

89% sensitivity and 87% specificity. This test also helped to detect impairments in aging participants that are not detectable with traditional psychometric tests. *Discussion.*—The use of a DT that is inspired by an everyday event as an evaluation tool seems to facilitate the early detection of cognitive impairment in aging participants.

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CO70-006-e

### Proprioceptive vibration effect in old healthy subjects

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**Keywords:** Vibration; Posture; Cerebral hemisphere; Centre of pressure  
*Background.*—Declines in proprioception function is part of aging process. The contribution of proprioceptive information in postural control seems to increase with aging and contributed to a greater risk of falling. Our objective was to determine if asymmetry between hemispheres with age had some specific postural consequences.

*Methods.*—We applied bilateral or unilateral vibration on Achilles or Peroneus tendons, to young and senior adults in standing position. Positions of the Center of Pressure and the covered length were computed. Statistical analysis was realized.

*Results.*—Vibration applied on Achilles tendons led to a backward shift of the CoP. The amplitude of this displacement was larger for senior than young group. In Uni-vibration, the Y displacement became significantly larger for vibration applied on the left limb than on the right one, for the senior group only. The stabilization time after left vibration on Achilles tendon was increased compared to right one for the senior group.

*Conclusions.*—Sensory-motor integration of proprioceptive information is well affected by age. We highlight here some age-induced postural consequences reflecting an asymmetry in plays of hemispheres in the postural control. It reflects a difficulty to down-regulate individual sensory modalities, possibly linked to a larger recruitment of cerebral areas.

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CO70-007-e

### Towards an objective assessment in daily practice of eccentric evertors weakness in chronic ankle instability

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**Keywords:** Ankle; Inversion; Sprain; Evertor muscles weakness; Angular velocity; Weight bearing test

*Objective.*—Previous studies proposed that evertor muscles weakness represents an important factor affecting chronic ankle instability (CAI). Ankle evertors strength can be assessed by means of isokinetic evaluations. However, this methodology is too constraining to be widely used in clinical daily practice [1]. The present study assesses a new parameter, easily accessible for rehabilitation specialists. To this aim, we compared weight bearing ankle inversion control between healthy and CAI subjects.

*Methods.*—Twelve healthy and 11 CAI subjects made weight bearing ankle inversions on a specific ankle destabilization device equipped with a gyroscope. Instructions were to slowest possibly perform the ankle inversion. Angular velocity peaks were compared between the two groups.

*Results/Discussion.*—Data showed significantly higher angular inversion velocity peaks in CAI subjects, suggesting an eccentric weakness of evertor muscles. The proposed parameter seems to be interesting for daily clinical practice.

[1] De Nohonha M, Borges NG. Lateral ankle sprain: isokinetic test reliability and comparison between invertors and evertors. *Clin Biomech* 2004;19:868–71.

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CO76-001-e

### Simulation of muscle retraction in Cerebral Palsy (SiMusCP). Validation of a decision support system for surgical lengthening of contracted muscles

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**Keywords:** Hamstrings lengthening; Decision making; Cerebral palsy; Clinical gait analysis

*Introduction.*—We developed a customizable musculoskeletal model able to analyze the muscles kinematics during walking and to simulate the maximum muscle length from clinical goniometric measurements (SiMusCP). This study assesses the real contribution of this procedure to the therapeutic decision of hamstrings lengthening (HL).

*Material and methods.*—Forty-two cerebral palsy children (12 ± 3 years) were divided into two groups: G1 = 60 lower limbs and G2 = 20 lower limbs, respectively having followed and not followed HL among all the associated surgeries. All patients had clinical gait analysis before and 1.9 ± 0.8 years after surgery. The limbs were classified, improved or not improved by HL, with a supervised classification system. SiMusCP procedure is performed retrospectively on the basis of clinical data and preoperative gait analysis. The concordance between the predictions from the simulation and the actual outcome of the surgery was evaluated.

*Results.*—SiMusCP procedure had a sensitivity of 87.5% and a specificity of 65%. The positive predictive value was 83.3%. The intensity of the connection between the result and the indication was significantly ( $P < 0.001$ ) very high (Yule's-Q = 0.86).

*Discussion.*—SiMusCP requires significant rigor in the collection of data used as input. This decision support system can improve HL results by making outcomes more predictable.

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CO76-002-e

### Preliminary study of the kinematics of the lower limb during direction changes in locomotion of hemiplegic children

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**Keywords:** Hemiplegia; Curved walking; Gait analysis; Kinematics

*Object.*—The aim of our study is to evaluate the kinematic modifications of the lower limb joints of hemiplegic children compared to typically developing children during a 90° change of direction.

*Method.*—Fourteen typically developing and 14 hemiplegic subjects aged from 7 to 13 walked along a path including a 90° bend. The kinematics was recorded by means of an optoelectronic Vicon system. The results are analysed in terms of kinematic differences of each limb (paretic or healthy) of the hemiplegic children compared to the control subjects as a function of the position of the limb in the bend (internally or externally).

