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Neurophysiology 1

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Neurophysiology 1
Reliability of the nociceptive blink reflex evoked by electrical stimulation of the trigeminal nerve

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Background: Despite its clinical relevance and regular use, previous studies have not in detail reported the reliability of the nociceptive blink reflex (nBR).
Objective: To determine the reliability of the nBR of the trigeminal nerve.
Methods: Twenty-one healthy participants were evaluated in two sessions. The nBR was elicited by a "nociceptive-specific" electrode placed over the entry zone of the right supraorbital (V1R), infraorbital (V2R) and the mental (V3R) nerve and left infraorbital (V2L) nerve. The outcomes were: (a) individual electrical sensory (I_0) and pain thresholds (I_P); (b) root mean square (RMS), area-under-the-curve (AUC) and onset latencies of R2 responses; and (c) stimulus-evoked pain on a 0–10 numerical rating scale. Intraclass Correlation Coefficients (ICCs) and Kappa statistics were computed as a measure of the reliability ($\alpha = 5\%$). The local Institutional Review Board (IRB) has waived the requirement for its formal approval of the study.
Results: ICCs were fair to excellent in 82% of the psychophysical measures and in 86% of V1R, V2R and V2L nBR parameters, whereas the V3R showed poor reliability in 52%. ICCs for intrarater reliability were fair to excellent in 70% of measurements (V3R showed the lowest values) and in 75% of interrater measurements. All kappa values showed at least fair agreement and the majority of the nBR measures (93%) were considered to have moderate to excellent reliability.
Conclusion: The nBR and its associated psychophysical measures can be considered a sufficiently reliable test to investigate the trigeminal nociceptive function.

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Neurophysiology 1
In vivo correlates of thermoregulatory defense in humans: differences in the thermoregulatory network between lean and obese subjects

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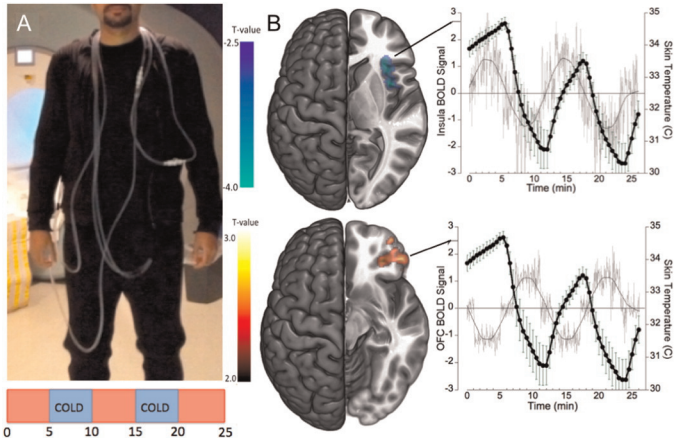
Human metabolism is controlled by neural feedback loops between tissues and brain structures that regulate energy homeostasis. Our objective was to delineate the CNS pathways mediating metabolic response to mild cold exposure in lean subjects and to determine whether those pathways respond differently in obese subjects to cold temperature.

fMRI studies were performed in 20 young adults (10M/10F, age range 20–31 years, BMI = 22.7 + 2.1 kg/m^2) and 6 obese subjects (3M/3F, age range 25–40 years, BMI = 32.3 + 2.2 kg/m^2). Thermoregulatory challenge was applied using a specialized whole-body garment through which subjects were exposed to either neutral or cold temperature stimulus (Fig. 1A). Skin temperature oscillations constituted physiological predictors of the BOLD response, employed to construct epochs of interest for fMRI analyses.

Bidirectional contrasts identified two clusters in core thermoregulatory and interoceptive regions, reflecting differential responses between obese and control subjects to the cold stimulus. During cold (relative to neutral) exposure, significant *decreases* in fMRI measured neuronal responses were observed in the right insula. In contrast, significant *increases* were observed in the right orbitofrontal cortex (Fig. 1B).

Whole body cooling evokes *differential* systematic responses between *lean* and *obese* subjects to a natural homeostatic challenge. This differential sensitivity might provide a new method to assess the severity of metabolic abnormalities in obese subjects.



