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ABSTRACTS

Symposia

Serial and Parallel Cortical Processes during Human Working Memory

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EEG, MEG, and fMRI data (separate sessions) were recorded during a working memory (WM) task including cue stimulus (two vertical bars), retention period lasting few seconds, go stimulus (no probe), and motor response compatible with taller bar. In the control (NWM) task, cue stimulus lasted up to the go stimulus. The scope was to evaluate the coarse cortical distribution over the two hemispheres of parallel attentional vs. task-specific processes. The WM induced a prolonged 6-10 Hz alpha desynchronization of EEG-MEG data (i.e. attention) mainly distributed over right "visuo-spatial" hemisphere. Whereas, a concomitant 10-12 Hz alpha desynchronization (i.e. task-specific processes) was preponderant mainly over left "phonological" hemisphere. This alpha rhythmicity showed a temporal dynamics, given that after 2-3 seconds the desynchronization reversed in synchronization (sign of cortical de-activation). FMRI data showed an activation of dorsolateral prefrontal, premotor and posterior parietal cortices of both hemispheres. These results suggest that phasic attentional anticipatory processes would prevail in the "visuo-spatial" right frontoparietal cortex, for the storage and rehearsal of the spatial and sensorimotor representations. In parallel, task-specific processes would impinge mainly upon the "phonological" frontoparietal cortex. In conclusion, this multi-modal approach disclosed parallel processes probably associated with the retention of visuospatial, somato-motor, and phonological representations, even if the stimulus feature to be memorized was merely visuo-spatial.

The Memory of Consciousness: Psychophysiological Assessment of Serial Processes by Means of Spontaneous Blinking Analysis

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A recent theory postulates that consciousness arises from a serial mechanism, exerted by automatic attention, that allows the self to interact with the external word and *vice versa* in a process that updates itself every few seconds or less as a kind of temporal sampling. We propose that this attentional shifting could be underlined by spontaneous eyeblinking, which corresponds to the updating of information contents concerning the preceding temporal span. Evidence that spontaneous blinking correlates with cognitive functions comes from the observation that blinking

rate is modulated by arousal levels, basic cognitive processes (e.g., attention, information-processing, memory, etc.) and more complex cognitive functions (e.g., reading, speaking, etc.). If updating of information contents occurs during eyeblinking, some form of memory (iconic/echoic or working memory) should intervene to make continuous a process that is really discontinuous in origin. To investigate the electrophysiological correlates of these processes we performed time/frequency analysis (event-related spectral perturbation, ERSP¹) of EEG epochs centered around each blinking event. EEG signals were previously processed with independent component analysis (ICA¹) to remove blink artifacts and to extract putatively significant components. Some preliminary results will be presented.

¹Makeig Scott et al., "MATLAB Toolbox for ICA applied to psychophysiological data (Version 3.52)"

Brain Electrical Microstates

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Multi-channel EEG activity can be viewed as a sequence of maps of momentary potential distributions. Different brain maps must be generated by different geometries of neuronal activity. The term "Microstates" describes the epochs of homogeneous electrical landscape which can be assumed to reflect different types of steps of information processing. Microstates are shown to be related to conscious mental experience as well as to psychiatric disorders typically associated with thought disturbances, and to the full spectrum of memory deficits from normal aging to dementia.

Deprivation, Brain Topography and Quantitative EEG Measures during Sleep

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Results obtained with a protocol of selective slow-wave sleep (SWS) deprivation, that does not affect sleep stage architecture (1), have detailed a pattern of neurophysiological changes supporting the view of homeostatic (restorative) mechanisms during both REM and NREM sleep.

Tonic and phasic changes have been found during recovery NREM sleep (as compared to baseline NREM sleep):

- a. a general increase of EEG power spectra within delta and theta frequency bands (1);
- b. a clear antero-posterior gradient with a further increase of spectral power on frontal areas, including also the alpha range (1);
- c. a greater power increase in the 1-25 Hz frequency range at C3 than C4 derivation (2);
- d. a decrease of sleep spindles density limited to the first sleep cycle (3);
- e. a reduction of ASDA arousal frequency (4) and of Cyclic Alternating Pattern (5).

Although not predicted, quantitative EEG changes have been observed also during recovery REM sleep:

- a. an increase of delta and theta power on frontal and central derivations (1);
- b. a greater power increase in the 1-25 Hz frequency range at C3 than C4 derivation (2);
- c. a decrease in REM density, negatively correlated to the amount of SWS (3).

The whole findings lead to a re-consideration of homeostatic mechanisms during REM sleep and of the functional meaning of the traditional EEG frequency bands during sleep.

1. Ferrara M et al. *Cerebral Cortex* 12: 737-48, 2002

2. Ferrara M et al. *Behav Neurosci* in press

3. De Gennaro L, et al. *Behav Brain Res* 116: 55-9, 2000

4. De Gennaro L, et al. *Sleep* 24: 673-679, 2001
5. De Gennaro L, et al. *Neuropsychobiology* 45: 95-8, 2002
6. De Gennaro L, et al. *J Sleep Res* 9: 155-9, 2000

Suggestion and Suggestibility in Perceptual Phenomena

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In this presentation a number of studies are reviewed in which is given experimental evidence that individual differences in suggestibility influence sensory perception. First, a definition of suggestibility is provided in terms of the self-organization theory. Second, using correlational analyses on suggestibility and other personality dimensions, is displayed the multicomponential dimensionality of suggestibility and the difficulty to define this dimension in terms of other related personality traits. Results from studies using ambiguous stimuli have demonstrated that perception is by no means a process of representation of informational input but an active process of disambiguation. Individual differences in suggestibility may account for this aspect of innersystemic instability. In a recent study of our own, imaginative suggestibility was found to significantly moderate the relationship between subject's sensitivity to placebo analgesia and sensory pain scores. Finally, findings concerning the EEG concomitants of perceptual switching during multistable visual perception and the influence of suggestibility are also discussed.

Effect of Dopamine on Event-Related-Potentials

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Dopamine (DA) acts as a key neurotransmitter in the brain. Dopamine functions are mediated by five receptors subtypes that, in the CNS, exhibit overlapping but also different localizations. All dopamine receptors are seen throughout the human neocortex.

Numerous studies have shown that cortical dopamine depletion causes lack of flexibility and shifting capacity, thus arising the idea that dopamine can be considered as the “interface” between internal and external constraints and behavioural capabilities. Data from experimental dopaminergic lesions also showed significant alterations in attentional processes, suggesting a direct involvement of DA in attention. Moreover, DA seems to contribute to behavioural adaptation and to anticipatory processes necessary for pre-programming activity of a voluntary motor act. Event-Related-Potentials (ERPs) are changes in electrical activity, recorded from many sites of the surface of the scalp, which are time-locked to the occurrence of a particular stimulus. These potentials reflect underlying neural activity, and components of the resulting waveform can be used to differentiate different cognitive conditions. There are several components of the ERP waveform that have been identified. The value of ERPs in basic neuroscience and medicine depends on an understanding of underlying biological mechanisms. Of particular importance is the description of neurochemical substrates that mediate ERPs. In this view, DA may also contribute directly and indirectly to the regulation of slow potentials.

