

THROWING

Purpose of a throw. A throw can be ...

- for max speed —
 - for max distance (shot put, discus)
 - for min travel time (baseball, softball)
- for precision (basketball, darts)
- for large speed and precision (football pass, bowling)

Phases of a throw:

- preparatory phase
- double-support delivery phase ← where projectile gets most of its speed
- follow-through phase

Giving large speed to projectile requires a **large force** on projectile over a **long time** ...

... equivalent to a large force over a **long range of motion**.

Patterns for throwing:

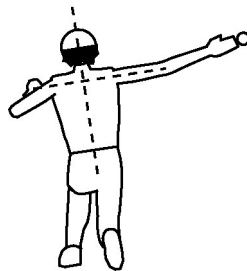
- “simple push” (shot put) ← (it’s not that simple)
- “straight sidearm throw” (discus throw)
- “underarm throw” (softball, bowling)
- “overarm throw” (baseball pitch, football pass, javelin throw)

The overarm throw does not look like most people would think.

It involves:

- external rotation at shoulder
- elbow extension
- stopping of elbow extension
- internal rotation at shoulder
- ball release

Position at release:



Why different patterns?

- underarm: Use it when rules say so.

(NOTE: specialists can reach very large speeds with it.)

- simple push: Use it for very massive objects. Allows to make large force on projectile.

- straight sidearm, overarm: Use for lighter objects.

straight sidearm involves:

- bad leverage ← bad
- long range of motion ← good – with light objects, this more than compensates for the bad leverage.

overarm is similar to straight sidearm, but with extra range of motion. Requires use of different muscles and good grip of object.

In **preparatory** phase, projectile gains some speed, but not much.
Most of the speed gain occurs in **double-support delivery** phase.

Preparatory phase

Goals:

- give some momentum to projectile by start of double-support
- put body at start of double support in a position that will allow long range of motion of projectile during double-support

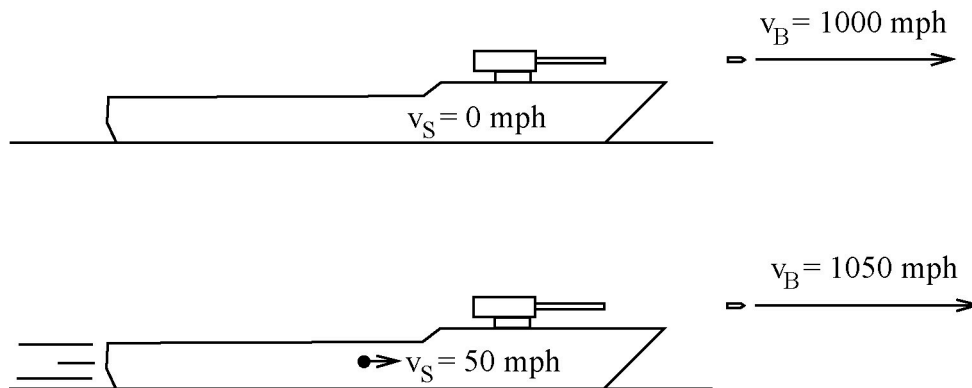
Double-support delivery phase

Goals:

- give a lot of speed to the projectile. This requires:
 - large force on projectile
 - over a long time (=over a long range of motion)

- Leg and trunk muscles are the most important
- Arm muscles are less important

A thrower can be compared to a ship firing a cannon:

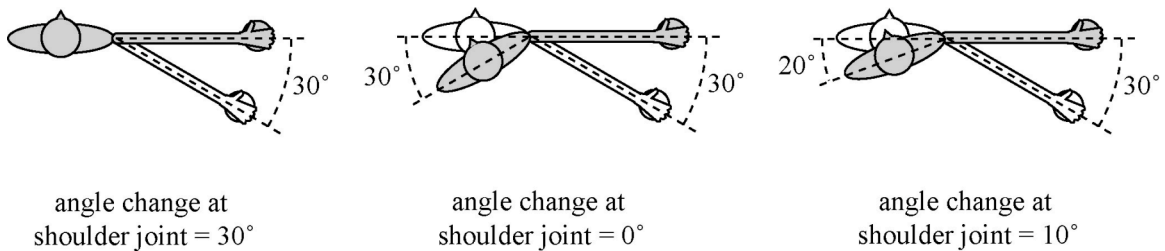


Legs need to provide momentum for the “throwing platform” (the thrower).

More specifically: Legs need to move shoulder of throwing arm in direction of throw.

This:

- provides longer range of motion for the projectile
- helps arm muscles to make larger forces

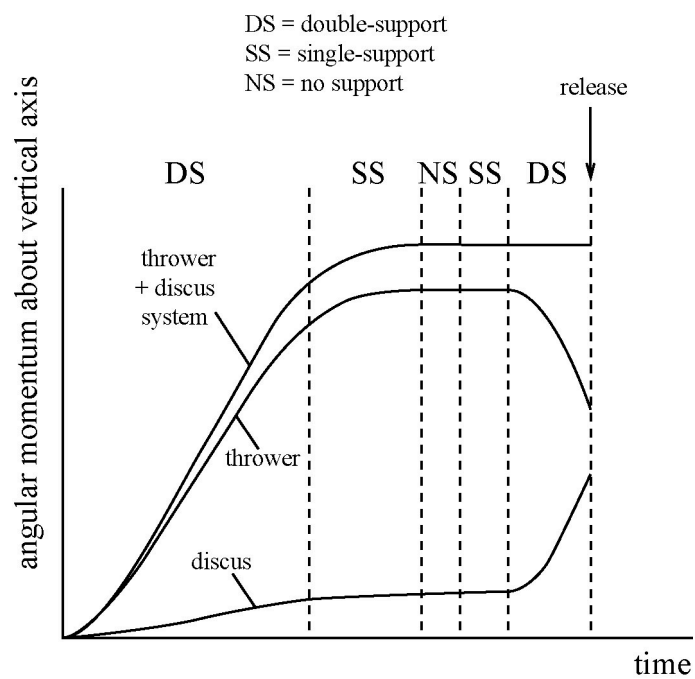


Sequencing

In throwing, muscles normally come into play in the following order:

leg muscles → trunk muscles → arm muscles

New findings



So ...

Preparatory phase

A third goal:

- provide most of the momentum for the thrower+projectile system