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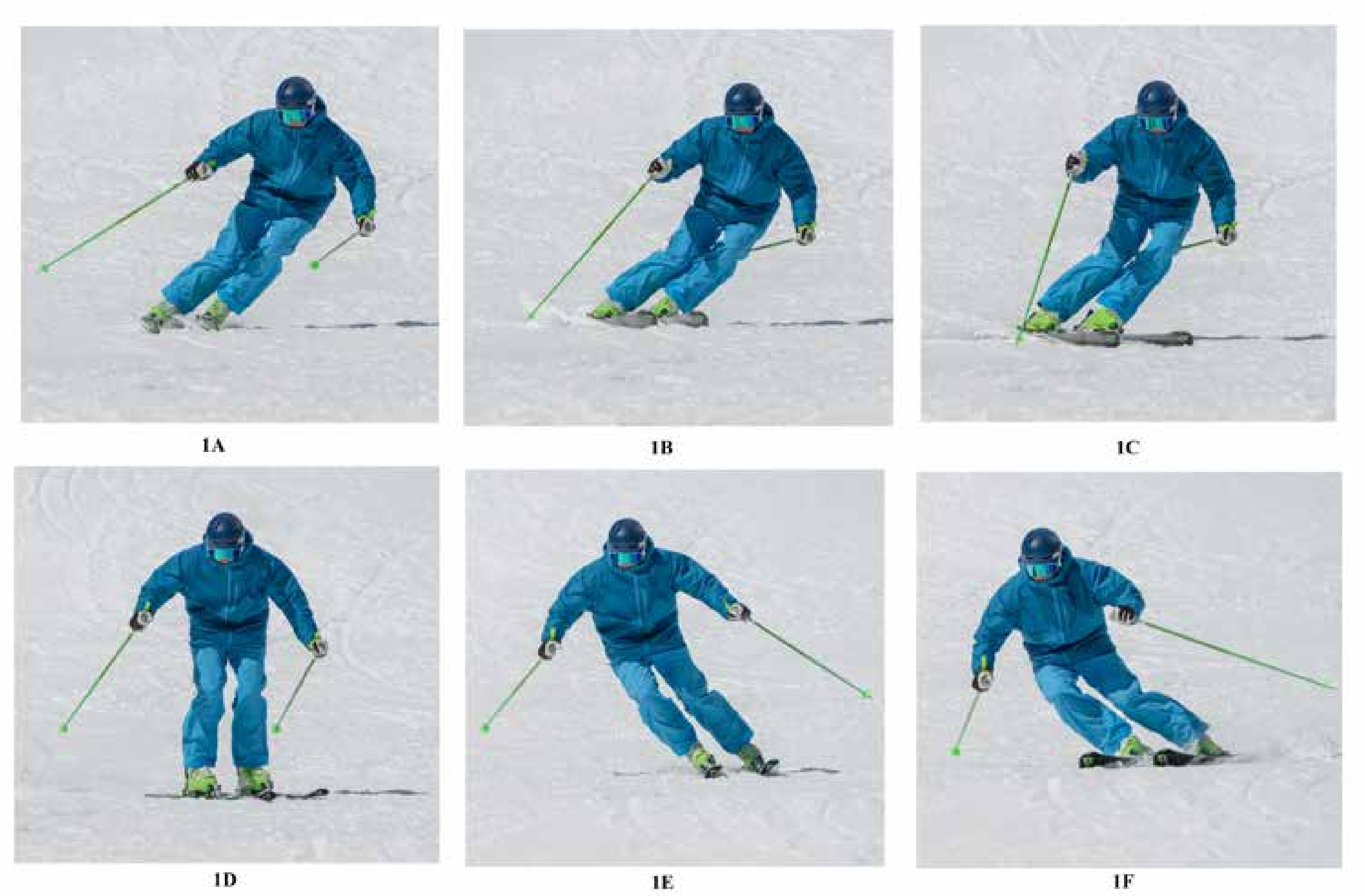
Railing It!