Sleep, Memory and Cortical Plasticity

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One of the most ancient and fascinating theory on sleep functions hypothesizes a role of sleep in consolidating memories acquired during wake. On the other hand, most studies on humans and animals delineate a complex and often contradictory picture. Recently, new experimental paradigms and the introduction of the dicotomy «declarative vs. procedural memory» yielded much more unambiguous results within two main, not necessarily alternative, theoretical models. The «double process» model predicts that the consolidation of declarative memory should occur mainly during slow-wave sleep (SWS), while procedural memory should be consolidated during REM sleep. According to the «sequential» (or double-step) model, instead, the NREM-REM sleep sequence is important to obtain an effective memory consolidation. Behavioral data on humans seem compatible with both models. Some neurophysiological findings also suggest a fundamental role of sleep in the mechanisms of neural plasticity and memory. For example, SWS seems to facilitate the cortical re-organization of ocular dominance columns in the developmental visual cortex after monocular deprivation. The hypothesis posits that the synchronized neural activity during SWS (mainly in the hippocampus) could act a «replay» of the neural activity associated to the waking codification of new informations, and subsequently, a re-activation of the neurons in the associative cortices correlated to these events. This replay could lead to synaptic long-term changes in the associative cortical networks. The communication between hippocampus and neocortical systems of memory should be inverted during REM sleep, where the gamma and theta activities are possibly related to the transmission of information from the neocortices to the hippocampus.

Synchronization and Complexity of the EEG during Sleep

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Whether different sleep stages truly reflect non-linear brain dynamics or not is still unclear. We used the non-linear cross prediction (NLCP) algorithm to investigate whether non-linear brain dynamics occur during sleep, taking into account the different sleep stages and the presence or absence of the 'cyclic alternating pattern' (CAP) which consists of transient arousal complexes (phase A) that periodically interrupt the tonic theta/delta activities of NREM sleep (phase B). The NLCP test uses three different 'model' time series in order to predict non-linearly the original data set (Pred, Ama, and Tir). Pred is a measure of the predictability of the time series, and Ama and Tir are measures of asymmetry, indicating non-linear structure. The results indicated that sleep EEG tends to show non-linear structure only during CAP periods, both during sleep stage 2 and slow-wave sleep. Moreover, during CAP periods, non-linearity could be detected only during the phase A1 subtypes (and partially A2) of CAP. Based on the results of this study, we might consider sleep as a dynamically evolving sequence of different states of the EEG, which we could track by detecting non-linearity mostly in association with CAP, and non-linearity seems to be closely related to the occurrence of the phase A of CAP. The same algorithm, applied to the sleep EEG of newborns, did not allow us to detect clearly nonlinear dynamics; probably because of the incomplete maturation of intracortical connecting pathways, in these subjects, which might be crucial for the development of nonlinear dynamics in the brain. On the contrary, the NLCP test showed clear nonlinear structure of the EEG in subjects affected by a particular epileptogenic condition called "electrical status epilepticus during slow-wave sleep" (ESES); in this case,

indications of probably chaotic dynamics were also found. Finally, we used a recently introduced measure, the synchronization likelihood, which characterizes generalized (linear as well as non-linear) synchronization with a high time resolution (Stam and van Dijk, 2002) in order to evaluate, during sleep, the degree of coordination in activity of different cortical areas, as reflected by multichannel EEG recordings. Again, increase in synchronization was detected mostly during the CAP phases A1, with a dynamically evolving complex pattern. The same algorithm, applied to the analysis of the ictal EEG, in one patient with nocturnal frontal lobe epilepsy, provided important insight into the ictal brain dynamics by showing significantly increased synchronization in the alpha band, during the seizures, which was followed by an increase in synchronization in the delta range, towards the end of each seizure. These studies show that a careful use of the tools for nonlinear EEG analysis can be very helpful in understanding the different normal and abnormal brain dynamics during sleep.

Dopaminergic Influence on Movement-Related Brain Rhythms

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Event-related desynchronization (ERD) of the EEG mu and beta sensorimotor rhythms occurring during preparation and execution of voluntary movement is considered a sign of cortical activation. Event-related synchronization of the same rhythms, occurring after movement termination, is considered a sign of cortical idling or inhibition. Various research groups have reported that ERD is delayed in patients with akinetic idiopathic Parkinson's disease (IPD), characterised by motor slowing. We found these abnormalities both to self-paced and to Contingent-Negative Variation paradigms. Chronic L-dopa treatment, besides improving motor functions in these patients, is related to improvement of ERD abnormalities. In order to test whether L-dopa has acute effects on ERD, we studied a group of patients affected by IPD before and after a single dose administered in the same experimental session. We found that ERD onset over the sensorimotor areas contralateral to movement became closer to normal after L-dopa administration. Our data, indicating acute drug-induced functional improvement of cortical areas involved in movement preparation, suggest that a single dose of dispersible L-dopa can improve not only motor performance in IPD patients but also the timing of cortical activation of sensorimotor areas during motor programming.

Attribuzione di nei Fenomeni Percettivi

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Nei processi di attribuzione di significato la ricerca ha evidenziato due tipi di analisi coinvolte: l'analisi "top-down" e l'analisi "bottom-up". Il primo tipo di analisi è prevalente durante l'elaborazione di stimoli figurali ambigui; il secondo tipo di analisi è caratterizzata da elaborazioni riguardanti stimoli chiari ed univoci. L'attribuzione di significato a pattern informativi ambigui è caratterizzata da un processo interpretativo e di categorizzazione guidato da specifiche strategie cognitive, quali la capacità immaginativa, l'attenzione, lo stile cognitivo di campo-indipendenza/dipendenza, ecc. La presente ricerca ha esaminato la prestazione di soggetti con differente livello di suggestionabilità individuale (alti, medi, bassi suggestionabili) ad un compito di categorizzazione di figure ambigue. La prova sperimentale era costituita da 12 figure ambigue di cui 6 definite "ricche di significati" e 6 "povere di significati". Ai soggetti veniva richiesto di indicare tutti i significati che essi erano in grado di individuare in ogni stimolo ad essi presentato. Sono stati misurati nei soggetti il livello di campo-indipendenza/dipendenza, la vividezza immaginativa, il

livello di attenzione. I risultati hanno mostrato che i soggetti molto suggestionabili sono più abili nella categorizzazione di stimoli figurali ambigui rispetto ai soggetti mediamente e poco suggestionabili. Inoltre il livello di suggestionabilità è stato trovato significativamente correlato con il livello di vividezza immaginativa.

