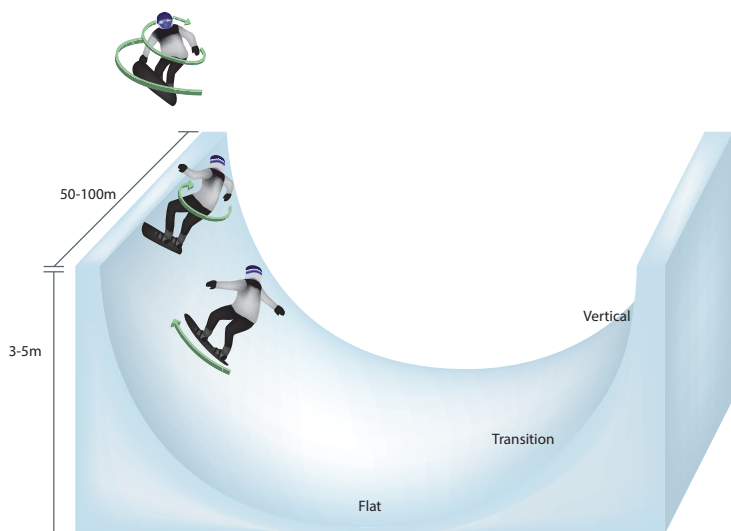
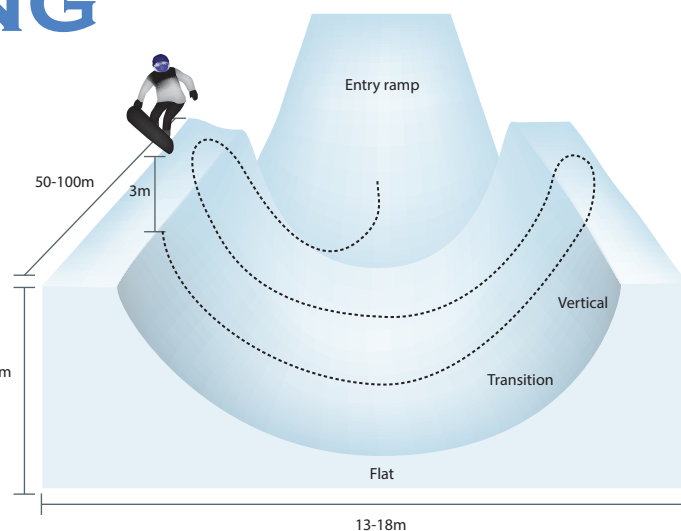


SNOWBOARDING

In the snowboard half-pipe event, snowboarders use **velocity** and **torque** to perform tricks in the air.



A snowboarder creates **torque** by twisting his torso at the “vertical” of the half-pipe. This turns **linear momentum** into **angular momentum** as he rotates around his own vertical **axis**.

Try This!

1. Stand up in a clear area. Make sure that you have enough space to reach out both your arms and not touch anything.
2. With your feet about shoulder-width apart, jump straight up. Do this a few times. What kind of momentum is your body experiencing? In what direction?

Your body has linear momentum, in an upward direction (perpendicular to the ground).

3. You're going to jump again, only this time, twist by rotating your chest and shoulders left as you jump. What happened?

