



## II Symposium on Innovation and Translational Neuroscience & XV International Symposium on Neuromodulation

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### NEUROMODULATION IN COGNITIVE DEVELOPMENT FOR A PATIENT WITH WEST SYNDROME: A CASE STUDY

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**Objectives:** Analyze the role of physiotherapy in cognitive development in patients with West Syndrome.

**Methods:** The present work is a case study where the Snap IV scale was used in the initial assessment and reassessment in the tenth appointment. The patient underwent 10 treatments using transcranial stimulation as a form of treatment, combined with cognitive activities aimed at learning. The parameters used were: Direct current in the frontal region of the left hemisphere (F3), 1 milliampere, rise time: 20 seconds; Descent time: 20 seconds, with a total time of 30 minutes.

**Results:** The patient was able to carry out activities that required challenges to respond more quickly and cohesively, a result observed through the evolution graph, in actions 4 (scored 1 to 2), 6 (scored 2 to 1), 10 (scored 2 to 1), and 17 (scored from 2 to 1), with 1 being "not at all" and 2 "just a little," according to actions on the Snap IV scale.

**Discussion:** It is concluded that the use of transcranial stimulation in a patient with West Syndrome achieved relevant results. Through cortical excitability, it was possible to observe changes in cognitive development. It is still necessary for more studies to be carried out with patients with West Syndrome and the use of transcranial stimulation.

### FAHR'S DISEASE AND THE THERAPEUTIC POSSIBILITIES THROUGH TRANSCRANIAL MAGNETIC STIMULATION: A BRIEF BIBLIOGRAPHICAL DESCRIPTION

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**Objectives:** To describe the motor symptoms of Fahr's Disease and the possibilities of treatment with transcranial magnetic stimulation. Evidencing the clinical responses of non-invasive neuromodulation of the TMS type in motor rehabilitation.

**Methods:** This is a narrative bibliographic review, carried out between January 2022 and May 2023 in Pubmed, Google Scholar, Lillacs, and the Virtual Health Library (BVS), with the descriptors considered in Portuguese and English, seeking to relate motor disorders with the treatment of TMS and motor changes in Fahr's disease.

**Results:** Twenty-nine correlated articles were initially found; however, only 12 articles met the eligibility criteria to constitute the present bibliographic review.

**Discussion:** The results of the research show motor damage in Fahr's Disease, and some studies suggest TMS as a potential treatment for movement disorders, thus being able to be an ally in the supportive treatment (physiotherapy) of the neuromuscular dysfunctions caused by this disease, may reduce the progression of limitations resulting from the pathology. Therefore, it is believed that neuromodulation may prove to be a viable alternative for such patients, suggesting specific studies for this group of patients with Fahr.

### FNIRS-BASED BRAIN FUNCTIONAL RESPONSE TO ROBOT-ASSISTED MULTI-JOINT POINTING MOVEMENTS OF THE LOWER LIMB: A PILOT STUDY

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**Objectives:** Investigate the effects of a robotic system for lower limb rehabilitation currently under development by Vivax Ltda (São Paulo, Brazil), the lower limb Vivax robot.

**Methods:** This study involved two conditions, varying the degree of robot assistance during a motor task. The robot provided no assistance in one condition, while it fully controlled the subject's lower limb movements in the other. Each experiment followed a block design, consisting of 30-second motor task intervals (playing a game) alternated with resting periods, signaled on a computer screen. This cycle was repeated six times, totaling 6 minutes. The robot synchronized fNIRS data recording with game stimuli using TTL pulses at the start of each phase (play/game and rest). Participants were seated comfortably 150 cm from a computer monitor, with their right foot secured to the robot using Velcro straps. The game involved lower limb pointing movements to prevent animated insects from reaching a towel and stealing food, requiring multi-joint coordination.

**Results:** All participants completed both experiments, with an average of 76.67 trials in the no-assistance condition and 70 trials with full robot assistance. Brain activation (HbO) was significant without assistance but only in two participants with assistance. Only the left premotor cortex exhibited significant HbO activation without assistance, with greater activation compared to assistance. Other areas and HbR-based analyses showed no significant differences.

**Discussion:** Our findings suggest that fNIRS could be valuable for monitoring HbO concentration changes associated with varying levels of robot assistance during lower limb exercises. Despite a small sample size, significant contralateral premotor activation was observed in the no-assistance condition during task intervals, with greater activation compared to robot-assisted conditions.

