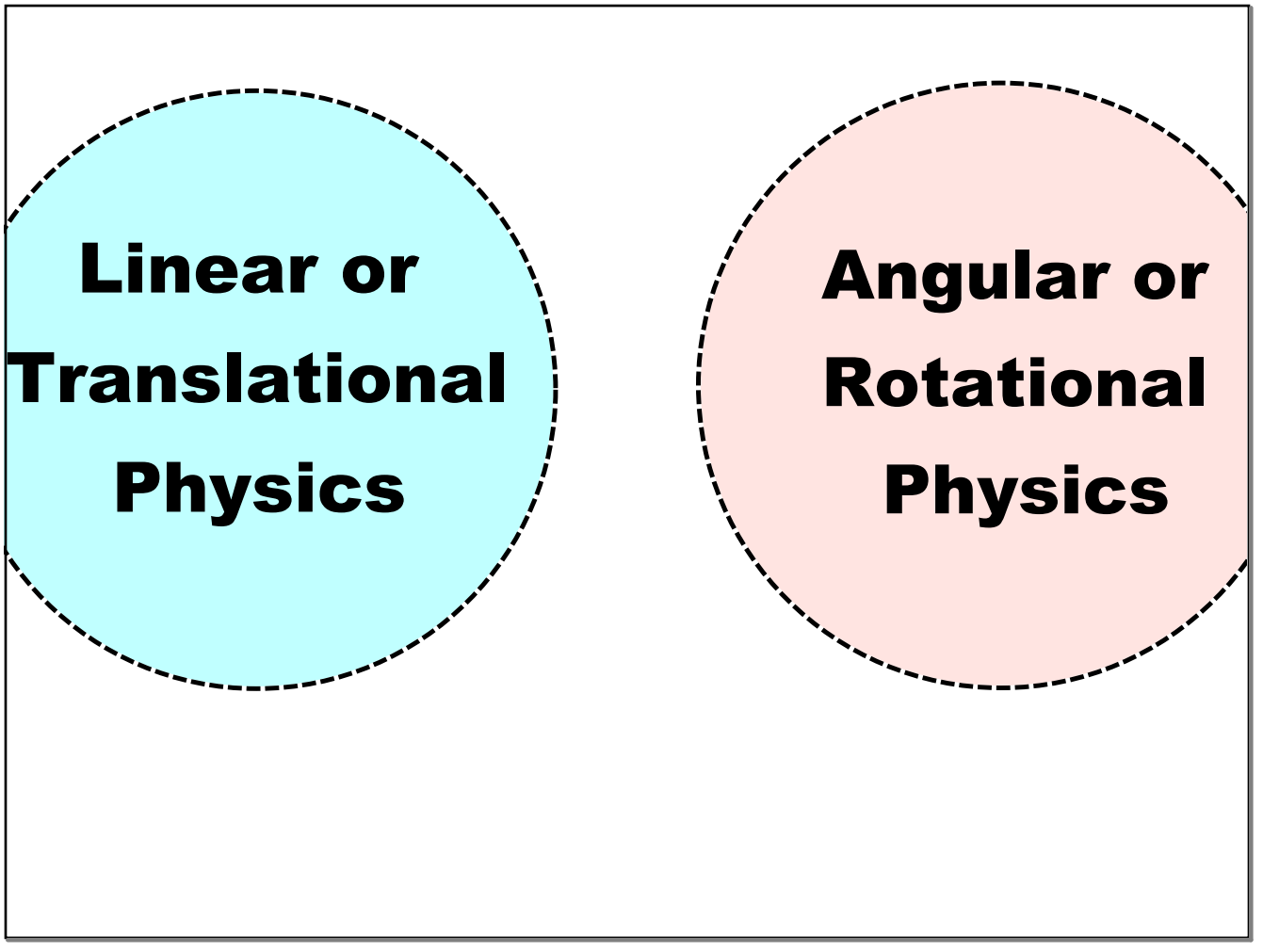

Linear or Translational Physics
Angular or Rotational Physics

Velocity (speed & direction) are constant unless a Force acts.

