we combine the aforementioned turn types with a variety of sizes and shapes, the phases of the turn often change as a result. For example, a large, closed, up unweighted carved turn will have a shorter initiation phase, but longer control and completion phases.

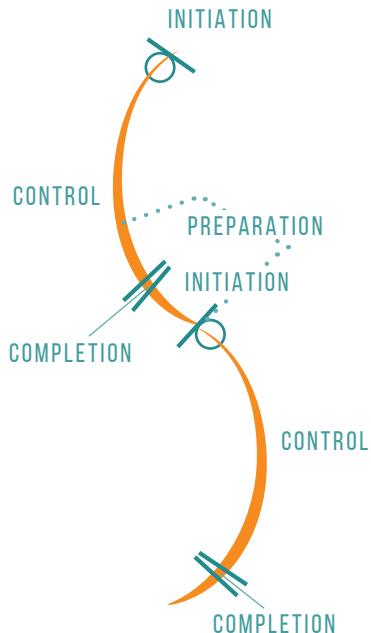


A medium closed, skidded, down unweighted turn in the off-piste will have fairly equal length phases, but the edge change will happen earlier in the turn when we compare it to an up unweighted version of the same size and shape turn that a beginner typically makes.

A small, open retraction turn also has a shorter initiation phase, but a longer control phase and virtually no completion.



## SMALL, OPEN, RETRACTION TURN



### TURN FORCES



Snowboarding is unusual in that, unlike other sports, where speed and forward movement is attained by internal, muscular strength and forces, the main source of speed and forward motion in snowboarding is gravity. An efficient rider knows this and works with gravity rather than against it to travel down the mountain. As a snowboarder rides down a mountain, his or her descent is modified by the terrain ridden. If they allow gravity alone to dictate their descent, they will take the most direct route down the hill, which is down the fall line. To alter this path, they apply forces using their body and board.

When their board is placed on edge, they are able to apply force through their body towards the centre of the turn. This is centripetal force. The higher the edge angle, the stronger the platform they create, thus the greater the centripetal force that can be applied. The force pulling a snowboarder towards the outside of the turn is centrifugal force. If edge angle is low and speed is high during a turn, centrifugal force will cause the board to lose its grip on the snow and wash out.

Looking at it simply, at the beginning of the turn the forces acting upon the rider pull them into the turn and they must be patient and move with these forces. At the end of a turn, the forces combine to pull the rider out of the turn. Here, the rider must be correctly aligned and balanced over the edge to resist these forces to help maintain control and create the desired turn.

## SECTION B - A TECHNICAL UNDERSTANDING OF SNOWBOARDING

## 7

# The Movements of Snowboarding

## IN THIS CHAPTER WE WILL EXPLORE...

How snowboarders balance and move on their equipment, the different movement options, and the methods in which these movements can be applied. As an instructor it is important to understand how to balance and move efficiently in order to achieve specific outcomes.

### STANCE & BALANCE

BASIC STANCE



ACTIVE STANCE



HIGH PERFORMANCE STANCE



### MOVEMENT OPTIONS

FOUR DIRECTIONS OF MOVEMENT



APPLYING MOVEMENTS



QUANTIFYING MOVEMENTS



### VERTICAL MOVEMENT

FLEXING & EXTENDING



UP UNWEIGHTED PATTERNS



DOWN UNWEIGHTED PATTERNS



### ROTATIONAL MOVEMENT

UPPER & LOWER BODY ROTATION



WHOLE BODY & COUNTER ROTATION



SEPARATION & ANTICIPATION



### LATERAL MOVEMENT

MOVING ACROSS THE SNOWBOARD



ANGULATION VS INCLINATION



BALANCED INCLINATION



### LONGITUDINAL MOVEMENT

MOVING FORE & AFT



BLENDING WITH VERTICAL



FORE/AFT PERFORMANCE



## STANCE & BALANCE: BASIC STANCE



Every first-time snowboarder needs to find a position on their snowboard that they feel comfortable standing and balancing in. This will often be a reflection of how they have learned to stand and balance in everyday life.

As the instructor, you are trying to encourage a position that your students can easily move from and back to, once they are in motion. This is known as basic stance. It is slightly lower and more flexed than a normal standing position, with the feet spread at a typical binding's width. The result of an efficient basic stance will put your student's centre of mass in balance.

The Centre of Mass (COM) is a three-dimensional balance point of a rider. Gravity acts on our centre of mass, constantly pulling us towards the centre of the Earth. The COM is not a fixed point. It will alter as the rider moves and changes their position on the board.



### EXAMPLE

#### CENTRE OF MASS:

Imagine that your COM is a small ball inside you moving in a perfectly smooth path, and that you are constantly moving around the ball and adjusting your position to keep the ball on its perfect path.

An efficient basic stance consists of:

- ▶ Even weight distribution over both feet.
- ▶ Ankles, knees and hip joints all relaxed and slightly flexed.
- ▶ Hips and shoulders in alignment with the position of the feet and the contact edge of the board.
- ▶ Torso upright with the arms relaxed by the sides.
- ▶ Head turned and eyes looking in the direction of travel.

This neutral position shown on the previous page will change if the rider is balancing on their toe edge or heel edge as the COM will have shifted.

To balance over the heel edge the rider will need to:

- ▶ Shift the hips and COM towards the heelside.
- ▶ Keep an even flex in the knees and hips to maintain balance, and use less flex in the ankles.



To balance over the toe edge the rider will need to:

- ▶ Shift the hips and COM towards the toeside.
- ▶ Use more flex in the ankles and knees, and less flex in the hips to maintain an upright position and balance over the edge.



It should be noted that all individuals are unique and, for this reason, everyone's basic stance will be slightly different with differing amounts of flex in their joints.

## STANCE & BALANCE: ACTIVE STANCE



Once a rider has started to develop a little confidence making turns on a green slope, they will be ready to begin exploring more of the mountain and develop as a rider. As they explore this new terrain, go faster or learn their first tricks, they will have less time to react and gain balance. This is due to the increased forces they are dealing with and how rapidly they occur. To be able to maintain a balanced position they will need to become more reactive with their stance and movements. Essentially they will have to make faster and more precise adjustments to remain balanced and stay in control.

**Reactive Balance** is the term used for this. It is an automatic response that creates movement to keep the rider's COM stable and stop the rider from falling over. Reactive balance only improves with practice and experience.

An active stance includes:

- ▶ A little more flex throughout all joints.
- ▶ A slightly lower COM than with a basic stance.
- ▶ Stronger use of muscles, yet staying loose in the joints.
- ▶ Similar positional differences between the toe and heel edge.

Time is needed to explore and develop effective positions from which to start and finish turns. The most effective position can change slightly depending on the task or terrain, but having an efficient stance to move from and come back to is key.

Being strong, yet remaining relaxed, will help the rider move more quickly to maintain balance and deal with the increase in forces. (See Turn Forces in Chapter 6.)



## STANCE & BALANCE: HIGH PERFORMANCE STANCE



At this level a rider should have developed a strong stance on both edges and show the ability to be reactive in their response in managing the increased forces. They are now ready to explore the whole mountain and develop new stance options that will enable them to ride more challenging terrain at faster speeds and with higher performance. They will also need to become more proactive, rather than reactive, to deal with this.

A high performance stance will allow the rider to create effective movements in any direction, to help increase or regulate performance, whilst maintaining a constant smooth and balanced path with the COM. As discussed earlier, the COM changes as the rider moves into different positions on the board. A high performance stance allows us to become more proactive with our COM.

**Proactive Balance** is the term best used to describe this. Being a proactive rider focuses on assessing and understanding the problems before they happen, rather than reacting as they happen. Anticipating what is about to happen gives you more time to adjust your responses accurately and effectively. The outcome is the most efficient and fluid riding for an individual, in any specific situation. A high performance stance helps to achieve this.



A high performance stance will be slightly different for all riders and tasks. It is constantly moving and adjusting, and includes the following:

- ▶ A lower COM and more flex throughout all joints, including the spine.
- ▶ The hips and shoulders in a more rotationally open position, often aligning to the same angle of the front foot.
- ▶ Allowing the hips to move slightly over the back foot, ensuring that the front knee and ankle both stay flexed.
- ▶ Maintaining strength through the back leg, yet suppleness in the front leg.



