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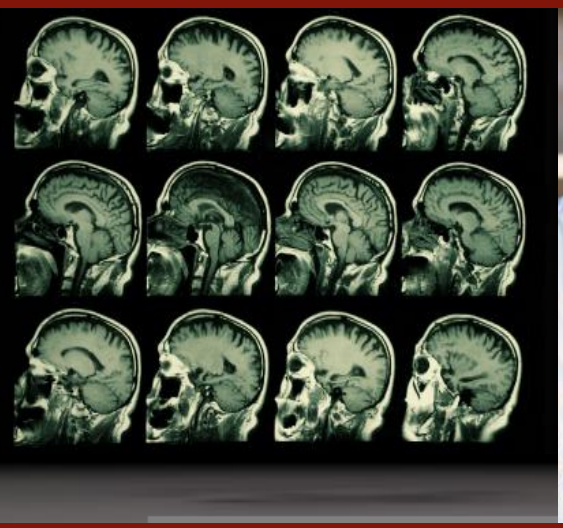
Anais do III Simpósio Internacional em Neuromodulação



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RESUMOS DE CONFERÊNCIA

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APRESENTAÇÃO DE POSTERS

A1

The Clinical Effects of Low Energy Neurofeedback System (LENS), a case presentation. J. Leon Morales Quezada MD, MSc. De Montfort University, Leicester, UK. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: In neurobiology, there are examples of animal models which exhibit behavioral changes when exposed to weak extremely-low-frequency (ELF) electromagnetic fields. As a perspective on the biological significance of this cell-surface current flow, there is evidence from a number of studies that ELF fields in the range 0-100 Hz and radiofrequency (RF) fields amplitude-modulated in this same ELF range, producing tissue gradients in the range 10-‘-10-1 V/cm, are involved in essential physiological functions (Adir, 1993).

Methodology: This is a case presentation of a 12-year-old male, right handed, with diagnose of total body athetoid cerebral palsy. On physical examination the child showed ataxic independent gait, with persistent bilateral upper limb aid involvement for bipedal balance, oro-facial dyskinetic disorder, and manual competence impairment characterized by a lack of forearm prono-supination function and poor bilateral motor coordination. Brief topographic electroencephalographic (EEG) map assessment and Gross Motor Function

Scale had been obtained before and after treatment. The protocol design followed the results of the EEG brief map. The patient received 10 treatment sessions, using the Low Energy Neurofeedback System (LENS) by OchsLabs®, 5 sessions of Brief Feedback 2 pd and 5 sessions of Brief Feedback 5 pd were completed.

Results: Findings indicate improvements in topographic map assessment when total amplitudes were compared before and post intervention. Sites of interest were; F8, P4, C4, T5, O1, T4, F4, Fz, FP2, F3. Amplitude and variability at each specific site decreased throughout the training sessions. The Gross Motor scale assessment showed improvements at the dimensions of; standing and walking/running /jumping. Initial scores were 41% and 36% respectively per goal area, to 67% and 59% post treatment. Gait quality improved, and by the first time the patient was able to take steps upstairs independently (hip flexion enhancement). The oro-facial dyskinesia decrease considerably also, total time for feeding decreased from 60 minutes to 40 minutes per meal.

Discussion: The LENS is an EEG biofeedback system used in clinical applications and research in the treatment of central nervous system functioning. It is unique in the field of neurofeedback in that instead of only displaying information on a computer screen to assist the patient in conditioning healthier brainwave patterns, the LENS uses tiny electromagnetic signals as a carrier wave for the feedback to assist in reorganizing brainwave activity (Ochs,2006). The derivate technology of LENS is design to pick out the dominant EEG activity in the low-frequency regime, and apply stimulation that was out of phase with the ongoing signal, and thus bring about its dephasing and disruption (Ibric and Davis, 2007).

Conclusions: The derivate technology of LENS is design to pick out the dominant EEG activity in the low-frequency regime, and apply stimulation that was out of phase with the ongoing signal, and thus bring about its dephasing and disruption (Ibric and Davis, 2007). The LENS effectively does this by means of electromagnetic stimulation with a carrier frequency in the megahertz region, modulated by the EEG signal of interest (Ochs, 2006). This case suggests the beneficial effects of weak ELF electromagnetic field stimulation, though we present only one case, more research needs to be done in the field of brain stimulation using the LENS system.

A2

The Reporting of Blinding in Physical Medicine and Rehabilitation in Randomized Trials: a Systematic Review.

Mauricio Villamar, MD; Vanessa Suárez Contreras, MD; Felipe Fregni, MD, MPH, PhD Laboratory of Neuromodulation, Spaulding Rehabilitation Hospital, Harvard Medical School Boston, MA, EUA.

Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.

ABSTRACT

Objective: To systematically evaluate the reporting of blinding in randomized controlled trials (RCTs) published in five leading journals in the field of Physical Medicine and Rehabilitation (PM&R) over two time periods.

Data Sources: Full reports of RCTs published in American Journal of Physical Medicine and Rehabilitation, Archives of Physical Medicine and Rehabilitation, Clinical Rehabilitation, Disability and Rehabilitation and Journal of Rehabilitation Medicine in the years 2000 and 2010.

Study Selection: All RCTs of human studies published either online or in print in the aforementioned journals over these two time periods were included. A total of 214 articles were initially identified, and 139 met our selection criteria.

Data Extraction: Reporting of blinding and study characteristics were collected for each study by two independent investigators. Consistency of data extraction between them was evaluated.

