

Biomechanical Principles



Why is it important to understand these principles?

1. To understand why certain techniques are more efficient than others
2. To help change and correct the way we perform a skill
3. To help design and create sporting equipment that will improve athletic performance

How do I increase my stability so I don't fall over?

- Increase my mass
- Centre of Mass
- Position my centre of mass to a desirable position - closer to base of support
- Increase my base of support
- Balance my mass

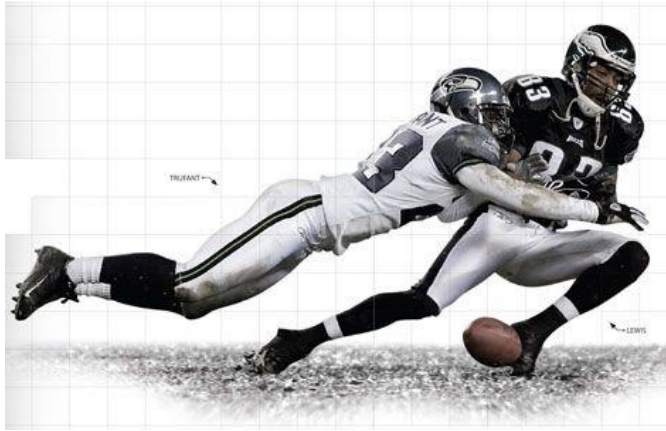
Principle #1: Stability

“The greater the mass, the lower the centre of mass to the base of support, the larger the base of support, and the closer the centre of mass is positioned to the base of support, the more stability increases.”

When do I want to be stable?



When would I want to be unstable?



How do we produce maximum effort when performing?

How do we lift that heavy object?

How do we run as fast as we can?

How do we jump really high?

How do we swim really far and fast?

By increasing our Joints Range of Motion (ROM)

Using multiple muscle groups simultaneously!

Principle #2:

THE PRODUCTION OF MAXIMUM FORCE

“The production of maximum force requires the use of all possible joint movements that contribute to the task’s objective.”

How do I make an object move farther?

How do I throw a baseball really far

How do I increase the speed of my tennis serve?

How can I improve my basketball shot so it reaches the net?

I can I improve my golf swing to make the ball go farther?

Answers

- Joint movement in legs
- Then hips
- Then arms
- Then elbows
- Then wrists

Principle #3:

PRODUCTION OF MAXIMUM VELOCITY

“The production of maximum velocity
requires the use of joints in order—from largest to smallest.”

Principle #4:

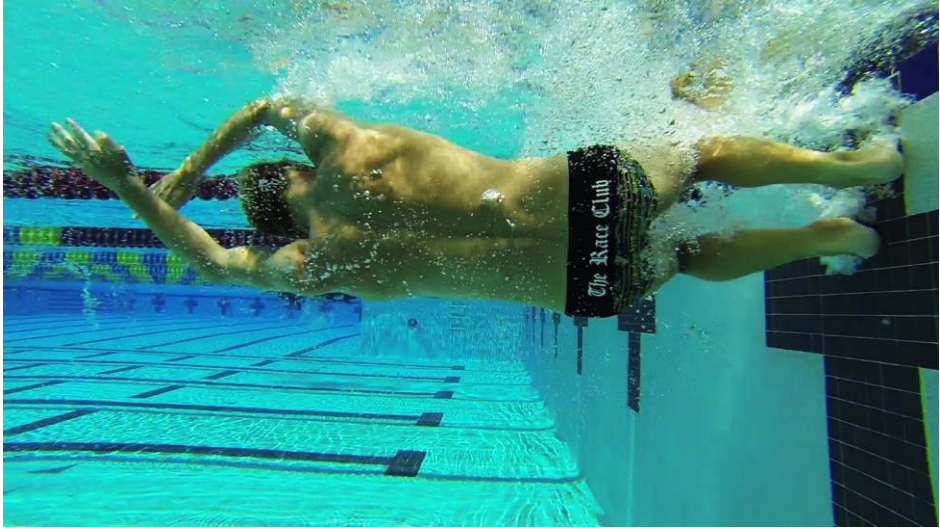
THE IMPULSE-MOMENTUM RELATIONSHIP

“The greater the applied impulse, the greater
the increase in velocity.”

Principle #5:

THE DIRECTION OF APPLICATION OF THE APPLIED FORCE

“Movement usually occurs in the direction
opposite that of the applied force.”



Principle #6:

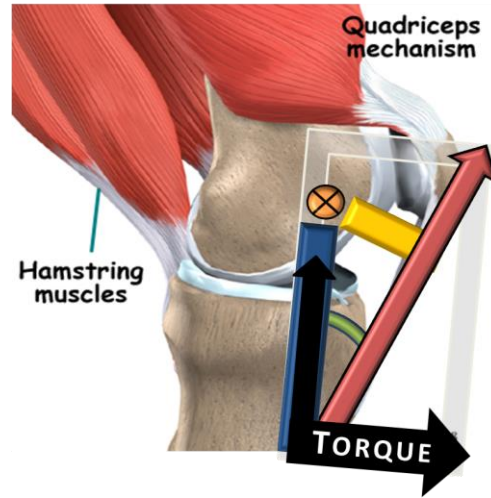
PRODUCTION OF ANGULAR MOTION (TORQUE)

“Angular motion is produced by the application of a force acting at some distance from an axis; that is, by torque.”

The amount of torque (the turning effect) that is generated is affected by three factors:

- The applied force,
- The length of the lever arm, and
- The angle of application of the force, as shown in the diagram.

TORQUE OF QUADRICEPS



Principle #7

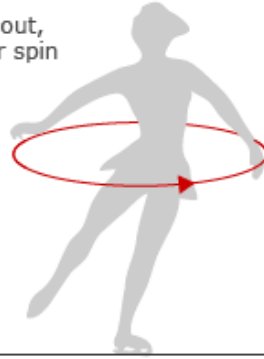
THE CONSERVATION OF ANGULAR MOMENTUM

“Angular momentum is constant when an individual or object is free in the air.”

(Angular momentum is the quantity of motion contained within an object or a body.)



Arms out,
slower spin



Arms in,
faster spin

