

Movement Analysis

Levers & Mechanical Advantage

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Lever arm: The bone or body part being moved about a point. It's shown as a straight line on a lever system.



Fulcrum: The joint where the lever arm pivots. It's shown as a triangle.

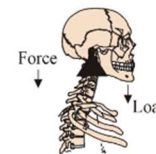
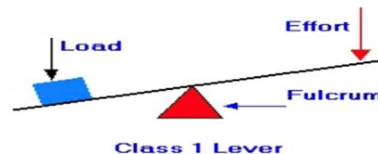
Load: The resistance against the pull of the muscles on the lever arm e.g. your body weight and/or something being lifted. A square is used to represent the load.



Effort: The force applied by the muscles to the lever arm. Shown by an arrow pointing in the direction of the force.



1st class lever: The load and effort are at opposite ends of the lever. The fulcrum is in the middle. E.g. in the neck, when heading a football.



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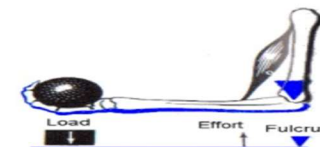
1st class =
Neutral MA. Can
be high or low.

2nd class lever: the fulcrum and effort are at opposite ends of the lever. The load is in the middle. E.g. standing on tiptoes for a free throw in basketball.



2nd class = High
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3rd class lever: the fulcrum and load are at opposite ends of the lever. The effort is in the middle. E.g. bicep curl, at the elbow joint.



3rd class = Low
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Mechanical advantage: Effort arm ÷ Resistance arm

Having a short effort arm allows for faster movements over a larger range whereas having a short resistance arm allows a heavier load to be lifted.

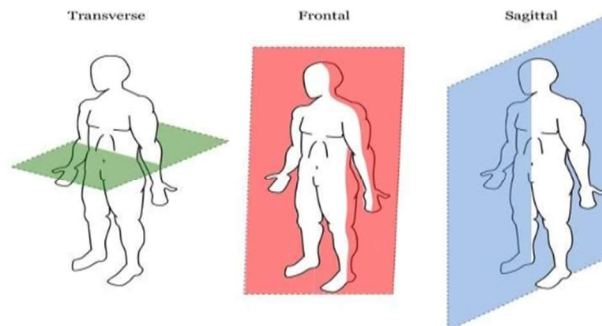
Plane = a line drawn through the body to split it in to two parts.

Axis = an imaginary straight line around which the body rotates.

1. Sagittal plane - through the centre and splits the body into left and right.

2. Frontal plane - separates the front and the back to create a front side and back side.

3. Transverse plane - cuts straight through the hips to divide the top of the body from the bottom.



1. Sagittal plane - forward or backward movement.

2. Frontal plane - side to side movement.

3. Transverse plane - rotational or turning movement.

1. Transverse axis- passes through the body from left to right at the hips.

2. Sagittal axis - passes through the body from back to front, through the belly button.

3. Longitudinal axis - passes vertically through the body from head to toe.

Movement Analysis

Planes & Axis of Rotation

1. Sagittal plane + Transverse axis

Movements in a sagittal plane (forward and backwards) move around a transverse axis.

2. Frontal plane + Sagittal axis

Movements in a frontal plane (side to side) take place around a sagittal axis.

3. Transverse plane + Longitudinal axis

Movements around a transverse plane (rotations) take place around a longitudinal axis.

PLANE	MOTION	AXIS	SPORTING EXAMPLE
SAGITTAL	Flexion/extension	Transverse	Walking, running, squats, bicep curl, leg extensions, front somersaults
FRONTAL	Abduction/adduction	Sagittal	Star jumps, cartwheel, side-bending
TRANSVERSE	Rotations	Longitudinal	Discus and hammer throws, 360 degree twists, ice-skating spin