Critical care; neurorehabilitation

P2321

Early prognosis during hypothermia in patients after cardiac arrest

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Introduction: In 40-66% of patients after cardiac arrest consciousness never returns, despite treatment with hypothermia. This study evaluated the contribution of continuous electroencephalography (EEG) in early prognosis in these patients.

Methods: Continuous EEG registrations were made in 75 consecutive patients during the first 5 days of admission or until ICU discharge. In the first 56 patients daily somatosensory evoked potentials (SSEP) were measured as well. Neurological outcomes were based on each patient’s best achieved Cerebral Performance Category (CPC) score within 6 months after cardiac arrest.

Results: 38 patients (51%) achieved good neurological outcome (CPC 1-2). After 12 hours, 47% of them showed a continuous, diffuse slowed EEG rhythm, while this was never observed in patients with poor neurological outcome (CPC 3-5). Poor neurological outcome could be predicted with a sensitivity of 40% based on the presence of low voltage and iso-electric EEG patterns measured 24 hours after resuscitation, compared to a sensitivity of 24% for bilateral absent SSEP responses, both with a 100% specificity. The presence of burst suppression patterns after 24 hours was also associated with poor neurological outcome, but not inevitably so. Besides visual scoring of the EEG, quantitative EEG features attributed to the prognostication.

Conclusion: EEG monitoring during the first 24 hours after resuscitation can contribute to reliable prediction of both good and poor neurological outcome in patients after cardiac arrest treated with hypothermia. At present, we are performing a pilot study to combine continuous EEG registrations with other modalities, such as near-infrared spectroscopy monitoring.

P2322

The influence of induced hypothermia and delayed prognosis on mode of death after cardiac arrest

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Introduction: Hypoxic-ischemic brain injury is considered the main cause of death in patients who are hospitalized after cardiac arrest (CA). Induced hypothermia is recommended as neuroprotective treatment after CA but may affect prognostic parameters. We evaluated the effect of delayed neurological prognostication on the mode of death in hypothermia treated CA-survivors.

Methods: Retrospective study at Lund University Hospital, analysing all in-hospital and out-of-hospital CA-patients treated with hypothermia during a 5-year period. Cause of death was categorized as hypoxic-ischemic brain injury, cardiac or other. Multimodal neurological prognostication and decision on level of care was performed 72 hours after rewarming or later. Neurological function was evaluated by cerebral performance categories scale (CPC).

Results: Among 162 patients, 76 survived to hospital discharge, 65 of whom had a good neurological outcome (CPC 1-2), and 11 were severely disabled (CPC 3). No patient was in a vegetative state. The cause of death was hypoxic-ischemic brain injury in 58 patients, cardiac in 14 and other in 14. 4 patients were declared brain dead and became organ donors. They were significantly younger (median 40 years) and with long time to ROSC. Active intensive care was withdrawn based on a statement of poor neurological prognosis in 53 cases and these patients died, mainly from respiratory complications, at a median 7 days after CA.

Conclusion: Following induced hypothermia and delayed prognostication anoxic-ischemic brain injury remains the main cause of death after CA. Most patients with a poor prognosis statement died within two weeks.
P2323

Should we aggressively abort periodic patterns on EEG in patients with impaired consciousness?

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Introduction: The significance of periodic patterns on the electroencephalogram (EEG) in comatose patients is controversial. We aimed to determine if terminating these patterns influences outcome.

Methods: In this retrospective study of 4246 patients who underwent EEG from 2007-2009, consecutive patients with impaired consciousness and periodic EEG patterns comprising periodic epileptiform discharges (PLEDs, BiPLEDs, GPEDs) and triphasic waves were included. Patients with clinical seizures within the preceding 24 hours of EEG were excluded. Multivariate logistic regression analysis was performed to identify factors associated with mortality, functional status and resolution of EEG pattern.

Results: 111 patients had periodic patterns on EEG; 64 met the inclusion criteria. Abortive therapy was an independent risk factor for poorer functional status on discharge (p=0.013, OR=36.65, 95%CI 2.12 to 634.34). Treatment did not affect mortality or resolution of the EEG pattern. Patients with prior CNS disease were more likely to return to baseline functional status on discharge (40.0% vs. 11.8%, p=0.009). Acute symptomatic etiology caused increased mortality (37.5% vs. 6.7%, p=0.026) and poorer discharge functional status (81.3% vs. 53.3%, p=0.043). GCS ≤7 during EEG was an independent risk factor for mortality (p=0.025, OR 6.93, 95% CI 1.27 to 37.79) and deterioration in functional status (p=0.038; OR=0.72, 95% CI 0.52 to 0.98).

Conclusion: Treating periodic EEG patterns in impaired consciousness does not independently improve outcome. In the absence of prior CNS disease, they are associated with poorer outcomes and may indicate severe acute neuronal damage. Lower GCS at time of EEG predicts a poor prognosis.

P2324

Effects of mild therapeutic hypothermia on genomic response to reperfusion injury after cardiac arrest and cardiopulmonary resuscitation in porcine brain

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Introduction: Cerebral ischemia/reperfusion injury, a common secondary effect of cardiac arrest (CA), is largely responsible for post-resuscitative mortality. Therefore development of therapies which restore and protect the brain function after CA is essential. Mild therapeutic hypothermia (MTH) is a promising neuroprotective treatment after CA, however its cytoprotective mechanisms are not fully uncovered. The present study analysed whole-genome cerebral transcriptional profiles in a porcine model of CA to further elucidate the mechanisms of action of 34-32°C MTH.

Methods: Pigs were subjected to 12 min of CA, 8 min of cardiopulmonary resuscitation (CPR) and spontaneous reperfusion during 3 hours. Hypothermia was induced during CPR and reperfusion. Genome-wide transcriptional profiling was performed to identify new mechanisms behind the neuroprotective effect of MTH after ischemic injury at 60 and 180 min, respectively.

Results: Our results showed that 51 and 290 sequences were regulated by MTH after 60 and 180 minutes, respectively. After annotation and functional analysis of the corresponding genes, involved pathways were characterized. A comparison of transcript profiles from MTH and other interventions - experimentally proven to possess neuroprotective properties in our model - allowed to identify genes commonly induced by all three therapies as well as sets of genes specifically regulated after each intervention.

Conclusions: Our results contribute to further unravel the multifactorial mechanism of action of MTH as therapeutic agent against ischemia/reperfusion injury induced by CA. Moreover, our data suggest that combining interventions could potentially enhance overall protection. Such an approach is at present being tested in our porcine model.
P2325
Clinical trial design to validate a BCI-supported task-specific training in neurorehabilitation after stroke
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Introduction: Motor Imagery (MI) was proposed to enhance motor recovery after stroke. EEG-based Brain Computer Interfaces (BCI) operated by MI can provide monitoring and reinforcement of such task-specific training. A BCI rehabilitation device was specifically developed for recovery of hand function after stroke. Here we report the validation of this device, conducted in accordance with the guidelines to demonstrate the efficacy of novel rehabilitation interventions.
Methods: 16 stroke patients were consecutively recruited upon their admission to the clinic for post-stroke rehabilitation treatment, and randomly assigned to the BCI-supported MI group (BCI) or MI control group (CTRL). The primary outcome measure was the arm section of the Fugl-Meyer scale. A minimal clinically important difference (MCID) for this scale was described to 7 points. Secondary outcome measures were European Stroke Scale and the arm MRC scale for muscle strength.
Results: No significant group differences at baseline were found on primary and secondary outcome measures. Regarding the primary outcome measure, a mean change of 9.3 (+45%) was observed in the BCI group, exceeding the MCID of 7, with respect to an improvement of 5.62 (+9%) observed in CTRL control group.
Conclusion: To our knowledge this is the first randomized controlled trial to evaluate the efficacy of BCI-supported MI for motor recovery after stroke. Our findings support the efficacy of this approach. Two possible biases were found in the randomization procedure: side of the brain lesion and time from the event.
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P2326
The Hospital Anxiety and Depression Scale provides valid measures of anxiety, depression and mood in post-polio syndrome
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Introduction: We aimed to evaluate the validity of the Hospital Anxiety and Depression Scale (HADS) in post-polio syndrome by testing it for fit against the Rasch model.
Methods: The scale was posted to 319 subjects, response rate was 284 (89%), mean age was 66.6y (sd=8.15), 65% were female. Data was analysed in an iterative procedure which examined evidence of misfit or violation of the assumptions of the Rasch model.
Results: The anxiety subscale (HADS-A) was found to be reliable (α =0.88), fitted the model (p=0.19) and showed no evidence of multidimensionality (t-test=4.3%). Item 13 showed uniform differential item functioning by gender which was eliminated by combining into a testlet with item 11 and the modified scale met the assumptions of the model (α=0.86, p=0.98, t-test=3.6%). The depression subscale (HADS-D) showed misfit to the model (p<0.0001). Deleting item 8 provided an acceptable solution (α=0.76, p=0.014, t-test=2.5%) but the modified scale had a significant floor effect with 34 patients recording levels of depression outside that measured by the scale items. An attempt to combine the two subscales into a global measure of mood (HADS-total) showed significant misfit (p<0.0001). Combining items into two testlets according to their original subscale provided a working solution (α=0.89, p=0.58, t-test 4.4%).
Conclusions: The HADS-A is a robust, reliable and one-dimensional measure in this population, requiring only minor modification. The HADS-D meets the requirements of the model but is poorly targeted. The HADS-total can be used as a valid global measure of mood in PPS.
P2327
Mechanical flutter stimulation induces a lasting response in the sensorimotor cortex as revealed with BOLD fMRI
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Introduction: It has been recently shown that 20min of mechanical flutter stimulation induces lasting motor cortical excitability changes, as assessed by transcranial magnetic stimulation in relaxed hand muscles. The present fMRI study aims to examine if such neuromodulatory changes are reflected in the BOLD signal during a motor test.