This rotationally open position allows the rider a greater range of movement through the whole body. This enables the rider to create more edge, be more powerful with steering, and regulate pressure faster, without having to shift their COM too far inside the arc of the turn.

This position also allows the possibility of creating different angles through the shoulders, to align them to the pitch of the slope. When used appropriately, this can aid stability at high speeds and help to maintain pressure when riding with increased edging. This is not only beneficial in carving, but also in many aspects of freestyle and freeriding.

## MOVEMENT OPTIONS: FOUR DIRECTIONS OF MOVEMENT



Snowboarding is an active sport that requires constant movement to maintain balance and control what the board is doing. To understand this further, the movements are broken down into the four directions that we are physically able to move in, in relation to the board.

**Vertical** - moving the body or parts of the body up and down.

**Lateral** - moving the body or parts of the body (COM) across the board toward the toe or heelside.

**Rotational** - turning the body or parts of the body around an axis.

**Longitudinal** - moving the body or parts of the body (COM) towards the nose or tail of the board.



**EXAMPLE**

We will very seldom use only one movement on its own. Instead, there are usually several or all the movements happening in unison.

**WHEN DOING AN OLLIE:**

When doing an ollie, the rider needs to move vertically to get low and longitudinally to load the tail for more pop.

**MOVEMENT OPTIONS: APPLYING MOVEMENTS**

As an instructor, your understanding of movements should extend beyond the four directions. You will need to know how each movement (and blend of movements) affects the snowboard to achieve a specific outcome or level of performance.

On top of this, understanding of the specific body parts that are moving will help to give clarity to what you are trying to achieve with your students. Once you have established the best movement option to get the desired outcome and board performance, you will need to consider how these movements are best applied.

Here are three ways to think about the application of movements:

- ▶ How LARGE or SMALL is the movement that my student needs to make?
- ▶ WHEN and for HOW LONG should the movement happen?
- ▶ How much EFFORT or FORCE should they put into the movement?

The three questions above can be thought of as:

- ▶ The RANGE of movement that is needed.
- ▶ The TIMING of the movements.
- ▶ The amount of POWER being applied to the movements.

**EXAMPLE****WHEN DOING AN OLLIE:**

The rider needs to use a medium range of vertical movement combined with a lesser range of longitudinal movement, then time the pop so the front foot lifts off the snow before the back foot. As the board bends, the rider needs to push with a degree of effort or power to get the board in the air effectively.

## MOVEMENT OPTIONS: QUANTIFYING MOVEMENTS



This is the ability to effectively measure the range of movement (or range for short), timing or power required or being used with a specific movement. This will not only help with measuring the amount of movement that is needed, it will also allow us to gauge any inefficiencies that are occurring.

Simply put, if any of the following three principles are not used appropriately, the task and/or performance of the board will be inefficient. For example, your student may be using the necessary movements but there may have been too much movement in one direction, or the movement happened too fast or with too much force.

### RANGE

This is the amount of movement or blended movement a rider is using or has access to. It can also be used to describe the amount of movement being used in a specific part of the body. Range of movement can vary greatly from person to person, and is influenced by many factors. Fitness levels, flexibility, strength, experience and being warmed up, are all relevant here. All riders have extremities within their range. Although it is good to explore these extremes, you should encourage movement within a range that is comfortable for each student yet also suitable for the task. Too much or too little, and the performance or balance of the rider will be compromised. Range of movement needs to work alongside timing and power to be effective.

### TIMING

This is when a movement happens and how long it lasts for. There are two aspects to consider here:

#### DURATION (how long a movement or position lasts for)

1 Any movement made over a short duration will occur faster than the same movement made over a longer duration. The duration a movement lasts has a direct effect on the performance of the board and balance of the rider. For example, rotation of the hip and knee over a short duration will create a more open turn. A longer duration of the same movement will create a more closed turn. Sometimes the duration of a static position needs to be considered. For example, a tail press that lasts for two seconds when the rider needed it to last for three seconds to get to the end of the box.

#### SEQUENCE (when a movement happens)

2 This defines when a movement occurs in relation to another movement, or a phase of the turn/trick. If a movement is out of sequence then it becomes very difficult to create the desired performance and the rider will have to compensate in some way to stay in balance.

## POWER

Power, or the amount of physical effort/force used to move, will deeply impact the result and performance of the board. Power can be applied to movements in a subtle and gentle way, or with strong and even explosive force being used. For example, when making a medium closed skidded turn on smooth snow the rider will need little effort with gentle movements. On sticky, slushy snow the same turn will require more strength and physical effort to steer the board. In every aspect of snowboarding, power needs to be applied appropriate to the desired outcome and performance aiming to be achieved. Too much or too little power and the outcome will be very different.

### EXAMPLE

#### CHANGING THE SEQUENCE OF VERTICAL MOVEMENT IN A TURN:

When changing your vertical movement from extending to flexing at the edge change, your up unweighted turn can become a down unweighted turn. If you change the duration in which the vertical extension is made, your turn will change in shape and/or size. If you then add more force to this extension, you can create a large spray or the board may rebound when it is unweighted again at the next edge change. Using an appropriate amount of range vertically is crucial to both the timing and power.

Power, timing and range are constantly present and linked together in all aspects of snowboarding, from first-timers to the most experienced riders. Using this as a tool to quantify movements will take time to perfect.



Rider: Keith Stubbs  
Photo: Richie Johnston

## VERTICAL MOVEMENT: FLEXING & EXTENDING



Vertical movement happens any time a rider moves part of their body up or down. This is achieved through flexion or extension movements in one or more joints within the body.

The main joints that are used in these flexing and extending movements are the ankles, knees, hips and spine. Efficient vertical movement is needed to maintain balance on a moving board. It is also used in everything from turning to jumping.

Vertical movements are used to help manage the amount of pressure in or under the snowboard. Flexing and extending movements work similar to shock absorbers on a mountain bike to help give you a smoother ride. You may have experienced the lack of efficient vertical movement that resulted in the board chattering or bouncing (inefficient pressure management).



## VERTICAL MOVEMENT: UP UNWEIGHTED PATTERNS



An up unweighted turn consists of an extension movement to help the rider flatten the board and move to the new edge. During this extension, pressure will begin to decrease as the edge's grip on the snow is released. Then the rider will begin to flex down helping to increase edge grip and manage the pressure building up in the board through the control and completion of the turn. (See Turn Types in Chapter 6.)

Once a student is able to make flexing and extending movements in this way, with appropriate timing, they can start to explore the amount of vertical movement and the parts of the body that they are able to use. They will also be at a stage where they can experiment with faster, slower or independent vertical movement to match up with the terrain, task and speed they are riding. As a general rule, the further away from the board the movement is, the slower it is; however, it can be more powerful. Ankles are typically fast but with limited power. Knees and hips are slower but with more power.



Vertical movement is also used as a blending tool and will often be needed to help make other movements work effectively.

## VERTICAL MOVEMENT: DOWN UNWEIGHTED PATTERNS



A down unweighted turn has the opposite vertical timing to that of an up unweighted turn. The rider now flexes through the initiation of the turn to help decrease edge grip and/or release pressure and flatten the board at the edge change. They will then begin to make an extension movement to increase edge grip and create/regulate the pressure under the snowboard throughout the control and completion of the turn.

This turn type allows the rider to make much faster and more controlled flexion movements to change edges. Being in a lower position as they change edge provides balance at the most critical part of the turn. The rider is able to use gravity, rebound from the board and/or the terrain to help bring their COM closer to the snowboard. In this way riders can utilise the build-up and release of pressure to help the initiation of a turn. This is why it becomes the more effective option in a lot of upper level riding.

How the rider chooses to create and regulate the pressure under the board will change the outcome. An efficient rider understands this and will make adjustments in their vertical movements through timing changes, the amount of range used within specific body parts, and the way they apply power. These decisions help to create the outcome they are trying to achieve.

