

DEADLIFT MECHANICS

A practical biomechanics & technique guide

CORE FRAMEWORK

Setup → Tension → Drive → Lockout → Diagnose

Objectives

- Understand the basic biomechanical demands of deadlifts.
- Use suggested warm-up strategies.
- Compare conventional and sumo mechanics.
- Build a consistent setup and create full-body tension.
- Execute the lift and address common weaknesses.

1. The Biomechanical Demands

SPINAL FLEXOR MOMENT	HIP FLEXOR MOMENT
Demand increases as the horizontal distance between the bar and an intervertebral joint increases. A more inclined torso or longer torso increases spinal extension demands. Major muscles: upper back.	Demand depends on bar weight and how far the hips are behind the system center of mass. Greatest at the beginning and decreases through the lift. Major muscles: glutes and hamstrings.
KNEE FLEXOR MOMENT	GRIP
Driven by the front-to-back distance between the system center of mass and knee joint. Knee demands remain relatively small because the knees cannot track forward very far. Quads anchor the tibia and help maintain knee extension.	Gripping the bar is one of the four basic biomechanical demands and must be maintained throughout the lift.

Body proportions matter

- Longer femurs and/or shorter arms require more torso inclination at the start.
- This places the hips farther behind the bar and can increase hip and spinal extension demands.

What the lats do

- The source does not present the lats as meaningful spinal extensors.
- Lat engagement extends the shoulder slightly, allowing the shoulders to move forward relative to the bar and the hips slightly forward.
- Scapular depression positions the shoulder joint farther down the torso, closer to the hips.
- Overall, lat engagement helps reduce required hip and spinal extension demands.

2. Warm-Up & Pulling Styles

Suggested warm-up sequence

- 90/90 breathing
- Deadbugs
- Hip CARs
- Glute bridges
- KB tall-kneeling glute activation
- KB swings
- Resistance-band front-pulling deadlift pattern
- Single-leg or staggered-stance RDLs

Conventional vs. Sumo

CONVENTIONAL	SUMO
More forward torso inclination ~10% greater demand on back Easier to reposition during lift Easier off floor, tougher lockout	More hip abduction More quad demand Less room for error when out of position Tougher off floor, easier lockout

Setup principles

- **Conventional:** stance around vertical-jump position; load hips and hamstrings with relatively vertical shins; create full-body tension; screw feet into the ground; protect the armpits; brace 360°; use the narrowest grip that avoids knee/arm interference.
- **Sumo:** step wide with heel under knee and shins perpendicular; maintain three points of foot contact; hips over the bar; torso as upright as proportions and flexibility allow; grip straight down at shoulder length.

3. Creating Tension & Choosing a Setup

Why tension matters

- A sudden, maximal jerk from the floor can cause the hips to shoot up and the back to round.
- Create as much whole-body tension as possible before adding the force needed to start the rep.
- Useful cues: “compress the spring” or “pull back the bowstring.”
- Gradually pull harder until the bar feels ready to move, then shift into the next gear.

Three conventional approaches

1 • Hamstrings first

Bend over and grab the bar with slight knee bend; breathe and brace; maintain hamstring tension while pushing hips farther back and lower; lift with chest high. Useful for lifters with greater hip hinge, longer limbs, or higher hip start.

2 • Back tight / spring

Extend spine and push chest high; hinge and bend knees to reach the bar; brace; keep back tight and pull hips lower into position. Emphasizes a more compressed leg position and potentially more quad involvement.

3 • Rock into position

Set up over the bar with weight forward; brace; rock hips back to shift weight over mid-foot and directly over the bar. Presented as the least dynamic setup.

Simplified conventional sequence

- Reach down and pull up on the bar.
- Brace.
- Pull the hips into the bar.
- Tighten the lats / depress the scapulae.
- Drive through.
- Think: wedge yourself underneath.

4. Executing the Lift

Conventional

- Keep the setup position as the bar starts moving.
- Drive the floor away for the first 3–4 inches.
- Push through the whole foot.
- Be patient—do not jerk the bar off the floor.
- Maintain hip position and back angle as you push.
- Hips and shoulders rise together.
- Finish with hip extension without spinal flexion.

Conventional lockout

- Initiate the lockout early, below the knees.
- Bring the hips to the bar.
- Use long arms; finish with glutes and quads flexed and head neutral or tucked.
- Squeeze the glutes and maintain a neutral pelvis.
- Avoid re-flexing the knees.

