

## Abstract 435

**ACCEPTABILITY VERIFICATION OF A MECHATRONIC SYSTEM FOR THE REHABILITATION OF GAIT**

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Recent studies hypothesized that stability in gait may be ameliorated addressing motor learning process. In this view, unexpected perturbations during gait may decrease the repeatability of walking patterns, introducing more flexibility into the motor control system, that which then became able to increase stability. In the framework of the European community-founded Smiling-Project (FP7 grant agreement 215493), a wearable (shoes-like) non-invasive mechatronic system was designed to cause small inclination of the weight-bearing support surfaces during gait and targeted for a population at risk of falling. A preliminary validation (five healthy young subjects) has been undertaken, with a provisional prototype of the system, for testing the complex data-flow necessary for the system to work, and to evaluate

- (1) ergonomics,
- (2) adaptation and
- (3) safety, by means of a camera-based motion analysis system.

Results demonstrated that:

- (1) The system changes knee and ankle patterns being flexion/extension reduced, revealing major rigidity, compared to baseline (baseline measured with subjects walking with their normal shoes).
- (2) A period for habituation to the system resulted essential: subjects became more confident and kinematics slightly moved toward baseline.
- (3) Foot inclination in the frontal plane (ranging 5-15 degrees) affected biomechanics for large angles only when a subject also claimed fear of falling, allowing the identification of an upper safety limit. Results confirmed the high capability of learning and re-tuning of the motor control system, confirming the approach of the Smiling-system, that may represent a promising and safe tool for rehabilitation. Further studies will test the system on people at risk of falling.