## APPLICATION OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (rEMT) TO TREAT ESSENTIAL TREMOR: CASE REPORT

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**Objectives:** This study focuses on reporting the effects of repetitive transcranial magnetic stimulation (rEMT) in patients with essential tremors, considering that it is a therapeutic intervention little used in this pathology.

**Methods:** A 67-year-old female patient from a city in the coastal region of Rio Grande do Sul was diagnosed with essential tremor. She was referred to a neuromodulation clinic in the Vale dos Sinos region, in the same state, to treat the tremor in her right hand, which was impairing her daily activities. The goal of this treatment was the patient's rehabilitation, significantly decreasing the tremor in her right hand, based on the literature of a clinical trial with similar objectives. We applied 10 sessions on consecutive weekdays of rEMT, for 15 minutes, with Neurosoft equipment, NEURO-MS/D, double cone coil, with inhibitory stimulus of 1Hz, O2 region, ipsilateral to the lesion, 900 pulses, 90% of the Motor Threshold.

**Results:** Since the first session, the patient already reported a small decrease in tremors, but from the seventh session on, there was

a more effective reduction of tremors. According to the patient's reports, the tremor improvement was 90%.

**Discussion:** It is known that the magnetic stimulus performed in the cerebellum inhibits the excitability of the primary motor cortex, contralateral to the cerebellar stimulus, through the cerebellum-thalamo-cortical connections (CTC). Thus, rEMT was a safe non-pharmacological treatment option for this patient, who was no longer improving with conventional pharmacological treatment. Single and multiple sessions of this cerebellar stimulation showed significant effects on the physiological and clinical improvement of essential tremors.

## THETA OSCILLATIONS IN EEG PATTERNS OF CHRONIC PAIN PATIENTS: A SYSTEMATIC REVIEW

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**Objectives:** Chronic pain is defined as pain persisting or recurring for over three months. The resting state electroencephalography is a largely available resource that can determine abnormalities in brain function in patients with chronic pain. These abnormalities, like the theta oscillations, can help understand the physiopathology of chronic pain and even become a biomarker for these conditions. The goal of this review is to evaluate a correlation between theta waves and chronic pain.

**Methods:** We conducted a systematic review of the last ten years using Cochrane, EMBASE, and PubMed databases. We included adults with non-oncological chronic pain, excluding populations with severe psychiatric disorders and neurological comorbidities.

**Results:** The search resulted in 880 unique records screened by at least two independent team members. Twenty-seven full-text articles were assessed for eligibility, and seventeen studies were included. Three out of four fibromyalgia articles showed higher theta activity in centro-parietal intra-hemispheric, prefrontal, and anterior cingulate cortices, while one showed decreased connectivity in the middle/inferior temporal gyrus and visual cortex. In nine mixed pain articles, seven showed an increase in theta bands in central and frontal areas, one showed no difference, and one study on knee osteoarthritis showed lower theta activity related to higher pain intensity. Three studies showed increased theta activity for neuropathic pain, and one paper showed no difference.

**Discussion:** This review showed there is no consensus in the literature about the relationship between theta activity and chronic pain, which reinforces the need for additional studies in this field.

## AURICULAR VAGAL NEUROMODULATION AND ITS APPLICATION IN PATIENTS WITH HEART FAILURE AND REDUCED EJECTION FRACTION

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**Objectives:** The autonomic nervous system (ANS) imbalance in heart failure (HF) creates a vicious cycle, excess sympathetic activity and decreased vagal activity contributing to the worsening of HF. Low-intensity transcutaneous electrical stimulation of the auricular branch of the vagus nerve (taVNS) is well tolerated and opens new therapeutic possibilities. The aim of this study is to hypothesize the applicability and benefit of taVNS in HF through intergroup comparison of echocardiographic parameters, 6-minute walk test, Holter heart rate variability (SDNN and rMSSD), Minnesota quality of life questionnaire, and functional class by the New York Heart Association. In comparisons,  $p$  values  $<0.05$  were considered significant.

**Methods:** Prospective, double-blind, randomized clinical study with sham methodology, unicentric. Forty-three patients were evaluated and divided into 2 groups: Group 1 received taVNS (frequencies 2/15 Hz), and Group 2 received sham. In comparisons,  $p$  values  $<0.05$  were considered significant.

