

The role of virtual reality in improving gait abnormalities

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To regain walking after a neurological disorder is considered one of the primary goals of the rehabilitation process, given that gait abnormalities are often disabling, negatively impacting patients' quality of life. In the last years there has been an intense technological development of robotic devices to overcome such problems. The robotic rehabilitation tools are typically based on the so-called phenomenon of motor learning, resulting from intensive, repetitive, and task-oriented motor activities that require patient's effort and attention [1]. Such robotic devices can be classified into stationary and overground walking systems: stationary systems (treadmill gait trainers such as Lokomat, and programmable foot end-effector trainers including Geo-System) and overground walking systems (e.g. Ekso-GT). Stationary devices and new treadmill and balance platforms, such as C-Mill and CAREN, may be equipped with virtual reality, to further improve functional outcomes. Virtual reality is conceived to put the patient in a situation to generate the augmented feedback towards his central nervous system (augmented feedback) through exercises performed in a virtual environment which help to develop knowledge of results of the movements (knowledge of results) and knowledge of the quality of the movements (knowledge of performance). Thanks to this, the central nervous system can activate a physiological key learning mechanism called "reinforcement learning" which implies an increase of the specific information of a movement to produce an effective improvement of performance quality.

References

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Keywords

CAREN, Lokomat, Virtual reality, Gait training