CHANGES IN CIRCLE AREA AFTER GRAVITY COMPENSATION TRAINING IN CHRONIC STROKE PATIENTS

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1. Introduction

After a stroke, many people experience difficulties to selectively activate muscles. As a result many patients move the affected arm in stereotypical patterns. Shoulder abduction is often accompanied by elbow flexion, reducing the ability to extend the elbow. This involuntary coupling reduces the patient’s active range of motion. Gravity compensation reduces the activation level of shoulder abductors which limits the amount of coupled elbow flexion. As a result, stroke patients can instantaneously increase their active range of motion [1]. The objective of the present study is to examine whether training in a gravity compensated environment can also lead to an increased range of motion in an unsupported environment. Parts of this work have been presented at EMBC2009, Minneapolis, USA.

2. Methods

Eight chronic stroke patients received 18 half hour sessions of gravity compensation training in a period of six weeks. The training consisted of reaching exercises needed to play a computer game called FurballHunt, see Figure 1. Gravity compensation was applied through a passive device called Freebal, see Figure 1.

3. Results

After training, FM scores increased in seven of eight patients. The average increase was 3.3 points. Circle area also increased in the same seven patients. The average increase was 113 cm$^2$ (34.4%). One patient showed a decreased FM score (-4.5) and a reduced circle area (-8.6 cm$^2$, -5.6%).

4. Discussion and conclusion

The majority of chronic stroke patients increased motor status and movement performance after training. Training in a gravity compensated environment can lead to an increased range of motion as represented by the increased circle area. Similar results were reported after instantaneous application of gravity compensation [1], suggesting an improved selectivity of movements of the shoulder and elbow. Gravity compensation training by means of a simple robotic device can induce improvements in arm function. Low-tech equipment such as the Freebal seems a suitable tool in post stroke rehabilitation.

References