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Neurophysiology 1
Concentric needle reference jitter values of voluntarily activated orbicularis oculi and frontalis muscles in Sudanese population

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Background: Single fiber electromyography (SFEMG) is the most sensitive neurophysiological test in diagnosing neuromuscular junction disorders, particularly myasthenia gravis (MG).
Objectives: There is very little published work comparing jitter values of the orbicularis oculi (OOc) & frontalis muscles together. Only one study used single fiber (SF) had compared reference jitter values of OOc and frontalis together performing axonal stimulation method. Other studies compared jitter values of myasthenic patients. The aim of our study was to establish and to compare normal (reference) jitter values of voluntarily activated (V-) orbicularis oculi& frontalis muscles using disposable concentric needle (CN) in the same normal subject.
Methods and patients: Prospectively 62 healthy volunteers (20-males & 42-females) were included in the study, their ages ranged (18–70 years) and mean age (43.2 ± 14.0 years).CN-jitter values were expressed as the mean consecutive difference (MCD) of 30 potential pairs in μs. Ethical clearance was obtained from the Ethical Committee at the Faculty of Medicine, University of Khartoum. Subject's informed consent was obtained.
Results: The mean jitter, mean of individual fiber pairs jitter & mean outliers jitter values with (upper 95% Confidence Limit — CL) for [OOc] were [26.9 ± 3.3 (31.97), 26.1 ± 8.9 (41.8) & 38.5 ± 5.7 (49.0) μs respectively] & for [frontalis] were [27.1 ± 3.0 (31.32), 26.4 ± 9.4 (42.9) & 39.9 ± 5 (49.2) μs respectively]. No significant statistical difference was found between CN jitter values of V-OOc & V-frontalis muscles.
Conclusion: The suggested practical upper limits for mean jitter & for outliers jitter values were (32, 49 μs) for OOc & (32, 50 μs) for frontalis. We had established reference values for the parameters that label the patient as having positive jitter test. The study was unique in that it established and compared between CN-jitter values of (V-OOc & V-frontalis) in the same individual in a large number of healthy subjects.

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Neurophysiology 1
Acute and subacute motor neuropathy in diabetic patients case reports

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Background: Diabetic neuropathy is the most common complication of diabetes mellitus (DM), affecting as many as 50% of patients with type 1 and type 2 DM. There are four main types of diabetic neuropathy: Peripheral neuropathy, Autonomic neuropathy, Radiculo-plexus neuropathy (diabetic-amyotrophy), and Mononeuropathy.
Objectives: To describe the clinical presentation, electrophysiological investigations and in the future the immunological profile of such patients.
Patients and methods: Seven type II diabetic patients were selected for the study. Ethical approval and patients' informed consent have been obtained. They are all presented with acute and subacute onset of predominantly lower limb distal muscle weakness, on occasion proximal. The onset of this weakness was not preceded by upper respiratory tract infection, diarrhea or febrile illness.
Results: On examination there was symmetrical weakness of the distal foot flexors and extensors (power ranges 0–3), lower limb reflexes varies from diminished to absent. Tone was normal in the majority and flaccid in some of the patients. All modalities of sensation are intact except for disturbance of light touch in two patients. All patients were investigated for other causes of neuropathies. Neurophysiological investigations revealed signs of predominant demyelination with axonal degeneration. Patients showed very good response to immunoglobulin infusion (i.e. recovery of weakness after one to three months). Immunological studies are undergoing.
Conclusion: This is a preliminary report of a very uncommon presentation of acute motor neuropathy in diabetic patients. The cause possibly might be immune-mediated nerve damage but this has to be confirmed when we recruit more patients with detailed immune-profile studies.

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Neurophysiology 1
Pattern reversal visual evoked potentials in primary open angle glaucoma

