

Physics of Longboard Downhill / Freeride Techniques

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Basics of Longboard Riding

- Your body together with the complete longboard (deck, trucks, and wheels) are all involving with your riding dynamics.
 - Stances
 - Depending upon your speed of riding and how you want to control of the board
 - Front foot:
 - Carving style (low speed): 0~30 degree from your traveling direction.
 - Hybrid style: 45 degree as hybrid style (balance between speed and control)
 - High speed downhill racing style: 0 degree (almost parallel with your traveling direction due to the speed is high)
 - Hip
 - Control how you want to distribute your body weight.
 - The higher speed you travel, move hip to the front of deck to have more weight at front foot including downhill (and racing) to create more 'stability'.
 - Chest
 - Control where your movement direction to go. Use your chest to face the direction of your traveling
 - Head & Eyes
 - Your head and eyes will also influence your travel direction. ALWAYS! Always eyes looking at your traveling direction.
 - Hands
 - Your two hands control your overall body's balance with most saying (more hands positions vs your hip/torso on later pages

What is Sliding from Physics aspect?

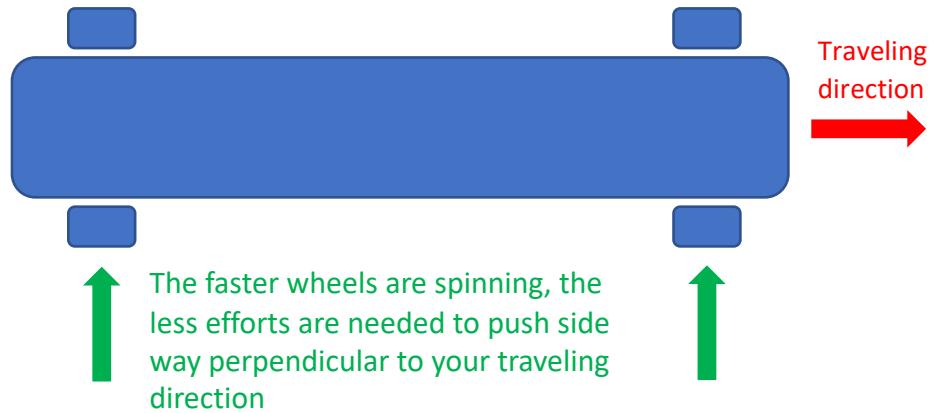
- Make your board move side-way against your traveling direction.
- Basically,
 - Sliding = “when wheels lost tracking on ground”
- Downhill Racing Wheels vs. Free-ride Wheels
 - Downhill Racing Wheels: Extra wide, larger Diameter, Softer Wheel, e.g., 75a.
 - To obtain maximum “bonding” to ground surface since the goal is the speed with minimum sliding as much as possible.
 - Free-ride Wheels: Narrower width, smaller Diameters, in-between Soft and Hard stiffness Wheels, e.g., 80a.
 - To control the speed with as much as Sliding / Carving as possible.

Factors of Sliding (1/2)

- Wheel shapes, size, contact width, stiffness making difference in sliding – all depending upon your needs.
- Hardness of Wheels
 - The softer wheel, the more “harder” to slide since the wheels deform to the ground surface with stronger “hogging (bonding) force with the ground (sticky to ground)” and hence, it is harder to create sliding.
 - The harder wheel, the more “icy” in sliding since the wheels deform less and hence less “bonding force” with the ground”. Hence, it is more icy / slippery for the harder wheels.
- Your Body Weight
 - The less of your body weight, the easier to create sliding since your weight creates less wheel deformation to bond to the ground surface. Hence, it’s easier for you to create sliding.

Physics of Sliding – how to initiate

- When wheels rotating along your traveling direction faster, it is easier to push your wheel side-way in theory.
- But, you can't achieve the 90-degree sliding suddenly in practical run.
- Why? You don't have “side-way force” (Law of Physics!) unless you create one. How?
- “**Pre-sliding Turning**” is the answer! You use ‘**centrifugal force**’ from your turning to create the needed “side-way” pushing force for you.