## ROTATIONAL MOVEMENT: UPPER & LOWER BODY



Rotational movement happens any time a rider moves part of their body by turning it toward the toe or heel edge, around an axis. There are two main areas of the body that we can rotate or turn:

### THE LOWER BODY

**1** This is essentially the legs, through the ankles, knees and hip joints. It includes the front leg/knee, back leg/knee, or both legs/knees, rotating around the ankles and hip joints.

### THE UPPER BODY

**2** This includes the hips, spine, shoulders and head. Upper body rotation is when one or all of these joints turn around the spine.



The image to the left shows a larger upper body rotation, with a smaller amount of lower body rotation.

As an instructor, you should be encouraging beginner snowboarders to use smaller movements from the lower body when learning to make their first turns. This is complemented with gentle and smooth movements of the upper body to maintain rotational alignment to the direction they are travelling in.

Note that hips are the point where the upper and lower body are technically divided and can be included as either upper or lower body, depending on whether you're referring to the movement out of the hip joint, or the hips themselves rotating around the spine.

Rotational movement is needed to pivot and steer the snowboard throughout a turn. It is also used in a lot of freestyle maneuvers. Most rotational movements need to be blended with vertical movement, or at least come from a comfortably flexed position, for them to work effectively. Rotational movement is also influenced by lateral and longitudinal movements. A board that is flatter to the snow will pivot more easily and if you shift your weight toward the nose or tail the pivot point will move along the length of the board.

## ROTATIONAL MOVEMENT: WHOLE BODY & COUNTER ROTATION



Efficient rotational movement is a combination of the body parts and how much they are rotated, mixed with appropriate vertical, lateral and longitudinal movements. By changing any or all of these, pivoting and steering the board (and spinning in the air) will also change, creating a different outcome.

As a rider progresses and attempts more challenging terrain or tasks they will need to increase their use and awareness of rotational movement by mixing and blending upper and lower body rotation with the other movements. They will also need to change the timing of these movements making them faster, slower, sooner or later. Rotational movement can also be utilised as a whole body rotation and a counter-rotation movement.

**Whole body rotation** is to rotate the entire body, from ankles to head, at the same time yet potentially with varying degrees. This happens to a small degree in the majority of turns made; however, it is more commonly used as riders increase their forward momentum and use of side-cut.

**Counter-rotation** is when the upper and lower body move in opposite directions rotationally, at the same time. This form of rotation is commonly used in freestyle and in making fast adjustments; however, it is also often seen in self-taught riders as a means of turning, which is less effective.

Rider: Ollie Midgley  
Photo: Keith Stubbs



## ROTATIONAL MOVEMENT: SEPARATION & ANTICIPATION



As a rider progresses into steeper, more challenging terrain, or more advanced freestyle riding, their need for rotational movement options will increase.

By this stage, they should have the ability to blend the other three movements efficiently or understand how they interact with the rotational movement being applied. The rider is now ready to explore other ways to utilise rotational movements of the upper and lower body, in the form of separation and anticipation.

These rotational movement options allow the rider to create, store and apply power and performance effectively. This is done through muscular tension in our core, with the rotation happening around the spine.

### SEPARATION

This is when the upper and lower body have a different rotational alignment. This can be described as keeping the upper or lower body in an open or closed position to the board. These separated positions are used to create specific outcomes for different tasks and terrain, utilising energy or tension within the core, or for the purpose of balance when riding at high speeds (see High Performance Stance earlier in this chapter).

### EXAMPLE

#### IN A BOARDSLIDE:

Separation between the upper and lower body allows the shoulders to remain in line with the feature (even though the board is at 90 degrees to it), so the rider can exit with the nose of the board pointing down the landing. To do this effectively, the rider must keep some tension in his/her core muscles.





## ANTICIPATION

This is a form of separation that allows the rider to build and store energy through muscular tension and timing of the movement appropriate to the turn or feature. It is commonly used in all mountain situational riding by making an early rotational movement of the upper body as a preparation movement into the next turn, or at the take-off from a feature. This causes tension to build in the core muscles, which can benefit the following turn or trick. The energy in the core is then released to aid the initiation and steering/pivoting of the snowboard or spin in the air/off the end of a rail or box.

### EXAMPLE

#### RIDING STEEP TERRAIN:

Small, closed, powerful turns are typically necessary when riding steep, off-trail terrain, to control speed. Utilising anticipation movements through the preparation phase of the turn will help to initiate the turn quickly, with a powerful rotational force throughout the rest of the body.



*Rider: Richie Johnston  
Photo: Keith Stubbs*

## LATERAL MOVEMENT: MOVING ACROSS THE BOARD



Lateral movement happens any time a rider moves part of their body across the board. These movements can come from the whole body or just a specific part of the body. For a lateral movement to be efficient the rider will need to blend in vertical and, often, rotational movements. Efficient lateral movement is needed to balance and move from edge to edge. Snowboarders use lateral movement to help tilt and torsionally twist the board.

**Tilt** of the snowboard refers to edging or the degree of edge angle being created. This is described in more detail in Chapter 8 on How the Snowboard Performs.

**Torsional twist** of the snowboard is used to help initiate a turn. One side of the body is used independently from the other (sometimes referred to as independent lateral movement). This is most efficient when it is created through the front ankle, knee and hip. It is used to help start the turn by releasing edge grip at the nose of the board. For it to work well, the rider should move the lead knee and hip across the board, whilst moving vertically.



## LATERAL MOVEMENT: ANGULATION VS INCLINATION



Efficient lateral movement is having the ability to move across the board whilst keeping the COM in balance. To be able to do this the rider must understand that there is a blend of vertical and lateral movements required to create tilt and stay in balance.

As a rider begins to explore steeper blue terrain and travel faster they will need to learn how to tilt their board on edge more. This can be achieved through a balance of angulation and inclination.

**Angulation** is to create angles within your joints by flexing vertically with the ankles, knees, hips and spine. It is possible to angulate without inclining.

**Inclination** is to shift the COM further away from the edge by inclining the whole body to the inside of the turn. You can incline without angulation.



For any balanced turn there needs to be both inclination and angulation to allow the COM to move to the inside of the turn efficiently. If a rider inclines excessively, however, they will be more vulnerable to falling, as their COM is too far away from their base of support. If the rider does not incline enough, the board will skid and lose grip on the snow, or they may even fall to the outside of the turn. This is where angulation is needed. The rider is able to flex their ankles, knees and hips, to tilt the board on edge, whilst keeping the COM balanced over and closer to the base of support.

## LATERAL MOVEMENT: BALANCED INCLINATION



As a rider starts to develop stronger edging and further performance, and travel faster in more challenging conditions, the amount of inclination and angulation required will need to adapt. This will depend on the terrain, snow conditions, speed and ability of the rider. The timing of how inclination and angulation is applied will also need to be adjusted.

As the performance increases, so do the forces acting on the rider. This can be used to the rider's advantage however. Using the whole body as a large lever when inclining can create a lot of power in a turn, whilst maintaining a particularly high edge angle. Lots of forward momentum and good snow conditions are both necessary to achieve this; however the timing of when inclination blends with angulation is crucial.

### EXAMPLE

#### TIMING INCLINATION WITH ANGULATION:

A down unweighted movement allows the rider to make very fast and stable lateral movements at the initiation of the turn. The rider is now at their lowest point vertically and is able to apply considerable power through extending laterally and vertically, creating the required edge angle by adjusting inclination and angulation throughout the turn. The amount of movement (or range) used and duration (timing) over which it is applied must be specific to the conditions and outcome they are trying to achieve.

Other movements can also be blended into this balanced inclination, to create more power within the turn or provide additional balance. (See High Performance Stance earlier in this chapter.)

Rider: Richie Johnston  
Photo: Keith Stubbs



## LONGITUDINAL MOVEMENT: MOVING FORE & AFT



Longitudinal movement, or fore-aft, happens any time a rider moves a part of their body along the length of the board. This is achieved by using flexion and extension movements in one side of their body. There may also be a rotational movement added depending on the task the rider is attempting. Fore and aft movement is required to maintain balance on a moving board. It is also used in everything from turning to jumping.

First-time snowboarders should be encouraged to keep equal weight over both feet, to maintain longitudinal alignment. This will keep the managed pressure in the centre of the board. By moving towards the nose or tail the rider will change where the pressure is being applied. This movement will be needed for tasks like tail presses and ollies.



