WHY YOU SHOULD NOT BEND FROM THE WAIST TO PICK UP A LOAD

A weight of 10Kg is placed on a teeter totter. To lift this load, you apply 10 Kg force because the fulcrum is placed in the middle. Place the fulcrum to the right at 1/10 of the length, and the force to lift that same weight becomes 10 times as high.

Fulcrum in the middle - It takes 10Kg force to lift 10Kg

Fulcrum at 10:1 - It takes 10 x 10Kg = 100Kg force to lift 10Kg (not taking the weight of the teeter totter in consideration).
Your back is comparable to the teeter totter in the example above.

Imagine that the striped line is the teeter totter. You upper body weight is approximately 40 Kg.

Bending from the waist to grab the 10 Kg load, the force \( F_1 \) exerted on your lower back becomes \( 10 \times 10 \text{ Kg} + 10 \times 40 \text{ Kg} = 100 \text{ Kg} + 400 \text{ Kg} = 500 \text{ Kg} \) (1100 Lbs).

A heavier person’s upper body may weigh 55 Kg. The force \( F_2 \) exerted on this person’s lower back will be \( 10 \times 10 \text{ Kg} + 10 \times 55 \text{ Kg} = 100 \text{ Kg} + 550 \text{ Kg} = 650 \text{ Kg} \) (1430 Lbs).