Objective Assessment of Visual Function in Childhood: Electroretinogram and Visual Evoked Potentials

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The function of the visual system can be evaluated by psychophysical tests such as visual acuity, visual field, contrast sensitivity and colour vision. These methods, related to a subjective cortical response, do not reveal which structures of the visual system selectively contribute to visual function and the use of these tests in childhood is sometimes difficult and arguable. During childhood, an objective assessment of the visual system can be obtained by electrophysiological methods (Electroretinogram- ERG- and Visual Evoked Potentials- VEPs) that allow a functional dissection and evaluation of the different structures composing the visual pathways. The ERG response evoked by luminance stimuli is related to the activity of the outer retinal layer (preganglionic cells: pigmented epithelium, photoreceptors, bipolar cells) while particular ERG responses, called Oscillatory Potentials, are likely related to the middle retinal layer (amacrine cells) and are considered electrophysiological indicators of retinal blood supply. The ERG response evoked by pattern stimuli (PERG) reflects the bioelectric activity of ganglion cells and their fibers, as suggested by animal models and studies recently performed in humans. The function of the entire visual pathway can be objectively assessed by VEP recordings that are defined as variations of bioelectrical potentials of the occipital cortex evoked by visual stimuli. They are the expression of complex neurosensorial events linked to the transduction and transmission of neural impulses along visual pathways, from retinal photoreceptors to the occipital cortex. The International Society for Clinical Electrophysiology of Vision provides clinical protocols to record ERG, PERG, and VEP responses.

Brain Dopamine Systems and Pathological Behavioral Phenotypes

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Central responses to stress play a major psycho-pathogenic role in the presence of a genetic liability and mesocortical and mesoaccumbens dopamine metabolism and release are the most relevant among these responses. Identification of relevant phenotypes related to neural functioning has yet to receive the needed attention, although behavioral phenotyping, through comparative studies in inbred strains (background) of mice, has produced some major findings. We demonstrate that the high vulnerability to stress-induced 'despair' and mesoaccumbens dopamine (DA) inhibition, exhibited by mice of C57BL/6 (C57) background in a common animal model of depression (FST), depends on their being highly susceptible to stress-induced mesocortical DA activation. Thus, C57 mice but not mice of the DBA/2 background showed extremely pronounced depression-like behavior as well as immediate and strong activation of mesocortical DA metabolism and inhibition of mesoaccumbens DA metabolism and release. In addition, the behavioral and the mesoaccumbens DA responses to FST in C57 mice were reduced and reversed, respectively, by mesocortical DA

depletion. Finally, chronic antidepressant treatment eliminated mesocortical DA activation, mesoaccumbens DA inhibition and depression-like behavior. These results suggest that a genetically determined susceptibility to stress by the mesocortical DA system may favor the development of pathological behavioral responses through inhibition of subcortical DA transmission.

Colour Perception: Psychophysical and Instrumental Evaluation.

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Research in colour perception may be allocated into three main distinct levels: the physics of stimuli, the physiology of receptors and the psychology of post-receptor processes. Aim of this presentation is to examine recent contributions of electrophysiologic studies to the understanding of circuitry and physiology of either retina and visual pathways, and visual processing related to colour perception. The physiological substrate for colour opponent encoding lies within the neural elements of the retina and perception of hue is opponent, involving antagonist comparison of signals from different cone types. Attention will be paid to selected recent contributions and clinical application in the diagnosis of specific involvement of colour perception in certain disorders of anterior visual pathways. Commercially available pseudo-isochromatic plates (Ishihara and Hardy-Ritter-Read) are designated to detect individuals with congenital colour vision deficit (dyschromatopsias); the Farnsworth-Munsell 100-hue colour vision test is used for the qualitative assessment of colour acquired defects. Eterochromatic flicker photometry allows determination of the equiluminant point and deviance from normal value, either for psychophysical contrast sensitivity as well as for electrophysiologic investigations. Equiluminant chromatic contrast stimuli represent the tool suitable to selectively activate sub-systems in visual pathways and detect their selective involvement in specific diseases, as multiple sclerosis, glaucoma, epilepsy, extrapyramidal disorders, retinopathies and other diseases. These studies will presumably become increasingly important in the years ahead considering the lack of understanding of colour perception in normal observers and its impairment in patients with neural disorders.

COMMUNICATIONS

Attentional Processes and Cognitive Performance during Expectancy of Galvanic Painful Stimulation: A High Resolution EEG Study

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In the present high-resolution electroencephalographic (EEG) study, we investigated the competition among attentional processes related to pain expectancy and concomitant cognitive demands. An omitted-stimulus paradigm paced highly predictable and repetitive non-painful or painful galvanic stimulations (pin finger electrode) at the left hand, given after a sequence of three visual stimuli (3.5 s inter-stimulus interval). The attentional processes were probed by event-related potentials (ERPs) and alpha oscillations during the expectancy of galvanic stimulation. The cognitive performance during the expectancy period was evaluated by a task of forward (i.e. short-term rehearsal) or backward (i.e. difficult working memory) repetition of digits. Behavioural results showed no differences in memory performance during the expectancy of nonpainful vs. painful stimulations. Neurophysiological results showed negligible ERPs during the expectancy of both nonpainful and painful galvanic stimulations. In contrast, a decrease of high-band alpha power (about 10-12 Hz) at the contralateral C4 electrode site was stronger during the expectancy of painful than nonpainful galvanic stimulations. These results suggest that, at least for the present cognitive demands, painful stimulation did not affect the cognitive performance, thus indicating that attentional processes accompanying cognition can prevail respect to attentional processes anticipating predictable and repetitive painful stimulations. Furthermore, high-band alpha rhythms would be modulated for the preparation of somatosensory channel during the expectancy of these stimulations.

Interhemispheric Transfer Dysfunctions in Migraine Patients.

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Aim of the study: To evaluate the reaction times (RT) and interhemispheric transfer time (ITT) in migraineurs by using Poffenberger's computerized test (PCT).

Background: Neuropsychophysiological studies have provided cognitive deficits in migraineurs. These subclinical alterations might be linked with structural abnormalities in the brain white matter.

Materials and methods: Forty eight migraineurs and 24 healthy controls were recruited. All subjects were submitted to PCT, a visuomotor task able to evaluate ITT. It is based on the concept that in unimanual RT to lateralized flashes, contralateral responses tend to be slower than the ipsilateral responses (Crossed-Uncrossed Difference-CUD).

Results: Migraineurs showed a mean RT significantly higher than controls ($p < .0001$). Considering only migraineurs, patients with high frequency (HF) of attacks showed a significantly higher CUD than both patients with low frequency (LF) ($p < .005$) and controls ($p < .02$).