Data Synthesis: Blinding was mentioned in 85.0% of trials published in 2010 as compared to 56.4% in 2000 (p=0.001). Among trials that did not mention blinding, 35.7% papers from 2010 discuss its absence as a study limitation versus 0.0% in 2000 (p=0.004). The blinding status of key persons was specifically reported in 79.0% of studies from 2010 as compared to 56.4% in the previous period (p=0.011). No significant differences were found in terms of reporting other blinding-related characteristics as enforced by the CONSORT Statement.

Conclusions: Although reporting of blinding has significantly improved over the past decade, it is still not adequate as it does not completely fulfill the recommendations of current guidelines.

A3

Impacto Comportamental do isolamento social em modelo murino de doença Prion, Behavioral impact of social isolation in piron diease murine model,

LEITE, A.O.F.[1]; PICANÇO-DINIZ, C.W.[2]

Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.

RESUMO/ABSTRACT

Discussão: Avaliar o impacto do Isolamento Social (IS) na Doença Prion. Mediu-se Grooming e Campo Aberto em murinos isolados e agrupados infectados com ME7.

Discussion: Evalueting impact of Social Isolation (SI) in Prion Disease. Grooming and Open Field was measured in grouped and isolated ME7-infected mice.

Resultado: O IS teve influência aditiva nos sintomas.

Result: The SI had additive effect on symptoms.

Conclusão: Concluiu-se que o IS agrava o início da doença.

Conclusion: Conclude that SI aggravates the onset of the illness.

A4

Estudo Preliminar das bases Neurológicas da observação de ações em contexto. Ana Carolina Alem Giglio Camila Campanhã, Paulo Sérgio Boggio. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introdução: A observação e a compreensão de ações são um importante estímulo para o aprendizado por imitação e o desenvolvimento da linguagem, processos mediados pelo sistema de neurônios espelho (envolvidos também em processos cognitivos como a empatia e a teoria da mente). Uma técnica que tem auxiliado na compreensão de aspectos envolvidos nas funções cognitivas é a eletroencefalografia (EEG), que permite a investigação dos padrões de ativação dos Potenciais Relacionados a Eventos (ERPs) diante da exposição a estímulos que representam contextos sociais, a fim de compreender o processamento de informação relacionada à compreensão de ações e à mentalização.O potencial N400 tem demonstrado sensibilidade em tarefas de compreensão que envolvem violações semânticas de contexto.

Objetivo: Descrever os componentes N400 e LPC gerados pela observação das ações congruentes e incongruentes, e investigar o efeito da ETCC anódica, catódica e placebo em área pré-motora nos componentes N400 e LPC.

Discussão: Os participantes foram divididos em 3 grupos: ETCC anódica, catódica ou placebo. Em seguida, foram submetidos ao teste de observação de ação no EEG. O teste foi constituído por 60 histórias, sendo 30 com finais congruentes e 30 incongruentes.

Resultados: Os principais achados foram: N400 de maior amplitude em eletrodos frontais durante a observação da primeira tela da sequência das ações, com envolvimento principal das áreas de Brodmann (BA) 10, 11 e 25; e LPC (500-800 ms) de maior amplitude em eletrodos centrais durante a observação dos desfechos

incongruentes das ações com envolvimento principal das regiões BA 8, 11, 18 e 32 Como característica fundamental o estudo emprega um teste de observação de ações no qual a violação semântica não é irreal, aproximando dessa forma os dados obtidos com situações mais próximas da realidade.

A5

Emotion affects corticospinal excitability during motor preparation. Nogueira-Campos, A.A.[1,2]; Oliveira, L.A.S.[1,3], Esteves, P.O.[1], Rodrigues, E.C.[3], Volchan, E.[1], Della-Maggiore, V.[4]; Vargas, C.D.[1]. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, pl-2*

ABSTRACT

Objective: Daily in life humans are faced with situations where they need to interact with emotional objects. Can the valence of objects influence the brain activity that precedes their grasping? The aim of this study was to examine the corticospinal excitability during motor preparation to grasp emotional-laden objects.

Discussion: Ten participants were instructed to grasp emotional objects (pleasant-P, unpleasant-U and neutral-N) or to look at those same objects while transcranial magnetic stimulation (TMS) was applied into the primary motor cortex. Four blocks (2 action and 2 no-action) containing emotional objects were randomly presented. Trials began with arrival of object and 3s after go signal was turned on indicating that the participant should to move. TMS single pulses were randomly applied at 500 or 250ms before the go signal. Motor evoked potentials (MEP) were measured by recording the EMG signal from the *first dorsalis interosseous*-FDI and the *abductor digiti minimi*-ADM.

Results: Tree-way ANOVA revealed a condition X valence X muscle interaction ($p=0.03$). To find out what muscle was driving this interaction, it was made a 2-way ANOVA. There was a condition X valence interaction for FDI. The MEP was larger for U/N compared to the P/N conditions. There was no significant effect for ADM ($p=0.29$). And there was no valence effect in the no-action block ($p=0.49$).

Conclusion: The preparatory activity is affected by the emotional value of the object to be grasped. Since that preparing oneself to grasp U objects requires more corticospinal resources than preparing to grasp P objects, this modulation being effector-specific.