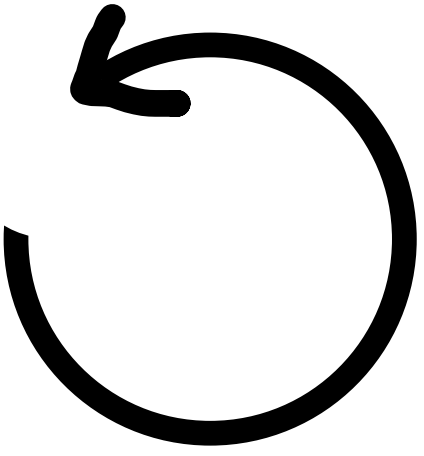
What is the equivalent for rotation?

Something that causes ANGULAR velocity to change.

Angular Velocity (ω) Directions

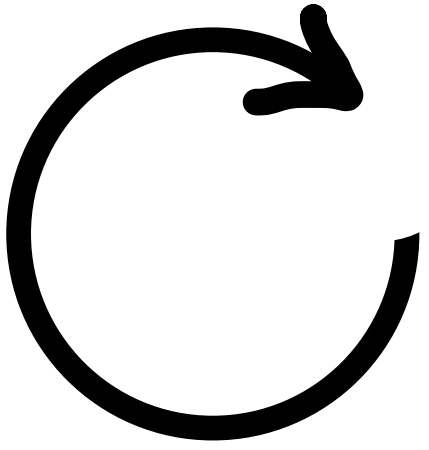
Counter Clockwise

ccw

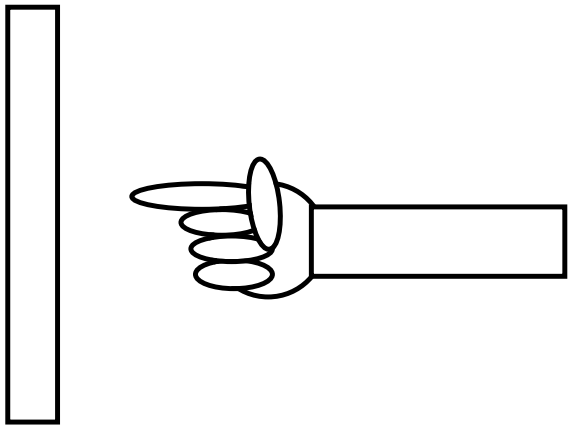


Clockwise

CW



Keep the ruler flat with the table. Poke it with your finger and notice how it rotates.



1. What kind of poke gives it a clockwise angular velocity ω? Counterclockwise?

2. What kind of poke causes it to have more angular velocity ω? Less?

3. What kind of poke does not give it any angular velocity ω at all?

Terminology:

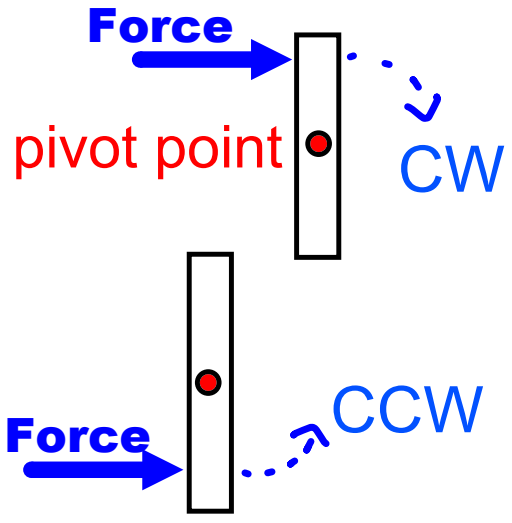
PIVOT POINT

Fixed point about which the object rotates. If there is no fixed point, the Center of Mass becomes the pivot.

TORQUE

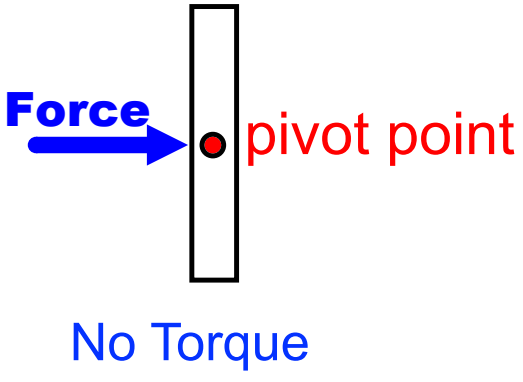
Rotational equivalent of force. It causes a change in angular velocity, ω.

What does it depend on?



