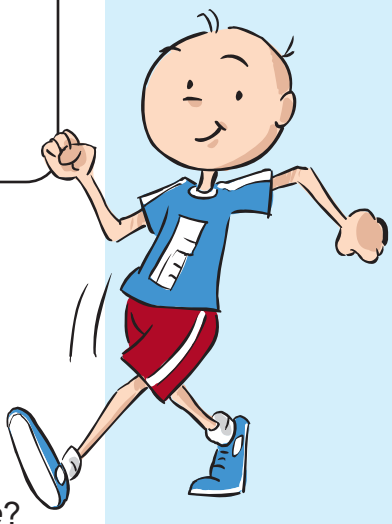
MISSION X: MISSION HANDOUT

YOUR MISSION: Base Station Walk-Back

You will perform a walk, progressing to 1600 m (1 mi) to improve lung, heart, and other muscle *endurance*. You will also record observations about improvements in this *walk-back* physical *endurance* experience using your lungs, heart, and other muscles in your Mission Journal.



Being physically active is an important way to keep your muscles strong and your heart and lungs healthy. When you are shopping at the mall, touring a museum, or on the way to and from class at school, your muscles, heart, and lungs benefit. They get stronger by being worked for long periods of time.

MISSION QUESTION: How could you perform a physical activity that would improve lung, heart, and other muscle *endurance*?

MISSION ASSIGNMENT: Endurance Training

- ◯ Measure a course with the following distances:
  - 400 m (¼ mi)
  - 800 m (½ mi)
  - 1200 m (¾ mi)
  - 1600 m (1 mi)

  This could be laps around the playground, track, gym, or your neighborhood.

- ◯ At your own pace, walk, jog, or run the measured distance.
  - Start by trying to complete 400 m (¼ mi).
  - Slowly work to increase the distance by 400 m (¼ mi).
  - Over time, your goal should be to complete 1600 m (1 mi).

- ◯ Record observations before and after this physical experience in your Mission Journal.

Follow these instructions to train like an astronaut.

Base Station:
A home-base on the moon or Mars where astronauts will be stationed.

Endurance:
The ability to perform an exercise or a physical task over a long period of time.

Rover:
A go-cart-like vehicle that astronauts drive on the moon and potentially the Mars surface.

Walk-Back:
The task of walking a distance up to 10 km (6.2 mi) which astronauts must be able to complete to in order to return to their base station.

It's a Space Fact:

When exploring the moon or Mars, astronauts will complete many physical tasks such as setting up science experiments and power systems around the base and collecting rock samples. They will also walk or drive the *rover* long distances in order to explore the surface. If their *rover* breaks down, they must be able to walk up to a distance of 10 km (6.2 mi) back to their base station. Astronauts are examined by research scientists in NASA's Cardiovascular Laboratory and they train with NASA strength and conditioning specialists to strengthen their lungs, hearts and other muscles before their mission. This helps NASA to know the crew member is physically prepared to complete their mission tasks and to perform a *walk-back*, if necessary.

Fitness Accelerations

- Sprint 100 m (110 yards) then walk 100 m (110 yards). Repeat this four times.
- Sprint intervals on a basketball court. Sprint 13 m (42 ft) touch the floor with your hand and reverse immediately to where you started and touch the floor. Sprint 22.6 m (74 ft) Touch the line with your hand and reverse immediately to where you started. Do this two times.
- Repeat the above intervals, this time increase the distance by doing the intervals four times instead of two.

By improving your ability to walk a measured distance, you may find that running a race, walking uphill, or carrying a heavy backpack while walking will become easier over time.

Think Safety!

- **Astronauts must be careful of overheating due to the release of body heat while wearing a thick spacesuit.**
- Always wear appropriate clothes and shoes for walking.
- Avoid obstacles, hazards, and uneven surfaces.
- Remember that drinking plenty of water is important before, during, and after physical activities.

Mission Explorations:

- Perform the activity as a relay team event.
- Trail walk or hike a measured distance.
- Compete in "fun-runs", races, or join a track team.
- Walk with your family or friends instead of using other transportation.

Status Check: Have you updated your Mission Journal?

Train Like an Astronaut: Adapted Physical Activity Strategies

Base Station Walkback

YOUR MISSION

You will perform a walk, progressing to 1600 m (1 mi) to improve lung, heart, and other muscle endurance. You will also record observations about improvements in this walk-back physical endurance experience using your lungs, heart, and other muscles in your Mission Journal.

LINK TO SKILLS AND STANDARDS

APENS: 3.09.08.01 Understand the different types of direct and indirect determinations of muscular strength, endurance, and flexibility tests for individuals with disabilities

Activity Specific Terms/Skills
Endurance, Strength, Orientation, Mobility

SPACE RELEVANCE

When exploring space, astronauts complete many physical tasks. When on a planetary surface, if their vehicle breaks down astronauts must be able to walk a distance of up to 10 km (6.2 mi) back to their base station. To help NASA know crew members are physically prepared to complete their mission tasks or perform a walk-back procedure, astronauts train by running and lifting weights to improve their overall physical fitness.