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Background: Visual evoked potentials (VEPs) assess the integrity of the visual pathways from the optic nerve to the occipital cortex. Primary open angle glaucoma is bilateral condition with optic atrophy and visual field defect. Optic disc cupping and visual field loss have been associated with prolongation of latency of VEP. Therefore, we studied the ocular glaucomatous damage and VEP abnormalities.
Objectives: To study VEPs and ophthalmic variables in primary open angle glaucoma (POAG).
Methods: Pattern reversal VEP tests were done in consenting 20 primary open angle glaucoma eyes and 40 normal control eyes. Statistical tests (paired t-test and Mann–Whitney test) were applied.
Results: In POAG cases the refractive error [3.51 ± 1.88 vs. 1.88 ± 1.11, D, p = 0.001], cup disc ratio in percent [66.00 ± 16.98 vs. 28.50 ± 5.80, p = 0.000], intraocular pressure [19.55 ± 2.08 vs. 11.65 ± 1.64, mm Hg, p = 0.000] and automated visual field pattern standard deviation [4.13 ± 6.96 vs. 1.64 ± 0.45, dB, p = 0.000] were significantly more than in control. The visual acuity [0.41 ± 0.29 vs. 1.00 ± 0.00, p = 0.000], foveal visual sensitivity [25.92 ± 6.88 vs. 33.48 ± 1.75, dB, p = 0.000] and automated visual field mean deviation [−9.63 ± 10.58 vs. 0.07 ± 1.54, dB, p = 0.000] were significantly less in cases than in control. Among VEP variables pattern reversal latency N75 [68.53 ±12.34 vs. 67.30 ± 5.09, ms] and P100 [103.21 ± 10.82 vs. 98.25 ± 4.05, ms] were increased in cases but were not significant whereas N145 [149.00 ± 15.75 vs. 137.52 ± 15.20, ms, p = 0.011], was increased significantly in cases. The pattern reversal amplitude N75 [1.97 ± .35 vs. 2.47 ± .58, μV, p = 0.001], amplitude P100 [3.09 ± .46 vs. 6.07 ±1.44, μV, p = 0.000] and amplitude N145 [2.21 ± .58 vs. 4.45 ± 1.99, μV, p = 0.000] were decreased significantly in cases.
Conclusion: POAG caused deterioration in all the ophthalmic variables measured with increase in latency and decrease in amplitude which signifies that there is glaucomatous damage.

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Neurophysiology 1
Should neurophysiological criteria for diagnosis of carpal tunnel syndrome be different for patients with diabetes mellitus?

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Background: Diabetes mellitus (DM) is a common association with CTS. The gold standard of diagnosis is nerve conduction studies. Boston Carpal Tunnel Questionnaire (BCTQ) is a self applied questionnaire which evaluates the severity of the symptoms and the functional status in CTS.
Objectives: We aimed to find out whether accepted neurophysiological criteria for diagnosis of CTS are applicable to patients with DM.
Patients and method: Following neurophysiological parameters were measured in clinic patients with DM; median motor distal latency (MMDL), median and ulnar-sensory distal latency difference (MUDLD), median and ulnar sensory nerve conduction velocity difference (MUNCVD). Distal latencies were compared with normal values available for the same laboratory. Patients with BCTQ score of zero was considered as asymptomatic and others; symptomatic. Percentages of subjects fulfilling different neurophysiological criteria to diagnose CTS were calculated i.e. MMDL ≥ 4.5 m/s, median sensory nerve conduction velocity (MSNCV) ≥40 m/s, MUNCVD ≥ 10 m/s, MUDLD ≥ 1 m/s.
Results: Among the 70 normal controls the mean MMDL was 3.36 ms ±0.53. In of 51 (females 68.6%, mean age 59.86 years) consented patients 102 hands were tested. There were 61 asymptomatic hands with zero BCTQ. Mean ± SD of MMDL in them was 4.30 ± 1.01. According to the above neurophysiological criteria 31.14%, 60.6%, 16.3% or 32.78% will be misdiagnosed as CTS. Among the symptomatic subjects mean MMDL was 4.92 ± 1.74. The corresponding proportions according to neurophysiological criteria for symptomatic patients were 48.87%, 48.87, 32% or 60.97%.
Conclusion: Accepted neurophysiological criteria will over-diagnose CTS in patients with DM. Different diagnostic criteria should be used in them to confirm CTS.

