AGILITY ASTRO-COURSE

A NASA Train Like An Astronaut Mission Handout – Instructor Guide

Learning Objectives

Students will:

- complete an agility course as quickly and as accurately as possible to improve movement skills, coordination, and speed; and
- record observations about improvements in agility during this physical experience in the Mission Journal.

Introduction

Agility is the ability to rapidly change direction without losing speed, balance, or body control. Agility training is part of an astronaut's endurance training. However, astronauts are not the only people who need to be agile. If one wants to last longer on the dance floor, or be a better athlete agility is key. Agility training reduces your risk of injury and helps build endurance which helps one make it through a single game and sometimes an entire season by giving more flexibility. This allows your body to accept the challenges that come with any physical activity.

Everyday we come into situations where agility helps us. If you ride a bike, skateboard, play videogames, roller blade, or play any type of sports, you must rely on your agility to be successful in these activities. For example, in the game of basketball having good agility skills is extremely important in order to reduce or eliminate turnovers. Basketball players are always starting, stopping, and changing directions and speeds. Basketball champions don't become champions without doing agility training. You can improve your performance in any sport or physical activity by practicing agility drills.

Just like an athlete, it is necessary for an astronaut to do strength and agility training. The healthier and stronger the astronaut is, the better they will perform during a space mission and when they return to Earth. Astronauts go through vigorous fitness training before each mission to prepare their bodies for space flight. Astronauts lose agility while spending time in space because they are in a microgravity environment for an extended period of time and do not have to change directions quickly.

An overall strength, conditioning, and rehabilitation program is designed to enable the astronauts to meet the physical demands of space missions as well as keep them healthy for their return to Earth's gravity. Astronaut Strength, Conditioning & Rehabilitation (ASCR) Specialists conduct annual fitness assessments on the astronauts, prescribe individualized exercise programs, and provide one-on-one pre-flight and post-flight conditioning activities which increase strength and agility.

Astronauts who stay in space for 4-6 months are assessed on their physical agility before and after a space mission. ASCR specialists focus on an astronaut's balance, coordination, as well as their agility. Long periods of time in space, can affect the astronaut's ability to react to normal situations on Earth in a timely manner. To help astronauts recover lost agility after a mission, ASCR specialists design an agility course that will test the astronaut's quickness, reaction time, hand-eye coordination and speed. This test helps NASA understand how to help the astronaut recover lost agility faster. Once the mission is over and the astronauts are back on Earth, they maintain their agility by staying active with a regular physical fitness routine.

Administration

Follow the outlined procedure in the Agility Astro-Course Mission Handout. The duration of this physical activity can vary, but will average **30-45 minutes** per class.

Location

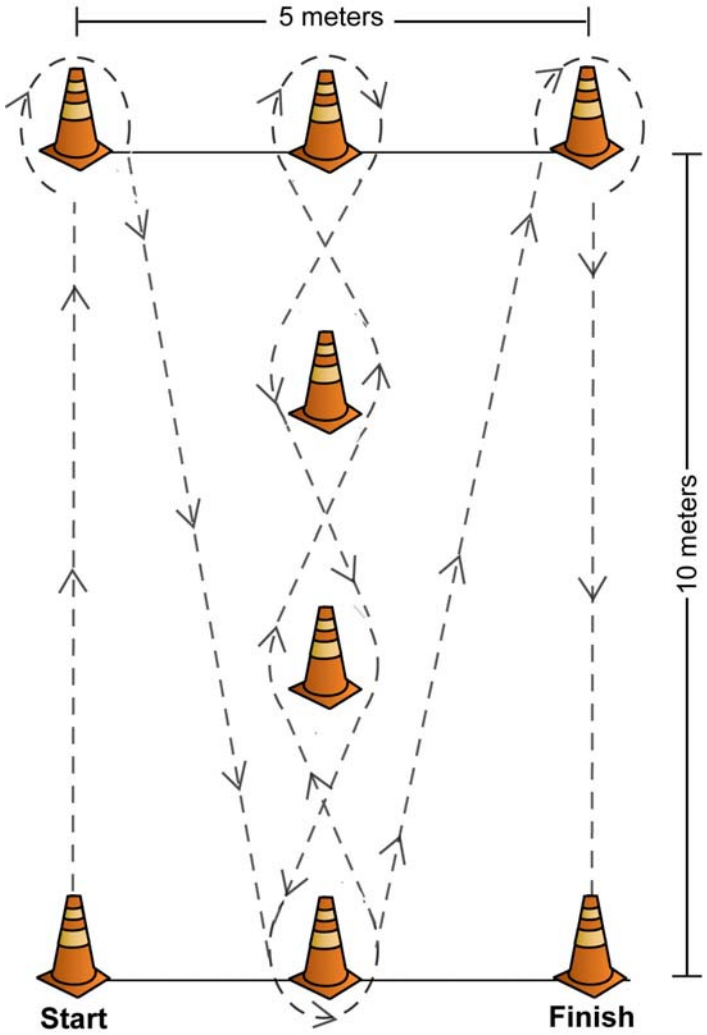
Students will begin on the ground so this physical activity will best be performed on a non-slip flat surface such as a gym floor, outside in dry grass, or on a 5-lane athletic track.