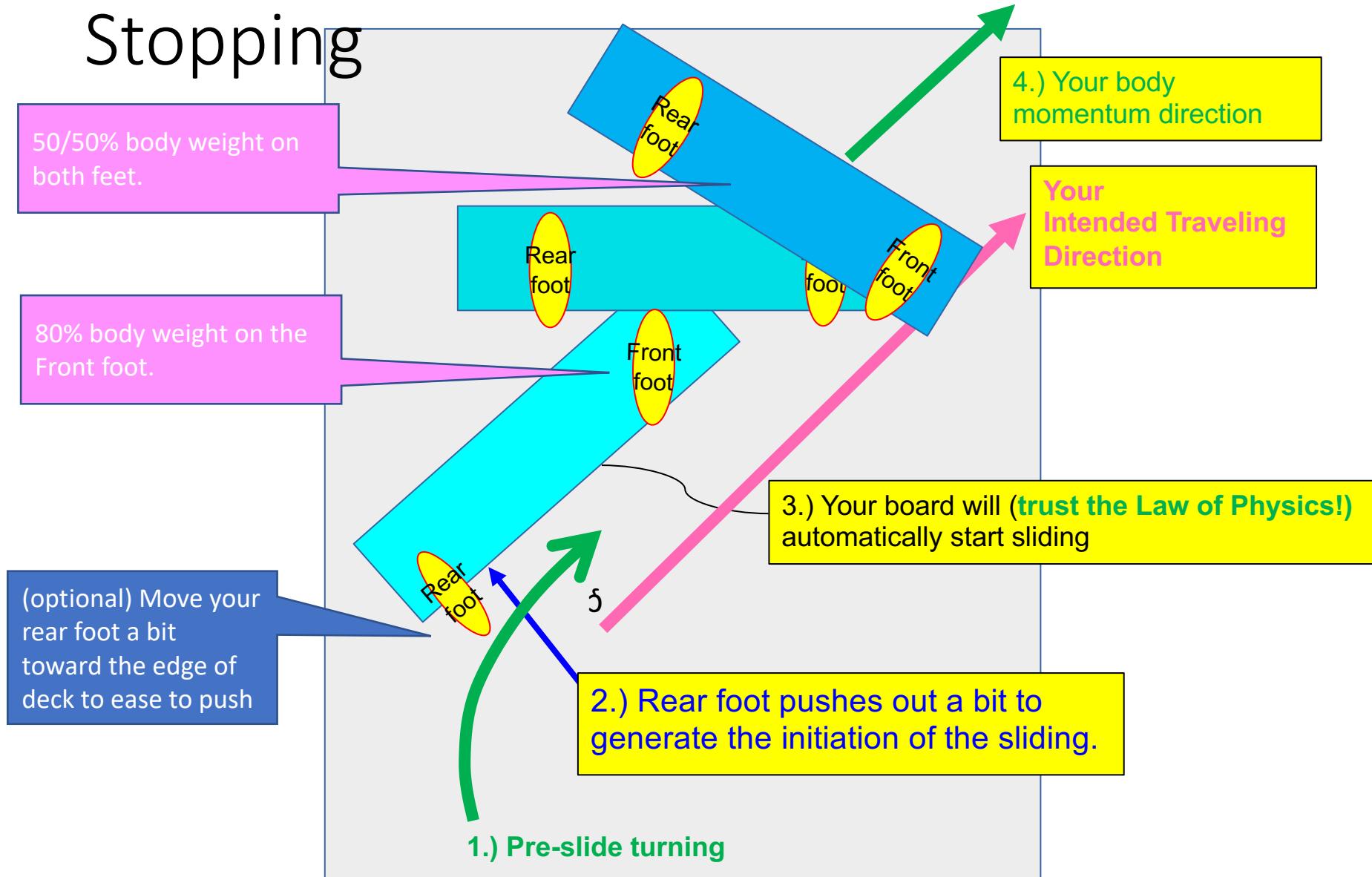
To convince / proof what I said here:

1. Lay your board on flat ground still and use your hand or foot to push it sideway.
2. Move your board with minor speed and again use hand or foot to push it sideway.
3. Compare the efforts in 1 & 2: You will verify step-2 taking less efforts and you confirm what I explain here!