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Neurophysiology 1
Do seasons affect Parkinson's disease: empirical examination from Australia

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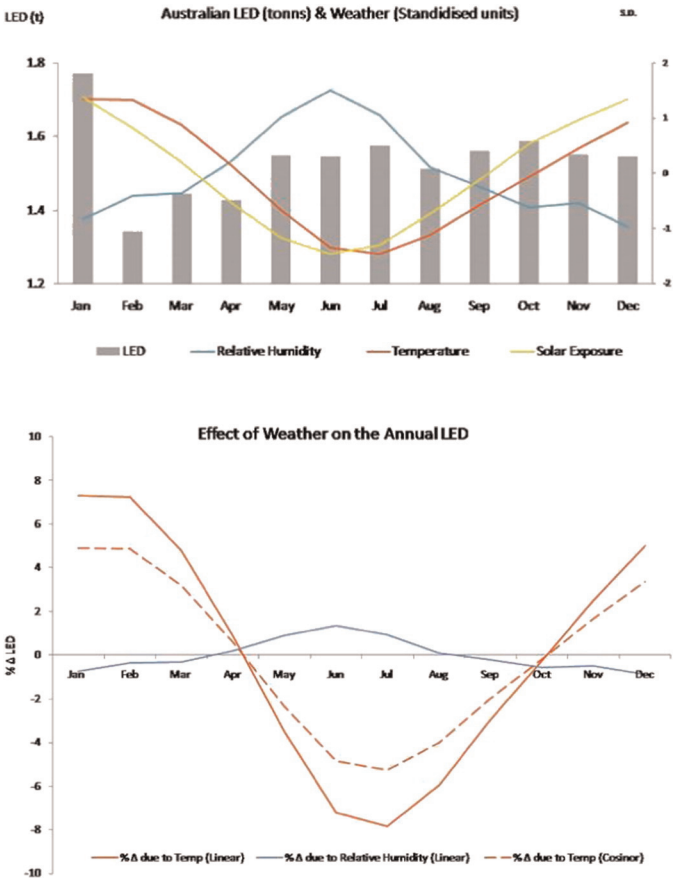
Background: Seasonal fluctuation in striatal dopamine has been documented in people with Parkinson's disease (PD), however variation in clinical signs and symptoms have not yet been identified. No research has sought to identify the root causes of any seasonal change in PD.
Objective: To test what effect seasonal changes the weather may have on PD.
Patients and methods/material and methods: 23 years of monthly data from the Australian Pharmaceutical Benefits Scheme and Bureau of Meteorology were obtained for eight Australian states and territories. The dependent variable, the national levodopa equivalent dose (LED) was aggregated from 50 PD medications. Three elements of weather, temperature (°C), relative humidity (%) and solar intensity (Mj/m^2) were analysed. The relationships are tested using linear and non-linear (Cosinor) regression with fixed and random effects, respectively.
Results: Temperature and relative humidity were positively correlated with the national LED. However, their effect on LED was seasonally opposed. Solar intensity had no effect on LED.
Conclusion: A better understanding of the causes of seasonal variation in PD may help clinicians and patients better manage this chronic disease.



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Neurophysiology 1
Changes in motor axons excitability in restless legs patients

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Objective: To clarify whether in restless legs an abnormal excitability of motor axons may contribute to the pathophysiology of the disease, we carried out a threshold tracking study on the median nerve of RLS patients and compared our results to controls.
Patients and methods: Axonal excitability studies were performed in idiopathic RLS patients without current treatment on motor axons

in vivo. All RLS patients showed pathological indices of periodic limb movements during polysomnography. The median nerve was stimulated at the wrist and compound muscle action potentials were recorded from M. abductor pollicis brevis. Threshold tracking techniques were used to record strength–duration time constant, threshold electrotonus, current/threshold relationship and recovery cycle. Recordings from 22 RLS patients were compared with those from 20 normal controls without subjective sleep complaints.

Results: Excitability studies on median nerve motor axons showed greater threshold changes to strong hyperpolarizing currents. In detail, in all patients (22) threshold electrotonus to hyperpolarization (TE_h −100%) showed significant changes compared to age controlled healthy subjects (20). Patients with RLS showed a smaller peak in response to −100% hyperpolarizing current. The results matches with the changes in minimal i/v-slope in which RLS patients showed a greater value compared to healthy subjects.

These changes are most probably due to an increase in I_h conductance. The responsible mechanism for this observation could be either an increased I_h-channel function or a more hyperpolarized resting membrane potential which leads to an increased activity of I_h.

Conclusions: The threshold tracking technique was used as a probe for detecting changes of motor axon excitability in patients with RLS. With this technique, we showed an enhanced excitability in motor nerves in RLS patients when compared to controls.

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