**Results.**– Some kinematic patterns identified for the typically developing children when turning tend to disappear in hemiplegic children. Moreover, specific kinematic adaptations were found for the hemiplegic children.

**Discussion.**– The ability to perform a 90° turning of the hemiplegic children depends on their capacity to develop kinematic strategies in order to compensate a lack of kinematic adaptations. The determinant kinematic role of the position of the paretic limb in turning [1] is not a fully confirmed hypothesis in our study.

#### Reference

[1] Godi M, et al. Curved walking in hemiparetic patients. *J Rehabil Med* 2010;42:858–65.

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CO76-003-e

### Mechanics of overground and treadmill walking in children



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**Keywords:** Biomechanics; Gait; Human locomotion; Inverted pendulum

**Background and objective.**– Motor impairments associated with cerebral palsy (CP) induce abnormal gait in children. The improvement of walking is an essential objective and the use of treadmill for walking analysis and training may offer several advantages. However, a controversy still exists regarding the similarity between treadmill and overground walking. The aim of this study was to compare the mechanics of these two types of gait modalities at standard and preferred walking speeds in hemiplegic cerebral palsy (HCP) and typically developing (TD) children matched on age, height and body mass.

**Methods.**– Mechanical parameters of walking were computed using two inertial sensors equipped with a triaxial accelerometer and gyroscope and compared in 10 HCP (14.2 ± 1.7 yr) and 10 TD (14.1 ± 1.9 yr) children during treadmill and overground walking at standard and preferred speeds.

**Results.**– The treadmill compared with the ground, induced almost identical mechanical changes in HCP and TD children with the exception of mechanical potential and kinetic vertical and lateral works, which are both significantly increased in the overground treadmill transition only in HCP children ( $P < 0.05$ ).

**Conclusions.**– These results showed that HCP children have a reduced adaptive capacity in absorbing and decelerating the speed created by treadmill.

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## Posters

P333-e

### Changes in gait pattern during dual task using smartphones



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**Keywords:** Gait; Dual task; Attention; Smartphone

**Introduction.**– Smartphones have been deeply involved in lives, and various tasks are performed simultaneously on smartphones. We investigated gait pattern changes in performing tasks simultaneously using smartphones.

**Material and methods.**– Three tasks were performed by 26 healthy adults. In the first, participants were directed to walk without using smartphones. In the second, they were required to walk while finding applications. Lastly, in addition to performing the second task, they were asked to listen to questions and answer

them on their smartphone. Spatiotemporal variables of gait and degree of lateral deviation during walking were measured.

**Results.**– The results showed that there was a significant difference between the first and second tasks, as well as between the first and third in all variables ( $P < 0.05$ ). In particular, gait velocity decreased by 33.49% in the second and 41.69% in the third compared to the first, the degree of deviation increased by 119.18% in the second and 122.67% in the third in comparison to the first.

**Discussion.**– It was determined that changes in gait, appear when walking while using smartphones in comparison to walking without smartphones. These changes in the gait pattern may contribute to an increase in the risk of accidents.

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P334-e

### Interest of postural control evaluation after ACL hamstring tendon reconstruction: A prospective monocentric study



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**Keywords:** Anterior cruciate ligament reconstruction; Knee; Postural control; Posturography

**Objective.**– The patients' monitoring seems to be inadequate with regard to the rehabilitation goals after an anterior cruciate ligament (ACL) reconstruction. We assessed the interest in postural balance evaluation after such a surgery.

**Methods.**– A preliminary prospective matched study allowed us evaluating the movements of the centre of pressure and the Romberg's coefficients during static and dynamic stances using a SATEL™ stabilometric platform in 16 patients at a mean 11 months after hamstring tendon ACL reconstruction.

**Results.**– We found the distances covered by the centre of pressure to be significantly increased in the operated group during unilateral stance on the healthy knee with eyes closed ( $P = 0.04$ ) and a significantly decreased Romberg's coefficient in dynamic stance in the frontal plane ( $P < 0.01$ ).

**Discussion.**– The posturographic evaluation showed an alteration in postural control during some stances including when it comes to the healthy knee. Thus, this device would be interesting in association with the muscular isokinetic strength and anterior laxity knee follow-up to improve rehabilitation after an ACL reconstruction.

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P335-e

### Presenting Helios Fitness Index (Hel.F.I.) for evaluating Greek women's performance compared to German Esslinger Fitness Index (E.F.I)



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**Keywords:** Jumping mechanography; Osteoporosis; Power; Force

**Introduction.**– In the study of muscle performance, movement has to be described in terms of velocity and acceleration. The purpose of this study was to analyze parameters of locomotor system and to compare Greek Helios Fitness Index (Hel.F.I.) with German Esslinger Fitness Index (E.F.I).

**Methods.**– Healthy Greek women aged 20–79 years ( $n = 176$ ) divided into 6 groups performed jumping mechanography (Leonardo platform, Novotec, Ger-