First for Stroke: Using the Microsoft ‘Kinect’ as a stroke rehabilitation tool for facial weakness

Philip Breedon1, Adam Russell3, Pip Logan3, Ossie Newell3, Becca O’Brien3, Judi Edmans3, Darrin Baines1, Patrick Hall2 and Ben Childs1.
1 Nottingham Trent University, UK, 2 University of Nottingham, UK, 3 Nottingham Citycare Partnership, UK, 4 Maddison Product Design, UK

There are around 152,000 incidents of stroke each year in the UK, with 16% of cases having long lasting facial weakness. The majority of strokes occur in older people, and with people living longer, the number of sufferers will continue to increase, making cost effective community rehabilitation a higher priority.

This project is developing a new rehabilitation intervention for use by stroke patients, using the Microsoft Kinect camera and a PC monitor, to provide interactive feedback in a programme of rehabilitation exercises configured uniquely for each user. The system provides multimodal interaction to support varied patient symptoms – with physical remote control, using mouse and voice, with plans for touch screen interface.

‘Providing an affordable, effective and engaging interactive facial exercise system for use in stroke rehabilitation’.

The system compares the patient’s live facial expression with a ‘palette’ of preconfigured facial poses. We derive our exercises to ‘match strengths’ against multiple target poses in real-time. This forms the basis of our rehabilitation exercise definitions, allowing clinicians to customise an exercise programme for an individual patient in just the same way that they might currently (e.g. alternate 5 times between ‘oo’ and ‘ee’ mouth shapes, holding each for 3 seconds). Pre-recorded video clips of a real therapist are used on-screen to guide the patient through the exercises and to provide feedback on how well they performed.

The device transmits usage monitoring data in situ from the patient’s home to a remote database using mobile data networks. A simple web interface is in development to link to this database to be accessible by clinicians so they can assess and monitor the patient’s ongoing treatment and compare this with the advised usage to rapidly identify compliance issues without requiring site visits.

‘a better way of meeting patient and clinical needs to lead to a measurable improvement in clinical outcomes’.

This project seeks to develop a system that supports NHS policy to deliver more tailored services in the community and improve the quality of rehabilitation regimes. Essential to system development have been regular meetings and discussions with the projects’ PPI group, presenting them with live demos and involving them in the iterative design of the user interface from the earliest concept stages.

Critical to our approach throughout has been to show our PPI group tangible work-in-progress, frame questions which feed directly into our ongoing design process resulting in taking note of their very valuable and personal feedback which then plays a key role in informing our system design strategy. This has resulted in hugely positive feedback from the PPI members, who in the space of just six months have seen our work evolve in response to their input. The project has completed an interim commercialisation study, which has showed a recurring interest amongst service providers in reducing the cost of SLT time spent on delivery of care. A proof of concept study with NHS patients has recently gained ethical approval (Research Ethics Committee Number 14/EM/0163).