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Gait biomechanics and neurorehabilitation: Time for individualized practice?
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Keywords: Gait; Biomechanics; Hemiparesis

Introduction.--Despite the recognition of the benefits of gait analysis, appropriate examinations are thought to be too sophisticated for clinical practice. The study was conducted to test the feasibility of recently developed systems for biomechanics analysis in neurorehabilitation.

Methods.--Thirty patients (26 men) aged 55.2 ± 15.2 years with central hemiparesis were included in the study. Paresis grade averaged 3.7 ± 0.9, Ashworth spasticity index — 1.1 ± 1.2, Rivermead mobility index — 11.8 ± 2.9. Gyroscopic TRUST, tension-sensing Diasled systems, stabilometric platform Balance Master, Raptor motion videoanalysis system (“gold standard”) were studied.

Results.--The following predictors of Rivermead mobility index were identified: amplitude of motion in hip and knee at the paretic (AUC 0.82 and 0.7) and the non-paretic side (AUC 0.88 and 0.72), walk asymmetry (time of the second double support, AUC 0.63). No significant differences between Raptor and TRAP results were observed. The shortness of Balance Master platform caused huge amount of false positive results. Diasled system revealed a shift of the center of mass to the non-paretic side, which resolved with treatment.

Discussion.--Portable systems for gait analysis provide clinically significant information. Their use in neurorehabilitation is feasible for the goal of physiotherapy individualization and objective assessment of rehabilitation efficacy.

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P343-e
Relationship between dynamic balance and stance phases during gait in normal ageing
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Keywords: Balance; Gait; Ageing; Posturography

Introduction.--In old subjects, keeping a good balance is fundamental to maintain a functional independence. The purpose of this study was to evaluate the relationship between dynamic standing balance and single and double support phases during gait.

Method.--Twenty asymptomatic subjects over 60 years old and twenty under 60 years old participated in this study. Static balance, dynamic balance and spatiotemporal gait parameters were recorded using a WinFDM Zebris® platform. Antero-posterior (AP) and circular (Circ) dynamic balance parameters were quantified. A cognitive test (Codex) was performed in the group of older subjects.

Results.--It has been found a change in the spatiotemporal gait parameters and balance with age. A multivariate analysis showed that most of the changes were related to an impairment of cognitive functions (Codex), but not the AP and Circ index. Relationships were found between the AP index and the percentage of double support phase (r = –0.65).

Discussion.--The change in spatiotemporal gait parameters and balance with age is associated with the appearance of cognitive impairments, but not with dynamic balance parameters for which impairments of proprioceptive, visual and vestibular systems could be preponderant.

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P344-e
A new dynamic posturography method to quantify the quality of balance
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Keywords: Dynamic posturography; Balance evaluation

Objective.--To quantify the quality of balance in patients suffering from sensory or motor problems, using a new method of dynamic posturography.

Methods.--We compared posturography measurements of 3 groups: 8 subjects with neuropathy sensitive, 8 subjects with myopathy and 8 healthy subjects. IsiMove platform was used to measure posturography parameters. The protocol consists of 5 exercises that are repeated for five frequencies (0.1 Hz to 0.5 Hz). The exercises are applied in a sequential manner: anterior posterior tilt, mediolateral tilt, anterior posterior translation, vertical rotation and mediolateral translation. A normal range was developed with surface measurements in healthy subjects. A subject will note 5 if the value of the measured surface is in the normal range; 2 if the value is outside and 0 if he does not perform the exercise. Each subject will have a final score of quantification (the sum of scores for each exercise).

Results and discussion.--Patients with neuropathy have obtained scores between 0 and 107; patients with myopathy have obtained scores between 0 and 95, while all normal subjects have scores of 125. We chose a schematic star that can analyse the quality of balance by comparing the three groups.

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P345-e
How gait parameters of the adolescents differ from the adult population. Cohort study using an accelerometer
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Introduction.--The aim of our study was to compare gait parameters of an adolescent population with the gait standardized parameters of the adult Italian population using an accelerometer.

Methods.--We used the BTS G-WALK, it uses an inertial sensor to determine spatio-temporal parameters of gait. For each adolescent data about cadence and gait cycle duration, together with other gait parameters, were collected. We excluded all those who were affected by muscle-skeletal, vestibular or neurological disease. BTS gave us the gait standardized parameters for adults.