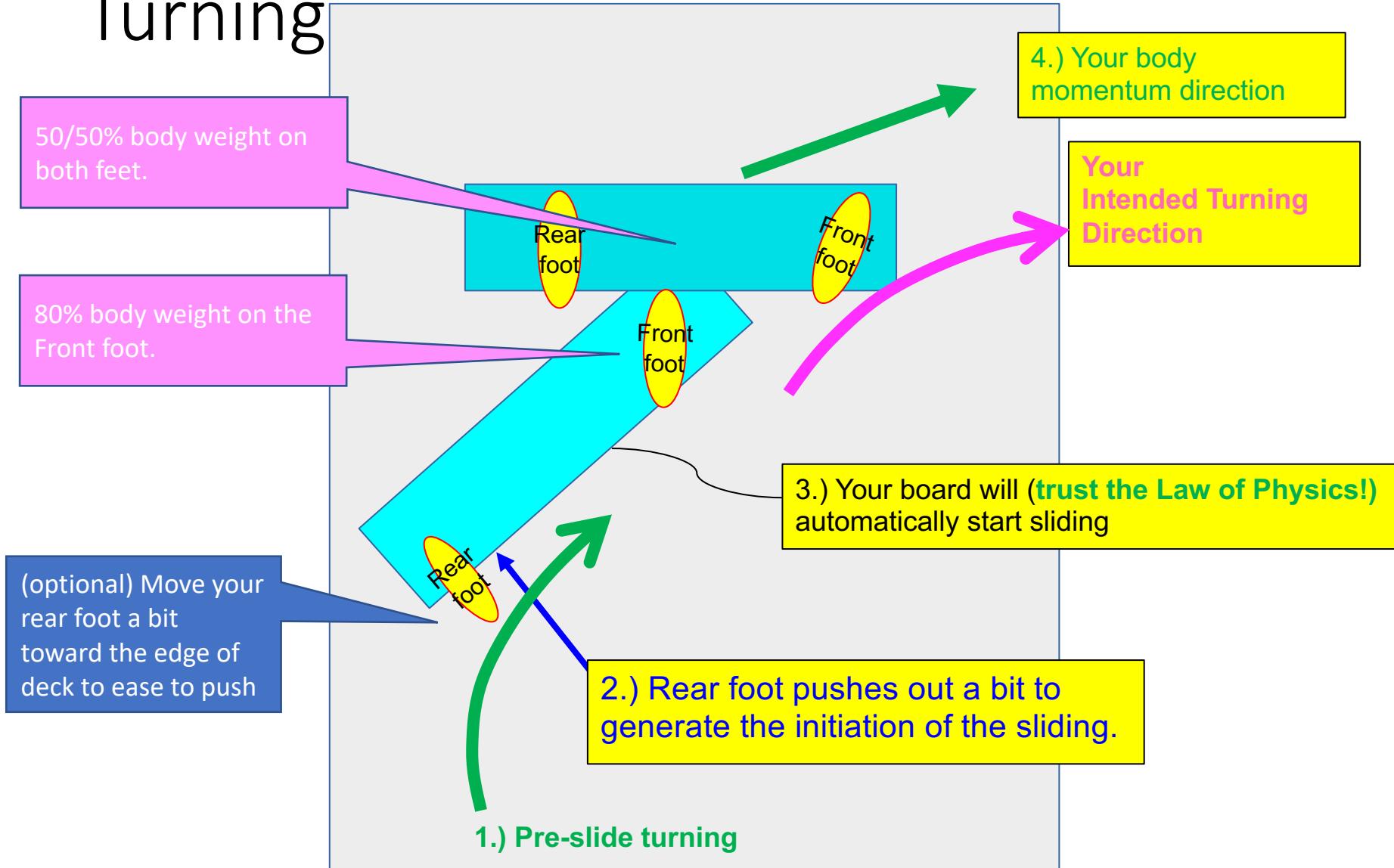
“Pre-Sliding Turning” is the key to create “sliding” – the Law of Physics!