**Results:** In the post-intervention phase, it was observed that Group 1 had better rMSSD ( $31 \times 21$ ;  $p = 0.046$ ) and achieved better SDNN ( $110$  vs.  $84$ ,  $p = 0.033$ ). When comparing intragroup parameters before and after the intervention, it was observed that all of them improved significantly in group 1, and there were no differences in group 2.

**Discussion:** taVNS is a safe to perform and easy intervention and suggests a probable benefit in HF by improving heart rate variability, which indicates better autonomic balance. New studies with more patients are needed to answer the questions raised by this study.

## THE THERAPEUTIC POTENTIAL OF AURICULAR VAGUS NERVE STIMULATION IN PREVENTION OF THE OXALIPLATIN-INDUCED NEUROPATHIC PAIN: NEUROPHYSIOLOGICAL AND MOLECULAR INSIGHTS

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**Objectives:** To evaluate the effectiveness and underlying mechanisms of preemptive percutaneous auricular vagus nerve stimulation (paVNS) in modulating oxaliplatin-induced neuropathic pain.

**Methods:** Male Wistar rats (CEUA HSL 2021-03) underwent oxaliplatin (Oxa) treatment for two weeks, three times a week, with a cumulative dose of 36 mg/kg, followed by assessments of thermal and mechanical nociceptive thresholds. The groups comprised control, Oxa, sham+Oxa, and paVNS+Oxa. The paVNS group received auricular concha stimulation before each Oxa cycle, while the sham group received needling without stimulation. The spinal cord analysis focused on neuronal, microglial, and astrocytic activity, along with levels of enkephalin, substance P, glutamate, aspartate, GABA, glycine, and GluR1. The sciatic nerve analysis focused on myelin basic protein (MBP) and neural growth factor (NGF).

**Results:** Oxa treatments induced thermal and mechanical hyperalgesia, which were prevented by paVNS (thermal:  $p < 0.0057$ ; mechanical:  $p < 0.0021$ ). paVNS also prevented neuronal ( $p < 0.0001$ ), microglial ( $p = 0.0003$ ), and astrocytic ( $p < 0.0001$ ) hy-

peractivity in the SDH. The paVNS group exclusively exhibited increased spinal enkephalin ( $p < 0.003$ ), GABA ( $p = 0.043$ ), and glycine ( $p = 0.0005$ ) alongside reduced substance P ( $p < 0.003$ ). Additionally, paVNS reduced NGF expression in the nerve ( $p < 0.005$ ), with no changes in spinal glutamate, aspartate, GluR1, or nerve NGF.

**Discussion:** Preemptive paVNS effectively countered Oxa-induced neuropathic pain, partially through inhibitory mediators, preventing pain at the spinal level and regulating nerve degeneration. Our findings provide a multifaceted perspective on paVNS's potential value against neuropathic pain in cancer patients.

## THE CEREBELLUM AND ITS CONNECTIONS WITH OTHER BRAIN STRUCTURES INVOLVED IN MOTOR AND NONMOTOR FUNCTIONS

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**Objectives:** The aim of this review is to identify the neuroanatomical and functional aspects regarding activation areas in the cerebellum and their connection with other structures of the central nervous system in different functions.

**Methods:** A comprehensive literature search was conducted using different search terms in different databases to identify studies that addressed the neuroanatomy and physiology of the cerebellum and its relationship with other brain structures in sensory, motor, cognitive, emotional, and autonomic functions.

**Results:** Studies show that there is a cerebellar activity in different functions and connections with multiple brain regions that directly influence behavior. The same region of the cerebellum shows activation in different functions and, at the same time, connection with different brain structures involved in certain functions.

**Discussion:** We conclude that the cerebellum is involved in several functions, directly influencing behavior. There may be regional activity patterns in the cerebellum, which may reflect the relationship between cerebellar activation region and different functions. Details related to this hypothesis may be objects of research in future studies.