## LONGITUDINAL MOVEMENT : BLENDING WITH VERTICAL



As a rider progresses and begins to explore different terrain, simple tricks and riding at speed, they will need to distribute pressure to different parts of the board for specific purposes. This is done by actively moving the COM along the length of the board or through moving the board longitudinally underneath the COM. The rider is able to blend their longitudinal movement with vertical movement to create a form of independent vertical, utilising different amounts of flexion and extension within each side of the body. This helps to keep the rider's COM in balance.

As a rider begins to fine-tune which specific body parts they are using to blend the longitudinal and vertical movements together, they can be more precise with their pressure distribution. This will allow the rider to store and release pressure in the snowboard.

Longitudinal movement can also be blended with lateral movements to aid edge grip, or with rotational movements when performing tricks like a butter.

### EXAMPLE

#### HOLDING A PRESS:

If you flex your back leg and hold that position you can create a tail press. The further toward the tail you move, the bigger the tail press becomes but the further back your COM also moves. Blending vertical movement efficiently will help to keep your COM in balance and release the pressure quickly to create an ollie.

### LONGITUDINAL MOVEMENT: FORE/AFT PERFORMANCE



Once a rider has learnt to blend longitudinal movement with vertical, rotational and lateral, they are ready to explore how power and timing can be applied to increase performance. As discussed earlier, the stance a rider is using is relative to the level of performance.

A high performance stance enables a large range of longitudinal movement through the lower body, whilst maintaining a stable upper body. The rider can now move from a longitudinally centred position, shifting aft to pressure the tail and increase edge grip through the control and completion phases of the turn, then begin to re-centre again through the preparation phase.

Timing this longitudinal movement with turn phases is a technique that can be utilised in any turn; however, the power and range must also be adjusted depending on the outcome the rider is wanting to achieve.

By understanding how all movements are constantly being blended and regulated, experienced snowboarders are able to make quick and often powerful fore/aft movements in most situations they ride. From slashes in powder and technical butter combinations, to the subtle adjustments required to deal with sticky slush.



Rider: Will Jackways  
Photo: Keith Stubbs

## SECTION B - A TECHNICAL UNDERSTANDING OF SNOWBOARDING

## 8

# How the Snowboard Performs

## IN THIS CHAPTER WE WILL EXPLORE...

The outcomes of blended movements through use of timing, power and range, and how the snowboard performs with edging, pressuring and steering. As well as the various movement options an instructor needs to understand how the snowboard should perform for specific tasks and outcomes.

### BOARD PERFORMANCE



### EDGE-PRESSURE-STEER SEQUENCE IN TURNS



### UNDERSTANDING STEERING ANGLE



### CREATING & MANAGING REBOUND



## BOARD PERFORMANCE



Board performance refers to the actual outcome within the snowboard or what is physically happening to it during a turn or trick. As explored in Chapter 7, when you move your body laterally, rotationally, vertically or longitudinally the board is manipulated to tilt onto its edge, torsionally twist, pivot around an axis, or flex and bend (otherwise known as cambering and decambering).

The edging of the snowboard is affected by tilting and torsionally twisting the board, predominantly through use of lateral movement. Pressure is created and managed as the snowboard flexes and bends, both from nose to tail and cambering/decambering, through a combination of vertical and longitudinal movements. Steering is created through rotational and lateral movements primarily, and is a balance between the amount of pivot and tilt used.

By understanding the way a snowboard performs, an instructor can accurately describe what should happen or what is actually happening to the board in any given task.

### BOARD PERFORMANCE

#### EDGE



Tilt & Twist

#### PRESSURE



Flex & Rebound

#### STEER

Pivot & Spin



Rider: Ollie Midgley  
Photo: Keith Stubbs

To fully understand how edging, pressuring and steering work in relation to the turn or a trick, it is necessary to have a knowledge of the side-cut, length, camber profile and flex of a snowboard (see Snowboard Equipment in Chapter 22).

## EDGING

Edging is used to increase and decrease grip on the snow surface. During the initiation of a turn, edging in the snowboard must decrease, or flatten to allow it to change edges. In effect, this is the edge angle of the board reducing to a flat base before increasing again on the new edge. This may occur as torsional twist to flatten the snowboard at one end before the other, or it may be tilt through the entire running length of the board. Edging of the snowboard will then continue throughout the completion phase of the turn.

The angle and the rate that the board is twisting or tilting will greatly affect the path the snowboard will take, as well as the performance, unless influenced through pressuring and steering.

Here are some key points about edging the snowboard:

- ▶ Higher edge angles will create more edge grip and, with momentum, the result is less skid and an increase in speed as the board starts to carve.
- ▶ Lower edge angles will generally result in skidding of the board through less grip on the snow (see Understanding Steering Angle later in this chapter for more about this).
- ▶ As a board is torsionally twisted, edge grip will be released and the nose of the board will seek the fall line. The amount of twist used, and rate at which it is applied, will affect the release of edge grip at the start of the turn.



The amount of edging required, and the rate at which it is applied, is dependant on the terrain, snow conditions and task the rider is trying to achieve.

It should be noted that edging of the board may need to be completely eliminated at times, especially when riding boxes and rails.

## PRESSURING

Pressuring is used to create, manage, distribute and release flex and bend in the snowboard. Within a turn, pressure is generally released in the initiation phase to allow for an easier edge change. As the board moves onto the new edge, pressure can be applied from somewhere within the control phase (where exactly depends on the turn) through to the completion phase. Pressure is then released again through the initiation phase.

Pressuring of the snowboard during a turn has a direct relationship to edging. The faster the board travels and the higher the edge angle, the more the board will bend or flex through the forces acting on it (see Turn Forces in Chapter 6). Pressure can also be distributed to different parts of the board, such as the nose, the tail, the centre or throughout the whole board. This is used in many freestyle aspects but can also be applied in turns.

Once pressure has been applied to the snowboard, at some stage it will have to be released. How the pressure is released will affect the overall outcome. Most snowboarding relies on efficient, progressive management and regulation of pressure to suit the task and terrain.

At times, pressure will be the only performance being utilised. For example, in an ollie or nollie, where there is no edging or steering required, just creating a large increase in pressure, flexing the tail of the board, then a rapid release (or rebound) of pressure.

Here are some key points about pressuring the snowboard:

- ▶ Managing pressure through the centre of the board will bend the entire running length, enabling even edge grip.
- ▶ Distributing more pressure towards the nose of the board will make the tail lighter. Using twist to initiate a turn may become easier as a result.
- ▶ Directing pressure towards the tail when riding through the completion of a turn can help to increase edge grip.
- ▶ Pressure should always be increased and decreased as smoothly as possible, relative to the terrain, turn or trick.



## STEERING

Steering is used to help direct the snowboard in the desired direction of travel. During a turn, it is best applied once edging and pressuring of the snowboard have begun. Steering is most prominent from the control through to the completion phase of a turn.

The amount of steering that is needed, or can be applied, is directly related to the degree of edge and pressure in the snowboard. In most cases steering begins in the leading half of the snowboard, around the front foot, with the back half following.

Here are some key points about steering the snowboard:

- ▶ A lower edge angle will enable the board to pivot easily, allowing a smaller turn, if desired. Creating a small turn with a higher edge is only possible with an appropriate increase in rotation (see Understanding Steering Angle later in this chapter).
- ▶ As the edge angle increases and pivot becomes minimal the board's side-cut has a greater effect on the steering.
- ▶ Distributing pressure along the length of the board also has a significant effect on steering. Pressure towards the nose will make steering easier, whilst pressure towards the tail makes steering harder or less efficient.

The aim in most turns is to remain centred to enable efficient steering. The timing and amount of steering needed will vary depending on the task and terrain being ridden. In some situations there may be a need to eliminate all edging and pressuring whilst steering, like in a boardslide on a box or rail. In this situation, steering is better referred to as pivot.