Design: Therefore two groups were recruited: one group, receiving whole-hand flutter stimulation with a frequency of 25Hz (FSTIM group, n=22) and a second group receiving no stimulation (NOSTIM group, n=22). As motor test finger-to-thumb tapping was performed in order to activate a wide sensorimotor network during the fMRI measurements. Three fMRI measurements were obtained with this test: before stimulation (PRE), after stimulation (POST1) and one hour after stimulation (POST2). Three regions of interests (ROIs) were defined: primary motor area (M1), primary somatosensory area (S1) and supplementary motor area (SMA).

Results: In the absence of baseline differences between both groups, the FSTIM group showed increased movement-related brain activations compared to the NOSTIM group, both at POST1 and POST2. ROI analysis revealed increased BOLD responses within contralateral S1 (+20%) and M1 (+25%) at POST1 which lasted until POST2. These post stimulatory effects within S1 and M1 obviously reflect neuroplastic changes associated with augmented cortical excitability.

Conclusion: These findings are of high clinical relevance, for example, to improve the treatment of stroke patients.

P2328
Effects of a combination of constraint induced movement therapy with bimanual approach on fine motor skills in 5-10 year old hemiplegic children
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Introduction: Different therapeutic techniques are used to help hemiplegic cerebral palsy (CP) patients. Constraint-Induced Movement Therapy (CIMT) and Bi-manual approach (BIM training) are promising treatment to improve upper limb function in spastic hemiplegia.

Aim: This study was done to evaluate the effects of a combination of CIMT and BIM training on fine motor skills in children with hemiplegic CP.

Method: 25 hemiplegic CP, aged 5-10 years participated and randomly assigned into intervention (n=12, 4M and 8F, age 93.58±14.24m) and control (n=13, 7M, 6F, age 85.35±17.15) groups. All participants received current occupational therapy treatment 3, 45min sessions per week, for two weeks. The intervention group received a combination of CIMT and BIM training additionally, in which each session was started with restraint on non-involved upper limb while practicing with the paralyzed upper limb for three hours and followed by BIM training for another three hours. This process continued for 10 out of 12 consecutive days. Fine motor skills, upper limb function and muscle tone were assessed using BOTMP, Jebsen-Taylor test of Hand Function, and Modified Ashworth scale, respectively, before and after intervention.

Results: Fine motor skills and function of the upper limb were improved significantly in an intervention group in comparison with the control group (P>0.05) but spasticity did not differ significantly.

Conclusion: A combination of CIMT and BIM training improved fine motor skills in hemiplegic CP children.
P2329

Weaning and recovery of function during neurorehabilitation in critical illness polyneuropathy compared to brain lesions

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Introduction: After the exclusion of possible differential diagnoses critical illness polyneuropathy (CIP) seems to be one main factor for prolonged weaning in intensive care neurorehabilitation. The aim of this retrospective study is the analysis of different variables influencing weaning and the success of neurorehabilitation in comparison to lesions of the brain.

Methods: We included 142 patients (88 male, 54 female; mean age 62.8 years±14.4 years). Patients were categorised into five diagnostic groups: CIP, ischemic stroke, intracranial haemorrhage, traumatic brain injury and global cerebral ischemia. CIP was diagnosed using clinical examination and electrophysiological measures. The success of neurorehabilitation was measured using the Functional Independence Measure (FIM)-scale at the beginning of neurorehabilitation and discharge. The difference between FIM score at discharge and at the beginning of neurorehabilitation was regarded as measure of the absolute gain of function during rehabilitation (delta-FIM).

Results: Over all diagnostic groups weaning lasted between 21 up to 147 days. Post-hoc analysis using Mann-Whitney-U-tests showed significant longer weaning durations in CIP compared to traumatic brain injury, ischemic stroke and intracranial haemorrhage (p<0.05). Delta-FIM was significantly higher in CIP compared to all other diagnostic groups with the exception of ischemic stroke (p=0.112).

Conclusion: Our data support that CIP is associated with prolonged weaning compared to brain lesions. Once weaning is completed, however, patients with CIP significantly benefit from neurorehabilitation making a stronger recovery than patients with brain lesions. These data suggest a better rehabilitation potential of peripheral nerve disorder compared to brain lesions.

P2330

Evaluation and restoration of the respiratory motor control in chronic spinal cord injury

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When control of accessory respiratory muscles, innervated from within and below a level of spinal cord injury (SCI), is altered, it leads to respiratory function deficits and cause respiratory complications which are the leading causes of death in individuals with chronic SCI. However, current rehabilitative techniques for the restoration of respiratory motor control have not been proven to be effective in this population. This study was undertaken to characterize respiratory muscle control and to evaluate the application of physiologically-based rehabilitation strategies. Standard spirometrical pulmonary function measures were obtained along with surface electromyographic (sEMG) recording from respiratory muscles (Ovechkin et al., 2010) to qualitatively and quantitatively evaluate the respiratory muscle activation patterns from 16 individuals with chronic C3 to T12 SCI. Two matched groups were evaluated before and after 62±10 sessions of locomotor step training or 24±3 sessions of resistive respiratory muscle training. Functional outcomes, overall sEMG magnitude and initial raising slope, a measure of the rate of motor unit recruitment during maximum respiratory efforts, were significantly increased in both groups (p<0.05). The distribution of activation across multiple muscles was not significantly changed following locomotor training. In contrast, task-specific respiratory training brought a significantly improved respiratory muscle activation patterns. Although non-specific exercise increased amount of respiratory muscle activity and improved respiratory function, specific respiratory muscle training induced positive activity-dependent reorganization of the respiratory motor control networks. These results suggest that the implementation of task-specific respiratory training might be a valuable addition to the standard of care in chronic SCI.
**P2331**

**Correction of the advanced hand activity in stroke survivors with the use of sensor gloves**

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**Introduction:** The most frequent consequence of a stroke is motor deficit observed in nearly 80% of stroke survivors. In the modern literature methods of neurorehabilitation based on computer games are gaining more and more attention. The purpose of the present research was to assess the effectiveness of sensor gloves for restoration of advanced hand activity.

**Methods:** The treatment group consisted of 22 persons who suffered an ischemic stroke 1 to 6 months before the experiment; the control group included 18 stroke survivors. Scales used to assess motor deficit: NIHSS, Ashwort scale, Fugl-Meyer Motor Test (FMA), Motor Assessment Scale (MAS), 9 Peg Hole test; a questionnaire of Disabilities of the Arm, Shoulder and Hand (DASH). Cognitive examination was performed with the use of MMSE, FAB. Intervention group patients received two courses of exercises with the use of sensor gloves. Each course lasted 28-30 days, duration of training sessions - 30-40 minutes.

**Results:** MAS and FMA results demonstrated a statistically significant improvement of upper extremity functions in the treatment group (p=0.04 and p=0.001 respectively). Results of DASH did not show significant improvement by the end of the first treatment course, but there was a tendency for improvement after the second course. Use of sensor gloves did not provoke an increase in spasticity according to Ashwort scale.

**Conclusion:** The first experience of use of sensor gloves for correction of advanced hand activity after the stroke has shown significant improvement of hand function and a tendency for improvement of daily living.

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**P2332**

**Central neuroplasticity and lower limbs functional outcome following repetitive locomotor training in chronic stroke patients**

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**Background:** Task-specific repetitive gait training may induce central neuroplasticity in chronic hemiparetic stroke.

**Aims:** Explore central neuroplasticity underlying lower limbs functional improvement following repetitive locomotor training by electromechanical gait trainer (EMGT) compared to treadmill with partial body weight support (PBWS) in chronic hemiparetic stroke.

**Methods:** 50 chronic hemiparetic stroke patients allocated into 2 groups. Group 1 trained on EMGT of Hesse and group 2 trained on treadmills with PBWS. Fugl-Meyer lower extremity motor performance test (FM) and motor evoked potential (MEP) of paretic rectus femoris (RF), tibialis anterior (TA) and gastrocnemius (GC) muscles were assessed at beginning, end of eight-week training, and three months.