## THE FEASIBILITY OF ROBOTIC THERAPY WITH EMPHASIS ON THE ANKLE FOR INDIVIDUALS WITH PARKINSON'S DISEASE

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**Objectives:** Verify the feasibility of using robotic therapy with the Anklebot® exoskeleton in individuals with Parkinson's Disease

**Methods:** The assessments were carried out as follows: on the first day, screening was carried out to apply the eligibility criteria to the participants and the assessment of functionality through the Test timed up-and-go (TUG) tests and their variations, Walking Test 10 meters and the Obstacle Test. After the initial assessment, 8 patients diagnosed with Parkinson's Disease were familiarized with the Anklebot equipment and the computer games used in the protocol. One week after screening, the intervention was carried out, which consisted of approximately 40-minute sessions of robotic therapy with an Anklebot exoskeleton. At the end of therapy, functional tests were reapplied. For statistical analysis, Paired Student's T Test was applied to compare pre and post

Robotic Therapy assessments. The Pearson test was used to calculate correlations. A significance level of 0.05 was considered, with a confidence interval (CI) of 95% for all tests.

**Results:** There was a satisfactory performance by the volunteers during the game, with the success rate being greater than 70 percent. Furthermore, patients showed levels of interest and value related to robotic therapy. The interest/pleasure ( $p=0.025$ ;  $R=0.82$ ) and value/utility ( $p=0.012$ ,  $R=0.87$ ) domains of the Intrinsic Motivation Scale showed strong correlations with the game 2 score. Our results demonstrate that the patients were more agile during walking, according to the obstacle tests ( $p=0.03$ ;  $F=0.2$ ) and the 10-meter walk test ( $p=0.02$ ;  $F=0.7$ ). Regarding the TUG variations, there was no significant difference for the simple test and the cognition task. However, the TUG associated with the motor task proved to be more sensitive than the others ( $p=0.05$ ;  $F=0.06$ ).

**Discussion:** Robotic ankle therapy associated with video games proved to be viable in the rehabilitation of individuals with Parkinson's disease. It was possible to observe an improvement in gait performance, considering speed and balance strategies when overcoming an obstacle. Furthermore, the game proved to be suitable for the cognitive levels, depression, and interest of individuals when considering the percentages of correct answers during the game. Furthermore, the game was able to promote motivation.

## NEUROPHYSIOLOGICAL AND BIOMECHANICAL ADAPTATIONS IN ELDERLY AFTER TRANSCRANIAL DIRECT CURRENT STIMULATION DURING WALKING

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**Objectives:** To examine neurophysiological changes, strength, and balance in the elderly following a 2-week intervention comprising five sessions of walking combined with transcranial direct current stimulation (tDCS). Additionally, to assess correlations between parameters of orthostatic postural balance, strength, and neural excitability.

**Methods:** The intervention involved five 20-min sessions of walking with 8% ( $\approx 4^\circ$ ) of downslope receiving anodal tDCS simultaneously over two weeks. Electromyographic (EMG) and biomechanical variables were assessed before (PRE) and after the five sessions (POST-2). The following variables were analyzed: 1) Orthostatic posture control using Root Mean Squared (RMS) and mean velocity (MV) of the center-of-pressure (COP) displacement; 2) Excitability of spinal cord and descending pathways through the H-reflex and V-wave, respectively. 3) Rate of EMG rise (RER) of the soleus muscle; 4) Rate of force development (RFD) during plantar flexion.

**Results:** The COP-MV exhibited significant correlations with RER (Pearson's  $R=0.81$ ) and RFD ( $R=0.78$ ), highlighting the association between muscle strength and activation with rapid postural adjustments. The intervention was efficient in reducing the RMS of postural oscillations in the anteroposterior direction ( $p<0.05$ ; Cohen's  $d=0.41$ ), which is an important predictor of falls among the elderly.

**Discussion:** The findings suggest that five sessions of downhill walking coupled with anodal tDCS can enhance balance in the elderly population. The control of balance is linked to rapid neuromuscular activation and strength development. Therefore, this intervention holds promise for improving balance and potentially

reducing falls in elderly individuals.

## RELATIONSHIP BETWEEN TRAINING INTENSITY AND MATRIX METALLOPROTEINASE-2 AND -9 ACTIVITY IN CHRONIC POST-STROKE INDIVIDUALS: EXPLORATORY STUDY

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**Objectives:** Aerobic exercise (AS) as a strategy for preventing cardiovascular complications has been recommended for people post-stroke. In chronic post-stroke stages, there is an increase in the activity of matrix metalloproteinase-2 and -9 (MMP), suggesting systemic inflammatory processes. MMPs have been associated with neoangiogenesis processes resulting from exercise. EA has been suggested as a "prime" to facilitate the effects of other therapies, such as Induced Restraint Therapy (TCI). The objective of this study was to correlate changes in MMP-2 and -9 activity with the percentage of heart rate reserve (HRR) in chronic post-stroke individuals who performed TCI to recover coordination of the paretic upper limb.

