

Good Balance on Skis Comes from Proper Boot Alignment

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Good balance on skis comes from properly fitted and aligned ski boots. When a skier is not aligned properly in their ski boots, good balance is a much greater challenge compared to another skier who has good alignment. In the sport of skiing (especially ski racing) where good balance is a prerequisite to success, every maneuver becomes more difficult and skis seem less responsive to the skier who does not have good balance. Often, a skier's performance (and fun) is lessened, not because they aren't as athletic as they would like to be, but because their improper boot alignment is holding them back. When a skier gets properly fitted and aligned in their ski boots, improvement in performance can often be dramatic. Skiing in good balance requires less effort and is much more enjoyable, compared to skiing out of balance.

When it comes to results on the racecourse, proper alignment (if needed) will yield greater timesavings, than will fast race wax or an aerodynamic race suit. Skiers who need alignment help will most notably suffer at turn initiation, with either a skidding action or erratic body action of some type. This compromised turn initiation often results in a less efficient and dynamic turn. Poor alignment manifests itself in the arc of a turn as 1) sustained skidding action (slow), or 2) unbalanced body positions that get exposed with challenging terrain or course set, resulting in poor line (slow), more skidding, or falls. Lastly, out of balance skiers will have a harder time returning to a good neutral position in turn transition. (Sitting in "the back seat" is a good example.) This then makes the next turn more difficult to execute efficiently.



In ski racing it is important to begin first with proper fit and alignment before getting on the snow. Those skiers who have good balance will have a greater advantage in learning and executing skills, and in lower race times; over those whom need alignment help. Those who need alignment help may experience frustration, as they are not able to perform up to their full potential. Proper alignment does not negate the need for learning and executing good ski technique; rather it enables the skier to be able to make fuller use of good ski technique.

Reasons for alignment:

- 1) People – People are not standardized. They come in different shapes and sizes. Their leg bones are different in length, proportion, and alignment. Their bodies are not symmetrical. Their centers of mass or gravity differ. Some have flat feet. Some have high arches. Therefore, ski boots that are standardized in the production process cannot be expected to work most effectively for everyone, off the ski shop shelf. It is safe to say that 90% of all skiers are not in optimum balance with the equipment they buy off the shelf. In testing approximately 50 skiers last year for lateral balance, I found only one skier who showed no need for modification.

- 2) Equipment – Boots. There are many different kinds of ski boots. Different brands of ski boots have different amounts of ramp angle inside the boot (the angle of heel elevation in relation to the toes of the boot ramp in the boot). Different brands of ski boots also have different amounts of forward lean. These differences mean that a skier's fore/aft balance may vary between ski boot brands. Different ski boots brands may also have different cuff angles, meaning that a skier's lateral balance could differ from one brand to the next.

- 3) Equipment – Bindings. Ski bindings also have different amounts of ramp angle (the angle of elevation of the heel piece to the toe piece) from one brand to another. For example, in the last few years I have seen some Atomic race bindings have zero delta (heel piece and toe piece are the same height), while some Salomon race bindings have the heel piece 3/8" higher than the toe piece. Neither one is better, but they are different! When just 1/8" can make a noticeable difference in fore/aft balance, 3/8" is a huge difference. This explains how a racer can be skiing well one year and then change skis with different bindings the next year and have trouble "finding" themselves on their new skis.

* Very few people can buy ski boots and ski bindings off the shelf and be in good balance when they get on the slope. Most people can use alignment help to improve their balance and skiing. Individuals have to be evaluated with their individual equipment to determine optimum balance.

Getting Aligned – 5 Steps:

1) Properly fitted ski boots. A good ski shop should have well trained people to fit boots properly; taking into consideration your foot shape and size, proper boot flex for your body weight, and skill level. Being comfortable in a boot is a high priority. When the body and feet are relaxed and comfortable, circulation in legs and feet are better and the body is more athletic and responsive. Having to deal with uncomfortable feet on the ski slope dampens the enjoyment of the sport. If you don't feel comfortable in a boot, no matter what the brand name, don't buy it. Don't try to save money at the expense of comfort. Money well spent on ski boots is more important than money spent on skis. Strive for the highest performance boots you can utilize that will also be comfortable.

