MEMIC Minute

Why Keep Lifts Between Knees and Shoulders

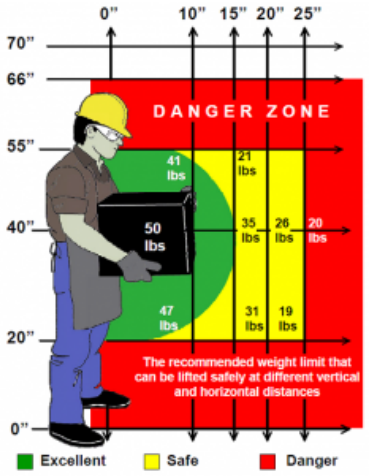
How did this lifting range come into existence? Some might say experience and logic got us here. Actually from past history and research done by the National Institute of Occupational Safety and Health (NIOSH) we arrived at this range using mechanical models and understanding injury causation.

The NIOSH lifting equation calculated a load constant of 51#. This was the starting load that 99% male and 75% of female workers could handle safely in perfect conditions. Perfect conditions rarely exist in our manufacturing and manual lifting worlds.

The NIOSH Lifting Equation accounts for this imperfection and reduces the 51# load constant as risks increase. Once all considerations are accounted for, the final recommended weight limit is calculated. This is often something less than 51#. The healthcare industries as well as some manufacturers are starting to use 35# as a standard. It's a basic recommendation that doesn't account for all risks when lifting.

Why knee and shoulder height?

Above shoulder height the dynamics and forces around the shoulder become poorer and increase, respectively. According to a review of literature by Rhode and Rhode titled Occupational Risk Factors of Shoulder Tendon Disorders 2015, above shoulder height the core/stabilizers become less efficient so we change our body mechanics and the risk of shoulder injury increases dramatically.



The graphic above illustrates safe lift zones and appropriate weights in those zones. The green area is the best zone, often referred to as the power zone. The red zone is the no-lift zone and is appropriately above shoulder and below knee height. The further a worker reaches from the body, the lesser the weight safely handled (yellow zone). In order to avoid the Danger Zone you can see why 35# became the healthcare industry standard and a good recommendation for all lifting environments.

At the lower end of a lift, moving below the knee increases the risk and exposure to the back especially the lumbar region. Early research completed by Al Nachemson with a more recent study by Wilke, Neef, Caimi, Hoogland and Claes illustrated in the following graphic shows the changes in disc pressure with different activities. Note the 3 tallest bars on the right of the graph are lifting activities. Better body mechanics reduces the force and keeping the load off the floor in an upright position reduces the force further.

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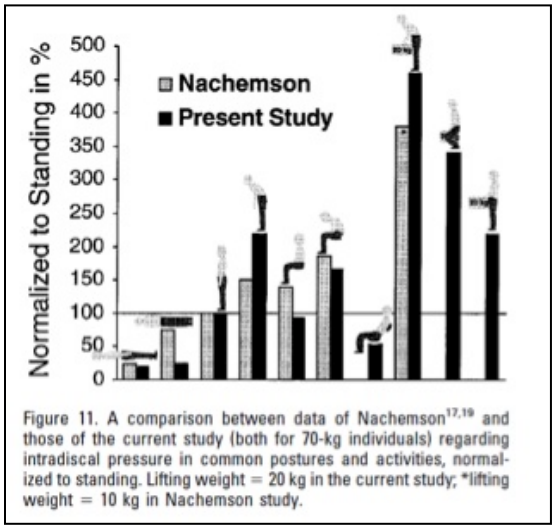

Figure 11. A comparison between data of Nachemson[17,19] and those of the current study (both for 70-kg individuals) regarding intradiscal pressure in common postures and activities, normalized to standing. Lifting weight = 20 kg in the current study; *lifting weight = 10 kg in Nachemson study.

Graphic from: [New In Vivo Measurements of Pressures in the Intervertebral Disc in Daily Life]

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Here's a fact that should make you pause before you lift from the floor. Bending at the waist and reaching to the floor with no weight in the hands increases the pressure in the lumbar disc to around 1000 inch pounds.

NIOSH recommends safe lifts are no greater than 770 inch pounds. Forces beyond 770 inch pounds begin to physically change the health of the disc. Lifting properly can reduce the force but proper technique is a skill rarely mastered or used by workers in a lifting environment.

Through these studies we know the safest lift range is between standing knee and shoulder height. This is a basic guideline not taking into consideration reaches and twists away from the body as well as coupling (grip).

Work environments outside these ranges increase the risks of shoulder and back injuries.

Here are a few simple considerations:

- Keep lifts between knee and shoulder height
- Limit weight to 35#, consider lift assist devices (vacuum lifts)for heavier loads
- Avoid placing work on the floor. Double up pallets to raise load height
- Consider dynamic pallet lifts to keep the load in the best position
- Anything lifted manually over 35# should be a 2 person lift