	<i>RT(msec)</i>	<i>CUD(msec)</i>
controls	285,3 (17*)	4,46 (3)
migraineurs LF	331,3 (27)	3,24 (6)
migraineurs HF	320,9 (35)	9,19 (6*)

Conclusions: We observed a subclinical psychomotor dysfunction in migraineurs. Patients with HF of attacks presented a deficit of ITT suggesting the presence of white matter subclinical dysfunctions in migraine. Repeated migraine attacks might have a role in determining organic damage; the knowledge of the mechanisms of cerebral damage may guide therapeutic choice of both preventive and acute phase drugs.

Linguistic Creativity and Fronto-Temporal Functions: A Case Report

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In the last few years, neurobiological basis of creativity have drawn attention of experimental research. New inputs have been given by recent reports on emergence of creativity as onset of dementia and by neurobiological study in artistic Savant Syndrome. The peculiar feature of temporal lobe variant (TLV) of fronto-temporal dementia (FTD) is the emerging of visual creativity that develops steadily in contrast to a progressive cognitive decline. Similar creative pattern has been recognized in artistic Savant Syndrome that exhibit extraordinary artistic talent despite of severe intellectual, linguistic and behavioral impairments. The neurobiological basis of the aforementioned conditions is thought to be given by the functional impairment of anterior temporal lobes with reduction of their inhibitory effect on visual creativity. At our knowledge, no literature data on linguistic creativity in FTD are described. We report a case of a 75-year-old man who suddenly developed linguistic creative production and behavioral changes (depression, disinhibition, irritability, coprolalia, hypersexuality). He began to write poems and novels winning a local literary competition. Linguistic and psychometric test scores were normal except borderline values on executive function and even-related potential testing. Cerebral SPECT evidenced bilateral frontal and left temporal lobe hypoperfusion. Brain MRI disclosed bilateral frontal lobe atrophy. This case could be indicative of early FTD with linguistic ability enhancement as onset, supported by clinical and neuroimaging findings. The integrity of linguistic and semantic domains suggests that the decreased fronto-temporal activity underlies the emergence of artistic creativity.

The Theory of Mind Tests (1° and 2° Order False Belief and Faux Pas) in Normal and Autistic Children

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The ability to represent and infer others' mental states has been termed *Theory of mind*. It is believed that the cognitive capabilities underlying the theory of mind are selectively impaired in autistic individuals and in patients with lesions of the prefrontal cortex. Present work is intended to study development of the theory of mind in children and compare the performance of normal subjects with that of autistic patients of the same mental age. The presence of the theory of mind can be investigated by specific tasks defined as 'false belief' that evaluate the subject's capability to interpret others' behaviour in terms of intentions and beliefs. 24 normal children (both males and

females, aged between six and nine yrs) and 9 patients were submitted to three different tests for each category of the false belief tasks, that is 1° and 2° order false belief and faux pas.

All together the results show

- 1) large (and unexpected) individual variability among normal subjects
- 2) significant prevalence of females' compared to males' performance
- 3) impaired performance of autistic patients

Effects of Inhibitors of Acetylcholinesterase on Mismatch Negativity in Alzheimer Disease

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The mismatch negativity (MMN) component of the auditory event-related potential has been indicated as being altered in patients with Alzheimer disease (AD). In particular, MMN to duration changes seems to be more affected than that to frequency changes in these patients. However, the cholinergic system seems to be implicated in the regulation of the frequency-specific comparison of incoming stimuli to existing memory traces and to modulate the pre-attentive processing related to stimulus detection. For these reasons, we studied the MMN obtained with frequency deviant stimuli in 5 patients affected by AD before and after 3 months of treatment with drugs inhibiting acetylcholinesterase, currently used in this disease. Two interstimulus intervals (ISI), 800 and 3000 ms, were used and auditory evoked potentials were recorded from 19 scalp locations. Table 1 shows the results obtained from Fz with 800 ms ISI.

TABLE 1	Baseline		After 3-months treatment		Wilcoxon test
	Mean	Std. Dev.	Mean	Std. Dev.	
Standard stimuli					
N1 latency	104.97	2.873	110.74	10.497	NS
N1 amplitude	7.77	2.539	7.70	2.353	NS
<i>Deviant stimuli</i>					
N1 latency	111.28	10.585	113.29	8.238	NS
N1 amplitude	8.99	4.856	8.04	2.593	NS
<i>Deviant-Standard</i>					
MMN latency	133.02	10.730	118.96	10.461	NS
MMN amplitude	3.28	1.600	3.09	1.420	NS

From this table, it is evident that no significant differences were found for the parameters considered. As expected, only two patients showed recognizable MMN with 3000 ms ISI, at the first recording; after 3-months treatment, none of the patients had MMN. Our preliminary study seems to show that auditory MMN to frequency changes is preserved in patients with AD, with short ISI, and is not modified by the chronic administration of drugs acting on the cholinergic system; this is in agreement with previous studies on MMN in AD and does not support the idea suggested in other studies that auditory evoked potentials might be suitable to monitor cholinergic activity in AD.

Transcranial Magnetic Stimulation (TMS) with Interhemispheric Paired Pulses: Effect on Handedness

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The study assesses the effect of hand preference on the Transcallosal Inhibition (TI) as measured by the Inter-Hemispheric Paired Pulse (IHPP) paradigm with Transcranial Magnetic Stimulation. IHPP has been recorded in 32 normal subjects [16 right-handers and 16 left-handers (8 M and 8 F for each group)], with stimulation intensity set to 120% of Motor Threshold (MT) for each subject in both stimuli (conditioning and test). The Inter-Stimulus Intervals (ISIs) were: 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20 msec for both hemispheres. The Motor Evoked Potential (MEP) responses were recorded from the abductor digiti minimi (ADM) muscles. The variables analyzed were the MTs and the ratio between conditioned responses (preceded by conditioning pulse) divided by unconditioned responses (in which only the pulse has been administered). Results on the amplitude ratio showed only a main effect for the ISI factor without any interaction involving Handedness. Therefore, TI does not seem different between handedness groups, and callosal conductivity could be not affected by which hemisphere controls the dominant hand. On the other hand, results on MTs showed a significant Handedness × Hemisphere interaction, pointing to a higher threshold on the hemisphere contralateral to non-dominant hand.

Time-Course of Electromagnetic Field Effects on Human EEG and Performance

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The present study was aimed to investigate the time-course of GSM-induced effects on EEG, cognitive and behavioral performances. Twenty subjects were randomly assigned to two experimental groups: in the first, subjects were exposed for 45 min before the recording session ("before"); in the other condition subjects were exposed during the recording («during»). Each subject was submitted to a baseline (BSL), a real exposure (ON session) and a sham exposure (OFF session), according to a double-blind design. Resting EEG, reaction times, cognitive and attentional tasks, and tympanic temperature were collected during the recording sessions. The tympanic temperature was significantly higher for the exposed ear, indicating a local heating. No effects were found on cognitive and vigilance tasks. The results of ANOVAs on reaction times (RTs) showed a significant effect: ON sessions showed shorter RTs as compared to both BSL and OFF conditions. Moreover, a significant effect for the Group factor indicated that the "before" group had faster RTs than the "during" group. The EEG spectral power showed comparable effects on Fz, Cz, Pz and T3 derivations, indicating more marked EEG changes under the electromagnetic field exposure. These findings point to a clear time course of the effects induced by electromagnetic field on human EEG and performances.

