

## Positional biofeedback to improve gait in subjects with stroke

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### Introduction

The purpose of our study was to investigate the effectiveness of positional bio-feedback on reducing gait impairments in a population with hemiparesis following stroke. Positional BFB was used to improve patient's ability to self-regulate the movement to a specific joint angle or body segment position in order to improve symmetry of gait.

Biofeedback is a technique in which a person is given information about physiological processes that is not normally available to them with the goal of gaining conscious control of those responses. In order to maximize the effect of feedback in learning motor activities, we provided a "dynamic biofeedback" in which feedback from a kinematic variable is provided during function-related task training in accordance with current theories of motor learning [1,2]. In neuromotor rehabilitation, task-oriented training encourages a patient to explore the environment and to solve specific movement problems.

The purpose of this presentation is to provide preliminary evidences concerning a subset of variables used to characterize the gait cycle.

### Methods

10 subjects with chronic stroke participated in the study (mean age 56.8 years (SD = 15.05), mean onset 3.2 years (SD = 5.9). Affected side: 5 right, 5 left; 5 males/5 females. After initial screening subjects underwent a baseline quantitative gait analysis (pre), using E.Li. Te and Kistler platform and a 8 channel EMG). After completing 20 treatment sessions the patients were again subjected to quantitative gait analysis. Treatment sessions consisted of task-specific and task-oriented balance and gait activities using positional feedback tools, see Fig. 1. In particular, inclinometers were used for providing feedback about absolute angles and goniometers for relative angles. The feedback devices were designed to be easily applicable to all districts of the body.

A paired *t*-test was used to assess statistically significant differences between pre and post treatment. The significant level was

set at  $P < 0.1$ . The following dependent variables were considered: velocity, cadence, step length, stride length, knee maximum flexion and hip maximum extension.

### Results

There were statistically significant pre-post differences for stride length (from 34.7 to 38.6% height) and hip maximum extension (from 30.1° to 34.1°). No statistically significant differences were observed for velocity, cadence, step length or knee maximum flexion.

### Discussion

Positional BFB treatment administered in a task-oriented rehabilitation program was effective in improving stride length and hip extension in a population with chronic stroke. Small but interesting effects were anecdotally observed in the frontal pelvis plane. Subjects were very heterogenous among them and treatment was tailored to individual needs: this partly explains the lack of many statistically significant pre-post improvements. Positional biofeedback increased the motivation and attention of the subjects and might improve sensorimotor integration. This hypothesis has to be tested in future studies.

### References

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## Neuromuscular strategy to prevent ACL injury

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### Introduction

The large number of anterior cruciate ligament (ACL) injuries in all sports is the motivation of several investigations. Almost 80% of ACL injuries are non-contact in nature. Neuromuscular strategy or training can be used to reduce ACL injuries. Several authors have studied the hypothesis that mechanical stability does not guarantee functional stability, and have suggested evidence that the ACL has a sensory and proprioceptive function, in addition to its role as a static stabilizer [1,2]. The hamstrings muscles have the potential to counteract anterior shear forces at the knee joint by co-contracting during knee extension efforts. Such a muscle recruitment pattern might protect the ACL by reducing its strain.

The purpose of this study consisted of investigating the relationship between in vivo ACL strain and neuromuscular control during cutting and stopping movements.

### Methods

Total of eight participants were volunteered but only five healthy males from the Medical School at the University of Perugia (mean: age; 25 years; height: 175 cm; weight: 75.5 kg) with no previous knee joint injuries were used for the study. The partici-

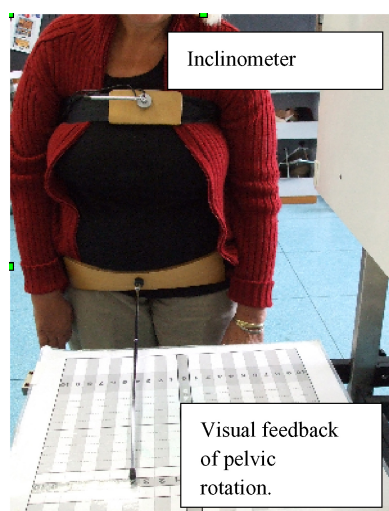


Fig. 1. Experimental setup.