Description

The length of the course is 10 meters (33 feet) and the width (distance between the start and finish points) is 5 meters (16.5 feet). Four cones are used to mark the starting point, finishing point, and the two turning points. An additional four cones are placed down the center of the course at an equal distance of 3.3 meters (11 feet). The first center cone is placed between the start and the finish cones while the fourth center cone is placed between the two turning point cones. Refer to diagram below for further clarification.

Agility Astro-Course

Adapted from the Illinois Agility Course



Procedure

Using a stopwatch or clock with a second hand, time the students as they complete one lap through the course.

Teacher will run the course to demonstrate for students the proper path to follow in the course.

Have students form one line and complete the course one at a time.

Students should lie on their front (similar to starting a push up) with hands by their shoulders. The stopwatch starts on the 'Go' instruction. The student gets up quickly and runs around the course in the direction indicated without knocking the cones over. Time is stopped when the student crosses the finish line.

Equipment

Instructor

- Eight marking cones, or other small, steady objects
- Measuring tape or meter stick
- Paper and pencil
- Watch or stopwatch

Student

- Mission Handout
- Mission Journal and pencil

Optional Equipment

- Swimming noodles placed on the cones to create a more challenging course.

Safety

- Avoid obstacles, hazards, and uneven surfaces.
- Students must wear the appropriate clothes and shoes that allow them 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.

  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://presidentschallenge.org/tools-resources/docs/getfit.pdf.

Monitoring/Assessment

Ask the Mission Question before students begin the physical activity and then facilitate a discussion between students as they 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?
- Are you getting more tired each time you complete the course?
- Are you getting better each time you practice the course?

- How do you know you are getting better?
- What do you think would be more difficult for an astronaut: completing this course after a 14-day mission or a six-month mission? Why?
    - An astronaut working in space for a six-month mission will have a more difficult time completing the agility course when they return to Earth. During longer missions, an astronaut's body has been exposed to the microgravity environment for a longer period of time. Because of this, the body will take longer to adapt to the Earth environment. Astronauts must get as much exercise as they can in order to help their bodies prepare for the Earth environment.
- Do you think an astronaut could successfully complete this course the day they landed from a 6-month mission? A week later? A month later?
    - An astronaut could complete the agility course after being in space for a six month mission, although as time goes on their performance will improve. The astronaut's body will become better adapted to Earth's environment each day they are back on Earth. The astronaut will begin to perform as they did before spaceflight and in some cases even better then when they went into space. Being healthy and fit upon their return to Earth will help the astronaut regain their strength and agility faster.