Finding the right boots usually takes time. It is necessary to try boots on for at least 15 to 20 minutes to allow the ski boot liner to begin to conform to your feet. Some pressure points you feel when you first put the boot on may go away after a while. For difficult pressure points, ski shops can often work with the hard plastic ski boot shells to fit them to your peculiar foot needs, by grinding them or by reshaping spots with high heat. A word of caution on the comfort side: boots that are ultra comfortable in the ski shop may end up being too big on the ski slopes. The liners continue to adjust and expand to your feet. Boots in the ski shop should be comfortable but snug on the lightest buckle settings.



2) Custom foot beds or Orthotics. After selecting boots, getting custom foot beds is the next important consideration in getting properly aligned. Good foot beds may negate the need for other alignment aids such as canting shims or lifts. Custom foot beds are made to conform to the shape of an individual's feet. This helps correct misalignment problems. It also provides support to the feet, helps them to relax, and makes them more responsive. Dynamic foot beds, that give and move a little with the feet, are better than static ones, such as cork foot beds. But any custom foot beds are a big improvement for most people, over standard foot beds that come with ski boots out of the box. As children grow their feet continually change, making it expensive to keep buying high cost foot beds each year. However, once a young person's feet stop growing their foot beds can be transferred to new boots, if they decide to change boots. Alpine Shop sells foot beds. I currently do not know what kind they sell or the level of expertise of their boot fitting people. Places out west like Surefeet or Harb Alignment Centers have very qualified people and quality products. Orthotics are usually more expensive, are often fitted by a foot specialist, and also take into consideration heel height issues.

* Custom foot beds help greatly but by no means guarantee proper alignment.

3) Boot cuff adjustment. Some ski boots allow the upper cuff of the boots to be adjusted. Except in extreme cases these should not be adjusted to address canting needs, but rather to conform to the shape of the skier's legs, so as to get the best performance out of the boots. If ski boots have adjustable cuffs, remove the boot liners and have the skier stand in the boot shells, hip width apart. From behind the skier, observe the space on either side of each leg, between the leg and the boot cuff. Adjust the cuffs so that the space on either side of each leg is as equal as possible.

4) Fore/Aft balance – Front to back balance is often little appreciated, but its effects can be profound! It requires no real technical skill to assess, but rather some simple on snow experimentation. Fore/aft balance addresses balance issues arising from boot ramp angles, boot forward lean, and binding ramp angles. The following are aids to help with fore/aft balance:

- a) Heel lifts inserted inside the boots.
- b) Heel lifts installed under the binding heel pieces.
- c) Toe lifts installed under the binding toe pieces.

Heel lifts inside the boot - These heel lifts address tight ankle flexion, as well as, low center of gravity, and can lessen the need for lateral adjustment (cants) by helping to align the ankle joint. If the heels of your feet lift up in your ski boots, the primary problem is not boots that are too big, but a need for heel lifts. Being in the "back seat" or having thighs that "burn" are often symptoms of needing a heel lift inside the boot.

To test for a possible need of heel lifts inside the boots, place heel lifts inside your ski boots and ski a few runs. Ski shops sell heel lift wedges or you can add thickness of any material you like under your boot liner. They do not have to be wedge shaped. Tape them to the heel of the ramp boards in your boots underneath the liners. If the lifts give a positive feedback, then experiment with different thicknesses of lift.

Heel lifts installed under the binding - Indicators for possibly needing external heel lifts are having ski tails that wash out, especially on hard snow; or feeling unstable when trying to put skis on edge; or having trouble feeling the edge.

Toe lifts mounted under the binding - If needed, toe lifts help to straighten the legs a little and relax when there is too much flexion in the legs. This can result in a stronger extended leg during the apex of a turn. Toe lifts may also improve tip pressure during turn initiation. Toe lifts are the fore/aft modification most used on the World Cup circuit today.

Again, on snow experimentation is the best way to determine a need for these lifts that address fore/aft balance. Experiment with 1/16" to 1/8" thick pieces of material (plastic) placed under the toe or heel between the boot and binding** (see caution). The pressure of the binding on the boot will hold it in place. Ski a few runs with the lift under the toe, ski a few runs with the lift under the heel, and then ski a few runs without any lift. Most skiers can identify for themselves that one of the three setups is better than the others; that they are in better balance and their skis are more responsive. Some skiers may end up needing two thicknesses of lift. If lifts are desired on a permanent basis you can have pieces of plastic mounted under your binding toe or heel pieces with longer screws.

Some skiers might need a combination of a heel lift inside the ski boot as well as a lift mounted underneath the binding. The heel lift inside the boot may address very tight ankle flexion or misalignment, giving more balance, flexibility and power to the ankle; while under the binding lifts may address overall fore/aft balance and leg flexion.

