Tandem paracycling

In 2022, British surgeon John McFall, whose right leg was amputated after a serious motorbike accident, became the first disabled person to join ESA's new class of astronauts. He is now part of an unprecedented programme to study the *"feasibility"* of spaceflight access for "parastronauts". John McFall is also a former parasport world sprint champion over 100 and 200 metres, in 2007, before winning a bronze medal at the Beijing Paralympic Games the following year!

The 17th Paralympic Games took place from 28 August to 8 September 2024 in France. During these games, 23 different sporting disciplines were represented, including tandem paracycling. Cycling is also one of the sports included in astronauts' training on the ground and in maintaining their physical condition on board the International Space Station (ISS). Would it be possible to incorporate it into training for a disabled astronaut?

Are you ready to take on this challenge like a parastronaut?

Sports session in the ISS
© ESA

MISSION DESCRIPTION

When you work in a team, cohesion and communication are essential. This is especially true on board the space station, where astronauts have to live and work together in a confined space for several months.

This team spirit is also one of the most important values in sport. One of the best examples of this is the tandem paracycling event, in which one person is visually impaired or blind and the other can see. Perfect trust and coordination between the two cyclists is essential if they are to win the race.

Your mission will be a three-legged race with a blindfolded friend, who will have to rely on you.

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SKILLS WORKED ON

- Developing motor skills and building a body language
- Acquiring methods and tools for learning, individually or in groups, through practical experience
- Abiding by the same rules, taking on roles and responsibilities to learn to live together
- Learning how to maintain one's health through regular physical activity
- Adopting a physical, sporting and artistic culture

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MISSION PREPARATION

- The terrain should be flat and smooth, with no obstacles.
- Mark off the start and finish lines (~ 30 m).
- Provide bands to tie the children's ankles.
- Provide scarves to blindfold the children.
- Create mixed, balanced and equitable pairs wherever possible.

WARM-UP

Do 10 turns of the ankle in one direction and then the other (left and right).
Swivel the knees 10 times in one direction then the other.
Go back and forth on the track 3 times individually.

MISSION SEQUENCE

Contextualise the tour by imagining that the children are future astronauts doing collaborative sports training for their next mission in space!
Tie the partners in each pair together by the ankles. One of them is blindfolded. Place the pairs side by side on the starting line (number of pairs adapted to the width of your track, run several races depending on the number of pairs racing). It is also possible to assign a third child or an adult to assist each tandem and guarantee their safety if you deem it necessary.
At the starting signal, the pairs have to reach the finish line as quickly as possible. The first pair to arrive wins.
Other criteria can also be taken into account in the assessment, such as the walking/running technique, team communication, good coordination and listening to each other's suggestions, mutual aid and goodwill, etc.
Start the race again, reversing roles if possible.

Point out to the children that their performance improves with practice and that they can then gradually increase the difficulty and/or intensity of the activity.

EXAMPLES OF POSSIBLE ADAPTATIONS

Increase the difficulty and/or intensity:

- Increase the distance to be covered (round trip for example).
- Run a race around markers, passing under or over obstacles.
- Do a relay race with another pair.

Reduce the difficulty and/or intensity:

- Reduce the distance to be covered. Have the children use a wheelchair, walker or crutches, etc.
- Do the race without blindfolding and/or tying their ankles.
- Add more obvious visual cues and/or sound cues.
- Do not take into account the time taken to cover the course, as the aim is solely to reach the finish line.
- Do not tie children together if one of them is already walking less confidently.

DID YOU KNOW?

Two and a half hours a day - that's how long and how often astronauts on the ISS have to train compensating for the negative physiological effects of weightlessness, particularly the loss of muscle mass. This daily physical exercise, carried out in a closed, unchanging environment, quickly becomes repetitive and boring for the astronauts, whose motivation gradually lessens.

Immersive Exercise training session © ESA

The aim of the ***Immersive Exercise*** experiment, which was taken on board the ISS in 2021 for Thomas Pesquet's Alpha Mission, is to break this sporting routine, by using virtual reality. Installed on the CEVIS ergometer, equipped with an immersive virtual reality helmet and a pair of cycling shoes fitted with pace sensors, astronauts can pedal in the ISS with their minds still on Earth. Videos filmed at 360° on Earth are played in the virtual reality helmet and their scrolling speed varies proportionally to the speed of pedalling. Several scenes were shot on location, including, at Thomas Pesquet's request, a tour of Paris to discover its various monuments.

Already used in some land-based sports centres, the *Immersive Exercise* device could be developed further by incorporating a function that varies the difficulty of pedalling according to the visual imagery displayed, depending on whether the slope is ascending or descending, for example. *Immersive Exercise* therefore aims to improve the motivation of astronauts aboard the ISS and, consequently, their performance, with a view to long space voyages to the Moon and Mars, for which the psychological impact is a major issue.
https://youtu.be/SdX7hmiJ8dM?list=PLHWdbfW26EsZZ4CW_3UWpOetBVgJCTBWu