ERROR-ENHANCED AUGMENTED PROPRIOCEPTIVE FEEDBACK IN STROKE REHABILITATION TRAINING: A PILOT STUDY

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INTRODUCTION
It is believed that providing error-enhanced augmented proprioceptive feedback to stroke survivors leads to enhanced motor learning. [1,2] Stroke survivors will have more information fed back to their system than during normal movement execution, which therefore leads to enhanced motor learning. To provide augmented proprioceptive feedback, an automated system that can resist movements outside a virtual tunnel is developed.

GOAL
To determine whether stroke survivors are able to learn reach and retrieval movements with error-enhanced augmented proprioceptive feedback.

METHODS
Two stroke survivors performed reach and retrieval movements in a robotic device (Dampace) [3], through a virtual tunnel. When colliding with the virtual wall, error-enhanced proprioceptive feedback was provided to the shoulder and elbow. The feedback was provided as a resistance to elbow flexion-extension, shoulder ante-/retroflexion, shoulder ab-/adduction and shoulder endo-/exorotation movements.

The amount of collisions with the virtual tunnel wall were counted during two consecutive movement series with the same tunnel diameter, each consisting of 15 movements. In the different movement sets various tunnel settings were possible.

RESULTS
Subject 1 (FM 53): In the first series 58 collisions (mean 8.3 per 15 repetitions) with the wall were made, compared to 20 collisions (mean 2.9 per 15 repetitions) in the second series.

Subject 2 (FM 49): In the first series 23 collisions (mean 4.6 per 15 repetitions) with the wall were made, compared to 9 collisions (mean 1.8 per 15 repetitions) in the second series.

CONCLUSIONS
Both subjects had a considerable decrease in amount of collisions with the virtual wall during two consecutive movement series when error-enhanced augmented proprioceptive feedback was provided. This suggests that stroke survivors are able to learn predefined trajectories by means of error-enhanced augmented proprioceptive feedback.

REFERENCES