** CAUTION: Experimentation with plastic shims between a boot and binding toe piece or tape between a boot and binding toe piece, may impair the proper and safe functioning of release bindings. Please understand the possible risks before experimenting. Once testing with these temporary methods have been completed, discontinue their use and employ permanent safe solutions.

5) Lateral balance – Being knock kneed, bowlegged, having flat feet or high arches are obvious reasons for needing alignment help for side-to-side balance. But whether initially obvious or not, testing for lateral alignment shows that most skiers can benefit from some modification. Cants may be used to address these lateral balance needs. Canting shims or cants, are plastic wedges (varied by degrees) installed under the binding. Or canted plates may be fastened to the sole of the boot at the toe and heel. Fastening canted boot plates may also require grinding the toes and heels of the boots to restore their original thickness, for proper functioning with ski bindings.



Skiing nock kneed, excessive knee angulation, excessive counter rotation, skidding at the beginning of turns or throughout sustained turns; are some symptoms of needing canting shims with the thick part positioned under the inside of the boot.



Skiing bowlegged, head dipping to the inside of turns, upper body rotation to the inside of turns, wobbly outside knee in turns, skis that are “grabby”; are some symptoms of needing canting shims with the thick part positioned under the outside of the boot.

The need for cants can be measured on level ground with the skier in shorts and their ski boots on. First, the center of the knee mass of each leg is determined, and then the vertical alignment of the knee over the center of their ski boots is measured. The beginning goal is to align the center of the knee mass 1 degree to the inside of the center boot seam (this is 1/4” to 3/8” approx depending on the size of the skier). If needed, canting shims are placed under the ski boots to correct the alignment.

Further testing on snow should be made to fine-tune the alignment. By simply lifting one ski while gliding on a straight run on gentle terrain, and observing balance, the need for further modification can be determined. If the lifted ski starts to cross over the gliding ski then more cant is needed under the inside of the boot of the gliding ski. If the lifted ski starts to point or drift away from the gliding ski then more cant is needed under the outside of boot of the gliding ski. If the gliding ski starts to turn to the inside, more cant is needed under the inside edge of the boot of the gliding ski. If it turns to the outside, more cant is needed under the outside edge of the boot.

Further experimentation can be made by placing duct tape (4 pieces per degree) or plastic tape (6 pieces per degree) on the binding under the boot** (see caution). Place two small pieces of duct tape (1/2 degree) on the inside of toe friction plate and two small pieces on the inside of heel piece of one binding. Ski a few runs. Then switch the pieces of tape to the outside of the binding and ski a few runs. After that place the pieces of tape on the binding of the other ski and repeat. Evaluate the performance of your skis, your turns, and your balance. A good skier, who is close to being in good balance, can feel the difference of just two pieces of tape placed under their boots! Small amounts of adjusting can sometimes mean big improvement in skiing. Plastic tape can be installed under bindings for alignment needs of less than a degree.

Proper Alignment is an On Going Process:

Getting ski boots that fit right can take time in the ski shop. Getting foot beds, boot cuffs adjusted, and measured for cant are important steps that add to the process. After getting fitted and aligned, on snow testing is done to determine fore/aft balance needs and to fine tune lateral balance. On snow experimentation by skiing with different alignment set-ups is the final step to getting it “right”. On snow testing may take time.

As young skiers grow and their bodies change, their boot alignment needs can change as well. In addition, ski boots can break down with use during a season, which can change a skier’s boot alignment. Every racer should have their canting alignment checked at the beginning of each season and the dedicated racer should have their canting alignment rechecked during the season.

The Effort to Get It Right is Worth It:

The greatest amount of alignment improvement with lifts or cants is noticed the closer one is to getting it “right”. If a skier is “out” 3 degrees and improves to 1 degree “out”, they are still out of alignment. They may notice some change, but they will still be out of good balance. However, a change from 1 degree or a 1/2 degree “out” to “right on” will be much more noticeable, because they have changed from being - out of balance - to being - in balance!

* 80% of balance improvement is noticed in the final 20% of alignment adjustment.

For further info:

The Athletic Skier, by Warren Miller and Dave Evrard

Anyone Can Be An Expert Skier, by Harald Harb

The Ups & Downs Of Ramping The Foot, by Greg Hoffman

PSIA Archives, Reprints from The Professional Skier

–www.psia.org/psia_2002/education/TPSArticles/teaching/tpsfall99ramping.asp