

# Co-Design of an Immersive Virtual Reality Platform (NeuroVirt) for Gamification of Upper Limb Rehabilitation Following Stroke and Exploration of Initial Clinical Outcomes

Alison Watt (BSc)<sup>1</sup>, Laura Marriott (BSc)<sup>1</sup> & Evridiki Gregoriou (PhD)<sup>2</sup>

1. Hobbs Rehabilitation, UK 2. NeuroVirt, UK

## Background

Intensive therapy is crucial for effective stroke rehabilitation. Patients often receive insufficient rehabilitation dosage due to overburdened healthcare systems and poor adherence to repetitive exercise. Neurotechnology can drive motivation and intensity, promoting neuroplasticity. This project aimed to further develop NeuroVirt technology through clinical co-design to produce an effective and accessible upper limb rehabilitation solution, using immersive VR to improve both patient motivation and clinical outcomes.



Fig 1: Hobbs Clinician Supporting Patient at NeuroVirt Trial



Fig 2: Example of Hand Movement and Game Interaction

## Objectives

1. To co-design a clinically relevant neurorehabilitation device using immersive virtual reality
2. To test NeuroVirt's usability, tolerability and acceptability with subacute and chronic stroke survivors
3. To explore potential clinical outcomes of an intensive home-based rehab programme using NeuroVirt with clinical support

## Methods - Part A

40 Stroke survivors were recruited from Hobbs Rehabilitation, Jan - Jun 2022. Each participant completed one NeuroVirt session. Participant feedback and therapist observations of sessions with clinical reasoning were recorded. Between sessions, NeuroVirt applied feedback for constant device development and improvement.

## Methods - Part B

Case study - one stroke survivor was recruited for an intensive programme of NeuroVirt home-use. Six weeks standard care (2 x PT/OT weekly, plus self-care) was followed by six weeks NeuroVirt (2hrs/day, 6 x weekly) plus standard care. Intermittent clinical support was provided, and outcome measures completed fortnightly

## Results - Part A

- System Usability Scale – NeuroVirt scored 82.9
- Comfort level rating = 5.6/7
- Rating for 'very fun and engaging' games = 6/7
- 94% preferred NeuroVirt to standard home exercise
- No adverse effects (18% post-stroke fatigue)
- Therapists observed potential for home and clinic use, with improved motivation and intensity



**You completely forget about what disability you have, it makes you realise that you can do more than what you think!**

Joyce, 82  
Stroke Survivor

## Results - Part B

Home-use of NeuroVirt resulted in:

- 100% adherence
- 29% greater intrinsic motivation inventory score
- >200% higher rehabilitation dosage
- 65% improvement in comparative grip strength
- Greater improvements in Fugl-Meyer and Stroke Impact Scale scores



Fig 3: Case Study – NeuroVirt Home-Use

## Conclusion

Clinical relevance was ensured throughout device development by regular clinician involvement. Stroke survivors effectively used NeuroVirt with good acceptance and tolerance. Case study results suggest NeuroVirt's potential for clinical efficacy as part of an intensive rehabilitation programme. Larger validation trials are required for generalisability.