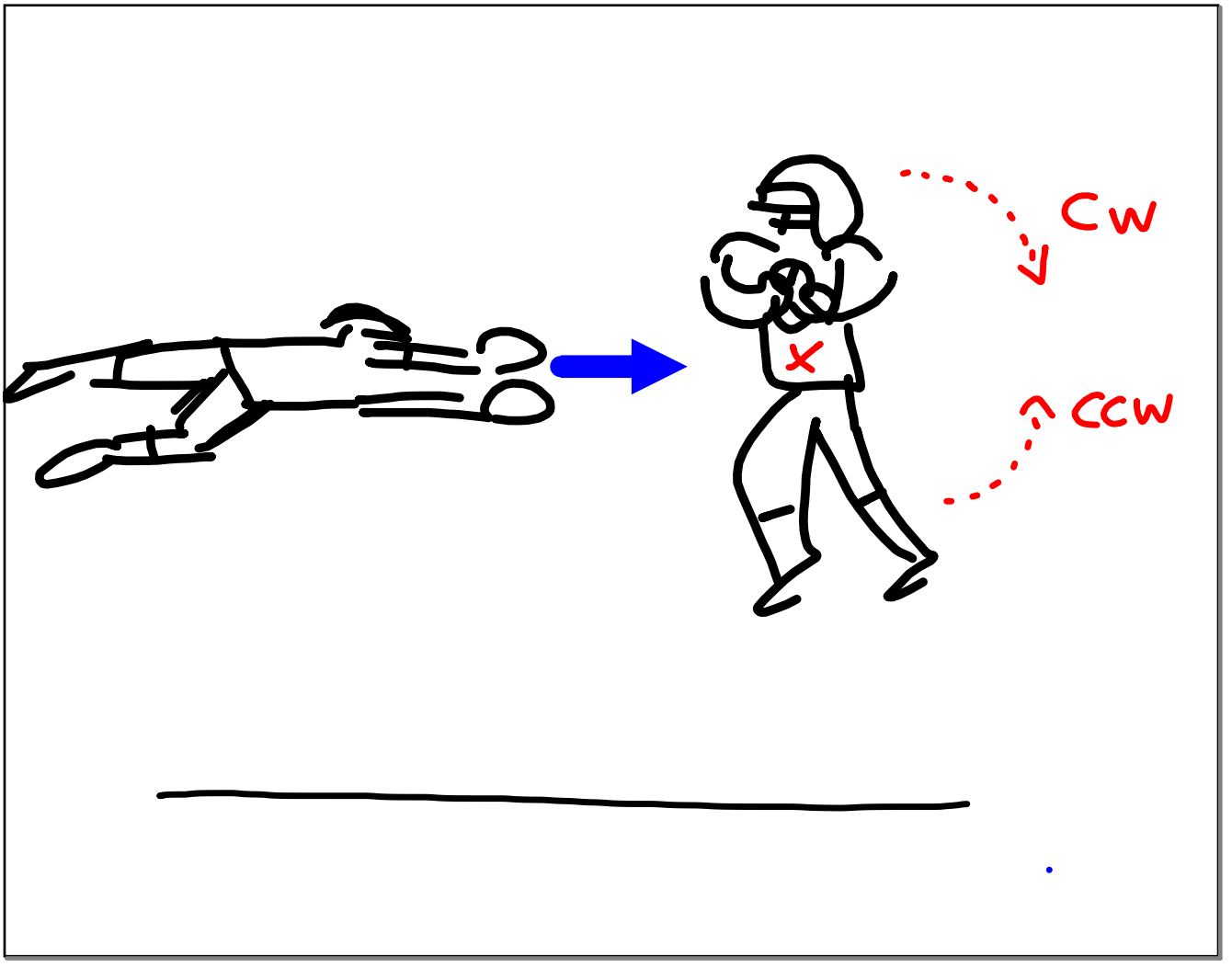
The farther from the pivot point a force acts, the MORE TORQUE.