A6

Development of open source Neuronavigation System for Transcranial Magnetic Stimulation. PERES ASC[1], SOUZA, VHO[1], RODRIGUES EM[1], AMORIM PHJ[2], MORAES TF[2], SILVA JVL, BAFFA O[1]. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: Neuronavigation System can be used to improve Transcranial Magnetic Stimulation application, protocols, however these equipments are expensive, making impossible their use in the most TMS clinics and research centers. These systems are composed by tracking system that allows the positioning of the device in the images of subject leading to a better precision of delivering the magnetic stimulus. To addrees this cost issue a freeware and open source neuronavigation software is being developed, wich presents several tools for TMS application and supports five kinds of motion tracker, based on electromagnetic, optical and ultrasound waves. Moreover our neuronavigator is integrated with the medical image software InVesalius, wich several tools for neuroimage and is being continually updated.

Discussion: Testing a neuronavigation system with main objective of improving Transcranial Magnetic Stimulation application.

Result: The neuronavigator was tested in simulated data and for TMS motor mapping in 20 volunteers with good results.

Conclusion: The accurancy of tool depends on the images and the motion tracker used in the neuronavigation and is about 5mm in the worst case scenario

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A7

Epidural Direct Current Stimulation (eDCS) on Spatial learning and working memory: preliminary data. CUSTODIO JCS[1], MARTINS CW[1], RODRIGUES LCM[1], ALVES NC[1], LUGON MMV[1], FREGNI F[2,3], NAKAMURA-PALACIOS EM[1]. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: Prefrontal cortex is implicated in a variety of cognitive and executive processes, including attention, set-shifting, decision-making, inhibitory response control, temporal integration of voluntary behavior, all functions depending on working memory processing. The modulation of the CPF excitability using low-intensity electrical stimulation has revealed promising data in order to treat various neuropsychiatry diseases and improve cognitive functions

Objective: The aim of this study was to develop a new method of brain stimulation by direct current stimulation offering a more focal stimulation and less loss of current using an epidural stimulation protocol.

Results: Male Wistar rats (n = 30, 250 - 300 g) received epidural direct current stimulation (eDCS) (100 or 400 μA) applied for 11 minutes before each training session in an 8-arm radial maze. After achieving the criterion of learning in the task, animals performed delayed-tasks of 5 s (short-term working memory) or 1 h (long-term working memory). Although the initial task acquisition have been somewhat compromised in animals that received active stimulation, a larger proportion of those who were stimulated with the highest intensity (400 μA) achieved the criteria of learning earlier. While in the *sham* group only 2 of 7 animals (28.57%) achieved the criterion of learning during 13 sessions, in the group submitted to the 400 μA stimulation it was 4 in 7 animals (57.14%), indicating a better performance of the animals receiving daily stimulation of 400 μA compared to *sham* animals. The data also suggest that the higher current stimulation used in the study (400 μA) showed a tendency to facilitate working memory after an interval of 1 h, suggesting eDCS may improve long-termed working memory.

Conclusion: These results, although preliminary, suggest that eDCS may be a promising technique to investigate the neuromodulatory effects of brain stimulation on the cognitive and behavioral response on experimental animals.

A8

Estudo preliminar sobre as bases Neurobiológicas do preconceiro. Julia Egito, Camila Campanhã, Lucas Marquez, Paulo Boggio. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

RESUMO

Introdução: Estudos recentes encontraram alterações perceptuais na identificação de ameaça de alvos negros e brancos. Os estereótipos nesse processo indicam a classificação desses alvos como pertencentes ou não a determinados grupos sociais.

Objetivo: O objetivo deste estudo foi verificar o efeito da Estimulação Transcraniana por Corrente Continua (ETCC) aplicada no lobo temporal (anódica à direita/catódica esquerda, catódica direita/anôdica esquerda e placebo) de voluntários caucasianos durante memorização de faces brancas ou negras associadas a palavras boas e ruins.

Resultados: ANOVA para medidas repetidas revelou efeito significativo apenas no total de acertos de faces para a interação raça*confiança, i.e. maior acerto para as condições brancos/ruim e negro/bom. Observou-se efeito significativo na interação raça*ETCC*confiança -respostas mais rápida com estimulação ativa; no entanto, na ETCC anódica à esquerda os participantes forma mais lentos para brancos/ruim.

Quanto as notas, efeito significativo da ETCC apenas para as faces – ETCC anódica à direita resultou em melhor avaliação para os negros e em notas semelhantes para as faces boas e ruins, pertubando assim o processo de registro de informação associativo. Sobre as figuras abstratas, verificou-se efeito significativo nas notas conforme a classificação inicial delas na fase de memorização, isso independente de suas cores. Assim, conclui-se que o viés racial influencia o registro e evocação literal das faces associadas à palavras positivas e negativas. Dessa forma, o efeito para os pares branco/ruim e negro/bom deve ter aumentado o direcionamento de atenção e conseqüentemente uma melhora da retenção.

A9

Transcranial Direct Current Stimulation (TDCS) effect in a rat model of chronic.

Laste, G[1,2]; Adachi, LNS[1,2]; Filho, PM[1,]; Nonose, Y[1]; dos Santos, VS[1]; Rozisky, JR[1,2]; Macedo, IC[1]; Caumo,W[2] ;Torres, ILS[1,2].

Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.

ABSTRACT

Introduction: transcranial direct current stimulation (tDCS) induces lasting alterations of cortical excitability in animals and humans, which are controlled by polarity, duration of stimulation, and current strength applied. Chronic inflammation has been showed altered afferent sensory input, leads to plastic changes in the central nervous system that ultimately sustain pain. Therefore approaches aiming at modulation of brain activity are attractive candidates to control chronic pain.

