

Basic Mechanics of Jumping

Preparation Phase

- Load the legs: ankle dorsi-flexion (maintain friction forces with the ground), knee flexion, hip flexion. The flexion angles are at a degree that is conducive to the strength of the jumper. The jumper needs to be able to develop force for the entire distance of the takeoff.
- The feet are shoulder width apart and the knees line up over the toes of the feet. Observe from the front to ensure the knees are not collapsing in or bowing out well past the foot line.
- Observe from the front to ensure the weight is distributed evenly on both feet.
- Line up the back vertebrae (flat back) and keep the head up. The development of force needs to be through a straight line to get a maximal effect.
- Hyper-extend the arms back with the elbow joint extended. Eventually, the arms movement forward will add inertia and force to the overall output of the jump.
- Maintain the nose over the toes and the 'butt' low (maximum 90 degree knee angle) and just off the back of the heels of the feet. This will ensure the center of gravity is lined up over the base (the feet).

Force Producing Phase

- All the body's movements add force and inertia to the direction (height/distance) of the jump.
- Each body movement directly builds onto the next. This will create a straight line of forces that contribute to the final outcome of the jump.
- The shoulder joints flex forward (the degree will depend on the amount of forces required for the jump), the elbow joints flex to 90 degrees.
- The vertebrae must remain aligned. This will allow the force lines to follow a straight and efficient line.
- The weight is shifting forward toward the 'toe box' (balls of the feet). Friction forces are maintained with the ground and balance is ensured.
- The hip and knee joints extend adding inertia to the straight force line of the body.

Critical Instant

- The foot plantar flexes (vertical jump) and/or 'claws' back (horizontal jump) at the ground as the body extends into the air.
- All the other built up forces that the body has accumulated will base off the surface of the ground. Therefore, maximal friction forces with the ground are desirable.
- Forcefully 'blocking' the shoulder joints at 90 degrees will ensure the straight lines needed in the upper body at take-off.

Follow Through / Recovery

- Legs prepare to absorb the weight of the body as it returns to the ground. Decreasing impact forces on the body's joints (ankle, knee, and hip) will decrease injuries over the long run.
- The entire de-summation of forces occurs smoothly, in order, and very quickly.
- The balls of the feet hit first, followed by the heels, ankle flexion, knee flexion, hip flexion. The body will eccentrically contract the associated joint musculature to keep the movement smooth.
- Locking the hip joint and keeping the chin up and level will aid the state of equilibrium at the end point of the landing (complete de-summation).
- Arms are slightly abducted from the body with the elbows bent, which will aid the final balance point.