& greater change in ω

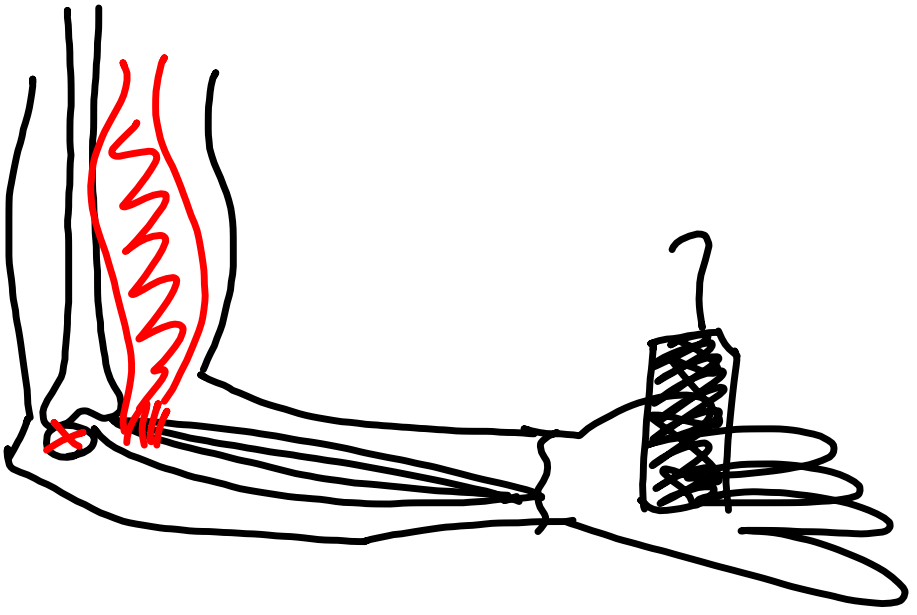


Forces that act at the pivot exert NO TORQUE.

no change in ω

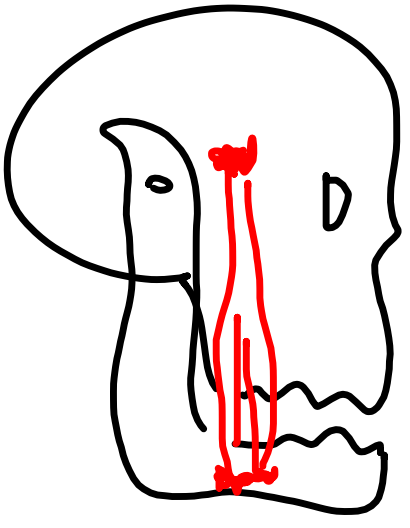

CW
CCW
x

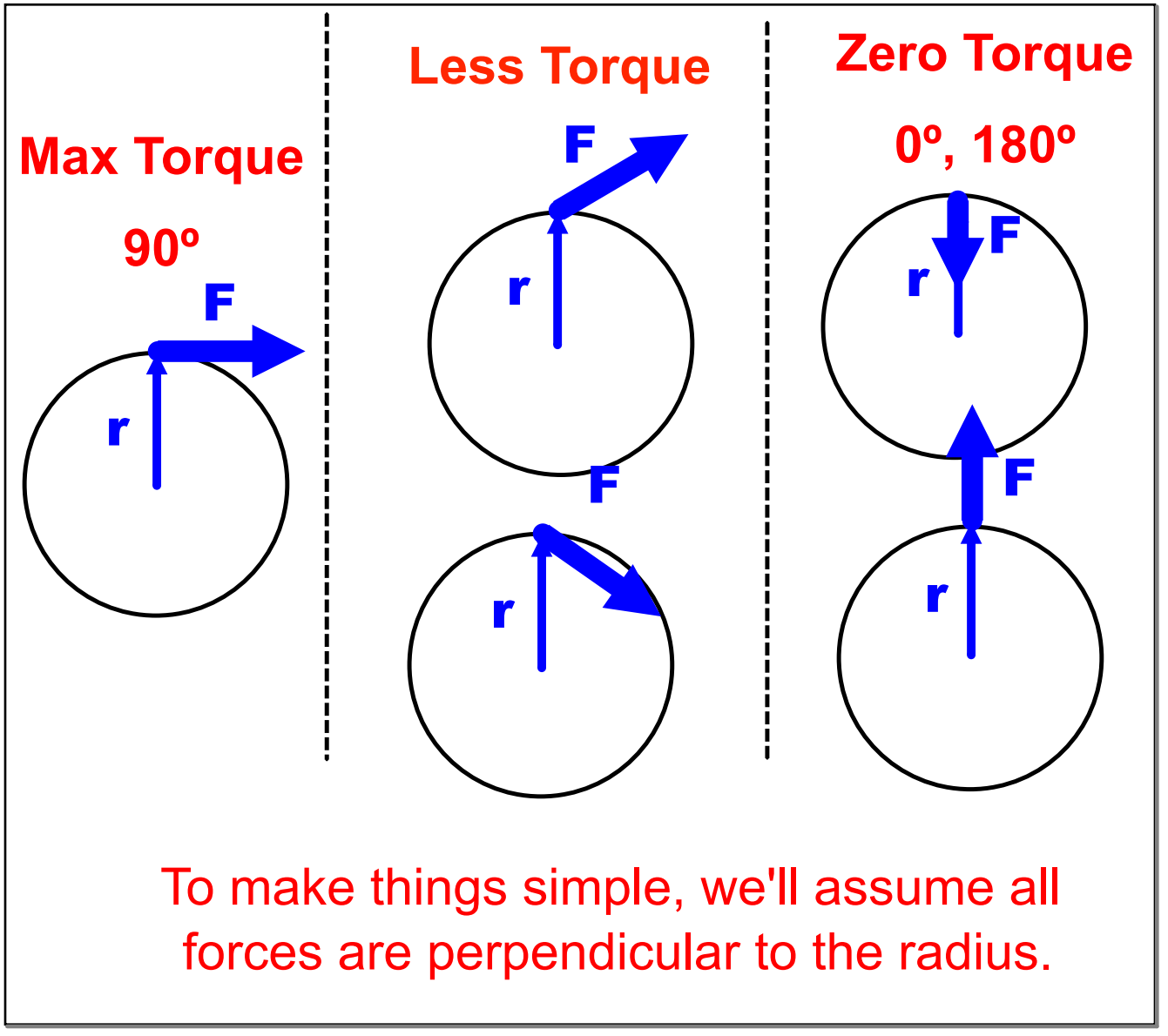
The human body is not built for strength!



