



Strong Bones, Weak Bones

How much force is needed to break a bone?

Description

Have you ever broken a bone? Most people break a bone in their body at some time in their life. But how much force is needed to break a bone? In this activity, you will find out how much force is needed to break a chicken bone.

Age Level: 10 and up



How much force is needed to break a bone?

Materials

- 1 or more cooked chicken bones, 5 cm or longer
- 2 tables or desks of the same height
- Heavy string or thin rope, approximately 1 m long
- Duct tape
- Bucket, approximately 12 L (3 gallons) capacity or more
- Bathroom scale
- Heavy objects, such as rocks, bricks, or sand (instead of water)
- Stack of books
- Access to water (optional)



Note

A bucket will be hung from a chicken bone. Water, heavy objects, or both can be added to the bucket to increase the weight of the bucket. The stack of books (approximately 5 cm thick) is used to support the bucket while it's attached to the chicken bone.

Safety

A heavy bucket will be hung from a chicken bone to break it. When the bone does break, the bucket will fall to the ground. Be careful that the bucket will not fall onto anyone's toes, or fall on a floor surface that could be damaged. If water is used to weigh the bucket down, be careful as water could splash out of the bucket when it falls.

Step 1

You will test the strength of a recently cooked chicken bone. Clean any bits of meat, tendon, and connective tissue off the bone.



Step 2

Move the two tables or desks so there is only a 3-cm gap between their edges.



Step 3

Place the chicken bone across the gap, so each end of the bone rests on the edge of one table or desk. Using duct tape, tape each end of the bone to a table. Tip: Duct tape can sometimes leave sticky residue, or damage some surfaces. Be sure you have permission to apply duct tape before doing so.



Step 4

You will use the weight of a bucket and its contents to try to break the bone in half. The bucket will hang from the chicken bone by a string or rope. Predict how heavy the bucket needs to be to break the bone.



Step 5

Place a short stack of books (about 5 cm high) on the ground directly below the bone. Set the bucket on top of the stack. Tip: This stack of books is used to hold up the bucket while you attach the string from the bucket to the bone. Once the books are removed, the bucket will fall this short distance to the ground.



Step 6

Tie the string or rope from the bucket handle to the bone. The handle should be upright, as in the photo. Make sure the rope is somewhat tight and the knots are secure.



Step 7

Lift up the bucket and move the books out of the way. Let the bucket hang from the bone. Slowly add water, sand, or bricks to the bucket so its weight gradually increases. Be careful, as the bone could break at any moment and the bucket will fall to the ground!



Step 8

Once the chicken bone breaks, weigh the bucket on the bathroom scale. How much does the loaded bucket weigh? Was your prediction correct? If you have more chicken bones, try this experiment again!



What's Going on?

"A typical chicken bone can withstand 150-200 Newtons (35-50 pounds) of force. The bone you broke may have been able to take slightly less or more force.

You may have noticed that the bone started to bend slightly before it broke. Bones seem stiff and rigid, but they're slightly flexible too. Calcium, a mineral in bones, keeps them rigid, while collagen, a protein in bones, gives them some flexibility. Both these properties are important. Rigid bones let us stand upright and walk around. Flexible bones bend slightly when force is applied, and so do not break instantly."



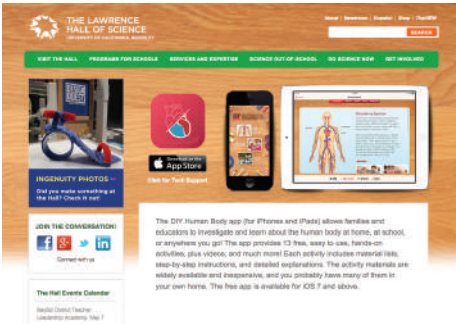
Exercise is Good for the Bones

Your bones get stronger when you use them, just like your muscles. Any kind of exercise is great for your whole body, but the best ones for your bones are weight-bearing activities like walking, running, hiking, dancing, tennis, basketball, gymnastics, and soccer. Swimming and bicycling make you healthier, but are not weight-bearing exercises & won't help build your bone density.

So join a sports team or head out for a walk with your family! The most important thing is to get up and move more. Alone or with your friends and family, indoors or outdoors, one of the best things you can do for your bones and your health is start a lifelong habit of physical activity.



Learn More



For more info and other activities, visit:

LawrenceHalofScience.org/do_science_now/diy_human_body

Credits



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THE LAWRENCE
HALL OF SCIENCE

This activity from the DIY Human Body app allows families to investigate and learn about the human body at home or on the go! The app features thirteen hands-on investigations, as well as images & videos.

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