Effect of Attention toward the Stimulus on C Fiber-Related CO₂ Laser Evoked Potentials

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This study aimed at investigating whether modifications of the attention level affect the CO₂ laser evoked potentials related to C fiber stimulation (C-LEPs). C-LEPs were recorded in 10 healthy subjects after stimulation of the right and left perioral region. The intensity of the CO₂ laser pulses was adjusted to entail a warm non-painful sensation, due to activation of the unmyelinated C fibres. LEPs were obtained in 3 different conditions: i) attention condition (AC), in which subjects were asked to count the number of laser stimuli; ii) neutral condition (NC), in which subjects did not have any task; iii) distraction condition (DC), in which subjects received an arithmetic task. LEP recordings during AC revealed two main vertex components: a negative C-N2a potential at 234.38 ms, followed by a positive C-P2 response at 408.2 ms. Two earlier C-N1 and C-P1 potentials were identifiable at 196.6 ms in the contralateral temporal region and in the frontal lobe, respectively. In both NC and DC, the C-N2a and C-P2 potentials were markedly reduced in amplitude, while the C-N1 and the C-P1 responses remained unchanged. Our findings show that the vertex C-LEPs, which are strongly reduced by any attention deviation, can correspond to the emotive-motivational aspects of warmth, while the earlier C-N1 and C-P1 components are probably related to the sensory-discriminative feature of thermal sensation.

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Cortical Functional Asymmetry Related to Visuospatial Episodic Long-Term Memory. A Multi-Modal rTMS-EEG Study

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Left and right prefrontal areas (LPF and RPF) are preferentially engaged in encoding and retrieval phase of long-term visuospatial memory, respectively (HERA model). Here we investigated the role of brain rhythmicity and the effective impact on memorization of this cortical functional asymmetry. During encoding, “internals” of apartments (figures) were randomly intermingled with “landscapes”. During retrieval (1 hour later), these “internals” were randomly intermingled with other “internals” (“distractors”). Repetitive TMS (500 ms, 20 Hz, 10% below motor threshold, 13 subjects) was delivered over LPF or RPF. In separate sessions, EEG data were recorded (46 electrodes; 10 subjects) and spatially enhanced by Laplacian transformation. According to HERA model, recognition of “internals” declined markedly stimulating LPF during encoding or RPF during retrieval. However, no change of frontal rhythmicity was consistent with HERA prediction. HERA prediction was fitted only by EEG gamma responses (about 40 Hz) in posterior parietal areas, thus disclosing a possible role of “binding phenomena” in the dorsal stream subserving visuospatial episodic memory. In conclusion, a multi-modal neurophysiological approach may

unveil the parallel frontoparietal processes at the basis of cortical functional asymmetry (HERA model) and successful episodic long-term memory.

Source Localization of Visual Processing during Spatial Attention

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In this study we combined electrophysiological (ERP) and functional neuroimaging (fMRI) methods in order to investigate the time course and anatomical loci of visual processing during spatial-selective attention. Subjects received identical stimuli and performed identical tasks in separate ERP and fMRI sessions. In an initial passive condition, checkerboard stimuli were delivered to each of the four visual quadrants. These stimuli produced discretely localized fMR signal changes within several retinotopically organized visual areas of striate and extrastriate cortex. These changes were related to the estimated dipolar sources of the short-latency components of the visual evoked potential. In a second condition, the same group of subjects attended to a single quadrant at a time and detected infrequent targets embedded within the stream of stimuli. Attention-related activations were observed in striate and several extrastriate areas with fMRI and were related to the temporal sequence of ERP components modulated by spatially-focused attention. The earliest ERP component (C1 at 50-90 ms) was unaffected by attention and was localized in the calcarine cortex. A longer latency deflection in the 150-225 ms range that was localized to this same calcarine source, however, did show consistent modulation with attention. These results provide strong support to current hypotheses that spatial attention in humans is associated with delayed feedback to area V1 from higher extrastriate areas.

Neurophysiological Investigation of Executive Function in Alzheimers Disease

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Reaction times (RTs) and event-related potentials (ERPs) to cognitive tasks are frequently employed for assessing cognitive processing. The Stroop test is frequently used in the assessment of frontal lobe function. We evaluated the usefulness of RTs and ERPs in the evaluation of frontal lobe involvement in a group of patients with Alzheimers disease (AD). Fifteen patients with probable AD (68 ± 8 yrs) and 14 normal subjects (61 ± 6 yrs, 8 women) underwent evaluation of Stroop test reaction times in simple, choice and Go-No Go paradigms. ERPs to the Stroop test were obtained from 64-channel EEG. AD had significantly slower RTs compared to normals ($p < 0.01$) for choice and Go - No Go tasks and a significantly higher number of errors in the same tasks ($p < 0.02$). The frontal P300 component of the Stroop ERP had significant amplitude reduction ($p = 0.02$) and latency increase ($p = 0.03$) in AD patients compared to normal subjects; no significant difference was found for the early posterior ERP components. These results, confirming the involvement of frontal function in AD, suggest the possible usefulness of reaction times and ERPs in the assessment of cognitive function in AD patients for monitoring the natural evolution and therapeutic interventions in this disease.

Cognitive Disease and CNS Maturation

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Three disorder fulfilling the criteria of late CNS maturation apart from the corresponding cognitive profile were studied: infantile autism, schizophrenia (S), and developmental dyslexia (DD). These disorder have in common deficits cognition, perception and somamotor function. The deficits range from an arrest in brain development to overall delayed brain and somatic development in S; in DD reading inability, problems in perception (vision and hearing) and in motor coordination, particularly between the two hemispheres. Brain maturation is obtainable through optimal nutrition, including a satisfactory amount of marine fat (PUFA). It is suggested that in the past environmental insults of the nervous system, dependent on the temporal and regional emergence of critical developmental processes (proliferation, migration, differentiation, synaptogenesis, myelination, and apoptosis). Various clinical disorders (S, DD) may be also the results of interference with normal ontogeny of development nervous system. The relationship between dyslexia and schizophrenia can be explained: the schizotypal personality characteristics of D; the increased risks of D in families with a schizophrenic proband; reduced asymmetry of the brain, especially of the planum temporale; hypoplastic cerebellar structures; frontal lobe deficits and basal ganglia; hippocampal area and dorsolateral prefrontal cortex (study of MRI).