It's built for speed!

with one exception...




Max Torque
90º
F
r
Less Torque
F
r
F
r
Zero Torque
0º, 180º
F
r
F
r
To make things simple, we'll assume all forces are perpendicular to the radius.

3rd Law of Motion

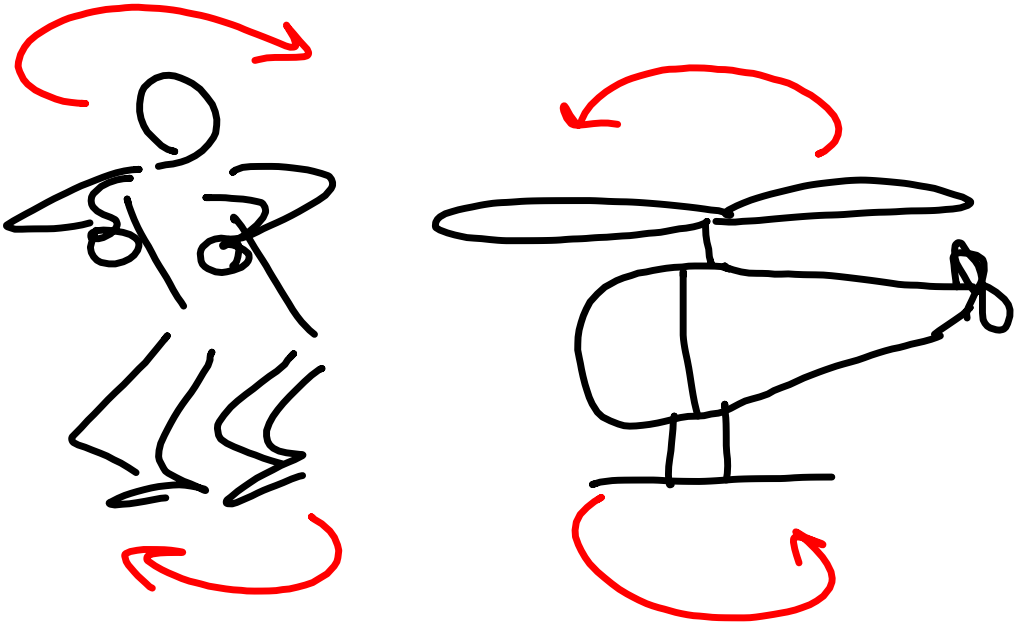
If one objects pushes/pulls on another, the other pushes/pulls back with an identical force in the opposite direction.

Is there a 3rd Law for Rotational Motion?

YES!