## EDGE-PRESSURE-STEER SEQUENCE IN TURNS



The edge-pressure-steer sequence is utilised in most balanced turns and can help to create understanding around the chain of events that occur. It can be seen as a series of decisions made by the rider (consciously or unconsciously) to achieve a particular style of turn and can also be used to help identify inefficiencies in the performance of the board, if this sequence is altered.

**First decision (edging)** - In any turn a rider must first make movements to create the edge change. The rider makes a decision as to how quickly the board should flatten (be it with tilt and/or twist), when the edge change should occur, and how quickly they apply tilt on the new edge.

**Second decision (pressuring)** - Once on the new edge, the rider must decide how much pressure they can apply to the edge, how quickly they are going to apply it, and where within the snowboard to distribute that pressure. They must also choose whether they are making an up unweighted or down unweighted movement pattern to achieve the above; however, this decision begins earlier during the preparation phase and is a continuous adjustment to allow for changes in terrain and snow conditions.

**Third decision (steering)** - Whilst pressure is being applied to the new edge, the rider chooses how much steering to apply and which parts of the body they will utilise. This depends completely on the size and shape of the turn being created, but is affected greatly by the amount of edging and pressuring already being used. Whilst steering through the completion phase of the turn, the rider begins to plan for edging and pressuring movements in the following turn - this is known as the preparation phase.

Note that whilst this can be seen as a series of decisions, humans do not possess the ability to make ALL of these decisions completely in the moment. Many of the factors described above happen unconsciously or as a reaction to the previous decision. They can, however, be seen as a domino effect of decision making that may lead to a positive performance outcome or a potential inefficiency (see The Domino Effect in Chapter 10 on Rider Analysis).

### EXAMPLE

#### RIDING STEEP, OFF-TRAIL TERRAIN WITH VARIABLE SNOW CONDITIONS:

You're making small, skidded, down unweighted turns. You choose to change your edge early in the turn using a little torsional twist but moving across the board quickly to a platform on the downhill edge. When on the new edge you begin extending a little too fast, putting your COM further inside the turn and creating a high edge angle with lots of pressure. This, in turn, limits your steering and makes it hard to close your turn and control your speed.

The timing, power and range used within the sequence will dramatically affect the overall performance outcome within the board.

The edge-pressure-steer sequence should be specific to the task and can be applied to freestyle as well as turns.

**EXAMPLE****A FRONTSIDE 360 ON A SMALL PARK JUMP:**

As you're taking off from an edge, the amount of edge angle used here is crucial. Too much edge and you end up leaning too far over your heels, not enough edge and you have no platform from which to pop. In this example, pressure is actually about regulating it throughout the transition and the steer is now a spin. As you leave the lip of the jump there is an automatic release of pressure, allowing you to get your board in the air. A strong and well-timed rotation movement creates the right amount of spin; however, if you try to rotate (i.e. steer) too early, before the pop, the spin will turn out poorly, and will be under or over-rotated.

**UNDERSTANDING STEERING ANGLE**

The steering angle of the board is measured through the path the nose and tail take on the snow surface. Put simply, a perfect carve has a steering angle of zero because the nose and tail are taking the same path. A skidded turn will have a degree of steering angle, because the nose and tail are taking different paths. The larger the steering angle applied, the more skid will be present.

The tracks left in the snow will allow you to see how steering angle increases then decreases throughout a turn unless it is a pure carve. The width of the track left and where it increases and decreases shows the amount of steering being used, when it was used and the duration it was used for.

By understanding steering angle the instructor can use edge-pressure-steer to quantify and describe what is or should be happening with the performance of the board. This knowledge is then applied in relation to the snow conditions and terrain.

## CREATING & MANAGING REBOUND



Utilising the rebound created in the snowboard is a vital part of high level riding. Essentially, rebound is the stored energy created through pressuring (bending and flexing) the snowboard. What a rider chooses to do with this energy will affect the overall outcome of the task.

Rebound can be stored anywhere from the nose to the tail of the board, as well as directing it to the desired edge, if required. Creating rebound for high performance tasks takes time and practice. Timing is crucial to creating rebound, however the amount of range and power applied can also greatly alter the result.

That being said, creating rebound is often the easier part. How the energy in the board is released and managed is actually the more valuable skill. Rebound can be regulated to release the stored energy at different speeds, slowly or quickly. For example, in a smooth progressive high performance carve, the rebound can be released quickly resulting in a snappy, aggressive edge change with the board leaving the snow. Alternatively, it can be released with more patience and strength, resulting in a slower, more progressive edge change, whilst maintaining contact with the snow.

Rider: Richie Johnston  
Photo: Keith Stubbs



## SECTION B - A TECHNICAL UNDERSTANDING OF SNOWBOARDING

## 9

# Basic Biomechanics

JOINTS



CONNECTIVE TISSUE



MUSCLES



INJURY PREVENTION



## IN THIS CHAPTER WE WILL EXPLORE...

A brief overview of the basic biomechanics utilised when snowboarding. This will help to create an understanding of some of the movements needed when riding. In turn, it will help you to present the most efficient movement options when teaching and train your eye to really pinpoint the origin of movements when analysing snowboarders. Additionally, it will give you a better understanding of your own riding and help you to progress to that next level.

Snowboarding, like most sports, relies heavily on balance. This can be broken down into stationary balance and dynamic balance. Stationary balance refers to the rider's position over the snowboard or natural equilibrium, with the centre of mass remaining equal between the edges, and the nose and tail of the board. Dynamic balance is considered the action of finding equilibrium via making reactive movements to the forces acting upon the rider's body or board's performance.

When learning about basic biomechanics of snowboarding, we need to consider the main joints that are used and how the muscles, tendons and ligaments interact with these joints.

## JOINTS



There are three main types of joints, but many different variations of these...

### BALL-AND-SOCKET JOINTS

These are joints that have the ability to flex and extend as well as rotate.  
1 Examples of these are the hips and shoulders.

### HINGE JOINTS

These are joints that can only flex and extend in a single direction. An example of this is the elbow joint. The knee is also a type of hinge joint, referred to as a modified hinge joint. It flexes and extends, glides and has a minimal amount of rotation.

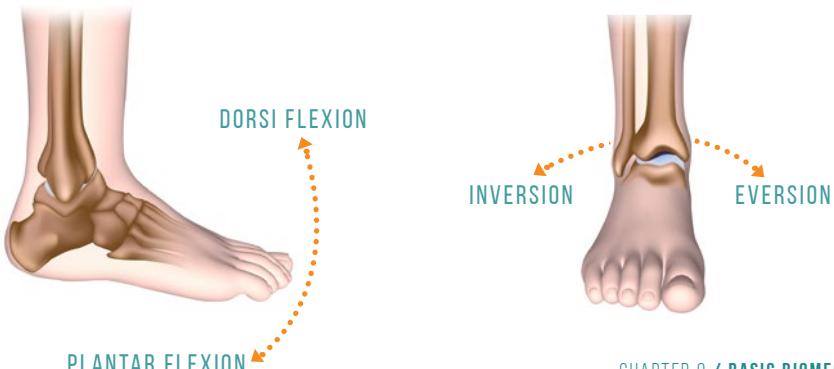
### GLIDING JOINTS

In these joints the bones slide along their smooth surfaces with a limited  
3 amount of motion. This joint allows for movements in a rolling fashion as well as gliding. The foot and wrist are examples of these.

## ANKLE JOINT

This is the key to the success of a snowboarder and their ability to create lateral movements on their snowboard. It can also aid in vertical movement, when used with other joints. These movements are known as dorsi and plantar flexion, which can produce lateral movements of the body over the board.

Plantar refers to the opening of the ankle joint, when the toes are pushed down or away from the shin. Dorsi flexion is the opposite, when the toes are lifted and move closer to the shin. The ankle is a complex joint and can make other movements such as inversion and eversion. These movements can aid a rider's ability to move longitudinally on their board. Inversion is when you roll your ankle to the outside of your foot pointing your soles towards each other. Eversion is the opposite, when you roll the ankle to the inside of the foot pointing your soles outward or away from one another.



## KNEE JOINT

The knee is a modified hinge joint and the most commonly mentioned joint in snowboarding. It has a large impact on riding as it manages two of the larger levers, controlling the femur (the large bone in our thigh) and tibia/fibula (the two main bones in our lower leg). The knees help snowboarders create lateral, longitudinal, and vertical movements. Due to the large range of movement in the knee, a rider can utilise this joint to create powerful movements.