Some quantitative data for this physical activity may include:

- length of time to complete the course
- number of penalties (knocked-over cones)
- number of times the course was completed (some students may have ran the course more or less than others)
- rate of perceived exertion (Use a scale of 1-10 to analyze how students perceived their exertion from the qualitative data)

Some qualitative data for this physical activity may include:

- identifying how environmental impacts affected course completion
- identifying physical readiness (stretched out, warmed up, alertness, diet, adequate rest)
- identifying discomfort in specific body parts
- length of rest period (Was it long enough? Was it too long? Was it too short?
- identifying perceived exertion (How hard you feel your body is working?)

Collect, Record, and Analyze Data

Students record observations about agility, coordination, and speed in their Mission Journal before and after the physical activity. They should also record their personal physical activity goals and enter qualitative data for drawing conclusions.

- Monitor student progress and safety throughout the physical activity by asking open-ended questions.
- Students should record data and observations about their experience on the Mission Journal before and after the physical activity.
- Graph the data collected on the Mission Journal or graph paper. Students analyze their data individually then share their graphs with the group.

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

Fitness Acceleration

- Using the same set up as the Agility Astro-Course, move the cones to make the agility course larger. One may also add more cones to increase the agility factor. One may also reduce the area of the Agility Astro-Course by using less cones. Is this course more difficult to complete?
- Immediately before engaging in the Agility Astro-Course, do jumping jacks for 30 seconds. Compare this time to the times for the first three trials. Did your time increase or decrease? Explain.
- Change the environment in which the Agility Astro-Course is performed (i.e. inside to outside).
- Decrease the rest time between trials.

Mission Explorations

- Stand on one leg. Wave your arms and other leg about and still try to keep your balance.
- Participate in a field sport such as soccer or a racket sport such as tennis.
- Take part in a relay race with other pairs of students.
    - Stand beside your partner.
    - Using a scarf or bandana, tie you and your partner's legs that are nearest to each other together at the ankle.
    - Race a measured distant to the finish line.
- Participate in sack races.
    - Step into a sack made of burlap, pulling it over your feet and up around your waist.
    - Hold the sack in place, and race against other students by hopping to the finish line.

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.

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

- Standard 5: Students will demonstrate the ability to use decision-making skills 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 Initiative

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.

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.

NASA Connect™ The Right Ration of Rest: Proportional Reasoning:
http://www.knowitall.org/nasa/connect/index.html

NASA Connect™ Better Health From Space to Earth
http://www.knowitall.org/nasa/connect/index.html

For guidelines to prevent heat-related illnesses:

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:

American College of Sports Medicine (ACSM)

- Exercise and Fluid Replacement
  http://journals.lww.com/acsm-msse/Fulltext/2007/02000/Exercise_and_Fluid_Replacement.22.aspx

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/physicalactivity/everyone/measuring/exertion.html

Credits and Career Links

Lesson development by the NASA Johnson Space Center Human Research Program Education and Outreach team with thanks to the subject matter experts who contributed their time and knowledge to this NASA Fit Explorer project.

Bruce Nieschwitz, ATC, LAT, USAW
Astronaut Strength, Conditioning & Rehabilitation (ASCR) Specialists
NASA Johnson Space Center
http://www.wylelabs.com/services/medicaloperations/ascr.html

David Hoellen, MS, ATC, LAT
Astronaut Strength, Conditioning & Rehabilitation (ASCR) Specialists
NASA Johnson Space Center
http://www.wylelabs.com/services/medicaloperations/ascr.html

John Dewitt
Biomechanist, Exercise Physiology Laboratory
NASA Johnson Space Center
http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/laboratories/exercise-physiology.html

Daniel L. Feeback, Ph.D.
Head, Muscle Research Laboratory
Space Shuttle and Space Station Mission Scientist
NASA Johnson Space Center

Linda H. Loerch, M.S.
Manager, Exercise Countermeasures Project
NASA Johnson Space Center
http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/project/exercise-countermeasures.html

Jacob J. Bloomberg, Ph.D.
Senior Research Scientist
Human Adaptation and Countermeasures Division
NASA Johnson Space Center
www.nasa.gov/pdf/64087main_ffs_bio_bloomberg.pdf