Objective: To evaluate analgesic effect of tDCS in a model of Freund´s adjuvant chronic inflammation.

Methods: Eighteen male Wistar rats were induced Adjuvant inflammation in by intraplantar injection in the right footpad of 100µl of complete Freund´s adjuvant (CFA). In the 15th day after CFA injection, rats were divided into two groups: tDCS stimulated (**T**; n=9) and sham (**S**; n=9). The tDCS was applied for eight days. Hot plate and Von Frey test were applied immediately after the last session of tDCS and 24 hours after one. The data were analyzed by Student's test t and expressed as mean±SEM.

Results: Twenty minutes of anodal tDCS at 500 µA resulted in an analgesic effect in von frey test 24 hours after last session (groups **T:** 3,67± 0,62; **S:** 2,87± 0.55 , paired t test, P<0.05). This effect were showed immediately (groups **T**: 3,66 ±0,17; **S**: 3,00±0,27; paired t test, P<0.05) and 24 hours (Groups **T**: 2,87± 0,55; **S**: 3,67±0,62; paired t test, P<0.05) after in the hot plate test.

Conclusions: Our results showed that modulation of tDCS is associated with a significant therapeutic effect in chronic inflammation pain.

A10

Impact of Transcranial Direct Current Stimulation in animal model of hyperalgesia induced by chronic stress.

ADACHI, L.N.S[1,2,3], NONOSE, Y.[1,3], MARQUES, P.R[1,3]., ROZISKY, J. R. [1,2,3], MEDEIROS, L[1,4] CAUMO W[1,2,,3,] TORRES, I. L. S. [1,2,3, 4,] *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Objectives: Chronic stress induces hyperalgesia/allodynia (CSHA) and it is relevant to numerous painful pathologies. Therefore, our objective was to evaluate the effect of a daily session of anodal transcranial electrical stimulation (tDCS) for 8 days in CSHA.

Methods: Male Wistar rats aged 60-days old were used and divided into four groups (n=12-13): control, stress, stress+tDCS and stress+SHAM. The restriction chronic stress model used was 1 hour/day in the morning/5 days per week/11 weeks. After 11 weeks of daily stress session we assessed the nociceptive response by the Hot-plate test and the mechanical allodynia using

electronic Von Frey test (basal measures), to confirm the CSHA , and the animals began the tDCS treatment for 8 days during 20 minutes (500 microA) in the afternoon. The tests were applied immediately after the last session of tDCS and 24 hours after one.

Results: at the end of the stress protocol, the animals showed hyperalgesia in both tests (Student's t-test, $P<0.05$). After 8 days of anodal tDCS, but not after sham tDCS exposure, the animals showed an increase in pain threshold only in Hot plate test, when they were analyzed immediately after the last session of tDCS (one way ANOVA; $P<0.05$). 24hs after the last session of tDCS, it was observed an increased pain threshold in both tests (one way ANOVA; $P<0.05$ for both).

Conclusion: our results showed that the anodal tDCS treatment, which acts by increasing the cortical excitability, was effective in decreasing the CSHA.
Financial Support: CAPES, GPPG/HCPA (Grant # 1003-81), PROPESQ-UFRGS, CNPq.

A11

Modulação do Efeito McGurk com o uso de Estimulação Transcraniana por Corrente Contínua. Lucas Murrins Marques e Paulo Sérgio Boggio. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

RESUMO

Introdução: O efeito McGurk é um dos paradigmas clássicos utilizados em estudos sobre integração multisensorial. Ele consiste na apresentação concomitante de estímulos auditivos (sons de sílabas como /ba/) e visuais (movimento de boca relativo a sílaba /ga/, por exemplo) incongruentes. Em função das sílabas apresentadas, o estímulo percebido pode ser uma combinação ou fusão como, por exemplo, /bga/ ou /da/. Nos últimos anos, a estimulação transcraniana por corrente contínua tem sido utilizada como uma ferramenta de neuromodulação segura, de fácil aplicação e baixo custo. Estudo recente demonstrou que esta técnica é capaz de interferir no processamento auditivo central, i.e. ETCC anódica aumentou a capacidade discriminação temporal de sons e ETCC catódica, diminui.

Objetivo: Em função disso, este estudo teve como objetivo investigar se a ETCC é capaz de intereferir em um processamento de informação que envolve a integração de duas modalidades sensoriais.

Métodos: Nesse sentido, 30 voluntários saudáveis com idade entre 18 e 35 anos receberam em dias alternados 3 tipos de ETCC: anódica em lobo temporal bilateralmente e catódica em músculo deltóide direito; catódica em lobo temporal bilateralmente e anódica em deltóide direito; e placebo. Durante a estimulação, os voluntários foram expostos a 56 combinações de sílabas congruentes e incongruentes (informação visual e auditiva) e foram solicitados a responder sobre qual sílaba era apresentada.

Results: Anova para medidas repetidas revelou efeito significativo para ETCC. Análise post hoc revelou que ETCC anódica melhorou o desempenho (77.7%) e ETCC catódica piorou (69.1%) quando comparadas ao desempenho da ETCC placebo (74.6%). Tais resultados encontram-se alinhados com estudos prévios sobre os efeitos da ETCC em funções visuais e auditivas.

Conclusion: No entanto, este estudo avança com relação aos estudos anteriores, pois pela primeira vez revela que a ETCC é capaz de interferir em processamento de informação relacionado a fase de integração multisensorial de estímulos de modalidades sensoriais diferentes.

