HAZARD 4: LACK OF GRAVITY

INTRODUCTION

A human journey to Mars, at first glance, offers an inexhaustible amount of complexities. To bring a mission to the Red Planet from fiction to fact, NASA's Human Research Program has organized hazards that astronauts will encounter on a continual basis into five classifications. Pooling the challenges into categories allows for an organized effort to overcome the obstacles that lay before such a mission.

For more information on the hazard of a lack of gravity, watch the following video:

"Hazards of Human Spaceflight | Hazard 4: Gravity Fields" (Length 3:05)

https://safeYouTube.net/w/I0PX

For students unable to access Safe YouTube links, the video is also available here:

https://www.youtube.com/watch?v=f3-96ZbY5NA&list=PLiuUQ9asub3RRA-BMh7wLsU7V6gUUSRwH&index=4

PROCEDURE

Read the description, in the first column below, of your group's assigned hazard. Then, brainstorm possible solutions to avoid or mitigate this hazard, and identify STEM skill sets that will likely be necessary to develop and implement these solutions. Record your ideas in the appropriate columns, and be prepared to share with the class.

Hazard Description	Possible Solutions	Necessary STEM Skill Sets
The variance of gravity that astronauts will encounter is the fourth hazard of a human mission. On Mars, astronauts would need to live and work in three-eighths of Earth's gravitational pull for up to two years. Additionally, on the six-month trek between the planets, explorers will experience total weightlessness.	*Astronauts should work to stay healthy before, during, and after their mission.* *Spacecraft designed for long-term habitation by humans should incorporate rotating sections that generate a force nearly equivalent to gravity.* *NOTE: FDA-approved osteoporosis treatments, and the optimal timing for such therapies, could be employed to mitigate the risk for astronauts developing premature osteoporosis.*	*Math* *Biology* *Physiology* *Psychology* *Engineering* *Physics*

Besides Mars and deep space there is a third gravity field that must be considered. When astronauts finally return home they will need to readapt many of the systems in their bodies to Earth's gravity. Bones, muscles, cardiovascular system have all been impacted by years without standard gravity. To further complicate the problem, when astronauts transition from one gravity field to another, it's usually quite an intense experience. Blasting off from the surface of a planet or a hurdling descent through an atmosphere is many times the force of gravity.	*Adaptability training programs and improving the ability to detect relevant sensory input are being investigated to mitigate balance control issues.* *Research is ongoing to characterize optimal exercise prescriptions for individual astronauts, as well as defining metabolic costs of critical mission tasks they would expect to encounter on a Mars mission.*	