The Twist and Helicopters

If you torque something one way, you get a torque the other way.



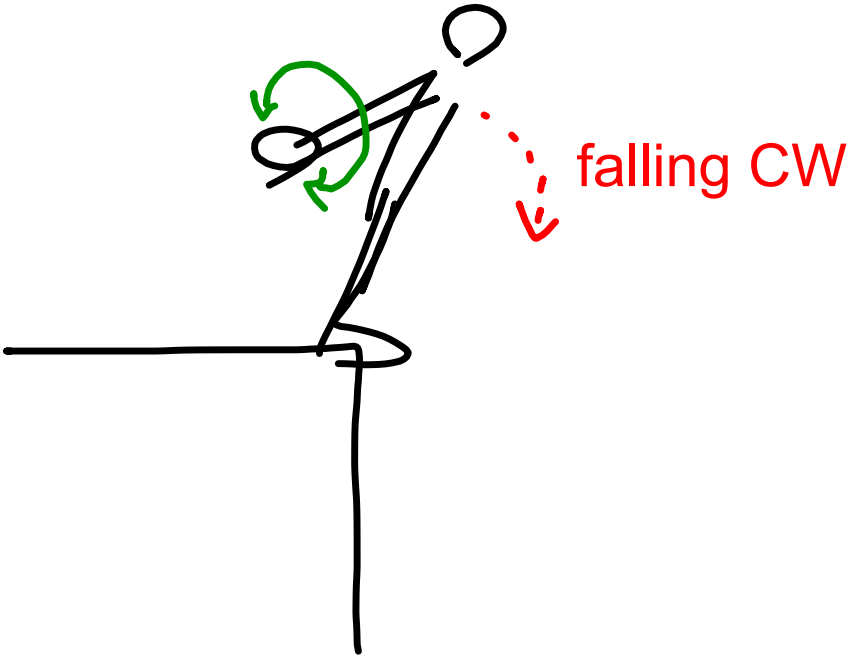
rear propellor cancels out the reaction torque

Rotors spin opposite ways **Torques cancel**

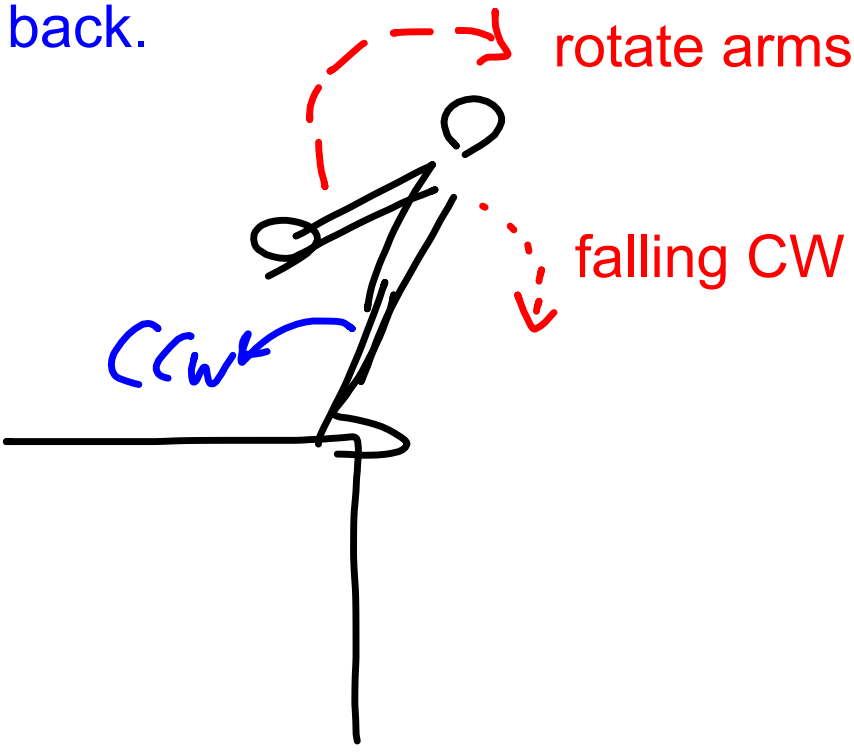
You naturally pinwheel your arms when falling.

Does that help?

Does it matter which way you pinwheel?



Rotate your arms the same way you are falling so that your body gets the reaction torque and goes back.



Tightrope Walking