Free-ride Style Downhill Sliding

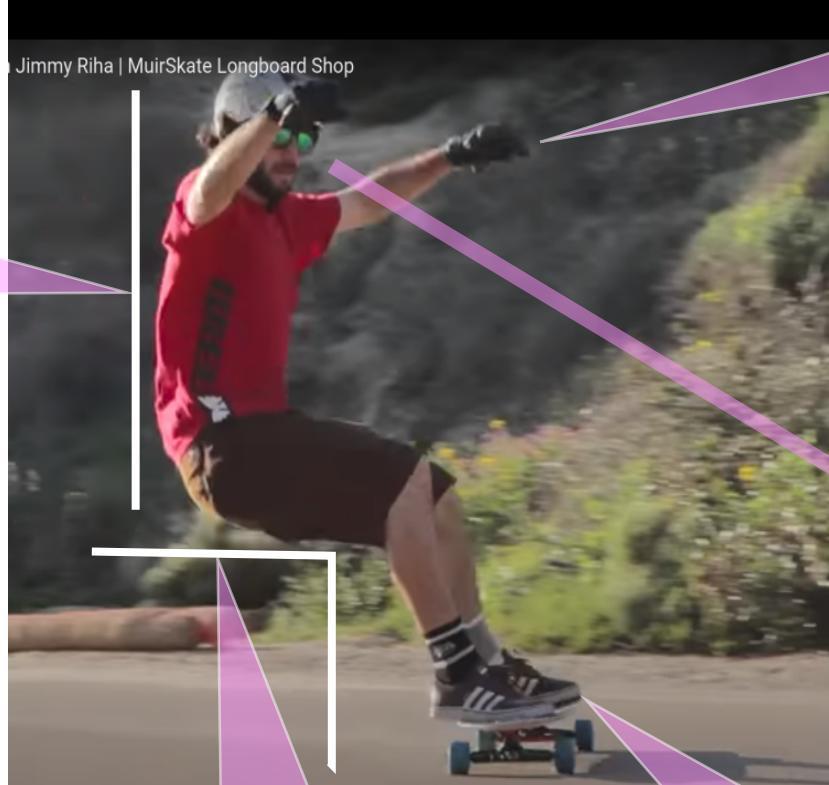
Standing Slide (facing downhill) – Stopping



Standing Slide (facing downhill) – Turning



Examples – Standing Slide (facing Downhill)



Maintain upper body
"Straight up" – important
for weight on your hip.

