Research into new technology is helping to improve rehabilitation in stroke, falls and joint replacement patients. Now work is underway to bring this technology into the clinic where it can benefit patients, helping them to lead healthier and more independent lives.

Rethinking rehabilitation

The ability to perform the physical activities of normal daily living is crucial for a healthy, fulfilling and independent life. However, there is currently an epidemic of health conditions which affect mobility and limit a person’s ability to carry out these activities. Among them are stroke, age-related frailty and joint pain. This situation is expected to worsen as the population ages, putting increased pressure on community health services and social service support.

Fortunately, effective rehabilitation can restore movement in people suffering from these conditions, and help to improve their physical and mental wellbeing.

The cornerstone of this rehabilitation is a solid understanding of biomechanics, but so far this has had limited uptake in clinical practice. This is due to a lack of simple and inexpensive technologies, as well as difficulties faced by the biomechanics community in explaining complex scientific information to patients and physiotherapists. The envisage project is a multidisciplinary study, supported by LLHW, which was set up to improve rehabilitation in patients who have fallen, suffered a stroke, or had joint replacements. It is testing a pioneering method of using software to help patients and physiotherapists visualise the biomechanical stresses, strains and movements of muscles and joints. It is hoped this new approach to rehabilitation will better help patients to regain their mobility and enjoy a better quality of life.

“One of the elements of therapy is explaining to patients how their movement is different from the norm and how to put it right. This is difficult to communicate for both patients and therapists”
About Envisage

The envisage project has developed and tested new visualisation software to help improve rehabilitation and prevent injury. This required the bringing together of a multi-disciplinary team led by specialists from the University of Strathclyde, the Glasgow School of Art, and Glasgow Caledonian University. The software generates an on-screen image of patients’ movements while they are performing their rehabilitation exercises, helping patients to visualise where they might be going wrong. It works by combining motion data from a range of technologies such as infrared cameras and markers, 3-D motion analysis, and motion sensor boxes which are attached to patients’ limbs. This data is then stored in the system so that physiotherapists can monitor their patients’ progress over time.

Envisage has looked at how effective this visualisation software is for preventing falls, and for improving rehabilitation for patients with total knee replacements, patients who have suffered lower or upper limb stroke, and stroke patients who are learning to use custom-made ankle-foot orthoses. It has also been tested in a number of environmental settings, including the home, community and hospital laboratory.

"The visualisation software shows patients the key aspects of their movement, enhancing their therapy and making their rehabilitation much easier"

Outcomes and impact

The visualisation software has been found to help rehabilitation in all environmental settings. Five feasibility trials have taken place in the NHS and the project has undergone extensive evaluation.

Patient feedback has been positive, with trial participants reporting using the software to practice their exercises independently at home. Physiotherapists were initially sceptical of the software, but by the end of the trial appreciated the power of visual feedback to help inform patients about their three-dimensional movement. It is believed they would adopt the technology if it was quick, easy-to-use and affordable.

In Strathclyde, where envisage has taken place, the local hospital has invested in a human biomechanical movement science lab. This is due in part to the success of the project. The visualisation software also has the potential to be used in the clinic, and researchers have now joined up with the manufacturing company, Motek, to design software packages for the rehabilitation market.