VIRTUAL REALITY FOR THE LOWER EXTREMITY
Information for Patients and Families

What is virtual reality?

Virtual Reality is a rehabilitation technique that is simulated by a computer. Most virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special stereoscopic displays (see picture 1). Virtual reality may also include auditory stimulation through speakers or headphones. Users can interact with the virtual environment through the use of devices such as a keyboard, a mouse, or a wired glove (see picture 2).

Why use virtual reality after a stroke?

Loss of leg function, movement, and strength are common after a stroke, and can result in difficulties with walking and standing. Virtual reality is becoming an increasingly popular intervention used to improve leg use after a stroke. It can be easily modified according to the needs of the individual, it is fun and motivating for patients, and it allows researchers to include elements that have been shown to maximize learning such as feedback.
Are there different kinds of virtual reality?

Generally, there are two types of virtual reality: full immersion, and non-immersion.

- **Full immersive VR** is when the environment is viewed through a device such as a head-mounted display to create the illusion that you are inside the environment.

- **Non-immersive, or partially immersive VR** is when you view the scene on a computer screen and it appears as if you are watching TV.

Does virtual reality work for stroke?

Researchers have studied how virtual reality can help stroke patients with:

**Remapping of the brain**
Research has shown that virtual reality is useful in retraining the brain for individuals who have had a stroke.

**Walking**
Research showed that virtual reality was more useful than regular rehabilitation in improving walking speed, length of step, stamina, and strength in people who have had a stroke.

**Stepping over obstacles**
Evidence has shown that virtual reality is not more effective than regular therapy in improving skills for stepping over obstacles.
Stair-climbing
There are no well-designed research studies that look at the effect of virtual reality on stair-climbing ability.

Community living skills
There is some evidence to show that virtual reality is more useful than regular rehabilitation in helping people who have had a stroke develop the community living skill of "cross the street" or walking.

There is conflicting evidence as to whether virtual reality is more effective than regular rehabilitation in developing the community living skill of taking the train in people who have had a stroke.

Perceived walking performance
There is evidence from one high quality study that virtual reality does not lead to any more improvement in how patients view their ability to walk, compared to regular rehabilitation therapy.

Are there any side effects or risks?

Use of devices such as a head-mounted display can cause nausea and vertigo. No real risks have been reported because of the absence of external manipulation. All activities are self-paced and are able to be controlled by the individual receiving the treatment.

Who provides the treatment?

VR treatments are usually provided by a Physical Therapist or Occupational Therapist. Presently most rehabilitation centers and private clinics are not equipped with this technology other than for research purposes. But, given the promising early evidence for the value of using VR, this treatment is likely to be integrated as part of post-stroke therapy in the future.
How many treatments will I need?

Information on the required amount and intensity of VR training is still not available. High quality studies need to be conducted before advice can be given regarding specific programs and content of treatment sessions.

How much does it cost?

There is concern that the use of VR in the clinic is not possible due to the cost of the equipment. While this was certainly true when the technology was created, the cost of virtual reality hardware and software has decreased in recent years, and should soon be reasonably affordable for clinical use.

Is virtual reality for me?

Overall, VR is an effective treatment for the lower extremity, which you may want to consider after your stroke. There is clear evidence that there are benefits to using virtual reality in comparison to regular therapy or no therapy. These benefits include walking strength, walking speed, length of step, stamina, skills for crossing the street and remapping of the brain. However, in terms of obstacle clearance, VR was not shown to be more effective than conventional therapy. More studies are needed to determine if VR is an effective intervention for stair climbing and the community living skill "taking the train". If you are interested in learning more about VR, speak to your rehabilitation provider about the possibility of using this treatment.

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