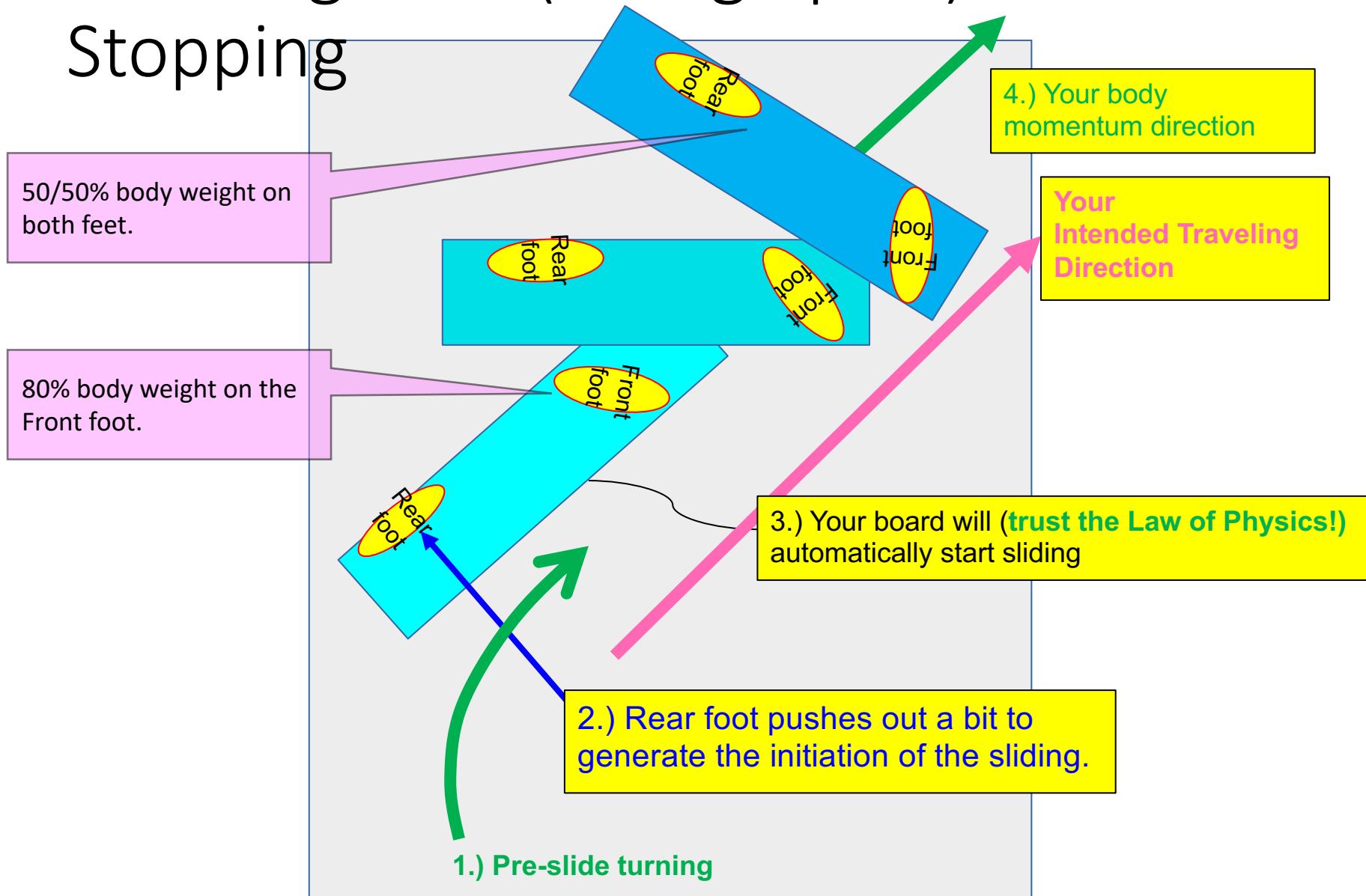
Sitting on the "Imaginary Chair" while facing downhill.

Both Hands up to shoulder to counter balance of your lower body doing the turning.

Head, Eyes, and Shoulder all facing the direction of your 'intended' traveling.