A12

Dissociation of motor task-induced cortical excitability and pain perception changes in healthy volunteers, a case presentation
Magdalena S. Volz[1,2]; Mariana Mendonca[1]; Fernando S. Pinheiro[1]; Huashun Cui[1]; Felipe Fregni[1] . *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: There is evidence that interventions aiming at modulation of the motor cortex

activity lead to pain reduction. In order to understand further the role of the motor cortex on pain modulation, we aimed to compare the behavioral (pressure pain threshold) and neurophysiological effects (transcranial magnetic stimulation (TMS) induced cortical excitability) across three different motor tasks.

Methods: Fifteen healthy male subjects were enrolled in this randomized, controlled, blinded,
cross-over designed study. Three different tasks were tested including motor learning with and without visual feedback, and simple hand movements. Cortical excitability was assessed using single and paired-pulse TMS measures such as resting motor threshold (RMT), motorevoked potential (MEP), intracortical facilitation (ICF), short intracortical inhibition (SICI), and cortical silent period (CSP).

Results: All tasks showed significant reduction in pain perception represented by an increase
in pressure pain threshold compared to the control condition (untrained hand). ANOVA indicated a difference among the three tasks regarding motor cortex excitability change. There was a significant increase in motor cortex excitability (as indexed by MEP increase and CSPshortening) for the simple hand movements.

Conclusion: Although different motor tasks involving motor learning with and without visual feedback and simple hand movements appear to change pain perception similarly, it is likely that the neural mechanisms might not be the same as evidenced by differential effects in motor cortex excitability induced by these tasks. In addition, TMS-indexed motor
excitability measures are not likely good markers to index the effects of motor-based tasks on
pain perception in healthy subjects as other neural networks besides primary motor cortex might be involved with pain modulation during motor training.

A13

Brain Stimulation by Cognoteca. Paola Barros Delben[1]; Helena Dresh Vascouto[1]; André Thieme[2], Mariana Lopez[3]; Pedro Sbissa[3]; Emilio Takase[4] *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Objectives: To develop healthy brain and production of neuromodulators the Cognoteca aims to increase the cognitive aspects of infants, with problems related to learning and behavior, by environmental stimulation.

Methods: Activities that exercise memory, concentration, visual spatial ability and arithmetic are performed in space designed to identify deficits in children with disorders like ADHD and Autism, using toys and games that require reasoning. Biofeedback data using Thoughstream, Mind Games, SoftVfc and computerized cognitive assessment battery ProA, applied to children as young as 7 years old, combined with the concept of Edutainment, physiological make possible comparisons with the progress in the development of cognition and attest to the importance of this project.

Results: Implanted in the School of Application at the Federal University of Santa Catarina, cognoteca presents new ways of including children, considering the neurodiversity. The child gains confidence and increased self-esteem to deal with challenges in life, greatly improves their school performance, able to accompany others in their age group.

Conclusion: With the low cost of running the project is viable, promoting neuromudulação in a non-invasive.

A14

Transcranial Direct Current Stimulation during tactile perception task – Efects on sighted and blind subjects. Patricia Aparecida Dall'Agnol (1) Paulo Sérgio Boggio (2). *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: The integrity of the sensory system is important to the development of human skills. Nevertheless , after the loss of one or more systems, the nervous system ability of adapting itself to the new condition depends on impairment type, age of loss and other factors involved on the learning of new skills, as in neural plasticity for example.

Objectives: We aimed to investigate the effects of transcranial direct current stimulation (tDCS) over primary somatosensory cortex (S1) on tactile discrimination task (two points and textures discrimination tests). In addition, we aimed to compare the effects of tDCS on sighted and blind subjects.

Results: Our results showed that anodal tDCS induce beneficial effects on the performance of two-point discrimination and texture discrimination tasks. By the contrary, cathodal tDCS resulted on worse erformance on texture discrimination task in early blind and sighted subjects, but not late blind subjects. These results show the tDCS ability in euromodulating the excitability of somatosensorial cortex over the tactile discrimination.

Conclusion: Interestingly, anodal tDCS improved the performance of both sighted and blind subjects opening an avenue of new possible studies investigating the effects of tDCS as tool to enhance learning of new abilities (such as Braille reading) after sensory losses.

A15

Transcutaneous Eletric Nerve Stimulation as therapeutical intervention for psychiatric disorders: emphasis on cranial nerve stimulation. Shiozawa P; Senço NM; Enokibara MS; Cordeiro QJr; Bunoni A; Fregni F. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: The last few decades testified many advances in psychiatric non-pharmacological intervention strategies as neuromodulation techniques.

Method: Sistematic review on eletronic database Medline using specific Mesh terms: (a) “vagus nerve stimulation” and “mental disorders” or (b) transcutaneous eletric nerve stimulation” and “mental disorders”. There were included all English language articles that investigated VNS or TNS as therapeutical strategy in humans in the last decade. The authors complemented the review with further citations within each article included so to enlarge the discussion scenario.

Results: A total of 80 papers satisfied inclusion and exclusion criteria and were integrally reviewed. The authors describe revision on Vagus Nerve Stiulaton (VNS) and Trigeminal Nerve Stimulation (TNS) techniques and clincial pracitces. VNS was aproved in 1997 for treating refractory epilepsy and later on, in 2005, for the treatment of refractory depression.