**Results:** Group 1 scored higher post-rehabilitation FM. In group 1, MEP variables showed post-rehabilitation improvement (lower resting threshold, shorter latency and higher amplitude). Group 2 showed improvement in MEP variables except for MEP latency of TA and GC. Higher percentage of group 1 patients had obtainable MEP at study end. Percent changes in FM score and MEP variables were higher in group 1. In group 1, percent change of FM correlated positively with percent change of MEP amplitude of TA and RF and negatively with percent change of MEP latency of GC. In group 2, percent change of FM score correlated positively with percent change of MEP amplitude of RF and GC.

**Conclusion:** Central neural plasticity, underlying EMGT, promoted lower limb functional recovery in chronic hemiparetic stroke. This can help optimizing the therapeutic approach in chronic stroke rehabilitation with facilitated work and fewer therapists.
Central neuroplasticity and upper limbs functional outcome following repetitive lower limb locomotor training in chronic stroke patients

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Introduction: Locomotor training may improve chronic hemiparetic upper limb motor function. Aim: Explore the neurophysiological mechanism underlying the effect of long term repetitive locomotor training on treadmill with partial body weight support (PBWS) in improving swinging and supported paretic upper limb motor function.

Methods: 30 chronic hemiparetic stroke patients were assigned to either one of 2 experimental conditions while trained for 20 minutes on PBWS treadmill for 8 weeks. Patients under condition one received verbal cueing to perform bilateral upper limb swinging. In condition 2, patients were instructed to support both upper limbs on treadmill handrails. Fugel-Meyer upper extremity motor performance test (FM) and motor evoked potentials (MEP) of paretic deltoid (D), biceps brachii (BB) and abductor pollicis brevis (APB) were assessed before, immediately and at end of program and at three months.

Results: Both conditions resulted in an increase of FM score. Group 1 showed significant improvement of MEP variables (lower resting threshold, shorter central motor conduction time and higher amplitude ratio) in the 3 muscles. Group 2 showed significant improvement in MEP variables of APB muscle and increase of MEP amplitude of BB muscle only. Change of MEP threshold and amplitude of D and BB muscles were significantly higher in group 1 patients than in group 2.

Conclusion: During treadmill training, active bilateral upper limb swinging improves effectively paretic upper limb motor function than supported upper limbs training. Central neural plasticity is underlying this improvement. Task-dependent neuronal coupling between lower and upper limbs could be beneficial in stroke rehabilitation.

Mindfulness-based stress reduction (MBSR) and an advanced program: an effective treatment for long-lasting mental fatigue after traumatic brain injury or stroke

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Introduction: Mental fatigue is for many a very distressing and long-lasting problem after a traumatic brain injury (TBI) or stroke. It may be difficult for the person to return to work and participate in social activities. Furthermore, it can take several years to find the right balance between rest and activity in daily life, find strategies and to accept the new situation. Since no effective therapy exists today, the aim with the present study was to implement mindfulness-based stress reduction (MBSR) aimed at improving the condition of these patients.

Methods: MBSR is a structured public health intervention to cultivate mindfulness. It consists of 8 weekly 2.5h long group sessions, one day long silent retreat and home practice every day. The results of the program were evaluated using the mental fatigue scale (MFS) and tests measuring information processing speed, attention and working memory. Eighteen stroke, 11 TBI and 3 with other brain diseases were included. 16 were randomized for the MBSR program, and the other 16 served as controls on waitlist and were offered MBSR the next 8 weeks. In total, 25 completed the MBSR program. After that, we offered an advanced program and 17 participated during 8 months.

Results: Statistically significant improvements were achieved in the MFS, and in information processing speed after 8 weeks. These positive results remained at follow-up after the advanced program.

Conclusion: The results from the present study show that MBSR may be a promising non-pharmacological treatment for mental fatigue after a stroke or TBI.

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P2335
A highly challenging, progressive and specific balance training program in elderly with Parkinson's disease: theoretical framework and feasibility
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Introduction: Balance control is a task specific multi-joint skill dependent upon the interaction of several physiological systems (musculoskeletal, neuromuscular, cognitive and sensory). Recently the importance of the interaction between these systems and their impact on balance disorders in PD has been acknowledged. Nevertheless, previous balance interventions in PD have mainly been non-specific. To improve balance performance, innovative interventions, focusing on impairments specifically related to PD are crucial [1]. Therefore, a randomized controlled balance intervention in elderly with PD was initiated, by using highly challenging, progressive and individually adjusted exercises.

Methods: This group intervention (12-weeks, three times/week) pin-points four subsystems underlying balance control (stability limits, anticipatory postural adjustments, sensory integration and motor agility), to target symptom specific balance impairments in individuals with PD. Initially, each subsystem will be separated to enhance motor learning. As participants progress multitasking is introduced, and subsystems integrated- to increase demands on motor programming. Tasks are individually adjusted to optimize demands of each participant. 5 subjects (one female), mean age 72 years (range 69-80) idiopathic PD (Hoehn & Yahr 2-3) participated in a pilot study investigating the interventions feasibility.

Results: Preliminary results indicates this intervention to be feasible (safety, intervention compliance, pain and general fatigue) and exercise progression was easily performed during training. The pilot study indicated positive effects on functional balance and gait parameters.

Conclusions: This pilot study showed the intervention to be feasible in elderly with PD with great potential to improve balance performance. However, a randomized trial is needed to further investigate this.

P2336
Low-level laser therapy accelerates nerve recovery after crush injury in rats
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Introduction: Peripheral nerve injury is a common clinical event related to incapacity. The mechanisms involving nerve regeneration are related to extracellular matrix (ECM) remodelling, by matrix metalloproteinases (MMPs), and the expression of neurotrophins, such as BDNF and NT-4. Low-level laser therapy (LLLT) has been indicated to accelerate nerve regeneration.

Objective: To characterize the temporal effects and molecular mechanisms of LLLT on nerve recovery after sciatic nerve crush injury in rats.

Material and methods: 70 male Wistar rats (250g) were divided into: normal; nerve injury 7, 15 and 21 days after injury; and nerve injury+LLLT daily irradiated during 7, 15 and 21 days post-injury. Electrical physiological variables, such as rheobase, chronaxie and accommodation, were evaluated. Furthermore, the mRNA levels of MMP-2 and -9, TIMP-1, BDNF and NT-4 were investigated by qPCR. The MMP-2 and -9 activities were accessed by zimography.

Results: LLLT accelerated the recovery of the rheobase and accommodation indexes, and reduced chronaxie levels at 21 days after injury compared to non-irradiated groups. At 7 days, LLLT up-regulated the expression of MMP-2 and -9, TIMP-1, BDNF and NT-4 were investigated by qPCR. The MMP-2 and -9 activities were accessed by zimography.

Conclusion: LLLT improves electrical nerve conduction and modulates the expression of BDNF and MMPs in crushed nerve of rat.
P2337

The effects of an electromechanical gait trainer on resistance, fatigue and quality of life in patients suffering from multiple sclerosis: a pilot study

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Introduction: Gait impairments are considered as one of the most important factors limiting the activities in daily life in patients with multiple sclerosis (MS). Several articles demonstrated positive effect of an electromechanical gait trainer (Gang Trainer I GT-I) in patients with neurological diseases.

Aims: To evaluate the feasibility of the GTI among persons with multiple sclerosis. To examine the effect on gait, fatigue and quality of life.

Design: The study was a pilot randomized trial.

Patients and methods: 24 patients were recruited during a 10-month period (March - December, 2011). Inclusion criteria: EDSS 3>x<6.5; age 30>x<65; ability to walk independently for minimum 15 meters. Exclusion criteria: relapses in the previous three months; rehabilitation training in the previous 6 months. The patients were randomly assigned to an experimental group, who received 30 minutes of locomotor training with the GTI, plus 10 minutes of passive joint mobilization and stretching exercises, and a control group who received conventional physiotherapy, for a total of 12 treatment sessions. Before and after treatment and then at 1 month, the patients were evaluated by means of clinical scales (10MWT, 6MWT, Fatigue Severity Scale, MSQOL-54) and instrumental evaluation (gait analysis).

Results: The experimental group showed significant post-treatment improvement on 6MWT. A statistically significant trend improvements were found in: 10MWT, gait speed, stride and step length.

Conclusions: The GTI device could be a safe and feasible instrument that can be integrated into routinely rehabilitative programs with patients with MS and have a positive effect on endurance and gait parameters.

P2338

Validation of a new movement monitoring method

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Introduction: In neurology, objective evaluation of the improvement of paresis is part of the daily routine. The aim of this study was to develop and test a small triaxial acceleration measuring device and validate its usefulness.

Method: Our new movement monitoring method based on that we calculate the integral of the derivative of the acceleration in a chosen time frame. We compared accelerometry data with muscle tone (measured by EMG) during movements. We collected data from 17 hemiparetic stroke patients and made comparisons using 22 control subjects. The devices were attached to the paretic and non-paretic extremities and any movements were registered (24h). Movement monitor data were also evaluated against to National Institute of Health Stroke Scale and European Stroke Scale scores.