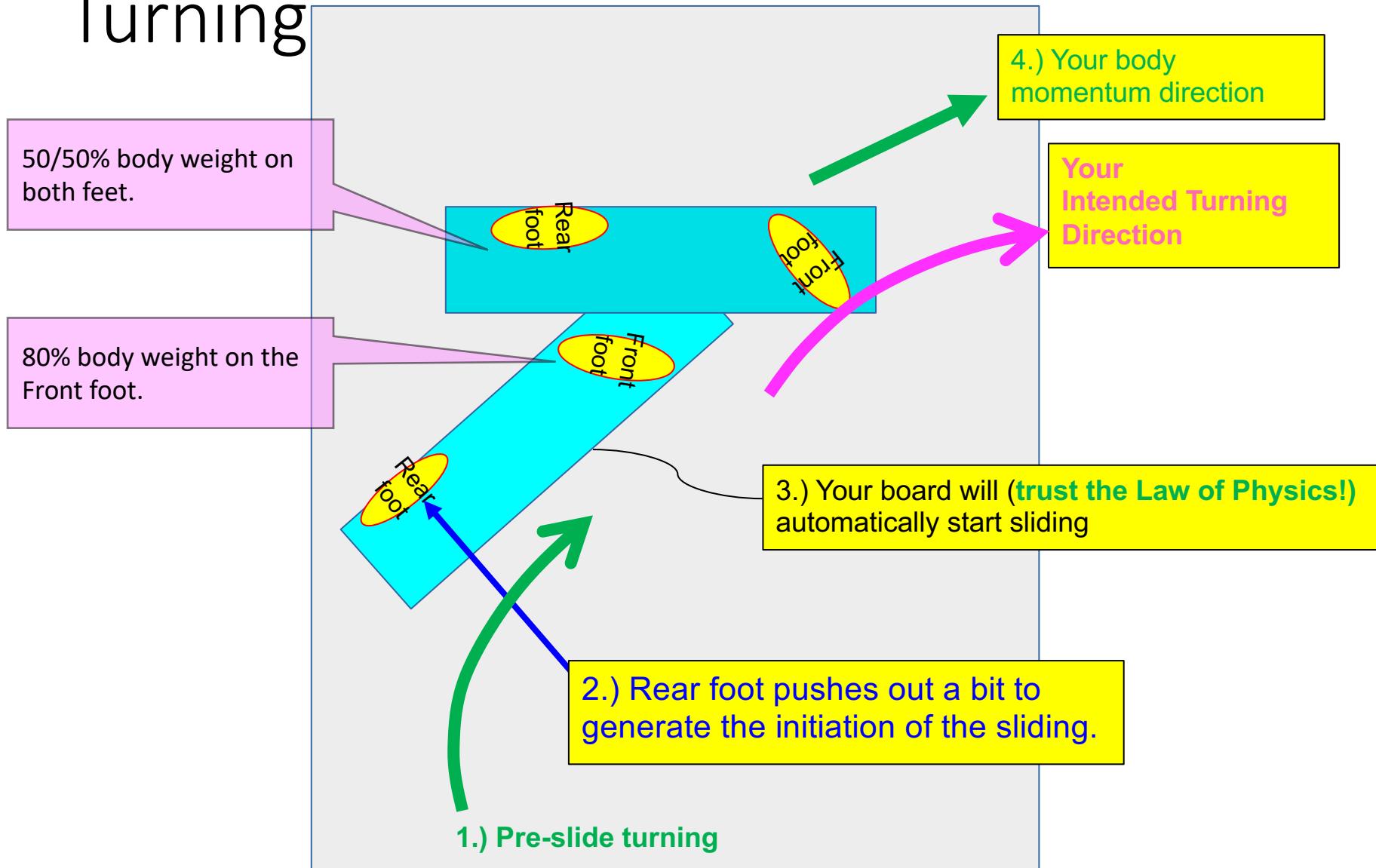
Both feet "in parallel" to the ground to maintain sliding straight and to avoid "turning".

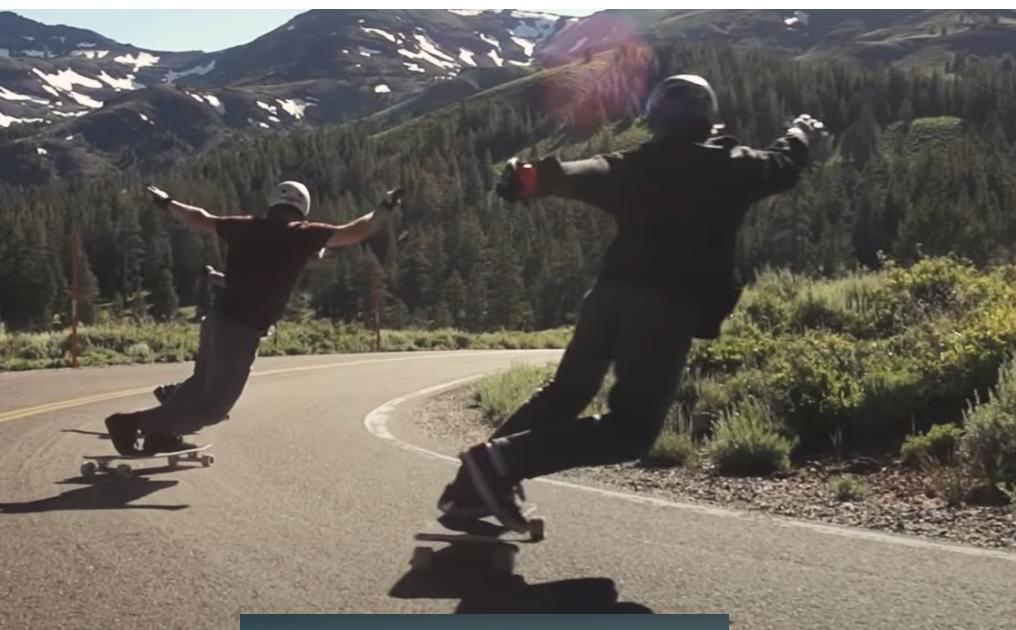
Standing Slide (facing uphill) – Stopping



