

MISSION X

TRAIN LIKE AN ASTRONAUT



CREW STRENGTH TRAINING

Team Leader Guide

MISSION OVERVIEW

Students will perform a series of body-weight squats and push-ups and repeat as many times as possible.

LEARNING OBJECTIVES:

- Develop upper and lower body strength in muscles and bones.
- Make and record observations about improvements in strength training.

Skills: strength, endurance, team encouragement, spatial awareness.

INTRODUCTION



↑ ESA astronaut Alexander Gerst uses the International Space Station's Advanced Resistive Exercise Device (ARED) to stay fit by simulating weightlifting using air pressure instead of traditional weights.

Astronauts need strong muscles and bones to perform tasks while exploring space and the Lunar or Martian surface. They must be able to lift, bend, build, manoeuvre and even exercise during a mission. Both the Moon and Mars have enough gravity to require strong muscles and bones for these tasks. If a crew member happens to trip and fall, the strength of their muscles and bones can mean the difference between getting up and returning to work or having to end the mission and return back to Earth.

On Earth, the strength of muscles and bones is important to being physically fit and healthy. Due to the microgravity environment in space, severe muscle atrophy or bone loss can occur which would mean a crew member might fail to recover their pre-flight physical condition back on Earth. Therefore, astronauts do regular exercise and strength training before, during, and after a mission to keep their muscles and bones strong.

Performing multi-joint weight-bearing exercises, such as the push-up for upper body strength and the squat for lower body strength, can help develop stronger muscles and bones, for astronauts and your students!

FAST FACTS

Subject: Physical Education

Age: 8-12

Lesson Time: varies, typically averages 15 minutes.

Location: classroom, outdoors or in the gymnasium.

LET'S TRAIN LIKE AN ASTRONAUT!



MATERIALS

Team Leader

- Watch or stopwatch

Student

- Mission Journal and pencil

Optional to be used in Mission Adaptations

- Resistant bands or cords
- Hand weights
- Weight bars
- Canned goods weightlifting
- Medicine balls

PROCEDURE

1) Body weight squats

- Starting position: Students stand with their feet shoulder apart, back straight, looking forward and arms at their side.
- Procedure: Students lower their bodies, bending their knees while keeping their back straight (as if sitting). They can raise their arms forward for balance as they squat. At the bottom of the motion, their upper legs should be close to parallel with the floor and their knees should not extend past their toes. They come back up to the starting position and repeat these squats 10 to 25 times. Students rest for 60 seconds before continuing with the push-ups.

SET-UP

Students should be at least an arm's length apart from each other.



2) Push-ups

- Starting position: Students lie down on the floor on their stomachs and place their hands on the floor, under their shoulders, shoulder width apart. From there, they move their body up from the ground with only their toes and hands touching the floor. Arms are straightened.
- Procedure: Students lower their body so that their arms are bent, and their body is parallel to the ground, not touching it. The feet don't move on the ground. After that, they return to the starting position and repeat these push-ups 10 to 25 times.



This entire routine of strength training should be repeated two more times, resting for at least 60 seconds before repeating the course.



THINK SAFETY

- Remind students to continue breathing normally while conducting each part of the physical activity.
- Always stress proper technique while performing exercises. Improper technique can lead to injury.
- Avoid uneven surfaces.
- Wear appropriate clothes and shoes that allow students to move freely and comfortably.
- Proper hydration is important before, during, and after any physical activity.
- Be aware of the signs of overheating.
- A warm-up/stretching and cool-down period is always recommended.

MISSION ADAPTATIONS



Increase Difficulty

- Increase the time in which the body weight squats and pushups are performed.
- Repeat the body weight squats activity only this time students hold an object in both hands while straightening the arms.
- Perform less squats in but hold each squat for 30 seconds.
- Complete 10-25 pushups on a balance ball. You will balance your body on the exercise ball and push off with your hands to complete one push-up.
- In push up position, alternate right and left hand crossing midline to touch opposite shoulder, keeping plank; attempt in wall push up position.
- Add more strength exercises using tools like resistant bands or cords, hand weights, weight bars...



Increase Accessibility

- Wheelchair push-up: Seated in chair with arms. Place hands on arm rests and lift body. Hold this position and come back to rest. Repeat this push-up 10 to 25 times.
- In a chair or at bench edge, hold, breathe, and squeeze abdominal muscles, hold, breathe and repeat again.



Decrease Difficulty

- Decrease the time in which the body weight squats and push-ups are performed.
- Students can perform the push-up with their knees on the ground, for extra support.



This resource has been adapted from NASA's "Crew Strength Training".

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