Results: We found strong linear correlation between muscle tone and movement data (p<0,0001). Minor differences could be found in the use of dominant and non-dominant upper extremities in controls. Controls used their upper extremities more frequently than stroke patients (p<0.0001). Our movement data showed significant association with NIHSS score (p=0.0047). Greater scores were associated with less intensive limb use. We found a correlation between patients’ level of consciousness and upper limb activity (p=0.0382). Patients with severe consciousness disturbances used their extremities significantly less intensively.

Conclusion: Our device sensitively detected the movement differences between paretic and non-paretic extremities and can be used for the quantitative evaluation of patients’ neurological and consciousness status.
P2339
How frequent is impaired arm and hand function after the first occasion of stroke? An unselected population from a stroke unit with a geographical catchment
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Introduction: Reduced upper extremity function after stroke has been reported in 70-80% of patients. There is limited information in upper extremity function within the first days after a stroke. Prior studies include either both first and recurrent stroke or only one type of stroke.

Aim: To investigate the frequency of impaired arm and hand function in an unselected group of patients with first occasion of stroke.

Method: All patients at a stroke unit at Sahlgrenska University Hospital were assessed during 18 months. Impaired upper extremity function was assessed within 72 hours after stroke.

Results: 771 patients over 18 years old with a first stroke were at the stroke unit within 72 hours, 56 patients were not from the catchment area, leaving 715. Of those, 58 (8.1%) had prior upper extremity problems. Of the remaining patients (n=657), 311 patients (47.3%) had impaired arm and hand function within 72 hours after stroke onset.

Conclusion: The frequency of impaired upper extremity function in this unselected population of first occasion of stroke is lower than previously reported. The Copenhagen stroke study noted 69% impaired at admission and 43% at one week. This indicates that today’s stroke patients present less frequent with impaired motor function in the upper extremity. However, they may have difficulties in functional activities which may influence content of rehabilitation process.

P2340
Irregular breathing in hemiplegic stroke. Analysis of movement and frequency of respiratory movements
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Background and Purpose: Hemiplegic stroke patients demonstrate clinical breathing disturbances, contributing to mortality and hampering rehabilitation. The purpose of this study was to investigate respiratory movement patterns among patients with right versus left hemisphere stroke with emphasis on regularity of respiratory frequency and range (amplitude) of movements.

Methods: In a prospective cohort study, participants were stroke patients, admitted to the neurological department at Landspitali University Hospital, who scored 4 or 5 on the modified Rankin scale. Respiratory frequencies and movements were measured with the Respiratory Movement Measuring Instrument (ReMo, Reykjavik, Iceland). The Motor Assessment Scale (MAS) was used to assess physical performance and a letter-cancellation-test to detect unilateral neglect.

Results: 18 individuals, including 10 right (age 62.2±14.2 years) and 8 left hemispheric stroke patients (age 65.1±8.9 years). The demographics and median score on the motor assessment scale were comparable for both groups. Deep respiratory movements were significantly decreased (p<0.001) and respiratory frequency significantly increased (p<0.03 for quiet and p=0.002 for deep breathing), for the whole group (n=18). Deep respiratory movements had irregular range in 10 (p=0.003) and irregular frequency in 6 (p=0.058).

Conclusion: Our results indicate that hemispheric stroke affects both regularity of range and frequency of respiratory movements among awake stroke patients. We demonstrate an interesting objective method to measure this problem.
P2341
Reaching in virtual reality - haptic robot for rehabilitation

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Background: Reaching may be impaired by different frontal and parietal cortical lesions. Haptic robot (HR) is claimed to be more useful in the rehabilitation processes compared to the natural movements. The aim of our study was to explore which differences in preparation of these two movements contribute to dissimilarities in the results of rehabilitation.

Methods: 10 right handed healthy subjects performed reaching with right hand with and without HR. Reaction times, movement times, accuracy as well as 64-channels EEG were recorded. We analysed current source density (CSD), synchronisation and desynchronisation in the alpha, beta and gamma bands regarding to target onset.

Results: No significant differences in task performance were found. The CSD was significantly bigger for HR-reaching in the electrodes overlying left medial frontal gyrus (from 110 to 130ms), left dorsolateral prefrontal cortex (from 160 to 200ms), right dorsolateral prefrontal cortex (200 to 250ms), and bilateral angular gyrus (150 to 190ms). Desynchronisation was weaker in the gamma band during HR-reaching preparation between 280 and 340ms in electrodes overlying bilateral superior parietal cortex and medial frontal gyrus. There were no differences in other frequency bands.

Conclusions: Absence of differences in task performance suggests the reliability of HR in mimicking actual arm movements. Differences in dorsolateral prefrontal and in parietal cortex may be due to differences in the control of motor programming as well as in motor programming itself. They might be beneficial in neuro-rehabilitation by stimulating alternative cortical connections for the same motor program.

P2342
Stimulation of the proprioceptive system in neurorehabilitation

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Objectives: The aim of the study was to investigate the human proprioceptive system in healthy subjects and in patients with severe brain damage and to develop a paradigm for the brain mapping of proprioceptive foot stimulation with vibration.

Material and methods: 15 healthy male subjects and 22 patients were stimulated with a vibrotactile stimulus on the right foot by a moving magnet actuator system and at the first and second toe with a cuff-type pneumatic stimulator.

Results: Brain activity within the main centres of the primary and secondary somatosensory cortex, within the pre- and post-central gyrus bilaterally and the right inferior, medial and middle frontal gyrus, within the inferior parietal lobule, the superior temporal gyrus, the temporal transverse gyrus, the caudate nucleus, the middle cingulate gyrus, the insula and the hippocampus on the left side. Only in 7 out of 22 patients a specific response within the primary and secondary somatosensory cortex could be elicited.

Conclusions: It could be shown that vibrotactile stimulation of the foot in healthy subjects can elicit specific brain responses in main centres of the sensorimotor system and in centres of attention and arousal. It was possible to map in detail the cortical representation of the proprioceptive system of the foot for a functional diagnosis and a monitoring of the proprioceptive system in neuro-rehabilitation, e.g. in subjects with degradation of the proprioceptive system (space disease, bed-rest syndrome) and in patients with severe brain damage for the planning of specific rehabilitation strategies and the induction of arousal.

P2343
Abstract cancelled
**P2344**

**Association of pathways of early rehabilitation with heart rate variability dynamics in acute stroke patients**

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**Background:** The aim of this study was to reveal the connection of heart rate variability (HRV) dynamics and pathways of early stroke rehabilitation.

**Methods:** We prospectively included 60 patients (67.5% males; mean age 59.1±9.6) with stroke (75% were ischemic) within 48 hours of stroke onset. All patients were treated using the standard medical and physiotherapy. 40 patients (main group) were verticalized using tilt table under blood pressure, heart rate and SpO2 control. 20 patients (control group) changed their position with functional hospital bed. The analysis of HRV using short-term recordings (5min) was performed. Total power (TP; ms²), standard deviation of the NN intervals (SDNN; ms), very low frequency component % (VLF%), low frequency component % (LF%), high frequency component % (HF%) was investigated.

**Results:** The analysis of HRV revealed on admission TP in main group 856.0 (447.5;1,570.5) vs. 713.0 (354.0;986.0) in control group, LF/HF 3,4 (1.3;6.6) vs. 2.2 (1.2;5.5), LF% 20.0 (15.0;32.5) vs. 28.0 (16.0;33.0), HF% 7.0 (3.0;16.0) vs. 11.0 (6.0;21.0), SDNN 28.0 (20.5;36.0) vs. 24.0 (18.0;31.0). We haven’t estimated any difference between two groups. The NIH score in main group completed 9.0 (8.0;15.8) vs. 9.0 (6.0;17.0). On discharge TP and SDNN decreased in main group: 399.5 (276.0;985.3), p=0.011 and 22.0 (15.0;36.3), p=0.039 respectively. In control group TP and SDNN presented non-significant tendency to decreasing: 323.5 (175.3; 675.5 and 16.5 (11.8;25.5) respectively. The frequency analysis did not reveal any dynamics in both groups.

**Conclusion:** We found that TP and SDNN decrease after stroke independently from method of rehabilitation. It may occur due to effect of central regulation of autonomic nervous system exceeded effects of early rehabilitation.

**P2345**

**Effect of rhythmic auditory cueing on gait dynamics in healthy individuals**

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**Introduction:** Rhythmic Auditory Cueing (RAC) can induce beneficial effects on gait performance in different neurological disorders. It is likely that RAC stimulates intact auditory-motor system, which partially substitutes to injured motor pathways. In order to better understand RAC enhancement, we analysed the effect of metronome walking on two non-linear indexes of gait variability: 1) long-range correlations in time series of Stride Time (ST), Stride Length (SL), and Stride Speed (SS=SL/ST); 2) Local Dynamic Stability (LDS).

**Methods:** 20 subjects performed 6x5min walking trials on an instrumented treadmill at three different speeds (slow, normal, fast). Freely-chosen walking cadences were measured during the first three trials and then imposed accordingly in the last three trials with a metronome. LDS was assessed from maximal Lyapunov exponents (λs) of the centre of pressure trajectories. Scaling exponent α, which reflects the auto-correlation structure present in times series, was computed by using detrended fluctuation analysis (DFA) on ST, SL and SS.