Standing Slide (facing uphill) –

Turning





Prism Skate Co - PILGRIMS



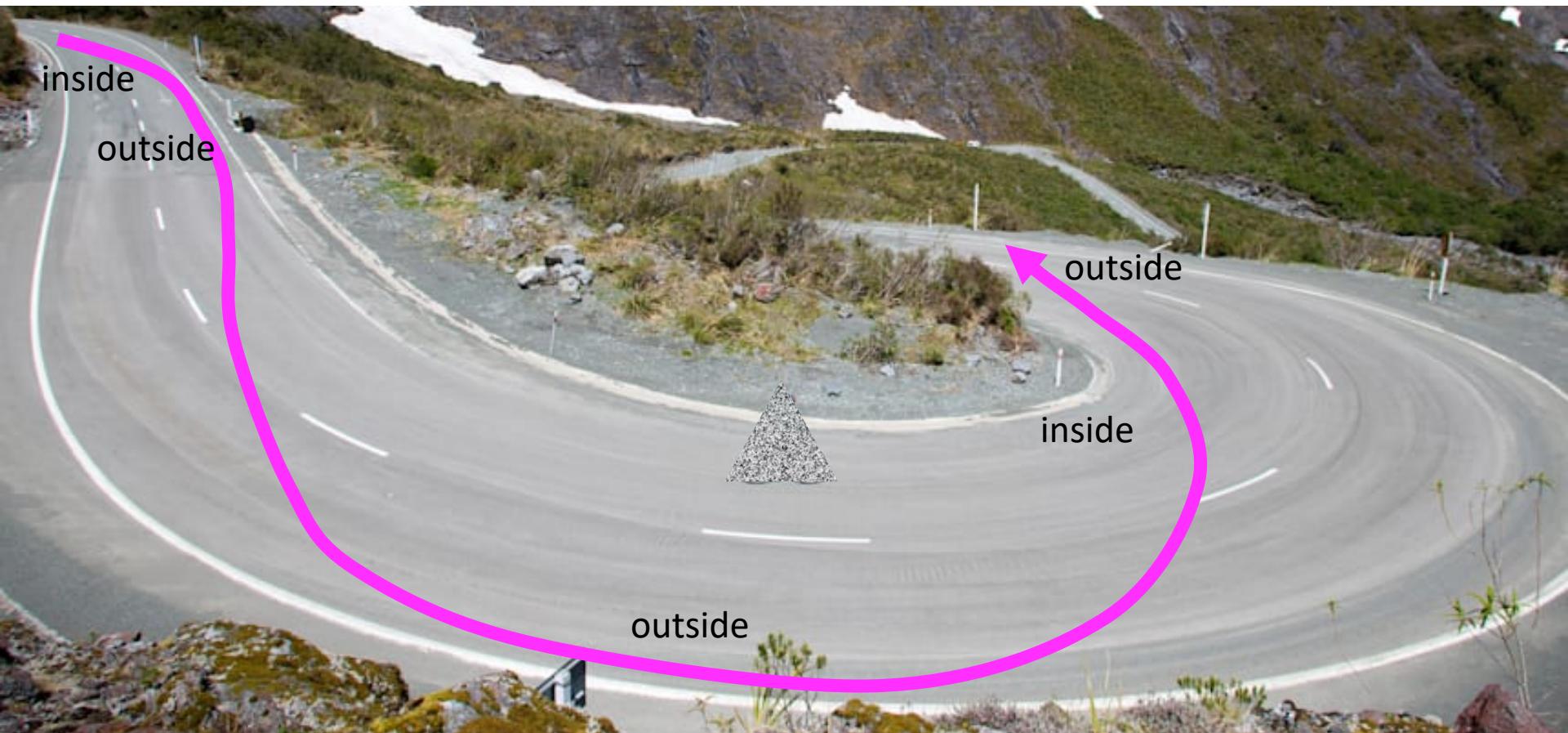


Prism Skate Co - PILGRIMS

Downhill Turning

Downhill Turning - Trajectory

The turning trajectory is “OUTSIDE-INSIDE-OUTSIDE” per single turning. However, the turn below requires two consecutive turning sequence combined as depicted below.