Subsequent studies reproducted VNS eficacy in comparison to exclusive pharmocological intervention. VNS has been an interesting intervention technique for other psychiatric disorders as for anxiety disorder; bipolar disorder; and other disturbs. TNS has been recently analysed as a usefull therapeutical strategy in the management of depressive disorder. In recent study, an UCLA research group demonstrated depressive-sumptoms remission hates up to 70% among patients that underwent TNS intervention in a two-month follow up.

Conclusion: The development of research in neuromodulation techniques can impact outcome of different neuropsychiatric disorders. Many studies have been focusing in pain distubs, depressive disorder and psychotic disorders. Lower intervention costs, reduced side effect hates and optimal clinical outcomes have been reassuring VNS and TNS as a relevant issue in current neuroscience

A16

Efficacy os standardized neurofunctional acupuncture in the treatment os myofascial pain: a randomized, blind, parallel clinical trial. Cláudio Couto[3] , Alejandro Elorriaga Claraco ; Izabel Cristina Custodio de Souza [3], Iraci Lucena da Silva Torres [2 3]. Wolnei Caumo MD, PhD[123]. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2*

ABSTRACT

Introduction: Acuputure is used worldwide for the treatment of pain. However, there is no widespread, standardized and scientifically validated approach to the design and integration of acunputure treatments in clinical practice.

Objectives: Compare the efficacy of standardized neurofunctional acupuncture approach with lidocaine injections and both with TENS-placebo on pain relief, pressure pain detection threshold(PPDT), sleep quality, physical and mental health.

Methods: Seventy-eighth females, ages 20 to 40 with myofascial pain syndromes (MPS) were randomized into one of the three groups. The treatments were provided twice week for four weeks. The acupuncture protocol include: standardized diagnosis; insertion sites determined by anatomic segment affected; number of needles; number of treatment sessios acupuncturist qualification and acupuncture needle stimulation techinique.

Results: Using generalized estimating equation was observed that related to placebo-sham acupucture and lidocaine-treated had a reduction in pain standardized mean of 77,6% (CI 95%, 97,1 TO 58,8) and 58,8(CI 95% 76,5 TO 40,8), respectively .Acupuncture and lidocaine improves the PPDT in 68,0% (CI 95%, 42,8 TO 93,2) and 32,0% (CI 95,0%, 15,3 TO 48,7), RESPECTIVELY. Compared with placebo-sham acupuncture and lidocaine reduced analgesic use, both improve sleep quality and physical healthy and acupuncture also improve the mental healthy.

Conclusion: Acupuncture reduced the analgesic doses: improves sleep quality and physical and mental health compared to placebo-sham, In overall, both acupuncture and lidocaine are effective and better tha placebo-sham to improve pain and rehabilitation of patients with myofacial pain. However, the acupuncture is slightly more effective tha lidocaine.

A17

Investigating the mechanisms of non-invasive brain stimulation for the treatment of pain in spinal cord injury: preliminary study with healthy controls. Jay S. Reidler[a], Mariana De Mendonca[a], Marcus Santana[a], Xiaoen Wang [b], Robert Lenkinski[b], Serge Marchand[c], Lydia Latif[a], Joshua Dahlben[a], Felipe Fregni[a,d] . *Anais do IIISimpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique which involves the application of a weak current through the scalp to the underlying cortex. tDCS has been shown to reduce chronic pain when applied to the motor cortex and the aim of this study is to combine tDCS with an indirect modulatory technique called diffuse noxious inhibitory controls (DNIC). The pain threshold of 15 healthy subjects before and after the administration of active tDCS, sham tDCS, cold-water induced DNIC, and combined tDCS and DNIC, was measured using algometric pressure applied to the right thenar eminence. Brain metabolite concentrations from magnetic resonance spectroscopy (MRS) suggested underlying mechanisms. Increases in pain threshold following active tDCS was positively associated with baseline N-acetylaspartate and negatively correlated with baseline glutamine levels in the cingulate cortex and thalamus, respectively. Our results suggest that motor cortex modulation may have a greater analgesic effect when combined with bottom-up neuromodulatory techniques, presenting new avenues for treating pain.

Methods: The study consisted of 3 visits. Visit 1 involved magnetic resonance spectroscopy (MRS) to measure baseline brain metabolite concentrations. Visit 2, within 3 days of Visit 1, involved sensory and cognitive assessments prior and following active or sham tDCS. Visit 3, at least 7 days after Visit 2, involved the same procedure as Visit 2 but with active or sham tDCS conditions alternated.The main outcome, pain threshold, was assessed via algometric pressure applied to the right thenar eminence until the subject reported pain.
DNIC was induced using cold-water immersion of the contralateral hand.

Discussion: The results suggest that NIBS can increase the human pain perception threshold and that this effect can be enhanced when combined with bottom-up techniques to induce endogenous analgesic DNIC pathways.These results support the potential benefit of additional exploration of cortical stimulation for pain alleviation in SCI patients by demonstrating that tDCS and DNIC effects on pain threshold are independent to one another. Cortico-thalamic effects potentially could play a major role in the analgesic effects of motor cortex stimulation.The study illustrates that the baseline brain metaboli levels may accurately predictthe effects of neuromodulatory pathways.

