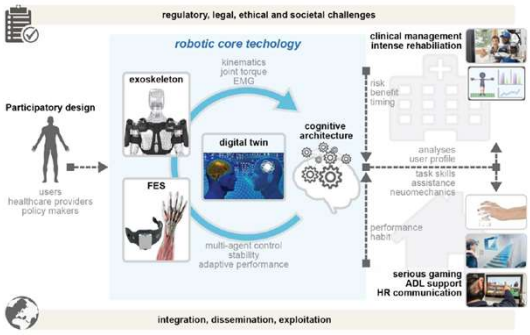
AR/VR Interface Design for Rehabilitation by Exoskeleton

Maximilian Wittmann, PhD project

Towards personalised and more effective stroke rehabilitation

The major cause of long-term disability among adults in Europe is stroke. Stroke patients often have to go through challenging and extensive rehabilitation. Rehabilitation is instrumental in complication management and in restoring motor and cognitive functions lost after brain injury. Regaining autonomy and living an independent life is at the core of rehabilitation efforts. Many patients cannot lead a self-determined life as they are faced with a loss of important daily skills and suffer from motor deficits.

This project is embedded in the larger European project ReHyb (Rehabilitation based on Hybrid Exoskeleton). ReHyb aims at developing a wearable therapeutic exoskeleton device for a home-based rehabilitation of stroke patients.



Currently, literature focuses mostly on immediate behaviour change where the undesired behaviour can be replaced with the desired one through the design of one intervention. Long-term behaviour change is, however, not characterized by such a linear relationship. In stroke rehabilitation, e.g., setbacks and lapses of the patient are common and the occurrence of a behavioural drift is likely. This PhD project examines the underpinning mechanisms of sustained behaviour change (e.g. adherence to rehabilitation programs). This is crucial as the next step of the project consists in designing a multimodal technical system for a more effective, personalised and digital rehabilitation journey. This proof of concept will comprise emergent technologies such as Augmented Reality/Virtual Reality, Digital Twin, as well as latest monitoring devices (tracking bio signals of the patient).

Method

1. **Literature review and delphi study:** Identification of factors reg. adherence
2. **Case-based study and interviews:** Observation of current practice
3. **Technical implementation**: Digital Twin/XR-based proof of concept

Expected results

The new insights on crucial factors affecting adherence will be exploited to design and develop a digital twin prototype with an AR Interface for stroke rehabilitation. The project will critically assess the potential of immersive technologies to enable sustaining behaviour over time. Particularly, it will be investigated what role wearable technologies, digital twins, and XR may play in this process.

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REHYB

Find out more about the project:

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