SNOWBOARD UPDATE | TRACING OUR ROOTS | EDUCATION STAFF TRYOUTS | ELECTION UPDATE | PARTY CENTRAL CELEBRATION

A Comparison Between Skiing and Snowboarding Carved Turns

By Chuck Roberts

Performing carved turns on skis is significantly different when compared to performing carved turns on a snowboard. Skiing turns are symmetrical in that a turn to the left involves the same mechanics as a turn to the right. The skier is facing the direction of travel with the upper body, and the biomechanics of joint and muscle movement are identical when performing a turn to the left or right. Snowboarding turns are asymmetrical in that the rider is facing with the upper body perpendicular to the direction of travel. The biomechanical aspects of the toe side turn are different from that of the heel side turn because of the asymmetry. To explore this difference, a review of the skiing carved turn is in order (Figure 1, Reference 1). In Figures 1A and 1B, the skier is in the shaping phase of the turn with appropriate angulation and inclination for the particular terrain. Figure 1C shows the turn initiation with center of mass moving in the direction of the new turn. In Figure 1D, the skier is in the transition phase with nearly equal pressure on each ski. In Figure 1E, the transition to the new turn has occurred and the ski edges are engaging the snow. Flexion of the new inside leg has occurred along with extension of the new outside leg in Figure 1F as the skier continues in the shaping phase of the new turn. The degree of center of mass movement toward the inside of the turn is determined by the skier using flexion/extension, inclination, and angulation of the ankle, knee and hip joints. The skills, joint and muscle movements are the same for the left and right turn.



2A

2B

2C

2D

2E

2F

2G

2H

2I

Now let's look at the snowboard carved turn. Figure 2A (Reference 4) shows a rider completing a heel side turn getting ready to transition to the toe side turn, with movement of the center of mass toward the center of the turn, accompanied with appropriate torsional flex of the board (Reference 3). In the shaping phase of the toe side turn, (Figures 2B, 2C and 2D) the rider moves the center of mass inside the arc of the turn, with appropriate inclination, ankle and knee flexion. The ankle and knee joints have sufficient flexion range to allow adjustment of the board edge angle to maintain the carved turn and adjust the center of mass location. Very little hip flexion is needed. Any requirement to adjust the center of mass position in the toe side turn can easily be performed with inclination and/or knee and ankle flexion/extension.

Figure 2E shows initiation of the heel side turn with center of mass movement toward the center of the new turn with appropriate torsional flex of the board. There is flexion of the knees, ankles and hip joints during flexed edge change. In Figure 2F, the transition to the new turn has occurred to the new uphill edge. Figures 2G and 2H show the shaping phase of the heel side turn. Note the increased hip flexion on the heel side turn. This is used to adjust the center of mass to the appropriate spot at the inside of the turn. In this position, flexion of the ankle joint is limited, making it difficult to adjust the center of mass, as needed, toward the inside or outside of the turn without some other anatomical adjustment. Consequently, hip flexion and extension accomplishes this goal as the rider bends at the waist, adjusting the center of mass position as needed. This is essentially the asymmetry experienced when making turns on a snowboard.

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Figure 3

Figure 4

Most students find that the toe side carved turn is relatively easy to perform since the three major joints (ankle, knee and hip) have sufficient range of motion to adjust the center of mass to the appropriate location in a turn. The heel side carved turn is slightly less comfortable in that one has to be more conscious of center of mass placement in a turn. Movement toward the inside of the heel side turn can create a situation that cannot be corrected and may become unrecoverable. If the center of mass is too far into the inside of a heel side turn, the only joint that can be used to correct this condition is the hip joint. The flexion of the ankle and knee joints are limited and may not allow sufficient movement to adjust the center of mass toward the outside of the turn.

In the toe side turn of Figure 3 (Reference 2), knee and ankle joints have sufficient range of motion (flexion/extension) accompanied with inclination to adjust the center of mass in the turn without much hip joint movement. In the heel side turn of Figure 4 (Reference 2), the knee and ankle joints do not have sufficient range of motion to adjust the rider's center of mass, especially if the center of mass is too far inside the turn and needs to be adjusted outward. Consequently, hip flexion dominates the body position when adjusting the center of mass of the rider in the turn. If the rider is on heel side and needs to adjust the center of mass more to the outside of the turn, then hip flexion has a significant effect on the movement of the center of mass. Not obtaining this dynamic balance may result in the rider falling to the heel side.

In skiing, the student utilizes essentially the same skills for both the right and left turns. While teaching snowboarding, the instructor has to teach two turns, toe and heel side. Snow skiing turns are symmetrical. Snowboarding turns are asymmetrical.

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1. Dusty Dyar, photos courtesy of Grant Nakamura
2. Scott Anfang, photos courtesy of Grant Nakamura
3. "The 4 Edges of a Snowboard," The Central Line, 2016 Issue 1, pp 8-9.
4. John Roberts, photos courtesy of Chuck Roberts