Results.--Of the 290 adolescents, 207 (97F, 110 M) were included in our analysis. Our data show that cadence and gait cycle duration seem to improve with age. The mean cadence in adolescents population was 48.6 steps/min while in the adult population is 54.30 steps/min. The mean gait cycle duration in the adolescents population was 1.25 s while in the adult population is 1.12 s.

Conclusion.--The results show an increase of cadence and reduction of gait cycle duration when the age increase. This might suggest a correlation between these parameters and muscle-skeletal development in the adolescent population.

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P346-e
Reproducibility of main posturographic and gait parameters in lower limb amputees
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Introduction.--The eye-tracker proves to be a useful device for visual compensation analysis during gait, at the same time reproducible and sensitive to the pathology tested in this study.

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**Background.**— There is an increasing demand for routine assessments of posture and gait in the rehabilitation of amputees. Are these assessments reliable?

**Objective.**— To analyse the reproducibility of main posturographic and spatiotemporal gait parameters in amputees.

**Methods.**— Reproducibility was investigated by calculating coefficients of variation (CV) of 6 posturographic trials and gait tests in 20 amputees (age = 63.1 years) compared to 20 matched healthy controls. Gait parameters were assessed using an optical track (optogait). Data are given in median values.

**Results.**— The reproducibility of posturographic parameters was excellent for the weight-bearing asymmetry (CV = 5%), and acceptable for the velocity of the center of pressure (CV = 14.5%), and its excursion on both axes (18% and 15.5%). The reproducibility of gait parameters was excellent for walking speed (CV = 4.4%), step cadence (CV = 2.8%), times of monopodal (CV = 3% and 4%) and bipodal support (CV = 4%), step length (CV = 3.6% and 3%). The reproducibility was good for step width (CV = 9%). Similar data were found in normals.

**Conclusion.**— This study is the first to report the reproducibility of posturographic and gait parameters in amputees. It shows that these parameters are reproducible and may be used for clinical assessments, overall regarding gait.

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**P347-e**

**Measuring the pressures under feet during the gait rehabilitation with G-EO System in stroke patients: An observational study**

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**Keywords:** Gait rehabilitation; Stroke; Robotic device; Foot pressures; Insole sensors

**Introduction.**— In a previous study we observed that in normal subjects, during the training with G-EO System, the maps and the curves of the pressures measured under feet are extremely different as compared with that recorded while walking over ground.

**Methods.**— In 14 post stroke patients we performed measurements of the pressures under feet using insole sensors during sessions of gait rehabilitation on G-EO System. Measure sessions have been done at the beginning and at the end of the study. The functional assessment has been made using: Trunk Control Test, Standing Balance, Functional Ambulation Category, Lower Limbs MI, FIM-Transfers and FIM-Locomotion, Tinetti Balance, Tinetti Gait.

**Results.**— When a gait cycle is clearly recognizable, the patterns of the pressures under feet are very different from that observed in free walking and show a high rate of asymmetry. Even though the sample group shows a statistically significant improvement in all functional tests, there are not substantial variations in the feet pressure measures.

**Discussion.**— The transmission of movement from an “end effector” robotic system to the lower limbs of the post stroke patients generates abnormal patterns of pressures under feet. Could this evidence be useful in the management of the gait rehabilitation program?

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**P348-e**

**Gait changes in patients with valgus and flatfoot deformities after application of foot insoles and special exercise program**

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**Keywords:** Gait; Valgus flatfoot; Insoles; Pedobarogram

**Objective.**— Evaluation of changes in static and dynamic pedobarogram findings and pain in patients with valgus and flatfoot deformities after the use of special modulated insoles in combination with a program of rehabilitation exercises.

**Methods.**— Ten patients (6 men, 4 women) with valgus and flatfoot deformity were included with symptoms of pain, fatigue, foot hyperkeratosis due to increased ground friction. Pain was assessed with visual analogic scale (VAS) before the intervention and after 6 and 12 months, concomitant. Static and dynamic pedobarogram measurements were performed. Special foot insoles were prescribed after the first evaluation, in addition to rehabilitation program for strengthening of the intrinsic foot muscles and stretching exercises for the foot aponeurosis.

**Results.**— Significant improvements were found after 6 and 12 months regarding both pain and gait parameters.

**Discussion.**— Patients with valgus and flatfoot were benefited by focused rehabilitation program and use of specially modulated insoles and presented improvement regarding pain and quality of gait.

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