Results: Significant increases in pain thresholds were observed following active tDCS and DNIC independently and in combined conditions, as compared to sham.No significant difference was observed in pain threshold following active tDCS alone compared to DNIC alone.Combined active and DNIC did lead to an observed pain threshold increase greater than either method alone. However, this threshold was only significant when compared to DNIC conditions.Exploratory analyses of the MRS data revealed that an increase in pain threshold following active tDCS was positively associated with total-NAA concentration in the anterior cingulate cortex ($r=0.58$, $p<0.05$), MI concentration in the anterior cingulate cortex and occipital cortex ($r=0.66$, $p<0.01$; $r=0.52$, $p<0.05$, respectively) and negatively correlated with Gln concentration and Gln/Cr in the thalamus ($r=-0.60$, $p<0.05$; $r=-0.61$, $p<0.05$, respectively). We found significant negative correlations between age and Glu concentrations in the thalamus ($r=-0.53$, $p<0.05$).

A18

Cognitive and Affective Modulation in PD Induced by Cortical DC Stimulation: preliminary analysis. P Wivatvongvana, MD[4,1]; HS Cui, MD,PhD[3,1]; J Perez, BA[2]; R El-Nazer, BS[1]; D Pimentel, MD[1]; K Weaver, BA[1]; D Macea, MS, PT[1]; A Connor, MS, RN[2]; C Burzynski, RN[2]; D Press, MD[2]; A Pascual-Leone, MD, PhD[2] and F Fregni, MD, PhD[1]. *Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.*

ABSTRACT

Introduction: Transcranial direct current stimulation (tDCS) is a powerful non-invasive, safe and inexpensive technique to modulate cortical excitability. Recent studies have shown that tDCS of the prefrontal cortex can transiently enhanced cognitive function and exerted an antidepressant effect in patients with Parkinson Disease (PD). However, it was not clear whether repeated sessions of tDCS might induce more sustained and clinically meaningful changes in cognitive and affective function without worsening motor function in PD patients.

Objectives: To determine whether adjunct treatment with tDCS to the dorsolateral prefrontal cortex (DLPFC) in PD can enhance cognitive and affective function as compared with sham tDCS.
2. To assess the effects of repeated sessions of tDCS to the DLPFC on motor function in subjects with PD who are receiving optimized dopaminergic treatment for motor symptoms.

Methods: Patients with PD were randomly assigned to one of the three groups: to

receive 10 consecutive active tDCS sessions over the Left DLPFC, to receive 10 consecutive active tDCS sessions over the Right DLPFC and to receive sham tDCS. All the patients had 13 visits total, including: 1 baseline visit, 10 consecutive stimulation sessions, and 2 follow-up visits at 4 and 8 weeks after the tDCS sessions. All of the subjects received the entire battery of assessments at baseline, at day 5 and 10 of the stimulation sessions, and at 4 and 8 weeks after the tDCS sessions.

Results: In this preliminary analysis with 8 patients, we found that patients who received 10 consecutive active tDCS sessions over the Left DLPFC showed significant improvement in one cognitive function test which is Victoria version of the Stroop Test, and two motor function tests which are Purdue Pegboard Test and Finger tapping as compared with patients who received 10 consecutive active tDCS sessions over the Right DLPFC and sham stimulation at week 4 after tDCS sessions. There were no adverse effects during and after stimulation sessions.

Conclusion: Our preliminary results suggest that 10 consecutive active tDCS sessions over the Left DLPFC enhance cognitive function with some improvement in motor function up to 4 weeks in PD patients. However, this is the preliminary analysis of only 8 patients; therefore, there is not enough power to detect other outcome improvement

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A19

Dissociation of motor task-induced cortical excitability and pain perception changes in healthy volunteers. Magdalena S. Volz[1, 2]; Mariana E Mendonca[1]; Fernando S. Pinheiro[1]; Huashun Cui[1]; Felipe Fregni[1.]
Anais do III Simpósio Internacional em Neuromodulação, 2011, v1, p1-2.

ABSTRACT

Objetive: This study intends to increase our understanding on the role of M1 modulation for the modulation of pain perception by testing the hypothesis that pain perception can be modified with different motor tasks and whether these tasks produce changes in the M1 excitability as assessed by transcranial magnetic stimulation (TMS) in healthy male individuals.

Methods: This study consisted of a blinded, randomized, controlled, cross-over trial to determine effects of different motor tasks on pressure pain threshold and M1 excitability in healthy male volunteers. Fifteen healthy right-handed male subjects were included.and they fulfilled the following criteria: (1) age between 18 - 45 years; (2) right-handed; (3) male; (5) no rheumatologic disease; (6) no clinically significant or unstable medical or psychiatric disorder; (7) no history of alcohol or substance abuse within the last 6 months; (8) no neuropsychiatric co-morbidity; (9) no contraindication to TMS; and (10) no use of central nervous system-effective medication. Subjects completed a total of three study visits. There was an interval of at least one day between each visit to avoid carryover effects. Every visit included one of the three different tasks (see below), which were performed with subjects' left hand, each for 20 minutes. The right hand served as a control as there were no tasks performed with this hand. Participants were randomly assigned to a given order of interventions.

Evaluation

Subjects were evaluated with:Pain threshold, TMS – MEP, ICI, ICF, CSP,VAS anxiety, go-no-go task, Purdue pegboard test.

Results: All tasks showed significant reduction in pain perception represented by an increase
in pressure pain threshold compared to the control condition (untrained hand). ANOVA indicated a difference among the three tasks regarding motor cortex excitability change. There was a significant increase in motor cortex excitability (as indexed by MEP increase and CSP shortening) for the simple hand movements.