**Results:** LDS was not different between normal (λs=0.82) and metronome conditions (λs=0.81). Conversely, the correlated pattern present in ST (α=0.8) and SL (α=0.7) under normal condition was modified to an anti-correlated pattern under metronome condition (ST, α=0.3; SL α=0.4). SS exhibited anti-correlated pattern under both conditions (α=0.3).

**Conclusion:** Anti-correlated pattern in stride fluctuations has been associated to increased conscious/voluntary gait control, and to fast over-correction of deviations in the controlled variable. Furthermore, LDS is an index of fall risks. By efficiently stimulating alternative gait control process, without increasing fall risk, RAC is an attractive rehabilitation tool.
P2346

Validation of assessment method and outcomes with interventional medium frequency currents (IMFES) therapy for micturition control in mainly post SCI patients with neurogenic bladder (NB)

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Introduction: 2 non-urodynamic classifications were used to assess the efficiency of an IMFES standardized therapeutic method for micturition control (MC) rehabilitation in NB.

Methods: Comparison of Bors-Comarr (BC) with an own classification (OC) quantified scale (intrinsic and extrinsic validation) based on a related prospective study: 332 inpatients with NB at the P (neural-muscular) RM Clinic Division of our hospital, fulfilled between September 2006 - April 2011, cases divided in two lots: IMFES (162, mean 39.63 years, st.dev. 17.06) and control (170 cases, mean 39.96 years, st.dev 17.58), stratified by AIS sensory (SS) and motor (MS) scores.

(Main) Results: BC/OC intrinsic: sensibility (0.82/0.68), specificity (0.48/ 0.73), test efficiency (0.65/0.71) and extrinsic: Somers (0.921), Spearrman (0.970), Cronbach (0.922), Kendall (0.921), Pearson (0.949).

The number of inpatients that significantly improved their MC was overall higher in the IMFES lot (mean 365.80, st.dev. 488.61) compared to controls (mean 824.94, st.dev. 63.22; p<0.001, especially for those AIS B at admission, with SS between 160-224 (IMFES: mean 283.09, st.dev. 403; control: 1061.29, st.dev. 437.17; p<0.001) and AIS C, with SS between 160-224 and MS below 40 (IMFES: 229.63, st.dev. 389; control: mean 694.14, st.dev. 671.89; p<0.001). For the AIS A and/or B cases, with SS between 89-160 and for those AIS C and/or D, with SS between 160-224 and MS over 40, the method is useless but obviously for different reasons.

Conclusion: OC is valid for the evaluation and IMFES is useful in rehabilitation of incomplete - both for patients with NB.

P2347

Predicting participation in stroke patients admitted to a rehabilitation unit

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Introduction: The level of participation is an important factor influencing rehabilitation outcome. Participation can be potentially affected by factors such as motivation, mood and cognition. Despite the abundance of studies on outcome after stroke rehabilitation, few have actually evaluated rehabilitation participation and its clinical predictors

Objective: This study aims to establish the level of participation and its predictors in stroke patients undergoing inpatient rehabilitation.

Design: Prospective study of a cohort of stroke patients admitted for inpatient rehabilitation over a 12-month period. Setting: Inpatient rehabilitation unit participants: 122 patients with a first clinical stroke admitted for rehabilitation. Main Outcome Measures: Pittsburgh Rehabilitation Participation Scale (PRPS), National Institute of Health Stroke Scale (NIHSS), Functional Independence Measure (FIM), Elderly Cognitive Assessment Questionnaire (ECAQ), Centre for Epidemiologic Studies -Depression Scale (CES-D), Fatigue Severity Scale (FSS), Lubben Social Network Scale-Revised (LSNS-R) and a multidimensional questionnaire evaluating health attitudes and beliefs.

Results: The level of rehabilitation participation was generally good, with the mean admission PRPS score being 4.3 (0.9). Participation was significantly predicted by admission FIM, EACQ, NIHSS and FSS scores but not by age, gender, site of stroke, depression, social support or health attitudes and beliefs.

Conclusions: Poor participators were more likely to have a severe stroke, cognitive impairment, fatigue and lower functional status. We suggest that apart from cognition, fatigue should be routinely screened in stroke patients undergoing rehabilitation as some of its causes e.g. medical co-morbidities and drugs, are potentially treatable.
P2348

Mild movement and mental disorders in children. The impact of EEG biofeedback for voluntary and involuntary movements and ADHD compared to intensive classical neurorehabilitation

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Introduction: EEG biofeedback belongs to the new attractive neurorehabilitation methods. Its efficacy on motor skills and ADHD and/or ADD in children is not well known. Aim of this study was to compare efficacy of this method with intensive classical neurorehabilitation.

Material and methods: Material consists of 60 children with mild central movement disorders in combination with ADHD/ADD. Whole material was divided into two groups: 1st group: 30 children, mean age 8.9yrs, underwent 30 EEG biofeedback procedures. 2nd group: 30 children, mean age 8.5yrs, underwent intensive classical neurorehabilitation 2-3 times a week. The length of one procedure was 30-45 minutes in both groups. All children were tested using PANESS test before and after procedures (PANESS test was used for assessment of various movement variables: lateral preference, standing, walking, balance, coordination, overflow movements, dysrhythmia, repetitive and pattern movements). Achieved total time in repetitive and pattern movements was also evaluated.

Results: Significant improvement in total score of all variables of PANESS test: before (M=58.57) and after (M=26.87) biofeedback rehabilitation was documented (p≤0.000). Sum of achieved time of repetitive and pattern movements was (Mdn=101.60) vs. (Mdn=88.95, p=0.000) after procedures. In the 2nd group (intensive classical neurorehabilitation) improvement in motor skills was also found out but these changes did not reach statistical significance. Achieved time: (Mdn=137.06) vs. (Mdn=107.85, p=0.000) was significantly shorter but less marked. Significant improvement was found also in total time of repetitive and pattern movements.

Conclusion: EEG biofeedback neurorehabilitation significantly improved not only motor skills but also ADHD/ADD parameters. Comparing results of both groups, showed significantly better results in motor skills in the 1st group and similar significant results in total time of repetitive and pattern movements in the 2nd group.

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P2350

Neurorehabilitation after cellular therapy for chronic spinal cord injury patients


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Chronic spinal cord injury patients have lost potential to recover neurologic function of areas innervated below lesion site. Many regenerative therapies fail because of shortcomings of these rehabilitation programmes. To overcome this problem, we have developed a rehabilitation approach that enhances the functional outcome of the treatment. A total of 13/15 patients with chronic Spinal Cord Injury (cSCI) underwent a customised multidisciplinary neurorehabilitation programme based on the lesion level that consisting of 30 hours per week and employed 1-3 therapists per patient. The programme was intended to achieve the following neurodevelopmental steps: 1- Holding the head up; 2- Rolling motion of the body; 3- Crawling on all four limbs; 4- Sitting down; 5- Standing up; 6- Walking. The protocol changed as the patient progressed; it was exigent but avoided muscle fatigue. Active-assisted work, using muscular tracks that enable strength radiation from healthy territories to compromised ones, achieves productive movement patterns without extra-regional muscle compensation. Movements were repeated several times, combining voluntary orders with reflex stimulation and starting with the minimum resistance, which increased as the muscle strength was recovered. ASIA A patients evolved to B, C or D, recovering anal sphincter and bowel evacuation control. Urinary, sexual and tactile function recovery was variable. Pattern of muscular recovery started with increases in muscle volume and tone. Involuntary movements then appeared, followed by pathologic reflexes and spasticity and ending with control of muscular contraction. Sensitivity started with deep sensations, proprioception, nociception and postural recognition. Tactile sensitivity recovered in patches.
P2351
Simultaneous training of visual attention and motor function in children using virtual reality and eye tracking
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Objective: The aim of this study was to quantify the effects of intensive virtual reality training of reaching and grasping on visual attention and eye movements in children with congenital motor deficits.

Design: 6 children (4 females, age 8.8±1.4y) with congenital motor deficits, single-case pilot study.

Methods: An interactive virtual reality system called YouGrabber (YouRehab, Zurich, Switzerland) was used to train reaching and grasping. Training was applied at two different dosages: 3-4 sessions/week over 4 weeks [N=2] and 1 session/week over 4 weeks [N=4]. No additional training for arm, hand or visual attention was provided during the study. Eye movements were measured using the Tobii eye tracker (Stockholm, Sweden) at the beginning and the end of therapy, plus a follow-up 2-4 weeks later. Arm and hand function was also assessed.

Results: Gaze pattern analysis showed that visual attention normalized over the course of therapy towards the locations of the events during training, indicating improved visuo-motor attention. Arm-hand dexterity showed some improvements, as measured by the Box and Block Test.

Conclusions: These preliminary results suggest that intensive virtual reality training may improve both motor function and visual attention. Larger studies on similar and other neurological patient groups are warranted.