## HIP JOINT

As a ball-and-socket joint, snowboarders benefit from being able to create both flexion/extension, as well as rotation, through our hip joints. The width and flexibility of hips will greatly change the riding style of each individual snowboarder.

Generally speaking, women tend to have slightly wider hips. This can be measured by the difference in males' versus females' Q-angle. Another

typical difference in hip structure between males and females is what is known as Anterior Pelvic Tilt. This is where the pelvis is actually tilted forward on the top and the bottom is tilted back. This generally shifts the centre of mass more over the heel edge, making it more challenging to create pop.



## SPINE

This complex set of joints consists of 33 vertebrae. There is very limited movement between each of the vertebrae; however, when they all work together the result is a much larger range of movement, allowing flex in all directions, as well as rotation. There are many muscles that surround and protect the spine. This is why we get a more powerful, yet slower result when we make larger movements through the upper body. That said, the spine can be quite useful when we choose to create these more powerful movements, especially when acting upon larger forces.

## CONNECTIVE TISSUE

To help us get a better understanding of joint movement, we can look at how they are connected, through three different types of connective tissue...

**LIGAMENTS**

**1** These connect our bones together. Their tightness can determine that person's range of movement.

**TENDONS**

**2** These connect muscles to bones and create movement by transferring forces created by muscle contractions to the bone that it is connected to. This, in turn, causes that bone to move using the nearest joints to that bone.

**CARTILAGE**

**3** Essentially this is a cushion between our bones. This is often a cause of pain when it gets worn down through overuse or age.

**MUSCLES**

Muscles are bands of soft tissue fibres that contract or relax. They are attached to bones through tendons and are responsible for moving those bones through one's joints.

Generally speaking, muscles make three different types of contractions, based on muscles working with and against one another as they contract or relax...

**CONCENTRIC MUSCLE CONTRACTION**

**1** This is where the muscle shortens when contracting. A snowboarding example of this is when you pull up your toes (dorsi flexion), moving through the ankle joint. Here we make a concentric muscle contraction in the tibialis anterior (the muscle beside your shin), reducing the length of it as it tenses.

**ECCENTRIC MUSCLE CONTRACTION**

**2** This is where the muscle lengthens when contracting. For concentric contraction to work, the muscle must be paired with another muscle that works in the opposite way. In the example of dorsi flexion in the ankle, it is the gastrocnemius (the calf muscle) that works eccentrically, increasing in length as it stretches.

**ISOMETRIC MUSCLE CONTRACTION**

**3** This is where the muscle does not change in length when contracting. This happens when two opposing muscles contract at the same time. An example of this would be holding a static position where our body is tense but has limited movement, like a stance used in martial arts. Another example is when you tense in your abdominal muscles (stomach) before you are about to be punched in the belly. Isometric muscle contraction is used much more regularly in snowboarding than most other sports. Even the basic stance requires a degree of isometric muscle contraction.

## HOW MUSCLES WORK

The brain sends messages to the muscles to relax or contract, which in turn will move a bone in a joint. The more time that is spent sending this message to the same muscle group the quicker reactions become. This is also known as muscle memory. Even though muscles don't have their own memories, the messaging pathway will become more efficient with more frequent use.

Muscles also have proprioceptors, which are like little sensors in the muscle fibres to measure when muscles are contracted and flexed or relaxed and stretched. This provides confirmation for the brain that the body is actually making a movement, for example: that we are pulling our toes up inside our boots. When movements are made using muscles that a rider is less accustomed to using, these proprioceptors are not as quick to deliver the message. This is why your students tend to look down at their feet to make sure that the movement is happening.

## INJURY PREVENTION

Snowboarding is physically demanding. Both riders and instructors should be prepared to cope with the increased demands on strength, endurance and general fitness, using appropriate pre-season training, morning warm-ups and end-of-day stretching. There are a number of specific muscle groups used in snowboarding that should be focused on to reduce the risk of injuries...

### CORE MUSCLES

These are situated in and around your pelvis and abdomen. They work like a **1** corset to protect your spine from repetitive stress and aid our snowboarding by creating a stable platform from which to produce powerful movements with our limbs. Activating your core muscles helps you to maintain the alignment of your spine when both riding and lifting students. It also promotes correct loading through your spine and limbs which, in turn, helps to reduce the risks of injury from repetitive stress or sudden over-loading when you fall or jump.

### LOWER LIMBS

Leg strength is a necessity in all aspects of riding. To help maintain a long **2** career in snowboarding, it's important to make sure there is no major muscle imbalance in our lower limbs. The shin and calf muscles work together to control our ankle joint. The quadriceps muscle and hamstring muscles in our upper leg work together to create vertical movement through our knees. The hip flexors and gluteal muscles work together to enable movement through our hips. All of these muscle groups have to be active to maintain an active stance. Tightness or weakness in any of these muscle groups can increase the risks of injury.

## UPPER LIMBS

**3** Our upper limbs are used predominantly for balance when riding; however, they often take more of an impact when we fall. Shoulder dislocations and broken wrists account for more than half of the injuries in snowboarding. Whilst it is important to teach students how to fall correctly and use protective gear, it is also very important to maintain strong muscles in the shoulders and arms to aid joint stability and minimise risk of injury.

## PRE-SEASON TRAINING

A healthy lifestyle with regular exercise is the most important snowboard training you can do. Resistance training and lots of stretching will help to reduce the risks of injury and prepare you for a full winter of riding. Yoga is also an excellent cross-training activity for snowboarding. If you get injured during the season, seek medical help as soon as possible before it becomes a chronic injury.

## WARMING UP

Pre-riding warm-ups play a big role in injury prevention. Before putting your board on, take the time to warm up by doing some dynamic exercises to mobilise the joints, get blood flowing into the muscles and the cardiovascular system. Some good examples are leg swings, lunges, squat jumps, trunk twist and arm swings. On your first run, focus on activating all major muscle groups by doing simple tasks that explore range of movement. Tasks that focus on the core muscles are particularly useful here. When teaching, encourage your students to warm up in whichever way they know how. This may be with the board off or on. Do not encourage your students to stretch in ways that are unfamiliar to them.



## AFTER RIDING

Many injuries occur when riders become fatigued or start to think about other things, such as the journey home. When your mind begins to wander, recognise this fact and simply call it a day. Your final run should be done with a much lower intensity to help the body begin returning to its resting state. At the first opportune moment, perform some static stretches to prevent stiffness and reduce the chance of delayed onset muscle soreness. Foam rollers are an especially good tool for loosening the muscles later in the evening. When teaching, encourage your students to do the same. Keep this within their current knowledge and experience, however, unless you happen to be a yoga teacher, physiotherapist or personal trainer.

## SECTION B - A TECHNICAL UNDERSTANDING OF SNOWBOARDING

10

# Effective Rider Analysis

INTRODUCTION TO RIDER ANALYSIS



ANALYSING STANCE



ANALYSING MOVEMENTS



UNDERSTANDING CAUSE & EFFECT



PRIORITISING INEFFICIENCIES



THE DOMINO EFFECT



## IN THIS CHAPTER WE WILL EXPLORE...

How to effectively analyse your students' riding. This chapter will provide useful information for what analysis is, why we use it and guidance for how you can develop your analysis skills.

Within the world of instructing, the skill of analysing a student's riding is essential to their future progression and achievements.

If you wish to provide the most effective feedback and a suitable lesson plan which will bring out efficient changes in your students' riding, firstly you need to be able to make an accurate analysis of their riding.

## INTRODUCTION TO RIDER ANALYSIS



To establish an accurate analysis, it's necessary to remain objective throughout the entire process. This objectivity should remain consistent outside of individual biases, feelings or interpretations.

Simply put, analysis begins with an observation based on fact.

As you develop your analysis skills, there are some simple considerations that can help you discover your preferred or most reliable way to gain an accurate analysis. Below are just a few examples of analysis methods, including visual, audio and kinesthetic - much the same as the aforementioned Learning Styles (Chapter 3).