No hyperextension

- The source describes hyperextension at lockout as unnecessary and without payoff.
- It can cause the knees to re-flex and may reflect an anteriorly tilted pelvis or hamstring-driven strategy.
- Cue a neutral pelvis and glute squeeze; KB swings or cable pull-throughs can be used for practice.

5. Sumo Execution

Start

- Drive the floor away slightly longer—be patient.
- Use the cue “rip the floor in half” to maintain hip and quad tension.
- Keep the knees out and prevent the hips from drifting back.
- Initiate the lockout early, below the knees.
- Use long arms and shoulders to minimize the distance to the bar.

Key concept: patience

Allow small positional adjustments as tension builds. Keep pushing with the legs until the bar begins to move. The first inch or two is described as heavily dependent on quad and leg drive.

Lockout

- Meet the bar and stand tall.
- Finish with glutes and quads flexed.
- Maintain the position created through the start rather than rushing the final portion.

Sumo cue

- Imagine a fault opening between your feet and actively try to pull the floor apart with your hips.
- Maintain that tension as you pull the hips down to the bar and begin driving the bar upward.

6. Diagnosing Weaknesses

Before calling it a strength problem

- The source recommends being able to maintain form up to roughly 70–80% 1RM before assuming the primary limitation is strength.

Bar position & balance

- Too far back on the heels → difficult to drive shoulders back and chest up.
- Too far forward → delayed hip drive, greater tendency to fall forward, and increased likelihood of spinal flexion.
- Target balance: middle of the foot.
- Use an off-the-floor isometric adjustment or paused deadlift to find the natural balance point.
- On heels: raise hips or bend knees more. On balls of feet: rock back, raise hips, and extend knees.

Conventional: off the floor

- If setup feels uncomfortable, the setup may be the main issue.
- Check whole-body tension, breathing/bracing, lat strength, and hip strength.
- Possible accessories: deficit deadlifts, low-pause/halting deadlifts, knee pulls, front squats, weighted jumps.
- Lat-focused options listed: back raises, rack pulls, bent-over rows.
- Hip-focused options listed: RDLs, hip thrusts, good mornings.

7. Weaknesses by Range

Conventional • Midrange

- Most common biomechanically weak area: below to above the knees.
- Potential limitation: hamstring strength.
- Options: RDLs/stiff-leg deadlifts, 2-second pauses just below the sticking point, good mornings/good-morning squats.
- Also check lat strength or lat tightness.

Conventional • Lockout

- Address setup positioning first.
- Round-back lifters may struggle to re-extend the spine; front squats and rack pulls mimic useful positions.
- If spinal extension is available but hip lockout is limited: hip thrusts, kneeling squats with a band around the waist, block pulls.
- Shrugs are listed to help prevent rounded shoulders.

Sumo • Off the Floor

- Commonly the weakest area.
- Focus on both hip extensors and quads rather than assuming one isolated weakness.

Sumo • Midrange

- Weak quads and glutes relative to hamstrings can contribute.
- A frequent technical issue is shooting the hips up too quickly, reducing quad contribution.
- If the bar breaks the floor effectively with the quads, the midrange is described as easier.
- Options: bottom-half paused deadlifts and three pauses (just after breaking the floor, at knee height, and just off the floor on the way down).

Sumo • Lockout

- Potential issue: lack of range-specific strength or technical positioning.
- Options: wide-stance hip thrusts and knee-height rack pulls.
- Check whether the weight is too far forward when the bar clears the knees or whether the stance is too wide.
- Vary rack-pull stance width and toe angle; conventional training can supplement spinal erector work.

8. Quick Coaching Checklist

Before the pull

- Bar balanced over mid-foot.
- Stance and toe angle match the chosen style.
- Brace 360° and create whole-body tension.
- Lats engaged; shoulders positioned appropriately.
- Hips and torso set for the lifter's proportions.

During the pull

- No jerking the bar from the floor.
- Drive through the whole foot.
- Keep hips and shoulders rising together.
- Keep the bar close and maintain setup positioning.
- Use patience through the first inches, especially in sumo.

At lockout

- Bring hips to the bar.
- Stand tall with glutes and quads flexed.
- Keep head neutral or tucked.
- Neutral pelvis—avoid unnecessary hyperextension.
- Do not re-flex the knees.

Source note

This visual guide reorganizes and restyles the information from the provided "Deadlift Mechanics" presentation while preserving its core terminology, sequencing, and coaching points. It does not add outside research.