Racing Style Downhill Techniques

Downhill Racing – Postures (1/N)

- Body Postures
 - Fully squatting-down style
- Concept
 - The lower of your body's 'Center-of-Gravity (C.O.G.)', the more stable while forwarding and turning.
 - More weight in the front to create more stable forward speed.
 - You need to "**FULLY Squatting down**" your body when racing downhill or free-ride higher turning stability – You minimize the height of your "C.O.G." and more stability.



Picture from Emily Press Facebook:
<https://www.facebook.com/emilylongboards/>

Downhill Racing – Postures (2/N)

- Another Racing Posture as shown on the right.
 - The racer uses drop-deck longboard while extending his hands to create aerodynamics.
 - The center-of-gravity (C.O.G) is both pushed closer to the ground and further to the front foot to create more forward stability.
- For racers who can't fully squat down, this style is a good alternate posture while keeping C.O.G lower to ground. – For one, I am more suitable to use this style due to my right bad knee.

Just to contrast the above style of postures with this most commonly posture.

Pictures from longboardcenter.com



Picture from Emily Press Facebook: <https://www.facebook.com/emilylongboards/>



Downhill Racing – Turning Styles

- Two styles of Downhill Racing
 - No-Palm Down Style
 - Using upper body to control the turns only
 - Palm Down Style
 - Using Palm (one only!) to assist the turns besides using body.
 - Further, there are two sub-style for “forehand” and “backhand” turning depending your stance style (goofy feet or not)

Pictures:

1. From [Kozakov Challenge 2018](#)
2. from [Emily Pross Facebook page](#)



Downhill Racing

Comparing Forehand Turning



Downhill Racing

Forehand vs. Backhand Palm-assisted Turning

As you can see, both forehand and backhand styles are turning right. However, backhand turning (the left picture) has the 'lower Center-of-Gravity' (sitting position) and hence can achieve much sharper turn but trimming speed. In the right picture, Emily must use larger turning radius with maintaining higher speed in-and-out the corner faster.

Backhand Palm-Assisted
Turning

Pictures:

1. From [Kozakov Challenge 2018](#)
2. from [Emily Pross Facebook page](#)



Forehand Palm-Assisted
Turning



Downhill Racing Turning Anatomy

Forehand Palm-assisted Turning

20% vs. 75% weight distribution between the palm and the front foot.

Head, Eyes, and Shoulder all facing the direction of your 'intended' traveling.

Forehand's Palm in-parallel to ground and fingers up and pointing to your 'intended' traveling direction.

Pictures:

1. From [Emily Pross Facebook page](#)

Rear foot on the 'Edge' as rudder to control direction

Height of Center of Gravity

The other hand: minorly adjusting the direction of board to prevent sliding outward. (Don't pull up!)

Downhill Racing – Rear Foot when Turning

- The following photo shows how your rear foot should look like theirs as the rudders to steer the direction of your boards.



Picture from <https://skateslate.com/blog/2012/12/08/world-class-downhill-skateboard-racing/>

Racing Style: Backhand Palm-assisted Turning



Pictures:

1. From [Kozakov Challenge 2018](#)

Racing Style: Forehand Palm-assisted Turning

Approaching corner –
Palm down the side
you want to turn



Rear foot 'kick' out a bit



3. Eyes LOOKing at the
direction of traveling
while dragging your
sliding glove

Head, Eyes, and Shoulder all
facing the direction of your
'intended' traveling.



Time
sequence

For Downhill Racing, Standing-turning style is mostly not common. Most downhill racers use squat-down to push the center-of-gravity to its lowest to achieve maximum turning-stability.

Pictures:

1. From [Kozakov Challenge 2018](#)

Kozakov Challenge 2018

