



# DO A SPACEWALK!

*A NASA Train Like an Astronaut Mission Handout – Educator Guide*

## Learning Objectives

Students will

- perform the “bear crawl” and “crab walk” to increase muscular strength and improve upper and lower body coordination.
- record observations about improvements in muscular strength and coordination during this physical experience in the Mission Journal.

## Introduction

In space, astronauts must be able to perform physical tasks that require muscle strength and coordination. One task that certain astronauts must be able to complete is an Extra Vehicular Activity (EVA), or spacewalk. Spacewalks allow a crew member to examine the outside of space vehicles (like the space shuttle and the International Space Station) and make repairs or modifications to the vehicle if necessary.

Although safely tethered to the space vehicle, the conditions under which a spacewalk is completed can be long and strenuous for the crew member. An astronaut must manipulate his or her fingers within large, thick gloves – sometimes for hours at a time. A spacewalk also involves coordinating arm and leg movements to move around, or “translate”. Astronauts prepare for EVAs by practicing these strenuous tasks and movements underwater at the Neutral Buoyancy Laboratory at NASA Johnson Space Center. By training on Earth, crew members learn to rely on their upper body strength and coordination to pull and secure themselves close to the vehicle and to complete their assigned tasks in space.

On Earth, muscle strength and coordination are important to being physically fit and help us perform a variety of everyday tasks. An increase in muscular strength and coordination can be developed by practicing exercises such as the “bear crawl” and the “crab walk”. Use the information below to help administer the Train Like an Astronaut Mission Handout and help your students **train like an astronaut**.

## Administration

Follow the outlined procedure in the Do a Spacewalk! Mission Handout. The duration of this physical activity can vary, but will average **25 minutes**. In order for students to perform at their maximum potential, positive reinforcement should be used throughout the activity.

## Location

This physical activity should be conducted on a smooth, flat, and dry surface, at least 12 m (40 ft) in length.

*The use of a closely placed metronome may assist small groups in keeping cadence in the repetitions.*

## Set-up

Students should maintain an arms length distance from each other.

## Equipment

- Mission Journal and pencil
- tape measure or meter stick

Optional equipment:

- watch or stopwatch

*For physical activity, students should wear loose-fitting clothing that permits freedom of movement.*

## Safety

- The traveled surface should be smooth, flat, and dry as students will be placing their hands on the floor.
- Proper distance between students will ensure safety for hands and feet and will help prevent collisions.
- 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.

*For information regarding warm-up/stretching and cool-down activities, reference the Train Like an Astronaut (ages 6-17) from the President's Council on Physical Fitness and Sports at <http://www.presidentschallenge.org/pdf/getfit.pdf>.*

## Monitoring/Assessment

Ask the Mission Question before students begin the physical activity. Have students use descriptors to verbally communicate their answers.

Use the following open-ended questions **before, during, and after** practicing the physical activity to help students make observations about their own physical fitness level and their progress in this physical activity:

- How do you feel?
- How far did you go?
- How does the “bear crawl” feel different from the “crab walk”?
- What do your arms and legs feel like now compared to when we first tried this physical activity together?
- Where is the energy you are using coming from?
- Why might muscular strength and coordination be important for a spacewalk?
- If you were doing a spacewalk, do you think you would feel the same way as you do on Earth?

Some quantitative data for this physical activity may include:

- rate of perceived exertion (on a scale of 1-10)
- length of time activity was performed without rest
- distance traveled
- length of rest period

Some qualitative data for this physical activity may include:

- technique performance
- identifying soreness in body parts
- identifying shakiness or muscle cramping

## Collecting and Recording Data

Students should record observations about their physical experience developing muscular strength and coordination in their Mission Journal before and after the physical activity. They should also record their physical activity goals and enter qualitative data for drawing conclusions.

- Monitor student progress throughout the physical activity by asking open-ended questions.
- Time should be allotted for students to record observations about their experience in their Mission Journal before and after the physical activity.
- Graph the data collected in the Mission Journal on the graph paper provided, letting students interpret the data individually. Share graphs with the group.

## Progression

For this activity, students should initially be instructed to move by alternating their moving arm opposite of their moving leg. Later they may prefer to challenge their coordination by moving their arm in sync with the leg on the same side of the body.

- Increase the time over a given distance.
- Increase the distance over a given time.
- Change direction when a whistle is blown.

Students should practice the Mission Handout physical activity several times before progressing or trying the related Mission Explorations.

## National Standards

National Physical Education Standards:

- Standard 1: Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities.
- Standard 2: Demonstrates understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities.
- Standard 3: Participates regularly in physical activity.
- Standard 4: Achieves and maintains a health-enhancing level of physical fitness.
- Standard 5: Exhibits responsible personal and social behavior that respects self and others in physical activity settings
- Standard 6: Values physical activity for health, enjoyment, challenge, self-expression, and/or social interaction.

National Health Education Standards (NHES) Second Edition (2006):

- Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.
  - o 1.5.1 Describe the relationship between healthy behaviors and personal health.
- Standard 4: Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.
  - o 4.5.1. Demonstrate effective verbal and non-verbal communication skills to enhance health.
- Standard 5: Students will demonstrate the ability to use decision-making skills to enhance health.
  - o 5.5.4 Predict the potential outcomes of each option when making a health-related decision.
  - o 5.5.6 Describe the outcomes of a health-related decision.
- Standard 6: Students will demonstrate the ability to use goal-setting skills to enhance health.
  - o 6.5.1 Set a personal health goal and track progress toward its achievement.
- Standard 7: Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.
  - o 7.5.2 Demonstrate a variety of healthy practices and behaviors to maintain or improve

personal health.

## National Initiatives and Other Policies

Supports the *Local Wellness Policy*, Section 204 of the Child Nutrition and WIC Reauthorization Act of 2004 and may be a valuable resource for your Student Health Advisory Council in implementing nutrition education and physical activity.

## Resources

For more information about space exploration, visit [www.nasa.gov](http://www.nasa.gov).

To learn about exercise used during past and future space flight missions, visit <http://hacd/jsc.nasa.gov/projects/ecp.cfm>.

Access fitness-related information and resources at [www.fitness.gov](http://www.fitness.gov).

View programs on health and fitness:

Scifiles™ The Case of the Physical Fitness Challenge  
<http://www.knowitall.org/nasa/scifiles/index.html>.

NASA Connect™ Good Stress: Building Better Bones and Muscles  
<http://www.knowitall.org/nasa/connect/index.html>.

For guidelines for fluid replacement and exercise:

National Athletic Trainer's Association (NATA)

- Fluid Replacement for Athletes (Position Statement)  
<http://www.nata.org/statements/position/fluidreplacement.pdf>

For information on warm-up and cool-down stretches, visit:

American Heart Association (AHA)

- Warm-up and Cool-down Stretches  
<http://americanheart.org/presenter.jhtml?identifier=3039236>

For information about rate of perceived exertion (RPE), visit:

Centers for Disease Control and Prevention (CDC)

- Perceived Exertion  
[http://www.cdc.gov/nccdphp/dnpa/physical/measuring/perceived\\_exertion.htm](http://www.cdc.gov/nccdphp/dnpa/physical/measuring/perceived_exertion.htm)

## Credits and Career Links

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