Beans in Space

What's it like to work out in space? Earth's gravity makes your muscles work harder because it is constantly pulling on your muscles. But on the International Space Station there is no gravity to pull on your muscles so they don't work as hard. This can cause "muscle atrophy" – or weaker muscles. Astronauts have to work out almost 2 hours every day on special machines to keep their muscles in shape so that they are strong when they return to Earth's gravity.

In this model, you and your child will compare the mass of an object on Earth to the mass of an object in space to understand why our muscles get more of a work out on Earth, and why astronauts experience muscle atrophy.

What You Need:

- 2 opaque non-breakable containers (coffee cans work well)
- Tape (to seal the containers)
- 3 cups of beans (for the Earth can only)
- Paper or foam to stuff inside the Earth can so that the beans don't rattle
- Labels for each can

What to Do:

- Ask your child to hold the Earth can in one hand and the Space can in the other hand. Have them pretend the can of beans on the Space Station weighs what it would if they were actually on the Space Station.
- Ask your child if 1,559 beans weigh the same in space as 1,559 beans weighs on Earth. Nope! In microgravity on the Space Station stuff floats – it doesn't weigh anything at all! So, 1,559 beans on Earth weigh more than 1,559 beans in space.
- Ask your child if the mass – the amount of stuff – is the same on Earth as it is in Space. Yup! A can of beans or a toothbrush or a human has the same mass in space – the same amount of stuff - but none of these things weighs anything on the Space Station! Mass remains constant no matter where you are – Earth, Space, Moon.
- What might cause the same amount of stuff to have a different weight on Earth versus in space? Gravity! Earth's gravity "pulls" on objects, giving them weight. On the Space Station (because it and everything on it is in constant free fall together) objects do not weigh anything. There is no (apparent) gravity pulling on objects to give them weight. What does your child weigh on Earth? On the Moon his/her weight would be 1/6 because the Moon is smaller and has less mass so it has a smaller gravitational pull.

Now invite your child to lift the cans up and down 20 times. Which can gave his/her muscles more of a workout?

Parent Prompts:

If your muscles aren't having to do any work (to fight the force of gravity), will they become weaker or stronger?

Why do astronauts have to work out in space?

How much work is it to lift a weightless weight?

What can you do to keep your muscles strong and healthy?