



# Beans in Space

## Facilitator Background Information

Astronauts may seem to have a lot of fun in microgravity — doing flips in mid-air, pushing off effortlessly from one part of the spacecraft to sail to another part. However, there are some down sides for astronaut health!

On Earth, our muscles have to work when we walk and run and jump. Earth's gravity pulls against us, making our muscles work hard — and keeping them strong! On the Space Station objects have no weight — and little effort is required of our muscles to lift things or move around. Standing, walking, and even breathing on Earth requires more muscle strength than in space. Because we don't need as much muscle in space, our body stops maintaining them — our muscles atrophy. Astronauts have to exercise about 2 hours a day to force their muscles to work and stay healthy for their return to Earth. Even with the exercise, astronauts still experience some muscle loss and have to build their muscles when they are back home on Earth.

We'll face the same challenges on the Moon and Mars, though not so severely; the Moon's gravity is about 1/6th that of Earth's and Mars has about 1/3rd the gravity. So, our muscles will get a bit of a workout on the Moon and Mars, but we will still need to exercise more to ensure that we are healthy when we return to Earth.

In everyday conversation, the words "Mass" and "weight" are often used interchangeably; however, they are very different things. The mass of an object is simply how "much" there is of it — the amount of matter it contains, and that remains constant no matter where it is.

Weight, however, depends on gravity. Because Earth's gravity is larger than the Moon's gravity, an object of the same mass will weigh more on Earth than on the Moon. It will weigh considerably less, almost nothing, in the microgravity environment of the Space Station.