### VISUAL ANALYSIS

Watching your students ride is the most effective form of analysis. It allows you to clearly see how they stand over their snowboard, how they move and what their snowboard is doing. Within visual analysis you have some decisions to make for the method in which you will gather your information. Get creative and explore the considerations below:

**The Vantage Point** you use when watching your students is your first consideration. You can choose whether you remain in a fixed location or continually moving.

If you choose to remain in a fixed location, you can consider the following choices:

- ▶ You can go down the hill and watch them ride down to you.
- ▶ You may want to watch them ride away, staying where you are and giving them a point to ride to.
- ▶ You might prefer to go halfway down the hill and have them ride to you and past you to a predetermined point.

If you would prefer to keep moving for your visual analysis, you can consider the following choices:

- ▶ You may want to follow and ride behind your students.
- ▶ You can ride next to your students on either their toeside or their heelside.
- ▶ You can ride in front of your students ensuring you look back throughout.

Whichever vantage point you choose to watch them from, be aware that each one carries its own strengths and weaknesses. Can you think of one strength and weakness for each option above?

**The Focal Point** in which you focus your attention initially, is your next consideration.

For you to take in a complete picture of your students' riding you can choose to look at your students:

- ▶ From their head down to their board.
- ▶ From their board up to their head.
- ▶ From their centre of mass outwards.

When watching the body of your student, there are more options available to you. You can specifically look at:

- ▶ The upper body.
- ▶ The lower body.
- ▶ The peripherals such as the head, arms or ankles.
- ▶ The core and hips to see where the centre of mass is moving.

The equipment your student is riding on should also be considered. Here, you can choose to look at:

- ▶ The snowboard and target or focus on specific board performance(s).
- ▶ The student's boots to see if they allow for appropriate movements.
- ▶ The placement of their bindings on the board to assess stance width or lateral binding placement.
- ▶ Any protective equipment such as a back protector or impact shorts that may be portraying an image of inefficiency.

The environment is your final visual consideration. Looking beyond the actual rider at the environment, current conditions and how your student interacts with their surroundings is a useful tool. Here, you can look at:

- ▶ The width of the tracks left in the snow.
- ▶ The amount of traffic on the run.
- ▶ Where snow is being sprayed and distributed through the arc of the turn.
- ▶ When and where the edge change is occurring.
- ▶ Any obstacles, man-made or otherwise, that interrupt flow in your students' riding.

## AUDIO ANALYSIS

This form of analysis can be useful to gain an insight into how much experience they've had, when, where and what they achieved, and whether or not they've taken a lesson. It typically occurs in the early parts of a lesson, but may continue throughout. Through questions and conversation you can discover what their skill base is and begin to develop a mental image of their riding and the way they stand over their snowboard simply based on their age, sex, physical makeup and fitness. Be aware that with audio analysis it's possible that the description of their capabilities may not be as accurate as you would like. For this reason, it's essential to back this up with a visual reference for clarification.

## KINESTHETIC ANALYSIS

To help further understand the way your students balance and move, it's possible for you to experience similar sensations within your own riding. There are many options available for you to explore. You could:

- ▶ Copy your students' movements to understand how much they are moving.
- ▶ Follow their line to become aware of the timing of their movements.
- ▶ Ride at their speed to understand the forces they may be experiencing through their body in a specific phase of a turn.

With these considerations you have many tools at your disposal to gain a very clear analysis of your student.

### ANALYSING STANCE



As you know, standing on your board in an efficient stance is a baseline from which to make all movements in snowboarding. As an instructor, it's up to you to identify the difference between a stance that will result in efficient movements versus a stance that will cause your student to make inefficient movements. To do this, it can be as simple as having a mental image or picture in your mind's eye of a rider stood in an efficient, relaxed stance and comparing that picture to what you see in your student. You can then decide how they differ and what would need to change to make your student's stance and riding more efficient. To make this more precise, you can focus on specific body parts and joints when comparing those pictures.

Be aware that your student may be standing in a certain position as a result of temporary or permanent injury, inadequate equipment or even as a misunderstanding of your guidance. Ensure that you know the limitations of your student and make an allowance for this in your analysis. It's sometimes helpful to simply ask yourself: "*Is their stance stopping them doing this?*" or "*Is their stance making them do something they aren't wanting to do?*"

Questions like this can help you consider how good your student's stance really needs to be to have fun snowboarding. Good enough for their intended goal is perhaps more appropriate and will allow your students to keep riding and enjoying their time with you.

Just remember that a strong stance is the foundation of efficient riding, so an efficient stance maintained throughout their riding is beneficial. Challenge yourself to decide if your student's stance looks efficient consistently throughout their riding or if there is somewhere more obvious in their riding that their stance becomes inefficient. Ideally, your student is in their efficient stance before they begin to make movements for a new turn. From this efficient starting position, you should look for signs of stance inefficiencies that occur after they've initiated a turn as your baseline from which to begin your analysis and as an indicator to start looking at their movements.

## ANALYSING MOVEMENTS



Now you are looking more closely at the way your students stand on their board, it's important to take in the complete picture to build your analysis of their movements. A similar approach to analysing stance can be applied to analysing movements.

Comparing the image in your mind's eye of the way an efficient rider moves versus the real-time riding of your student is a useful tactic here. Using this simple approach, challenge yourself to analyse each of the directions of movement as quickly as you can. To help you with this, you can begin by asking yourself: *"Is my student moving efficiently vertically/rotationally/longitudinally/laterally?"*

To develop your eye within each of the movement directions, you can ask yourself: *"What body parts and joints is my student using within each direction of movement?"*

These simple questions will help you build a clearer understanding about the way your student is moving. More specifically, you'll know which body parts and joints are being used and how.

### EXAMPLE

#### **YOUR STUDENT IS MAKING SMALL SKIDDED TURNS ON A BLUE GROOMER:**

Questions you could ask yourself that relate to common inefficiencies include...

*"Did the way my student move their leading knee within their lateral movement benefit the task?"*

*"Did the way my student move their hips within their rotational movement cause a problem in the task?"*

*"Did my student's stiff ankles in their vertical movement cause them to lose their balance in the task?"*

*"When my student moved their hips towards the tail of their board, did it help them start their new turn?"*

Questions like this will offer you an avenue to understand how your students are applying their movements in their riding, relative to the power, timing and the range of movement they are using.

With this approach you can now compare the movements you are seeing to the movements you were hoping to see, following your instruction. This deeper understanding of how your student moves will allow you to think in more detail about the resulting effect of their movements on their snowboard.

## UNDERSTANDING CAUSE & EFFECT



With more of a focus on the relationship between body movements and how the snowboard responds, you can easily communicate this information in terms of a cause and an effect. The cause is the movement the body makes and the effect is the response within the snowboard or the turn/trick itself. When applied accurately, this can be a very effective method of analysis to establish efficiency of movements and desired performance of the snowboard. Take the time to build a strong understanding of the movements possible on a snowboard and how these movements differ between the toe and heelside turn. This will help you identify if the snowboard is edging, pressuring or steering as a performance response.

You can continue to work systematically through your student's movements to ensure that you take in the complete picture and identify which of the snowboard's responses are evident. When you spend more time practising this, you will find that tying movements (cause) and snowboard performance (effect) together becomes second nature.

Here are some simple examples of questions you can ask yourself to help develop this skill:

- ▶ “Did my student's vertical movement create desirable pressure management or distribution?”
- ▶ “Did my student's rotational movement help to create desirable steering?”
- ▶ “Did my student's lateral movement create desirable edging, be it tilt of the board or torsional twist?”

You may find that when you answer these questions your answers reveal that there is not enough performance in the board, or that the performance is used too quickly or slowly, or even that the performance is used too gently or powerfully. This additional information allows you to consider the application of each board performance when riding a task.

When you can confidently establish cause and effect it will leave you with a deeper understanding about the efficiency of movements being used and whether or not they create a desirable board performance. When you start to question whether or not the effect is desirable for the task being ridden, you are now challenging your analysis skills beyond simply looking at movements.

With a rounded and thorough understanding of cause and effect it's probable that, through self questioning, your answers will reveal that it is more than one board performance that is not as desirable as it could be for the benefit of the task. Now you have the enjoyable challenge of deciding which of those cause and effect relationships you think is more important for the benefit of the task being ridden.