WARM-UP & PRACTICE

Warm-Up

- Aerobics or dancing for 2 minutes
- Jumping in place
- Moving arms in circles
- Scooters (in a relay)

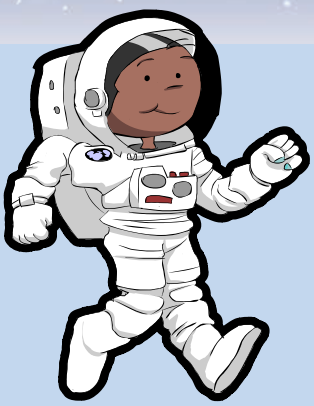
Practice

- Walk around for 2 minutes, increase the pace and/or distance
- Move your arms for 2 minutes, increase the speed and/or time
- Practice one task of the entire activity

SUGGESTED ADAPTED EQUIPMENT:

- TIMER/ STOP WATCH
- PEDOMETER/ACCELEROMETER
- MEASURING WHEEL OR TAPE
- EXTRA-LARGE COLORED COUNTING CRAFT STICKS
- STICKERS

Base Station Walkback



LET'S "TRAIN LIKE AN ASTRONAUT!"

Adjust steps and procedures as appropriate for participants

Instructions for individual play:

- Measure a course with the following distances:
  - 400 m (¼ mi), 800 m (½ mi), 1200 m (¾ mi), 1600 m (1 mi)
  - This could be laps around the playground, track, gym,or your neighborhood.
- At your own pace, walk, jog, or run the measured distance.
- Start by trying to complete 400 m (¼ mi).
- Slowly work to increase the distance by 400 m (¼ mi).
- Over time, your goal should be to complete 1600 m (1 mi).
- Record observations before and after this physical experience in your Mission Journal.

TRY THIS! *Some ideas for Adapted Activity*

- Ergometers (upper body)
- Stationary bike
- Bicycle motion with legs or arms
- Modify or accumulate distances
- Scooters
- Use Rockport Walk Test
- Swim
- Vary distances or areas to walk, jog, run, self-propel
- Offer incentives (desired objects) for performer to earn to complete distance (stickers, colored counting craft sticks)
- Use verbal cues/caller, tether rope, or sighted guide
- Select brightly colored items: cones, markers; or use sound emitting columns for performer to follow; color choice is dependent on performers needs
- Perform with assistance partner (push in wheelchair or stabilize walker in support via hand over hand assistance)

BASE STATION WALK-BACK

Learning Objectives

Students will

- perform a walk, progressing to 1600 m (1 mi) to improve lung, heart, and other muscle *endurance.*
- record observations about improvements in this walk-back physical endurance experience using their lungs, hearts, and other muscles in the Mission Journal.

Introduction

Whether exploring the cratered moon or the rocky terrain of Mars, astronauts will require the assistance of mechanical transportation, such as a go-cart like vehicle called the “rover”. The rover will assist with carrying sample collections, transporting crew members, and other daily operations. NASA sets limits (up to 10 km or 6.2 mi) on how far the rover can be driven from the base station in case of mechanical problems. Crew members must be physically capable of a walk-back to the base station if necessary.

Before their mission, astronauts undergo training (under the supervision of NASA Astronaut Strength, Conditioning and Rehabilitation Specialists) to ensure they are physically capable of performing normal, as well as unexpected mission tasks, such as a “walk-back”. Walking or jogging can improve muscular endurance and heart and lung endurance, also known as cardiorespiratory endurance. Regular exercise on Earth, and in space, helps crew members maintain strong physical performance levels.

A major factor that can impact performance for astronauts during a walk-back is their space suit. During exercise, the body heats up and the evaporation of perspiration is used to help reduce the body’s temperature. In the space suit, the perspiration does not evaporate and cooling is necessary with a liquid cooling garment (a form-fitting garment the astronaut wears under the space suit that contains tubes with water circulating to cool the body and reduce core temperature.) NASA engineers and scientists also make sure crew members get plenty of practice moving and "walking" in their spacesuits. They practice numerous tasks underwater at the Neutral Buoyancy Laboratory at NASA Johnson Space Center to simulate a reduced gravity environment.

NASA also employs different tools and types of research to better understand the physical endurance needed for a walk-back. NASA scientists use bed rest, lying down for up to 90 days, as a way to simulate reduced gravity. Engineers have designed a vertical treadmill to allow bed rest subjects to walk on the treadmill from a lying down position that can simulate lunar gravity. Researchers use these simulations to better understand how walking on the moon is similar to and different from walking on Earth. This knowledge is important when preparing the astronauts for spaceflight and during the development of space suits and mission plans.

