Learning and ImT: A pilot study for the development of a medical monitoring tool.

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Introduction

Intermanual Transfer (ImT) is the ability to train one limb to do a certain task and, in turn, improve the ability of the untrained limb to carry out the task.

Using bespoke software, we aimed to design a paradigm and develop a medical tool suitable for monitoring stroke patients performance during drug trials.

The design would allow us to monitor learning, retention and involve 2 tasks , in order to compare the effects of a patients therapy against a normal population.

Methods

- Dual instructions were given; reach the target quickly and hold the cursor steady over the target.

- Subjects had two tasks, tested a week apart. Task 2 was a similar, more difficult task, in which the controls were reversed. Retention tests occured 2 hours after the inital test.

- The game was grouped into trials (12 targets) and blocks (3 trials)

- The pre and post test consisted of one trial. The training phase consisted of 5 blocks.

- 8 subjects (3 males, mean age 22.8) all declared themselves as right hand dominant.

- Subjects controlled the game using Saitek X65 joysticks.

Figure 1 - A screenshot from the game. The orange marker is the human controlled cursor. The target is in green. Level, target number and time remaining to complete target are shown in bottom left. The bottom right shows scores for the current trial.

Results

Accuracy of the cursor over the target

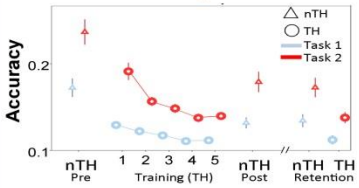

Figure 2 - The blue represents task 1 and the red task 2.

Accuracy was defined as the distance from the centre of the target while the target was present.

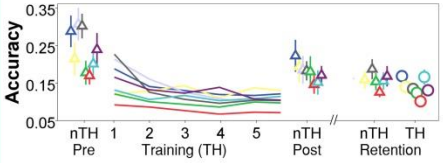

Figure 3 - Accuracy for each subject during task 2

Time taken to reach target

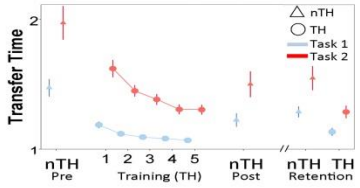

Figure 4 - The blue represents task 1 and the red task 2.

Transfer time was the time taken for the cursor to reach the target.

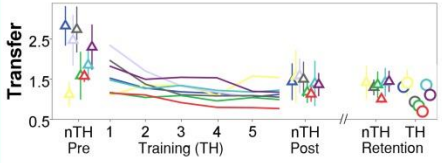

Figure 5 - Transfer time for each subject during task 2

Discussion

Motor learning

Using this software, we could monitor patients progress, as therapy would occur between task 1 and task 2. From our results, we can identify learning curves in both tasks. Although task 2 had a lower performance overall, rate of learning (final performance - initial performance) is similar to that of task 1.

The evidence of ImT

nTH performance increased after the training phase, with post nTH accuracy and transfer time significantly lower than pre nTH.

Learning curve plateau

The learning curve plateaus in first task, indicating maximal performance for each subject. Using the plateau we can compare patients maximal performance with the normative population, allowing us to tailor a patients treatment more effectively. Though looking at individual performance, some subjects started with a high scores and plateaued very early, showing little learning.

Performance was maintained during retention

Subjects maintained the level of performance from the last blocks of the training phase. This indicates that subjects were able to retain the abilities learnt over a 2 hour period. Using the software, patients can be monitored to assess the effectiveness of therapies, i.e drug therapies, over a short period of time.

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