Alteration of Behavioural and Frontomedial Rhythmic Activity in Demented Patients Involved in Cognitive Tasks

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We studied cortical alpha rhythms (8-12 Hz) in 13 Alzheimer disease, 9 vascular dementia, and 22 age-matched normal (Nold) subjects performing two choice reaction time tasks. In the first task, cue visual stimulus consisted of a couple of vertical bars (2 sec), followed by a retention period of "blank screen" (3.5-5.5 sec). At the end of retention period, a visual Go stimulus (1 sec) triggered a right hand movement, namely the click of the left or right mouse button if the taller bar was at the left or right monitor side. In the second task, the visual stimulus lasted up to Go stimulus. Magnetoencephalographic (MEG, 28 channels) recordings were performed from a circular fronto-medial region overlying supplementary motor and attentional cingulate areas. MEG data were analyzed in terms of event-related desynchronization/synchronization (ERD/ERS) of low- and high-band alpha rhythms. Demented patients showed a strong inability to wait for the Go stimuli, with respect to control Nold subjects. This was of extreme interest since patients' group included neither fronto-temporal dementia nor subjects suffering from substantial frontal vascular lesions. MEG data pointed to a significant increase of the frontomedial alpha ERD in dementia patients compared to normal subjects for both tasks. The present results support the idea that dementia is associated with impulsive behavior together with an excess of excitatory activity in attentional and premotor cortical areas (abnormal facilitation or dis-inhibition).

Heterogeneity of Brain Mechanisms of Emotional Processing

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In subjects with Panic Disorder (PD) psychophysiological studies have documented a tendency to interpret ambiguous stimuli as threatening and an attentional bias toward threat-related cues. In this study, drug-free PD subjects and matched healthy controls (HC) were assessed during a visual target detection task in which stimuli with different emotional valence were used as distractors. ERPs were recorded from 30 channels during the performance of the task, in which neutral (NE), erotic (ER), threat-related (TR) and phobic (PH) rare distractors were randomly intermixed with rare target and frequent standard stimuli. Field characteristics and three-dimensional source activity were assessed for each ERP component microstate. For both ER and TR distractors the P3a corresponded to the fourth microstate in PD subjects, while the same was observed only for ER distractors in HC. In PD subjects the topographic characteristics of the P3a microstate and the source activity of the same and preceding microstates discriminated both ER and TR versus NE. In HC the source activity of the microstate preceding the P3a discriminated only ER versus NE. Our results show that subjects' characteristics affect the time course and brain mechanisms of emotional processing and demonstrate a bias toward threat-related cues in PD subjects.

Trigemino-Cervical-Spinal Reflexes in Humans: Functional Significance.

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Introduction. Electrical stimulation of the supraorbital nerve (SON) induces a late response in the neck muscles supposed to be multi-synaptic reflexes participating in a defensive withdrawal retraction of the head from facial nociceptive stimuli. Such responses may be not limited to the neck muscles extending to the proximal muscle of the arms. **Objective.** 1) to evaluate the presence of the responses in the upper limb muscles (trigemino-spinal responses TSR) and its relationship with trigemino-cervical responses (TCR); 2) to better identify the nociceptive component of such reflexes and its functional significance. **Materials and Methods.** In twelve healthy subjects, the reflex responses were registered from semispinalis capitis and biceps brachii after an electrical stimulation of the SON. The following parameters were measured: sensory (ST), painful (PT) and reflex threshold (RT); the latency and the area of the responses, the effect of the heterotopic painful stimulation (HPT), the recovery cycle and the effect of the expected and unexpected stimulus. **Results.** Stable reproducible TCR and TSR were identified at 2.5 ± 0.4 ST, exactly corresponding to the painful threshold in every subjects. The area of the TCR and TSR was markedly reduced after the HPT. The recovery cycle of the TSR area was faster than that of the TCR. Repeated rhythmic stimulation failed to induce progressive suppression. **Conclusions.** These results confirm the nociceptive nature of the TCR and indicate that the biceps brachii response (TSR) has the same nocifensive significance. The possible role of the "WDR" and reticular formation neurons in the integration of these reflexes is discussed.

Cognitive Function in Parkinson's Disease: A Selective Review

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Cognitive impairment is a common feature of idiopathic Parkinson's disease (PD) with a prevalence of about 40%. The knowledge of cognitive dysfunction in PD has largely been obtained from studies of treated, long-term patients with questionable results. In the last decades the research has been focused on newly diagnosed, untreated patients. The cognitive impairment is characterized predominantly by abnormalities of executive function (planning, problem-solving, set-shifting), memory (working memory, recall, dating) and language (sentence comprehension, semantic processing, lexico-grammatical integration), up to overt dementia. Also depression is very common in PD with a prevalence of 20-40% and represents a risk factor of cognitive dysfunction. Even in the absence of dementia or depression, patients are likely to show impairments on neuropsychological measures sensitive to changes in dorsolateral prefrontal regions participating in cognitive basal ganglia-thalamocortical circuits. Thus, the pathogenesis of cognitive impairment in PD seems to be independent of the nigro-striatal dopamine depletion underlying motor impairment. This suggestion is strengthened by the observation of cognitive disorders in early stages or before motor sign onset in some cases. Modern diagnostic and experimental methods (fMRI, PET, ERPs) are useful to better understand the basal ganglia system but possible relationships between cognitive impairment and disease duration, clinical features and age of onset are still unclear and debated in literature.

P300 and Cognition in Parkinson Disease: An Update

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In the last decades, cognition and Parkinson disease has been an emerging aspect of our growing understanding, diagnosis, and treatment of this degenerative disorder. Herein, the current knowledge of cognitive dysfunction evaluated by means of psychophysiological approach is reviewed. The purpose is to update the literature data and to demonstrate that oddball P300 methodologies during the past 30 years have largely improved. Cognition is a well-established feature in Parkinson disease involving bradyphrenia, memory deficits, visuomotor dysfunctions, and executive impairment presumably due to dysfunction of the subcortical dopaminergic, noradrenergic, and cholinergic circuits. As the disease progresses, a few patients develop dementia which correlates with disruption of the corticostriatal pathways. Moreover, sub-clinical cognitive deficit could be present in not demented PD patients. Combined neuropsychological and neurophysiological studies have been conducted under various methodological conditions and consequently the authors have achieved different, and often conflicting, results. Although neuropsychological approach is the first method of choice for the assessment of cognition, severe physical disability could preclude that psychometric testing is completed in PD patients. For this reason, oddball P300 may represent an effective means to evaluate cognitive status in PD patients.