P2352
The incidence and risk factors of ventilator associated pneumonia in post-operative neurosurgical patients in New Delhi, India
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Background and objective of the study: Ventilator associated pneumonia (VAP) is the leading cause of mortality and morbidity in critically ill patients. The risk factors and impact of ventilator associated pneumonia seems different depending on the type of critically ill patient. The present study was undertaken to explore the incidence and risk factors of VAP and evaluate the existing endotracheal suctioning practices in post-operative neurosurgical patients.

Materials and methods: An exploratory study was conducted on 166 subjects following brain and spinal cord surgery and were on mechanical ventilation for >48 hours. Standardized clinical pulmonary infection score (CPIS) and Mini-Bronchioalveolar lavage culture were used to diagnose VAP. Three tracheal suctioning events on each patient were observed within 48 hours using a checklist. Chi-square and Fisher’s exact test, Univariate and multiple regressions were performed. Significance was considered at p<0.05.

Results: The incidence of VAP was 36 cases per 1000 ventilator days. On univariate logistic regression absence of bacterial filters (p=0.029) and frequency of changing breathing circuits for >72 hourly (p=0.017) were risk factors and on multiple logistic regression the independent risk factors of VAP were route of intubation (p=0.018), spinal cord injury (p=0.011) and patients not on antacid (p=0.008). Analysis of endotracheal suctioning practices revealed inconsistencies in the practices.

Conclusion: Adherence to meticulous aseptic techniques would help to control the risk of VAP in neurosurgical patients.


**P2353**  
The effect of bilateral activities on function in CVA patients  

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**Introduction:** CVA causes mild to severe defects in one or both sides of the body in survivors which leads to disorder in motor activities. We aimed to study the effect of bilateral activities in addition to other therapeutic modalities on the functionality of affected upper limbs in CVA patients.  

**Method:** 21 CVA patients, referred to two rehabilitation centres in Tehran participated in this study regarding the selection criterion. Participants were assigned randomly in the intervention (N=11, age 57.3 years old) and control (N=10, age 52.3 years old) groups. The intervention group received 18 sessions’ bilateral activities in addition to usual occupational therapy activities which both groups received. Each treatment session lasted 45 minutes for both groups. Data were collected using demographic specification form, Fugl-Meyer assessment and Wolf Motor Function Tests. Data were analysed statistically.  

**Results:** Two groups were equal in the scores of motor function, function time, and sensory-motor function before intervention. Results showed significant differences before and after intervention in function time score (p<0.023) and sensory motor score (p<0.002) in the intervention group but there was no difference between the mentioned parameters in control group before and after intervention.  

**Conclusion:** Accompanying bilateral activities to other therapeutic methods can be more effective to improve upper limb function in CVA survivors.

**P2354**  
Transcranial direct current stimulation in a vegetative state patient: a case study  

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In this study transcranial Direct Current Stimulation (tDCS) was applied to the scalp overlying the precuneus area, as one of the highly connected nodes in human brain, in a patient fulfilling criteria for a diagnosis of vegetative state. The patient received tDCS every day for 3 months. MRI images and clinical assessments were performed one month and also three months from the beginning of tDCS application. During this time the patient showed clinical improvement (based on Coma Recovery Score-Revised) particularly in emotional expressions and also a few purposeful motor responses which were accompanied by increased cortical volume in the right and left fusiform, right parahippocampal, right amygdala and supplementary motor areas respectively, in structural MRI series analysed by SPM8. Our findings suggest considering tDCS as a new non-invasive method for rehabilitation of patients with disorders of consciousness such as vegetative state.
P2355
Effects of non-invasive cortical stimulation on fatigue and quality of life in post-polio patients: a double blind real-sham study
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Background: Fatigue, a disabling symptom of post-polio syndrome is from central or peripheral origin. Central fatigue has been related both to changes in the activity of spinal motoneurons and to reduced supra spinal drive, accompanied by changes in motor cortex excitability and altered pre-motor cortex activation. Transcranial direct current stimulation (tDCS) is a non-invasive technique for modulating brain excitability. In this study we investigated whether brain polarization could modulate central fatigue and therefore could improve quality of life.

Methods: This was a prospective, double blind, real/sham study. Subjects were inpatients who performed a three-weeks rehabilitative-hospitalization and underwent a five days stimulation session (real/sham, bionodal, bilateral motor cortex, 1.5mA, 20min). 32 consecutive eligible patients fulfilled inclusion criteria. We evaluated patients, at baseline and two days after the end of stimulation sessions, for fatigue, pain, depression and quality of life.

Results: All the patients except one bore the stimulation procedures. No adverse effects were reported. Fatigue and quality of life improved in both groups (p<0.05) without group effect, while pain improved in both groups (p<0.05) but with a group effect (pain improved more in real stimulation).

Conclusion: Our patients performed a rehabilitation protocol during stimulation, demonstrating that there is no add-on effect on symptoms like fatigue. A stimulation effect is reported for pain, in agreement with literature. Non-invasive brain stimulation could be a useful tool in rehabilitation settings, but the physicians could have in mind the therapeutic target in the patient before stimulation.

P2356
The impact of age on the rehabilitation effectiveness in patients with traumatic brain injury
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Objective: To evaluate the impact of age to the rehabilitation effectiveness of patients (pts) with Traumatic Brain Injury (TBI) in an early rehabilitation stage.

Method: Study of 53 adults, both gender, pts with TBI: 35 (66%) pts were in the age group of 18-44, 18 (34%) pts were in the age group over 45; in 46 (86.8%) pts was diagnosed severe TBI; in 7 (13.2%) pts, moderate. Rehabilitation effectiveness was evaluated by Functional Independence Measure test (FIM).

Results: The FIM at the beginning of rehabilitation in the age group of 18-44 was 54.7±21.5, after rehabilitation, 92.8±26.4 (p<0.001). In the age group over 45 the FIM at the beginning of rehabilitation was 40.9±11.0, after rehabilitation, 70.9±33.5 (p<0.001).

Conclusion: The analysis of activity of pts after TBI according to age has shown that more evident dysfunctions and weaker recovery has been noticed in the age group over 45 in comparison to pts of young age (p<0.001).
P2357

Improvement of walking parameters and motor functions depending on the number of therapeutic units of robotic assisted treadmill training (RATT) in children with cerebral palsy

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Objective: To assess the impact of number of RATT sessions on improvement of gait and motor functions in patients with cerebral palsy (CP).

Methods: 22 children (8 males and 14 females) with bilateral spastic CP, aged 4.5 - 25.1 years underwent 40 therapeutic units (T.U.) of RATT using driven gait orthosis Lokomat with a frequency of 3 to 5 times a week. Outcome measures were dimension A (lying, rolling), B (sitting), C (crawling, kneeling), D (standing) and E (walking, running, jumping) of the Gross Motor Function Measure (GMFM-88), 6-minute walking test, 10 - metre walk test, Functional Ambulation Categories (FAC).

Results: To evaluate the results, we used Wilcoxon signed-rank test. After completing 20 and then 40 sessions, patients demonstrated highly statistically significant improvement (p<0.001) in all dimensions of the GMFM. We also observed a highly statistically significant increase (p<0.001) in walking speed, endurance when walking, and rating scales FAC, GMFCS. Comparing the average improvement (%) in outcome parameters after 20 T.U. and after 40 T.U., we documented a statistically highly significant difference (p<0.001) in the dimension of A, B, C, D and overall improvement in the GMFM and a statistically significant difference (p<0.05) in GMFM dimension E test, 10 MWT, 6 minWT.

Conclusions: Patients showed significantly greater improvement in outcome measures after completing 40 sessions than after 20 sessions. Our study indicates, that the number of therapeutic units of RATT affects the amount of achieved improvement.

P2358

Prevention of lower limb spasticity and immobilization complications with passive mobilization in acute stroke patients

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Aim: To test a self-developed, electronic mobilizing and stimulating device for bedridden, hemiparetic acute stroke patients. The device can prevent the stroke’s complications such as deep venous thrombosis, spasticity.

Methods: We treated 50 patients who suffered from ischaemic or haemorrhagic stroke (mean age: 69 yrs, min:51 max:89). Treatment period was 5.5 days (min:4, max:7), the duration 30 minutes per day of the hemiparetic leg. We evaluated the efficacy of our device with the help of national stroke scales (Modified Asworth scale, National Institute of Health Stroke Scale, Modified Rankin Scale) and goniometer. Every day (before and after treatment) the degree of spasticity was measured with Modified Ashworth Scale. On the first and seventh day we evaluated the patient’s status with Modified Asworth scale, National Institute of Health Stroke Scale, Modified Rankin Scale.