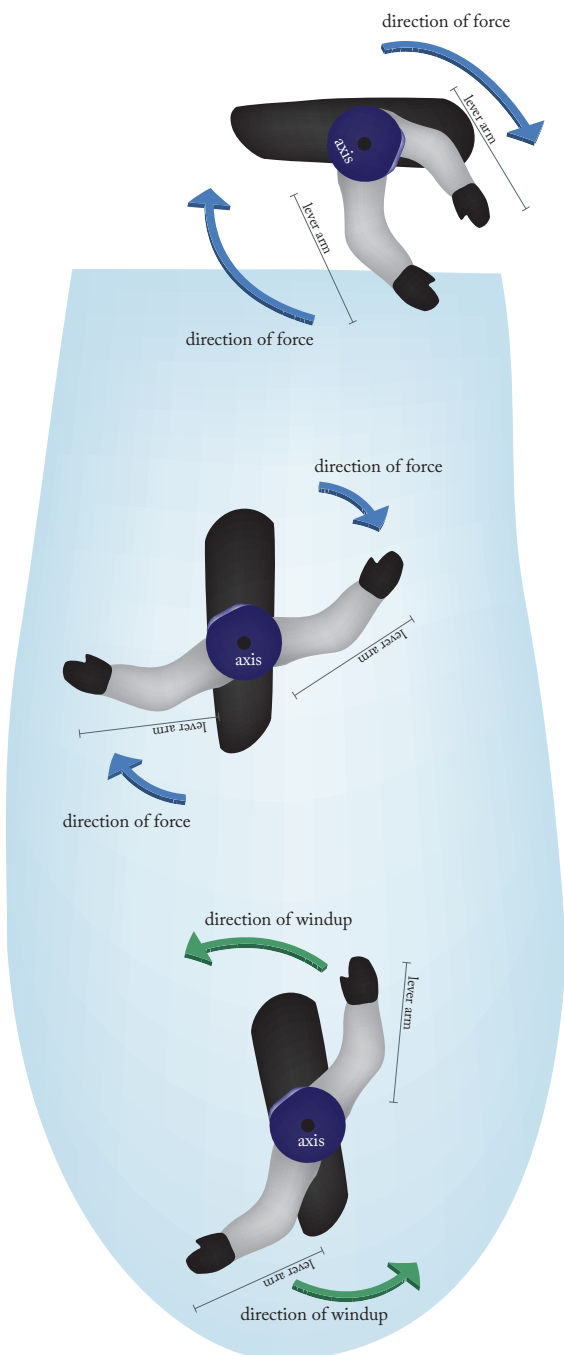
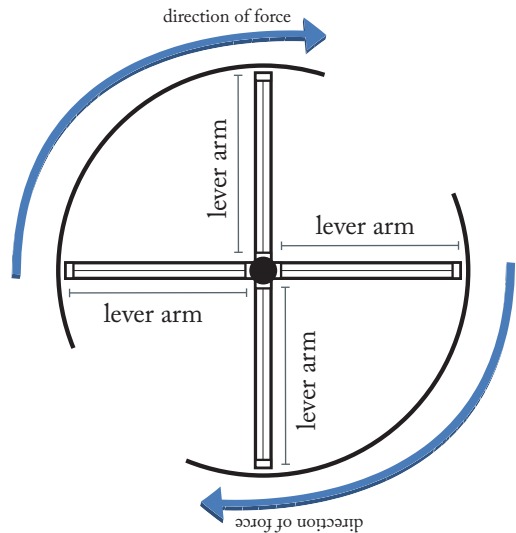
When you twisted your chest and shoulders in the air, your whole body rotated left. When you landed, you were facing a different direction from your starting position.

4. Explain how this happened using the terms **linear momentum**, **angular momentum**, **torque**, and **axis**.

When you jumped and twisted your chest and shoulders, you created torque, which converted your linear momentum into angular momentum and caused you to rotate around your vertical axis.

SNOWBOARDING

Before a snowboarder does a spin, he extends and “winds up” his arms. By doing this, he’s increasing the length of his **lever arm**, making it easier for his body to rotate. Think about opening a revolving door—is it easier to open by pushing on the edge farthest from the hinge or closer to the hinge? When a snowboarder swings his arms, it increases **torque**, making it easier for the rest of his body to spin.



Stand in your original position. Without moving your feet, extend your arms away from your body. Point your right arm in front of you and your left arm behind. Your chest and shoulders should be rotated left. Now, as you jump, swing your arms clockwise. How did winding up your arms affect your spin?

Winding up your arms increased the length of the lever arm and created more torque, so it was easier for your body to spin.

Cool Fact:

If snowboarders maximize their torque on the half-pipe, they can spin up to 600° per second—that’s nearly two full spins!