Event-Related Potential and Neuropsychological Findings in a Former Boxer with Parkinsonism

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Traumatic brain injury could lead to various pathological conditions of the central nervous system characterized by concussions, hemorrhage, ischemic lesions and, in case of chronic head injury, cortical atrophy and degeneration of subcortical and cerebellar structures. Chronic traumatic encephalopathy associated with boxing occurs in approximately 20% of professional boxers representing a risk factor especially for the smaller divisions. The permanent brain damage in amateur or professional boxers manifests itself in several clinical syndromes in which the pyramidal, the extrapyramidal and the cerebellar systems are involved. Parkinson's syndrome in boxers is quite rare and extrapyramidal symptoms could occur decades after stopping fighting. We report the case of a 70-year old man who referred to our observation complaining for one year the presence of tremor in the left arm. Cardiovascular and laboratory data were normal. He did not smoke and did not abuse of alcoholics. His own and familial history did not reveal neurological diseases. He had a 12-year boxing career, three of them as a professional boxer, with about 150 fights in fly and bantam divisions between the age of 17 and 29 without any knockout. Neurological examination revealed tremor at rest and moderate rigidity on the left arm, bilateral gaze-evoked nystagmus and hypermetric saccades. Neuropsychological investigation revealed good global cognitive and memory conditions but impaired language function. Event-related potentials confirm the linguistic deficits. The possible relationship between repeated head injury and the observed neurological disorders will be discussed.

The Hoxa1 G Allele may be Associated with Dismorphism in Autism

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The HOXA1 G allele has been found associated with autism (Ingram et al 2000). This study attempts to replicate and extend these findings in 127 simplex Italian families with autistic probands, and in 101 complete trios from 46 simplex and 55 multiplex Caucasian-American families. The A, and not the G allele, displays a significantly higher frequency in 127 Italian autistics contrasted with 173 ethnically-matched controls ($\chi^2=6.41$ and 3.87 for genotypes and alleles, respectively, 1df, $P<0.05$). Preferential transmission of the A allele to affected offspring in 215 complete trios (TDT $\chi^2=6.05$, 1df, $P<0.05$) confirms the association of the A allele with autism in our sample. Interestingly, 32/57 (56.1%) autistic probands assessed by Ingram et al (2000) displayed mild dysmorphic features, a cause for exclusion from the current study. We thus hypothesized that the HOXA1 G allele might be associated with dysmorphisms and indeed found a

significant association between the G allele and macrocephaly both in our sample and in the group assessed by Ingram et al (Mann-Whitney U test: $P < 0.05$ and Moses test $P < 0.001$). The HoxA1 G allele contributes 3-6% of variance in cranial circumference of autistic children. Supported by Telethon-Italy (E.0858), Italian Min. Health (ICS.190.1.RF99/90), CNR (99.00555.PF33), and N.A.A.R.

Selective Attention t Touch: Effect of Aging ad o Focal Ischemic Brain Lesions

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Our study aimed at investigating whether: i) aging influences the brain mechanisms operating during the attention to touch, and ii) cerebral ischemic lesions may impair these mechanisms. Seventeen elderly healthy subjects (mean age: 71.7 years), 12 young healthy subjects (mean age: 26.9 years) and 22 elderly ischemic patients (mean age: 65.8 years) were studied. Somatosensory evoked potentials (SEPs) to median nerve stimulation were recorded in a neutral condition (NC), in which subjects had no task, and in a selective attention condition (SAC), in which subjects were asked to count tactile stimuli given on the same hand of the stimulated median nerve. Within healthy populations, the N140 potential was identifiable only in SAC in young healthy subjects, while it was evoked in both NC and SAC in elderly healthy subjects. Within old populations, SEP amplitude modifications during SAC were not significantly different in patients and healthy subjects. No effect of lesion side on SEP changes during SAC could be demonstrated. Our findings suggest that: i) old subjects are probably unable to diverge their attention from the median nerve electric stimuli during NC, therefore they have lower “residual” attention resources to invest during SAC compared to young subjects, and ii) the brain functions underlying easy attention tasks are not impaired by cerebral ischemic lesions whatever hemisphere is damaged.

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Subsyndromal Symptomatic Depression (SSD) as Risk Factor of Essential Hypertension

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OBJECTIVE: To study the controversial point of view of association between depression and hypertension.

MATERIAL AND METHOD: 198 cases with essential hypertension inpatients and 96 controls inpatients for other pathologies were studied. The psychiatric assessment was done with: Hopkins Checklist (SCL-90), Toronto Alexithymia Scale (TAS-20), Anxiety Sensitivity Index (ASI). Detailed clinical evaluation was done in both clusters.

RESULTS: In all scales, the scores was more significant in cases than controls ($p < .0001$). A substantial number of patients continued to present with depressive symptoms that still did not satisfy any DSM-IV diagnosis. Subsyndromal symptomatic depression (SSD) is found to be comparable in demographics and clinical characteristics to major depression, minor depression and dysthymia. SSD is also associated with significant psychosocial dysfunction as compared with healthy subjects.

CONCLUSIONS: Clinicians continued to struggle with the concept of subthreshold depression. The subsyndromal symptomatic depression (SSD) is defined as a depression of the quality as in major depression, excluding depressed mood and anhedonia. It's possible that therapy of

subsyndromal symptomatic depression (SSD) could improve pressure values. The high prevalence of SSD, the significant psychosocial impairment associated with it, and the chronicity of its course make subsyndromal symptomatic depression a matter for serious consideration by clinicians and researchers.

Underfunctioning of Sensory Gating Mechanisms in Patients with Obsessive-Compulsive Disorder (OCD). A SEP Study.

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Background: OCD patients show functional abnormalities in basal ganglia/pre-central circuitry, pointing to cortical hyperexcitability and lack of inhibitory control. It has been postulated that gating mechanisms may reflect a protective system towards external stimuli: therefore, we tested the possibility that part of motor abnormalities in OCD could be related to a reduction of sensory gating due to cortical hyperexcitability.

Methods: median nerve SEPs were recorded in 11 OCD and 9 healthy volunteers during muscle relaxation (“Relax”) and during the execution of voluntary finger movements of the stimulated hand (“Move”). Latencies and amplitudes of pre- and post-central SEP components, normalized to individual “Relax” values, were computed and compared between groups during “Relax” and “Move”.

Results: Cortical responsiveness to sensory stimuli were enhanced in OCD patients during “Relax”. Sensory gating in normal subjects corresponded to a 60% amplitude reduction of pre-central components (“Move” vs “Relax”), while in OCD patients sensory gating was only 30%.

Conclusions: underfunctioning of sensory gating in OCD may reflect the inability to modulate sensory information due to a “tonic” high level of cortical excitability and failure of inhibitory mechanisms of pre-motor and related areas. This previously unexplored aspect may offer new insights into the pathophysiology of OCD.

EEG Analysis in Face Gender Recognition Tasks

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Aim of this study was to investigate bioelectrical correlates of face gender recognition. 20 healthy volunteers were enrolled (10 M and 10 F; mean age \pm DS: 23.6 \pm 3.2 years). All subjects were right-handed and heterosexual. Visual stimulation was performed with 64 pictures of human faces (32 M, 32 F) shown in random sequence on a PC monitor. EEG signals were recorded on the scalp with 32 electrodes. Traditional ERP analysis was performed: ERP signal obtained from female faces was subtracted from the signal obtained from male faces. EEG maps were also calculated, to detect brain regions involved in face gender recognition. Statistical analysis was performed with Student t-test ($P \leq 0.01$). Differences in the ERP signals were detected in male subjects in frontal, parietal and occipital regions of the scalp, at a mean latency of 140ms-210ms. In female subjects, high differences were detected in parietal and occipital areas of the scalp, at a latency of 140-160ms, and in the frontal, parietal and occipital areas at a latency of 300-370ms. Present data suggest the existence of neurophysiological correlates of cognitive processes linked to face gender categorization. Two main processes were detected: the first one at a latency of 100-210ms, causes a

differential activation of parietal and occipital areas, the second one causes a differential activation of frontal, parietal and occipital regions at a mean latency of 300-370ms.

