Physical Education and sport

Grade 13

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Momentum

Newton’ Second Law is also related to the variable momentum, which is the product of an object’s velocity and mass. Momentum is essentially the quantity of motion an object possess. Momentum can be transferred from one object to another. There are different types of momentum which each have a different impact on the sport.

**Linear Momentum**

Linear momentum is momentum in a straight line e.g. linear momentum is created as the athlete sprints in a straight line down the 100m straight on the track.

**Angular Momentum**

Angular momentum is rotational momentum and is created by the rotations of the various body segments e.g. The open stance forehand uses significant angular momentum. The tremendous increase in the use of angular momentum in ground strokes and serves has had a significant impact on the game of tennis. One of the main reasons for the increase in power of the game today is the incorporation of angular momentum into ground stroke and serve techniques. In tennis, the angular momentum developed by the coordinated action of body segments transfers to the linear momentum of the racquet at impact.

Centre of Gravity

The [Center of Gravity](https://www.physio-pedia.com/Centre_of_Gravity) (COG) is an imaginary point around which body weight is evenly distributed. The center of gravity of the human body can change considerably because the segments of the body can move their masses with joint rotations. This concept is critical to understanding balance and stability and how gravity affects sport techniques.

The direction of the force of gravity through the body is downward, towards the center of the earth and through the COG. This line of gravity is important to understand and visualize when determining a person's ability to successfully maintain [balance](https://www.physio-pedia.com/Balance). When the line of gravity falls outside the [Base of Support](https://www.physio-pedia.com/Base_of_Support) (BOS), then a reaction is needed in order to stay balanced.

The center of gravity of a squash racquet is a far simpler process and can usually be found by identifying the point where the racket balances on your finger or another narrow object.

Balance

[Balance](https://www.physio-pedia.com/Balance) is the ability of a player to control their equilibrium or stability. You need to have a good understanding of both static and dynamic balance:

**Static Balance**

The ability to control the body while the body is stationary. It is the ability to maintain the body in some fixed posture. Static balance is the ability to maintain postural stability and orientation with center of mass over the base of support and body at rest.

**Dynamic Balance**

The ability to control the body during motion. Defining dynamic postural stability is more challenging, Dynamic balance is the ability to transfer the vertical projection of the center of gravity around the supporting base of support. Dynamic balance is the ability to maintain postural stability and orientation with center of mass over the base of support while the body parts are in motion.

Correct Biomechanics

As mentioned above, correct biomechanics provide efficient movement and may reduce the risk of injury. In sport, it is always good to consider abnormal or faulty biomechanics as a possible cause of injury. These abnormal biomechanics can be due to anatomical or functional abnormalities. Anatomical abnormalities such as leg length discrepancies cannot be changed, but the secondary effects can be addressed such as a shoe build up or orthotics for example. Functional abnormalities that can occur can be muscle imbalances after a long period of immobilization.