Results:

<table>
<thead>
<tr>
<th>Before treatment period (mean)</th>
<th>After treatment period (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle’s plantar flexion (PROM*)</td>
<td>14.9 degree (min:5, max:20)</td>
</tr>
<tr>
<td></td>
<td>20.64 degree (min:15, max:26)</td>
</tr>
<tr>
<td>Ankle’s dorsal flexion (PROM*)</td>
<td>2.85 degree (min:0, max:8)</td>
</tr>
<tr>
<td></td>
<td>6.28 degree (min:0, max:13)</td>
</tr>
<tr>
<td>Foot’s outward position</td>
<td>18.9 degree (min:0, max:31)</td>
</tr>
<tr>
<td></td>
<td>8 degree (min:0, max:18)</td>
</tr>
<tr>
<td>Modified Rankin Scale</td>
<td>4.6 (min:3, max:5)</td>
</tr>
<tr>
<td></td>
<td>4 (min:2, max:5)</td>
</tr>
<tr>
<td>NIHSS (6th point, motor leg)</td>
<td>2.9 (min:1, max:4)</td>
</tr>
<tr>
<td></td>
<td>2.2 (min:1, max:4)</td>
</tr>
<tr>
<td>Modified Ashworth Scale (8 patients)</td>
<td>3.6 (min:3, max:4)</td>
</tr>
<tr>
<td></td>
<td>2.4 (min:1, max:4)</td>
</tr>
</tbody>
</table>

PROM=Passive Range Of Motion (p<0.05)

Conclusion: In the early rehabilitation our device was efficient and can be used to increase the ankle’s passive range of motion, to prevent and decrease the foot’s outward posture and to prevent the lower limb’s spasticity.
P2359

Monitoring the rehabilitation program after stroke using the myotonometric assessment

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Introduction: The aim of this research is to present the role of myotonometric measurement for assessment of the rehabilitation program after stroke.

Material and method: Our study included 50 patients from Rehabilitation Units Nr. 3, average age 50-60 years, who presented ischemic stroke in their history. For assessment we use the muscle tone, Myoton 3 system, using Triplescan mode for recording the next parameters: force index (FI), stiffness (S), elasticity (E), for lower limb side means tibialis anterior, biceps femoris, gastrocnemius. The main goal of rehabilitation protocol is to restore the muscle balance and delete the sincinesis movement for rehabilitation the gait. For this reason we propose a rehabilitation program based on sensito-motor reorganisation, and to involve the voluntary movement.

Results: After the rehabilitation program our assessment shows: for biceps femoris-increase of FI 26.62%, of E 28.55%, decrease of S 18.77%; for gastrocnemius increase of FI 35.77%, of E 19.01%, decrease of S 12.35%; for tibialis anterior increase of FI 32.9%, of E 17.17%, decrease of S 32.57%.

Conclusions: We observed that the rehabilitation program improves the muscle parameters and helps to restore the muscle balance al-shrank-level of lower limb, means to decrease the spasticity. By myotonometric measurements we can monitor the muscle status during the rehabilitation program. Also for shrank muscle group it is the same evolution of FI, the values are very closely and also the E. It is very important to show a significant decrease of S parameter for gastrocnemius, means the reduction of spasticity, increase mobility and motor control, two important aspects for gait rehabilitation after stroke.

P2360

A new method for diagnosis of walking changes in the central hemiparesis syndrome after a stroke

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Background: It is known that balance and gait are being changed after stroke [Yavuzer G.]. For definition of movement disorders severity it is necessary to have an objective method of the gait analysis [Augsburger S. et al.]. The known methods are expensive and difficult to use.

Aim: To diagnose walking changes after a stroke by using a new method with the help of a laser range finder.

Methods: We used model laser range finder Dimetix DLS BH 15. The footwear of the patient was prepped with electronic contacts. During a phase of a double support the range finder measured distance to the investigated patient. The data on distance measurement were registered in spreadsheets (Microsoft Excel). We measured gait of 30 clinically healthy people (men=15, women=15) at the age from 42 till 65 years. They had no neurologic and orthopaedic diseases/disorders. Also we measured 30 patients with central hemiparesis syndrome (men=15, women=15) after a stroke at the age from 40 till 65 years.

Results: The relative step length and gait variability in the healthy group corresponded to the standard values. For gait of patients with a syndrome of central hemiparesis the increase in spatial (0.21 [0.15: 0.29]) and time asymmetry (0.26 [0.17: 0.35]) was characteristic (Mann Whitney non-parametric test: p<0.05).

Conclusion: This method allows to estimate relative length and duration of a step, spatial and time asymmetry of a step. The proposed method can be used in neurological practice, as a complex for the objective gait parameters screening.
P2361

Effects of low-level laser therapy on neuromuscular recovery after moderate and severe nerve injuries in rats

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Introduction: Peripheral nerves are frequently target of traumatic injuries and their functional recovery is generally incomplete.

Objective: To evaluate the effects of 660 or 780nm low-level laser therapy (LLLT) using different energy densities on nerve sciatic recovery after severe (neurotmesis, TT) or moderate (axonotmesis, CR) injuries in rat.

Material and methods: 128 Wistar rats (275g) were divided: For axonotmesis: Normal (N); CR; CR and 660nm LLLT with 10J/cm² irradiation (CR660+10J); CR660+60J; CR660+120J; CR780+10J; CR780+60J; CR780+120J. For neurotmesis: N; TT; TT660+10J; TT660+60J; TT660+120J; TT780+10J; TT780+60J; TT780+120J. Tibialis anterior (TA) muscles and sciatic nerve were evaluated 28 (CR) and 84 (TT) after surgery. The following analyses were performed: muscle fibre, axon, myelin and nerve fibre cross-sectional area (CSA); matrix metalloproteinases (MMP) 2 and 9 activities; S-100 immunofluorescence.

Results: Groups 660nm LLLT with 10 or 60J/cm², and 780nm 10 or 120J/cm² showed normal values of nerve fibre and myelin CSA. The 660nm LLLT accelerated muscle fibre recovery and increased the MMP-2 activity in nerve. Furthermore, it also decreased the MMP-9 and MMP-2 activities in nerves and muscles, respectively. Regarding TT groups, TT660+120J presented higher values of myelin and nerve fibre CSA compared to TT. Superior values of muscle fibre CSA were observed in TT660+60 e 120J e TT780+10J compared to TT. These LLLT parameters were also efficient to decrease MMP-2 activity in TA muscles.

Conclusion: LLLT recovered nerves effectively, avoided muscle fibre atrophy and acted on muscle and nerve extracellular matrix remodelling via MMPs regulation.

P2362

Is balance correction necessary in neurorehabilitation of patients with central hemiparesis syndrome after stroke

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Background: It is well known that balance and gait are it is being changed by the central hemiparesis syndrome. The risk to fall down is increasing.

Aim: To prove expediency of the use of visual biofeedback training for balance correction in neurorehabilitation of the patients with central hemiparesis syndrome.

Methods: Research was performed with application of the complex MBN “Biomekhanika”. There were 150 patients aged from 42 to 70 years with post-stroke central hemiparesis syndrome. The patients had been randomized in 3 groups. In the first group patients received traditional neurorehabilitation methods: proprioceptive correction in “Adeli” suite, massage, physiotherapy. In the second group patients had traditional neurorehabilitation methods and balance training with visual biofeedback. In the third group patients got only biofeedback training on the force platform. The patients had passed 8-10 balance trainings during 20-30 minutes. The estimation of balance condition was performed before and after the trainings with help of: Berg Balance Scale, Dynamic Gait Index, and also computerized stabilometry.

Results: After the trainings we could observe the progressive displacement of the center of pressure towards the hemiparesis side and the approaching of the actual center of pressure towards “the ideal” in the second and in the third groups. The balance scales indices also had positive dynamics. The risk to fall down was high in the first group.

Conclusion: These findings lead us to conclude the expediency of the use of visual biofeedback programs for balance correction in neurorehabilitation of patients with post-stroke central hemiparesis syndrome.
P2363

Spinal rehabilitation in a patient with end-stage cardiac failure, who managed with ambulatory left ventricular assist device and subsequent cardiac transplantation: a case report

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Introduction: To present the world’s first reported case of rehabilitation following newly acquired spinal cord injury in a patient with ambulatory left ventricular assist device (LVAD) followed by successful cardiac transplantation for end stage cardiac failure.

Method: Case study.

Results: A 22-year-old woman developed peri partum dilated cardiomyopathy in the 26th week of pregnancy. Two months post-partum she suffered cardiac arrest despite intra-aortic balloon pump and inotropic support. Emergency implantation of LVAD was performed during the cardiac arrest. Unfortunately during the period of cardiac arrest she suffered infarction of the spinal cord, with subsequent T11 ASIA-A spinal cord injury. She underwent inpatient rehabilitation for a total of 121 days. Her spinal rehabilitation programme was adapted to allow for end-stage cardiac failure and the LVAD management. These adaptations included modification of her exercise program, modification of bowel and bladder management, restrictions on transfer training, and specific management of her cardiac failure and the LVAD. Other issues complicating rehabilitation included uncertain life expectancy, psychological trauma, and education of staff and carers at all stages of management. Successful community reintegration was achieved. No neurological improvement has occurred. Successful cardiac transplantation was performed 2 years later, with no further complications.

Conclusions: This case demonstrates that spinal rehabilitation and community reintegration are achievable in a patient with end-stage heart failure with LVAD support. Our patient attained a level of function to enable her to be fit enough to undergo cardiac transplantation.