Conclusions: Although different motor tasks involving motor learning with and without visual feedback and simple hand movements appear to change pain perception similarly, it is likely that the neural mechanisms might not be the same as

evidenced by differential effects in motor cortex excitability induced by these tasks. In addition, TMS-indexed motor excitability measures are not likely good markers to index the effects of motor-based tasks on pain perception in healthy subjects as other neural networks besides primary motor cortex might be involved with pain modulation during motor training.

A20

Experimental animal research in non-invasive brain stimulation for stroke and pain: A systematic review of translational findings, a case presentation

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ABSTRACT

IntroductionNon-invasive brain stimulation (NIBS) interventions are a set of techniques applied over usually cortical areas in order to induce neuroplasticity. The most used ones include transcranial direct current stimulation (tDCS), paired associative stimulation (PAS), transcranial magnetic stimulation (TMS), and transcranial electrical stimulation (TES).

TES is an established NIBS method in animals and based on application of a high frequency, intermittent, balanced current[1]. It is commonly used in animals as it can be applied focally and may mimic the effects of TMS. The other two other techniques are most commonly investigated and applied in humans: tDCS and TMS. The first method is based on the application of weak, electric direct current to the brain through relatively large electrodes. The latter one generates a magnetic field, which secondarily induces a transient electrical change predominantly in the brain cortex. Both techniques revealed growing relevance and significance in the last 25 years, since they have been found to be effective in various forms of pain, including neuropathic and chronic pain syndromes, fibromyalgia and pain after spinal cord injury[2-5]. Additionally, there is compelling evidence that both techniques facilitate recovery after central insult especially with respect to motor recovery in stroke .

However, the underlying principles and the effectiveness of NIBS on both stroke and pain remain to be determined. In addition, NIBS research in human subjects is often difficult for several issues, such as lack of funding, ethical concerns and methodological difficulties[6]. In clinical research is often not possible to perform invasive experiments and to collect safety data. For these reasons, research with experimental animals poses an interesting alternative to the field, as research in animals allows more detailed appraisal such as histological analyses, effects of combination with other drugs and safety limits. Only by gaining systematic knowledge from experimental research in animals and passing it to clinical trials would provide a high standard of introducing an intervention into clinical practice ("from bench to bedside").

Methods:

Eligibility criteria

We included studies with the following inclusion criteria: (1) Articles published from the first data available to April 2011; (2) Studies measuring at least one outcome related to stroke or pain; (3) Studies delivering transcranial brain stimulation; (4) Experimental studies in animals; (5) Studies published in English, German and Portuguese. We excluded studies if they were: (1) Experiments applying brain stimulation invasively (i.e., intracerebral/ epidural stimulation, invasive electrostimulation; deep brain stimulation); (2) Experiments using other techniques other than tDCS, TMS, PAS or TES(e.g.,electroacupuncture, vagus/ trigeminus nerve stimulation, peripheral nerve stimulation); (3) Studies in humans (4) Studies "in vitro" and (5) Articles that were reviews, editorials or reporting duplicate data or data extracted from original articles.

Sample

All statistical analyses are shown in table 2. Interestingly, all experiments used only male rats. The total number of rats in all studies is 1503. The mean sample size of the experiments was 100.2 (SD = 85.6; range 24

- 334). Eleven studies investigated Sprague-Dawley rats (total of 1187 rats), three studies Wistar rats (total of 224 rats) and one study used Simonsen Albino (S/A) rats (total of 92 rats). Their mean weight was 253.14 g (SD = 82.99; range 140 - 553). All studies targeting examination in pain had wild type rats only. Furthermore, the experiments done in stroke applied different stroke models in their animals, only one study had a healthy control group.

Qualitative analysis

We assessed quality of reporting referencing aspects of the criteria from ARRIVE guidelines for reporting of animals. In order to analyze these data, the following aspects were extracted from each study: methods (randomization, blinding, control (no stimulation vs. sham stimulation), experimental procedures (techniques of brain stimulation, details of experiment, and measurements/ assessment of pain or stroke); experimental animals (species, sample, gender, weight); housing & husbandry (light/dark cycle, number of cage companions, access to food and water); and analysis (outcomes, attrition/safety, histological analyses).

Literature search

The authors searched through Medline database using the following keywords: “brain stimulation” OR “non-invasive brain stimulation” OR “transcranial direct current stimulation” OR “transcranial magnetic stimulation” OR “transcranial electrostimulation” AND “animal(s)” OR “rat(s)” OR “rodent(s)” OR “mouse” OR “mice” AND “stroke” OR “pain”. Additionally, the reference lists from articles were screened and researchers in the field were consulted.

Data extraction

Each article was screened for the following data:

(1) Experimental results of transcranial brain stimulation including effects on stroke and pain perception as well as safety, lesions and histological analyses;

(2) Technique of brain stimulation including details of the method and application, such as location and duration of stimulation, electrode size, intensity and frequency;

(3) Sample characteristics, such as sample size (with active, sham or without stimulation), gender, weight and animal specimen.

Results: The search strategy resulted in 1824 potential articles initially. Most of the articles were not included in this review according to the eligibility criteria, mainly because of (i) invasive brain stimulation delivery; (ii) studies investigating other conditions than stroke or pain; (iii) articles not describing original data . After reviewing 18 articles in full text, we found 15 articles to be eligible for our overall criteria. Three of the 18 reports had to be excluded as they did not use any measurement of pain and had their focus on anaesthesia, opiate abstinence syndrome and levels of opioids and neurotransmitters in the rat’s brain. Finally, we could identify ten articles using non-invasive brain stimulation on pain perception in rats and five articles related to stroke and its outcomes.