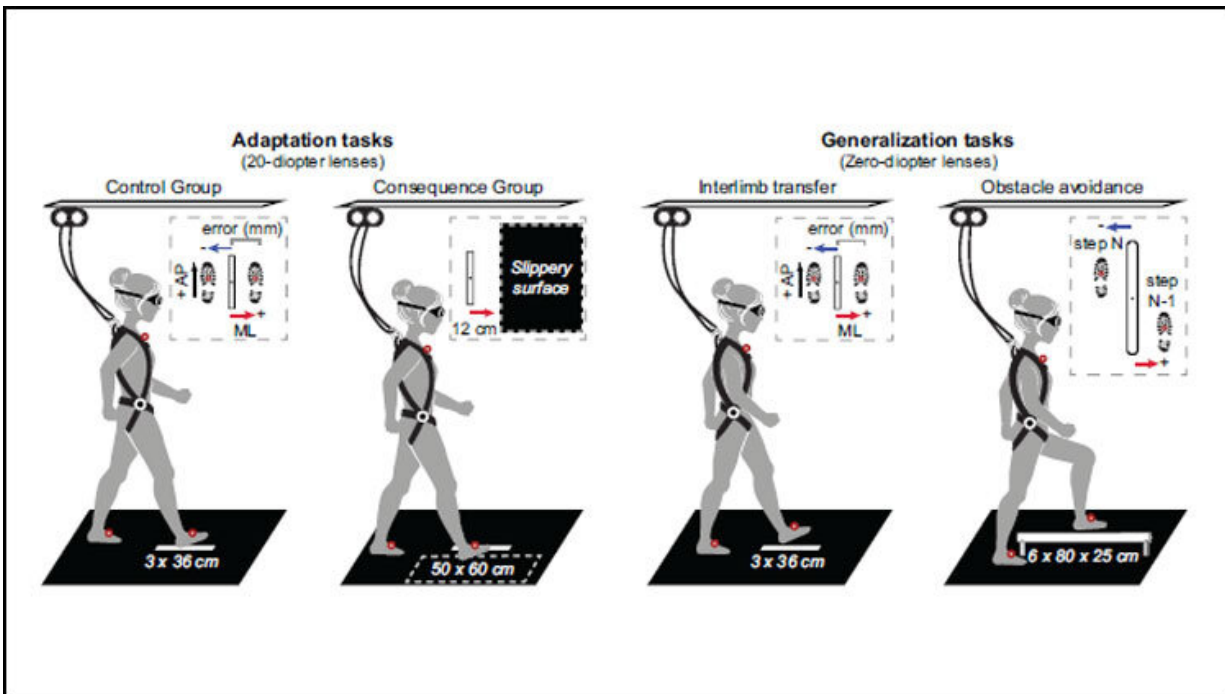


Researchers exploit the body's innate drive for safety to improve motor memory

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An illustration of the precision walking task without and with an adverse physical consequence—a slippery surface—present next to the stepping target. Credit: Bakkum and Marigold, *eNeuro* (2022)

A new study by Simon Fraser University researchers suggests the brain may learn faster when threatened with danger. Their research is published in the journal *eNeuro*.

Human bodies are constantly learning how to adapt to new situations. Through a process of motor learning, the brain corrects actions that lead to movement errors in order to develop movement patterns that allow the body to move more safely.

"Because of our innate drive for safety, and the fact that maintaining balance is fundamental to movement, we hypothesized that experiencing a balance-threatening physical consequence when making a movement error would enhance motor memory," says Amanda Bakkum, a former Ph.D. student in SFU's Sensorimotor Neuroscience Lab, who carried out the research with professor Dan Marigold, associate director of the SFU Institute for Neuroscience and Neurotechnology.

To test the idea the researchers asked a group of participants to carry out a precision walking task while wearing prism lenses to alter their vision. The lenses increased the difficulty of the task by artificially shifting participants' perceptions of the location of the target they needed to step on, which caused them to make errors.

For some participants this task was made even more challenging with a hazard placed near the target that caused them to slip and lose their balance. When this group returned the following week, they were able to remember and perform the task better.

When threatened with possible injury, participants' motor learning was enhanced. They were better able to correct for movement errors so they could carry out the tasks more safely in the future.

The researchers suggest that their findings could be used to design more effective therapies to rehabilitate individuals with neurological impairment.

"Physical therapists could consider incorporating tasks or situations that

elicit a threatening physical consequence, such as a loss of balance, if the individual moves in a way that is inconsistent with the goal of the training," says Marigold, noting how this could be accomplished with the individual in a safety harness, or possibly using virtual reality to simulate a loss of balance.

The findings also suggest that there may be other kinds of situations which could be used to enhance motor learning. "It is unclear at this point whether some other form of physical consequence or emotionally arousing event would work instead of a balance-threatening physical consequence," Marigold says, "This is something we plan to test soon."

More information: Amanda Bakkum et al, Learning from the physical consequences of our actions improves motor memory, *eneuro* (2022). DOI: 10.1523/ENEURO.0459-21.2022

Provided by Simon Fraser University

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