P2364

Acute effects of whole-body vibration on neuromuscular response of the vastus lateralis muscle: a comparative study of different devices

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Introduction: Whole-body vibration (WBV), which is designed to recruit muscles, is increasingly used in disabled people. However, effects of WBV on muscle force are contrasting, which might partly be explained by differences in mechanical behaviour of current WBV devices. We aimed to compare the acute effects of WBV provided by three devices with different mechanical behaviour on neuromuscular response of the vastus lateralis muscle. Additionally, the magnitude of effects was established for each device.

Methods: Under randomised cross-over study, 12 healthy persons (5 females and 7 males; age 28.1±7.8 years), were included. They were exposed to WBV for 15 and 40 seconds using two professional devices (Power Plate [PP] and Galileo 2000 [GA]), and a home-use device (Power Maxx [PM]). Integrated electromyography (IEMG) and root mean square electromyography (EMGrms) were evaluated during rest and during 40% of maximal voluntary contraction, both before and immediately after WBV.

Results: The effects on EMG were not significantly different among the devices. After vibration with PM, EMG activity at rest increased with 45%-62% (p<0.05), and at sustained contraction it reduced with 11%-22% (p<0.05). After vibration with PP, IEMG at sustained contraction reduced with 14% (p=0.05).

Conclusion: Our hypothesis that WBV devices with different mechanical behaviors would result in different acute effects on neuromuscular response was not confirmed. The findings of the current study imply that as yet, in order to improve muscle force, both professional devices and the home-use device may be used.
P2365

Efficiency of technique of focused dosed center-of-gravity shift in neurorehabilitation of patients with atactic disorder during stroke recovery period

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Balance disorders limiting functional abilities are found within more than 83% of stroke patients. Presently, therapeutic physical trainings and apparatus trainings with biofeedback are used to recover the balance. The aim of our research was to assess the influence of balance recovery methodology based on focused dose center-of-gravity shift in combination with other resources for the patients during post-stroke recovery period on balance and cognitive functions. 44 patients with atactic syndrome during post-stroke recovery period were included into investigation. The patients were divided into 2 groups. Group I (n=22) contained the patients whose treatment included standard drug therapy and the suggested technique of balance correction. Group II (n=22) contained the patients whose treatment included standard drug therapy, motor therapy, bio-feedback balance exercises. For assessment of these methods we used neurological status assessment, objective evaluation of balance by Computer Stabilometry (CS), balance clinical function by Berg Balance Scale, walking function - Dynamic Gait Index, cognitive function - MMSE, FAB, watch drawing test.

Results: In group I patients had significant improvement by the stabilometry, functional and cognitive scales (p<0.05). In group II patients had significant improvement by the stabilometry, functional and cognitive scales too. Correcting group I CS data with group II CS data no statistically meaningful differences were seen. The suggested technique is comparable with modern hi-tech methods. Trainings normalize stability and positively influence cognitive functions. This methodology can be used in complex comprehensive treatment of patients with atactic syndromes after stroke.

P2366

Management of scoliosis due to Rett syndrome with the novel spinal brace

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Scoliosis in Rett syndrome is often found with the incidence increasing in proportion to age and causes difficulty in rehabilitation and increased nursing demands. To address these issues, we have newly developed a spinal brace named Dynamic Spinal Brace (DSB), which is a custom-molded, polycarbonate orthosis characterized by lightness and flexibility. Unlike the other underarm orthoses, DSB does not fix the pelvic girdle rigidly and thus it potentially contributes to good compliance with bracing. The purpose of this study is to examine the efficacy of DSB for the management of scoliosis due to Rett syndrome. 40 patients with Rett syndrome and scoliosis have been treated by DSB (mean age: 15.2 yrs). Cobb angle without and with DSB were 45.2±35.0 and 30.0±33.4 degrees, respectively. Mean final curve correction was 15.2 degrees. 84.9% of the caretakers reported that DSB enhanced sitting stability. Many of the spinal braces designed for idiopathic scoliosis do not necessarily match the need of patients with more complicated medical conditions such as Rett syndrome. Considering the moderate curvature correction and good compliance, DSB could be an option for the management of scoliosis in Rett syndrome.
P2367

Effects of whole body vibration on balance and muscle strength in patients with diabetes type-2 associated with peripheral neuropathy

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Introduction: Peripheral neuropathy (PN) is a common complication of diabetes with the prevalence of 36% among diabetes sufferers. Muscle strength and balance deficits occur secondary to PN. Whole Body Vibration (WBV) is a new rehabilitation technique that could be beneficial for diabetes sufferers. Acute effects of WBV in patients with diabetes have not been studied yet, so the aim of this study was to investigate the effects of WBV on the above parameters in diabetic type-2 patients.

Methods: 10 patients with diabetes type-2 associated with neuropathy took part in study. Outcome measurements were total strength, strength of tibialis anterior and quadriceps femoris muscles and balance parameters including Unilateral Stance Test (UST) and Timed Up and Go Test (TUGT).

Results: Tibialis anterior muscle strength and TUGT parameters showed significant differences after a session of WBV.

Conclusions: WBV has positive effects on muscle strength and balance in patients with diabetes type-2 associated with peripheral neuropathy.

P2368

Unremovable idiopathic pelvic pain treatment by a novel ultrasound guided technique

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Background: Myofascial pelvic pain is a widespread problem, it occurs more frequently in women, it is detected in 10% to 15% of all gynaecological patients. Recently we proposed a new approach of trigger point therapy, performing precise muscle dry needling under ultrasound (US) guidance.

Materials and methods: This study included 7 patients, females, average age was 68±7 years. All patients suffered from extensive pelvic pain with different location, all with vulvodynia. The own method of treatment was applied, that included ultrasound identification of myofascial trigger points with following dry needling under US guidance using steel acupuncture needles (28 gage) to elicit the LTR effect. In one session one or two needles were inserted. Retention of needles depended of muscle twitch response duration. Visual analogue scale data (0 to 10) were measured before, immediately after and 24 hours after the intervention. A decrease in pain as measured by a VAS of 50% or more than one week after treatment was considered as success.

Results: Main active trigger points were diagnosed in deep pelvic muscles that caused compression of n.pudendus in Alcock’s canal. All patients showed decrease in pain as measured by a VAS of 64%, the difference was significant in this group (p<0.01) and pain relief outcome after one month observation.

Conclusion: The proposed method of dry needling trigger points under ultrasound guidance can be considered as an effective practice for treatment the idiopathic pelvic pain, evoked by myofascial disorders.
P2369

Long-term outcomes of Guillain-Barré patients with severe motor deficits
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Introduction: Guillain Barré (GB) disease may appear in patients from sensory deficits to severe motor deficits.

Methods: This is a retrospective chart review of 8 patients, bed-bound with severe motor GB disease in a single rehabilitation center from 2006 till 2010. They were treated by steroids and immunoglobulin. The ASIA impairment scale at the time of admission to our department was ASIA-C at high cervical levels. Neurogenic bowel and bladder was diagnosed for all patients. The time of inpatient rehabilitation ranged from 2 to 9 months (average 4.5 months) and involved physical-occupational- and speech language-therapy.

Results: All patients reached walking ability with aid (WISCI score 13 and above) and their neurologic status was at least ASIA-D. Patients recovered bladder and bowel control within 6 months from the onset of disease. Complications during rehabilitation included severe vagal episodes, urinary tract infections, constipation and haemorrhoids. 7 out of 8 patients developed finger contractures at the metacarpophalangeal and phalangophalangeal joints despite adequate therapy. Patients continued outpatient rehabilitation for at least 1.5 years following discharge.

Conclusions: Patients with severe motor GB disease need intensive inpatient rehabilitation program for a prolonged time but improve neurologically to walking assisted capacity. The most common deficit is finger rigidity due to soft tissue contractures.

P2370

Fatal complications after myelography with meglumine diatrizoate
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One-year survey of subarachnoid haemorrhage in a Croatian population
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Successful treatment of excessive dose of carbamazepine: a case report
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Hypoxia markers serve as indicators for mechanical ventilation in stroke
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The feasibility of enteral resuscitation as an alternative to standard intravenous therapy in hydration of patients in some elective situations
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Development, validity and reliability of the speech prosody comprehension test in Persian natives
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Development, validity and reliability of the facial expression test in Persian natives
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Does transcranial direct current stimulation of the premotor cortex improve fine motor function in the hand?
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Connection between vertical perception and postural stability in AIS patients: an ERPs study
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Evaluation of EEG in stutterers and non-stutterers
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Technical means of rehabilitation for patients with back pain
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Assessment of rehabilitation program in spinal cord injury
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Implication of an intervention program of physical activity on the relationship of the perception of illness with life satisfaction in people with multiple sclerosis
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Effects of continuous passive motion on muscle properties in individuals with chronic spinal cord injury
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Oculomotor rehabilitation training in patients with post-stroke disorders
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The effect of low-level laser therapy on acute neural recovery and inflammation-related gene expression after crush injury in rat sciatic nerve
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Brain necrosis related to radiation therapy, complicated with haemorrhage
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The particulars of naphthalene therapy in patients suffering from traumatic injuries of peripheral nerves
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Syndrome of painful shoulder in post-stroke patients’ recovery
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Abstract cancelled

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Abstract cancelled