Long Term Treatment of Generalised Anxiety Disorder: An Overview

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Generalised Anxiety Disorder (GAD) is characterized by chronic worry, hypervigilance and scanning that may persist for many years. It is a very debilitating disorder that tends to be a chronic condition, often associated with relapse rates after discontinuing acute drug therapy, therefore maintenance drug therapy must be considered. Because of the risk involved in the drug tolerance regarding long-term benzodiazepine treatment, it is very important to consider alternative treatments. In the last years other therapeutic options were explored. Buspirone and some of the new antidepressants have become the treatment of choice for patient with GAD requiring long-term treatment. The antidepressants that offer a better pharmacologic profile are the SSRI and SNRI, such as venlafaxine. Long-term studies also indicate that cognitive-behavioral therapy in association with relaxation training and/or anxiety management techniques present a relatively low drop-out rate, a frequent reduction of medications and a highest improvement compared to other psychotherapies. These therapies may be a useful approach both alone and together with pharmacotherapies. At present, the use of psychotherapies and SSRI or venlafaxine, represent the best approach to attain long-term benefit in patients with GAD, however, further studies are necessary to perform exactly an adequate evaluation of this anxiety disorder.

Sleep and Sleep Disorders in Normal Pregnancy

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Sleep represent one of the most evident and studied functions of the organism. This review examines sleep in pregnant women. We analysed physiologic bases for sleep alterations in normal pregnancy, including hormonal, neurological and psychobiological factors that can influence sleep patterns in pregnancy, as determined subjectively by surveys and objectively by polysomnographic studies. Generally it is possible to confirm that sleep complaints, during pregnancy, represent an incidence from 66 to 94%. Variations in REM sleep are very common and have an important influence on mood state and cognitive functioning. Most of the studies describe increased sleep time and increased daytime sleepiness as part of sleep features during the first trimester of pregnancy, whereas late pregnancy is associated with frequent awakenings and an overall decrease in sleep efficiency. The most common reason of these alterations are urinary frequency, heartburn, respiratory discomfort, fetal movements, back pain, restless-leg syndrome, cramps and frightening dreams. An important factor of these sleep disorders is anxiety and expectation. We outlined the effect of pregnancy on sleep disorders and the management of these sleep disorders during pregnancy. The paucity of available data needs further

Short-Term Plastic Changes of the Human Nociceptive System following Acute Pain Induced by Capsaicin

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This study aimed at investigating possible neuroplastic changes induced by pain in central nervous system (CNS) structures devoted to nociceptive input processing. CO₂ laser evoked potentials (LEPs) were recorded from 10 healthy subjects after stimulation of right and left hand dorsum. Acute pain was obtained by topical application of capsaicin (1 ml, 3%) on the skin of right hand dorsum. LEPs were recorded after right and left hand stimulation before capsaicin, at the peak pain (20-30 minutes after capsaicin application) and 10-20 minutes after capsaicin removal. Right hand LEPs were evoked by CO₂ laser stimuli delivered on the hyperalgesic territory adjacent to the painful skin (area II) during capsaicin and on both the painful skin territory (area I) and the area II after capsaicin removal. Right hand vertex LEPs were significantly decreased in amplitude during capsaicin and after capsaicin removal. Moreover, the topography of these potentials was modified after capsaicin removal, shifting from the central toward the parietal region. Dipolar modelling showed that a source in the anterior cingulate cortex (ACC) moved backward after capsaicin removal. All these changes were not observed after stimulation of left hand, contralateral to capsaicin application. Our findings suggest that: i) acute pain reduces the CNS reactivity to nociceptive inputs, and ii) it modifies the normal balance between the anterior and the posterior ACC parts, by increasing the relative power of the posterior region, which encodes the pain unpleasantness.

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Quality of Life and Depression in a Group of Patients with Parkinson's Disease

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In the past decade the improvement of social and healthcare conditions and the increasing number of treatment strategies allowed a reduction of mortality rate in parkinsonian patients to a level similar to that seen in the general population. Contemporary a lot of PD-specific questionnaire have been developed for evaluating quality of life of parkinsonian patients and applied in pharmacological trials and clinical practice. In this study it will be recruited a consecutive series of patients with a diagnosis of PD according to the United Kingdom Parkinson's Disease Brain Bank Society referring to four different diagnosis and care centres for PD. The following features will be evaluated with a questionnaire: place of residence, age at onset PD, Hoehn-Yahr stage, UPDRS-III (motor part), clinical form, risk and protective factors (family history of PD, pesticide exposure,

smoke habit, alcohol, coffee), drugs treatment, physical therapy, non-motor complication and concomitants diseases. Each patient will be asked to fill a PD-specific questionnaire of quality of life, the PDQ39 and the Beck Depression Inventory to assess the eventually concomitant presence of depression. Furthermore, considering the place of residence, it will be elaborated a development and wellbeing indicator that will be related to the quality of life measurement and to the clinical features of PD patients. Objective of our study is to characterize disease severity of parkinsonian patients referring to different Italian healthcare centres (rehabilitation structure, second and third referral centres) considering either physician's and patient's point of view in their own specific social and cultural context.

Functional Frontoparietal Connectivity during Working Memory as Revealed by High Resolution EEG Coherence Analysis

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In this electroencephalography study, we modeled the functional connectivity between frontal and parietal areas during working memory (WM) processes, as revealed by the spectral coherence between electrodes and by a mathematical approach (directed transfer function, DTF, computation) recently developed to estimate the “direction” of the information flow between electrodes. The WM task included cue stimulus (two vertical bars), retention period, go stimulus (no probe) and motor response compatible with taller vertical bar. In the control (no WM: NWM) task, cue stimulus lasted up to the go stimulus. Results showed that the functional frontoparietal connectivity as revealed by beta (14-30 Hz) and gamma (>30 Hz) coherence prevailed for the WM. Concerning the DTF, it was observed a prevalence of the parietal-to-frontal information flow at beta/gamma bands during NWM condition and at beta band during WM condition, according to a prevalence of visual processes from visual (parietal) to associative and motor (frontal) areas. In contrast, WM condition induced frontal-to-parietal and parietal-to-frontal information flows at gamma band. These results suggest that coordinated gamma oscillations within a fronto-to-parietal network would optimize “representational” memory during WM.