

A Comparative Study on Neurorehabilitation Gamification: Measuring Engagement, Motivation, and Perceived Challenge

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Focus, Need, and Industrial Relevance

Given the prevalence of stroke and the resultant motor impairments that often occur in survivors, novel methods of neurorehabilitation are required. There is an increasing recognition of the role that gamification can play in enhancing patients' recovery process in neurorehabilitation. The focus of the study is the development and evaluation of a new neurorehabilitation game intended to increase participants' engagement, motivation, and challenge. This study addresses this need, investigating the potential of gamified interventions to enhance engagement, motivation, and challenge, which could offer a new approach/tool to manage abnormal muscle synergies in stroke patients.

Project Goal

The goal is to develop a new neurorehabilitation game and assess participants' level of engagement, motivation, and challenge, and compare them with an existing game used in the lab. If the newly developed game shows higher levels of engagement, motivation, and challenge, it could potentially be used in future work to reduce aberrant co-activation of antagonistic muscles after stroke. In this project we're targeting two muscles, biceps and triceps. This is an important aspect of recovery for stroke patients who suffer from motor impairments due to abnormal intermuscular coordination, specifically high co-activation of antagonistic muscles such as the biceps and triceps.

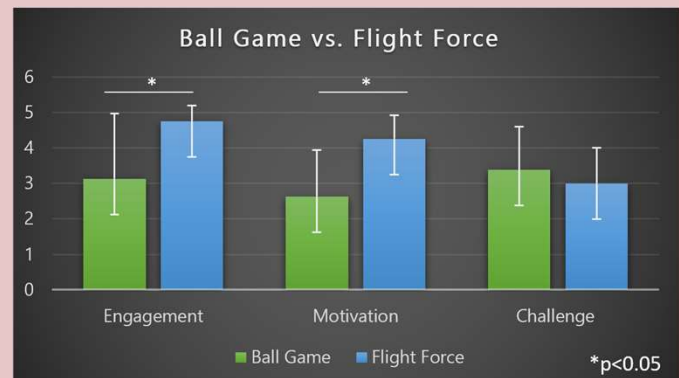


Project Objectives

- To develop a new game with higher levels of engagement, motivation, and challenge.

Research Methods

In the newly developed game "Flight Force", a special emphasis was placed on incorporating game elements to enhance patients' level of engagement, motivation, and challenge. This included background music, sound effects, visual effects, and win/lose reward feedback. The game was developed using Unity. To assess its effectiveness, a comparative study was conducted with 8 participants, where Flight Force was compared with an existing lab game, the "ball game". Participants played each game for 5 minutes; the games were controlled using EMG signals. Then a survey was distributed to participants to evaluate their levels of engagement, motivation, and challenge.



Deliverables and Expected Impact

The newly developed game "Flight Force", exhibited higher levels of engagement and motivation among participants compared to the existing "ball game", however with a slightly lower level of challenge. These findings have paved the way for further refinement of the game, such as adding new elements and possibly implementing machine learning algorithms to dynamically control game difficulty based on player performance. The expected impact of this research is profound, with the potential to introduce a new tool that can be used in our lab to support work aiming to reduce abnormal co-contraction of muscle synergies in stroke patients. Our future work will focus on leveraging these insights to create more challenging and adaptive gaming experiences, contributing to an innovative and patient-centered approach to neurorehabilitation.

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