## PRIORITISING INEFFICIENCIES



Prioritising inefficiencies is a vital tool within your analysis skill set. It allows you to decide which cause and effect within your student's riding should be made more efficient and desirable first. Perhaps, more importantly, you will be able to offer reasoning behind the chosen priority to provide purpose and this will often reflect the most effective way for your student to reach their goals.

There is no single way to develop the skill of prioritising inefficiencies; however, there are specific tools that can help to get you started. Be aware that this skill set within analysis is one that is more open to subjective, or individual opinion from you as the instructor. It's important to recognise that whilst there is often no right or wrong answer for deciding on a priority, there are still more and less effective priorities which will affect the overall experience in a lesson.

### STANCE INEFFICIENCIES

**1** More often than not, there is a stance inefficiency that is apparent throughout your student's riding that appears consistently in their riding around the mountain. As you know previously from analysing stance, an efficient stance is the foundation of efficient riding. Look at stance in more detail in Chapter 7 to determine if your student would benefit from a basic stance, an active stance or a high performance stance. Stance should be the priority within any lesson if your student is standing in a way that will hinder their progression or influence inefficient movements.

### FALLS AND MOMENTS OF IMBALANCE

**2** One of the most obvious clues that will lead you to prioritise an inefficiency is the evidence of falls, the use of hands touching the snow to keep balance, abrupt interruptions to riding flow or any combination of the above. The same issue may occur repeatedly at the same point in a turn or on similar terrain, for example cat tracks or bumpy variable snow conditions. In spite of this, you need to be realistic with your decisions here, it might be that your student is riding their first slope since last year and needs some time to get warmed up.

### PRIORITISING TOE OR HEEL TURNS

**3** Prioritising which turn to focus on first can be a tricky decision. Begin by asking yourself: are they using relatively evenly shaped heel and toe turns? Then consider where the rider looks more tentative; is it initiating the toe turn possibly? Look for movements that are more forced than others; are they pushing the back leg around on the heelside?



**EXAMPLE****ON STEEPER BLUE TERRAIN:**

Your student is using a large upper body rotational movement to start their toe turn but their snowboard is also losing some balance in their heel turn. You watch them ride for twenty turns total to allow ten toe and ten heel turns. You count eight toe turns with the large upper body rotation and five heel turns with the loss of balance. This shows that the rotational movement into the toe turn is a higher priority for this rider.

**INEFFICIENT MOVEMENT PATTERNS**

**4** With riders that have a reasonably efficient stance, it can help to look for an inefficient movement pattern that is occurring consistently, or more times than other inefficiencies you have noticed. To help you break this down, you can choose two inefficiencies that you are unsure of prioritising and count how many times you see each within one run or a set number of turns.

**BOARD PERFORMANCES**

**5** Another useful tool is to recognise how your student is trying to get their snowboard to perform. As a Level Two instructor you should be able to identify that their snowboard needs to perform in a more efficient way within edging, pressuring or steering. From there you can focus more on analysing their movements relative to the way the board is performing.

**TERRAIN CHANGES AND RIDING SPEED**

**6** Finally, take a look at the riding speed of your student and consider changing the terrain or situation. Ask yourself: is their speed under control ensuring that they are able to use efficient movements, or is it continually increasing without intending to? This can quickly highlight whether your student is choosing their riding speed through deliberate turn sizes and shapes, or not. Another approach to this would be to closely watch your students when they are riding on flatter terrain at slower speeds. When travelling slowly a rider needs to be more patient and precise within their movements to keep riding smoothly. However, be careful not to bore your students with terrain or riding that is too easy.

The best way to develop the skill of prioritising requires teaching experience to trial the above tools and others that you discover along the way. Only through teaching can you begin to link your prioritising eye with tangible benefits in your student's riding.

It's possible that these benefits will occur in multiple areas of your student's riding. If so, this will begin to shift your attention to what can happen sequentially from one turn phase to the following turn phase, or even from one turn to the next.

## THE DOMINO EFFECT



The domino effect is a concept used in more advanced analysis, that helps you to identify that an original or root inefficiency can go on to cause subsequent issues in your students' riding. If you think of the way dominoes fall, you need to establish if the identified issue is the first domino in the chain, a domino in the middle, or the last domino to fall. By asking yourself what happened prior to and after the most obvious issue in your students' riding, you will develop a larger overall picture of where to prioritise your correctional focuses.

Consider each domino to be an occurrence in a chain of events, each occurrence causing or resulting in the next. This chain of events could occur across different phases of a turn where a movement in the initiation of a turn, results in another movement during the control phase, which then affects the board in the completion of the turn. The same concept can be applied from one turn to the next or even from decisions made earlier in the run.

### TURN PHASE DOMINOES

In this application, each domino represents a different phase of the turn, working continually from one turn to the next:

- ▶ One Domino - The root cause is found within the previous phase to the identified effect.
- ▶ Two Dominoes - The root cause is found two phases prior to the effect.
- ▶ Three Dominoes - The root cause is found three phases prior to the effect.

#### EXAMPLE

### YOUR STUDENT HAS CHATTER IN THE COMPLETION OF THEIR HEEL TURN:

You were watching closely and determined that it was not a result of inefficient pressure management through heelside completion in the steep variable terrain you're riding together. The actual root cause was earlier in the same turn, during the initiation phase. Your student used an inefficient sequence of edge-pressure-steer, unintentionally changing it to steer-edge-pressure. The excessive steering in the initiation of the turn allowed them to get on the new edge and back across the fall line very quickly but without much edge grip on the snow. This then created a sudden increase in pressure for them to deal with at the end of the turn.

In the example above, without much experience considering the domino effect, your analysis may suggest that your student would need to use their vertical movement more progressively through the turn to eradicate chatter. By applying the domino effect you can identify that original cause is in the initiation of the turn, and that the lack of edging through the control phase contributed to the sudden pressure increase in the completion, which resulted in chatter.

## ATTL DOMINOES

This concept can also be used effectively within freestyle when considering how your student's approach affected their takeoff, or perhaps how their takeoff has subsequently affected their trick or landing. (See the ATTL Model in Chapter 17 - Intro to Park.)

An easy way to apply the domino concept to ATTL is as follows:

- ▶ One Domino - The root cause can be found in the Trick phase.
- ▶ Two Dominoes - The root cause can be found in the Takeoff phase.
- ▶ Three Dominoes - The root cause can be found in the Approach phase.

Within freestyle it is rare to find a root cause within the landing phase of ATTL. The landing is often a by-product of the overall efficiency through approach to takeoff to trick. No matter what your experience of freestyle analysis might be, if you see an inefficiency within the landing of a trick, challenge yourself to identify other inefficiencies earlier in the approach, takeoff or trick phases.

### EXAMPLE

#### YOUR STUDENT IS LANDING TAIL FIRST OVER A SMALL PARK JUMP:

You have been watching on the downhill side of the jump for the last two attempts and your analysis is that your student is extending their back leg during their landing phase. You decide to watch from the side as the same issue keeps happening. Now you can see their approach and takeoff, you notice that your student is not extending their back leg at takeoff and is simply coasting off the lip in an increasingly aft position. Now you understand why your student keeps landing tail heavy thanks to the domino effect.

## BIG PICTURE DOMINOES

The same domino concept can be applied to multiple turns or a whole run. This is when you might need to consider more than just two or three dominoes. When teaching advanced snowboarders, a large percentage of knowledge that is passed on from teacher to student is about decision making and tactics. Experienced snowboarders understand that decisions they make at the top of a precarious, off-trail situation, or when riding the first features in a full park lap, can affect their ability to maintain performance further down the face or on subsequent features in the park.

Although the domino effect can be essential in finding the root issue in many riding situations, remember that some issues can be improved with no consideration of the domino effect. This is where your experience within analysis will help you decide if the domino effect is needed and if so, how far back should you look to find the root issue. A great way to develop this aspect of decision making within analysis is to ask for another instructor's analysis of the exact same riding situation. This is where the use of videos can help us share our analysis decisions in an objective environment.