Although working in a space suit cannot be avoided, physical conditioning can help crew members perform at their best. Muscular and cardiorespiratory endurance are two components of fitness that can be improved just by walking. Use the information below to help administer the Fit Explorer Mission Handout and help your students **train like an astronaut**.

Administration

Follow the outlined procedure in the Base Station Walk-Back Mission Handout. The duration of this physical activity can vary, but will average **15-30 minutes**. In order for students to perform at their maximum potential, positive reinforcement should be used throughout the activity.

School educators: Try using this physical activity daily as an afternoon pick me up!

Location

- This physical activity should be conducted on a safe walking surface.
- Students might measure the distance from their classroom to the gymnasium, cafeteria, playground, or bus stop for use in this physical activity.

To measure distance, educators may use a walking wheel, access internet tools, or provide a wearable pedometer to students.

Equipment

- Mission Journal and pencil

Optional equipment:

- watch or stopwatch
- heart rate monitor
- pedometer
- walking wheel

Hint: If any of the data collection devices listed is new to the students, consider familiarizing the students with that instrument a few days before the physical activity begins.

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

Safety

- Always stress proper technique while performing exercises. Improper technique can lead to injury.
- 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 Get Fit and Be Active Handbook (ages 6-17) from the President's Council on Physical Fitness and Sports at http://wwwpresidentschallenge.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 get?
- What happened to your heart rate?
- Where is the energy you are using coming from?

- What do your legs feel like now compared to when we first tried this physical activity?
- Can you describe how your breathing changed during the physical activity?
- How did your body cool itself during the physical activity?
- How well would your body cool itself if you were wearing a thick coat?
- What are some challenges astronauts might face in completing a walk-back to their base station?
- How might these challenges affect their ability to perform the walk-back?

Some quantitative data for this physical activity may include:

- heart rate (beats per minute)
- respiration rate (breaths per minute)
- rate of perceived exertion (on a scale of 1-10)

Some qualitative data for this physical activity may include:

- identifying amount of sweat or thirstiness
- identifying soreness in body parts

Collecting and Recording Data

Students should record observations about their physical experience with muscular and cardiorespiratory endurance 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 the 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.

Apply a little mathematics! Convert the course of one mile to feet, yards, meters, or kilometers. (http://www.onlineconversion.com/length_common.htm)

Fitness Acceleration

- Sprint 100m (110 yards) then walk 100m (110 yards). Repeat this four times. *Students may also Sprint the distance around they gym floor. A standard elementary gym floor measures at 22.56m (74ft) in length and 13m (42ft) wide.*

- Sprint intervals on a basketball court. Sprint 13 m (42 ft) touch the floor with your hand and reverse immediately to where you started and touch the floor. Sprint 22.6 m (74 ft) Touch the line with the hand and reverse immediately to where you started. Do this two times. *This exercise is considered to be intervals on the basketball court. 13m (42ft) is the distance to the half court line on a standard elementary school basketball court. 22.6m (74ft) is the distance of the entire standard elementary basketball court. Remind student about safety and not to over exert themselves. Touching the line with the hand will force the student to slow down and not run into the wall and the end of the court at*

full speed. Running foul line to foul line is also a safety option to keep them from running into the gym walls at full speed.

- Repeat the above intervals, this time increase the distance by doing the intervals four times instead of two.

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.
    - 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.
    - 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.
    - 5.5.4 Predict the potential outcomes of each option when making a health-related decision.
    - 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.
    - 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.
    - 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.

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.

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 to prevent heat-related illnesses:

National Athletic Trainers' Association (NATA)

- Exertional Heat Illnesses (Position Statement)
  http://www.nata.org/statements/position/exertionalheatillness.pdf
- How to Recognize, Prevent & Treat Exertional Heat Illnesses
  http://www.nata.org/newsrelease/archives/000056.htm

American College of Sports Medicine (ACSM)

- Exertional Health Illness during Training and Competition
  http://www.acsm-msse.org/pt/pt-core/template-journal/msse/media/0307.pdf

Centers for Disease Control and Prevention (CDC)

- Extreme Heat: A Prevention Guide to Promote Your Personal Health and Safety
  http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp

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

American College of Sports Medicine (ACSM)

- Exercise and Fluid Replacement
  http://www.acsm-msse.org/pt/pt-core/template-journal/msse/media/0207.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

For guidelines on heart rate and exercise, visit:

Centers for Disease Control and Prevention (CDC)

- Target Heart Rate and Estimated Maximum Heart Rate
  http://www.cdc.gov/nccdphp/dnpa/physical/measuring/target_heart_rate.htm

American Heart Association (AHA)

- Target Heart Rates
  http://www.americanheart.org/presenter.jhtml?identifier=4736

To measure a walking/running distance near you, visit http://www.walkjogrun.net.

Credits and Career Links

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