**Methods:** Sub-analysis of a controlled clinical trial. Nine chronic post-stroke subjects underwent EA immediately before TCI. At the same time, seven people received stretching prior to TCI for two weeks. The EA ranged in intensities between moderate (60% FCR) and high intensity (75-90% FCR) on a bicycle. Motor coordination was measured by the "Box and Block test." Serum MMP-2 and -9 activities were analyzed before and three days after training by zymography.

**Results:** There were no differences in the recovery of paretic limbs between the control and EA+TCI groups. Correlations between the change in MMP-9 activity with the average percentage of training HRR during moderate intensity ( $r_s=0.586$ ;  $p=0.017$ ) and vigorous intensity ( $r_s=0.641$ ;  $p=0.007$ ) were observed. There were no correlations for MMP-2.

**Discussion:** The higher the percentage of HRR during training, the greater the difference in MMP-9 activity.

## VARIABILITY OF HEART RATE DURING TRANSCRANIAL STIMULATION BY DIRECT CURRENT AND VIRTUAL REALITY IN FIBROMYALGIA

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**Objectives:** To evaluate the HRV of individuals with FM in VR activity associated with anodic tDCS.

**Methods:** 20 women with FM, for HRV analysis, used the Polar

V800 during tDCS applied for 20 minutes at 2 mA intensity on the primary motor area (active and sham group) and in VR. The variables were evaluated before tDCS (Rest), during (VR), and after (Recovery).

**Results:** Sham group (11 participants aged  $41.3 \pm 7.0$  years) and active group (9 participants aged  $41.4 \pm 6.7$  years). For the Mean RR index, both groups showed a decrease in the MeanRR from Rest to RV ( $p=0.013$ ) and an increase from RV to Recovery ( $p=0.036$ ). For non-linear indices, both groups showed a decrease in PNS from Rest to Recovery ( $p=0.012$ ) and an increase in RV to Recovery ( $p=0.017$ ). At  $\alpha 2$ , the active group had an increase in Rest for RV ( $p=0.0007$ ) and Rest for Recovery ( $p=0.012$ ), and the Sham group had a reduction in RV for Recovery ( $p=0.027$ ).

**Discussion:** tDCS does not seem to alter HRV, but VR promoted a decrease in MeanRR, which predicts ANS modulation in women with FM.

## THE THERAPEUTIC POTENTIAL OF AURICULAR VAGUS NERVE STIMULATION IN PREVENTION OF THE OXALIPLATIN-INDUCED NEUROPATHIC PAIN: NEUROPHYSIOLOGICAL AND MOLECULAR INSIGHTS

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**Objectives:** To compare the frontal cortex activity of children with cerebral palsy (CP) and typical development (TD) during orthostatism under various visual conditions.

**Methods:** This cross-sectional observational study was approved by the local ethics committee. The study included 4 children with TD ( $11.25 \pm 3.30$  years; 2 girls) and 4 with CP ( $10.7 \pm 2.8$  years; 4 girls) classified as levels I ( $n=1$ ), II ( $n=2$ ) and III ( $n=1$ ) in the gross motor function classification system, who remained in a standing position under eyes open and eyes closed conditions, while frontal cortex activity was recorded by near-infrared functional spectroscopy (fNIRS) (Artinis). Changes in hemoglobin were obtained from regression coefficients and t-statistics using the BrainAnalyzir toolbox.

**Results:** There was a greater change in oxygenated hemoglobin in the CP group under the eyes open condition ( $p=0.04$ ) and a tendency to greater changes under the eyes closed condition ( $p=0.06$ ) when compared to the TD group (see figures 1 and 2); in both conditions, findings indicate a decrease in concentration in CP.

**Discussion:** Children with CP have altered brain activity during orthostatism across different visual conditions, with a possible decrease in activation. Further investigations of behavioral correlates in a larger sample will provide a greater understanding of the strategies utilized. Rehabilitation interventions should stimulate the refinement of postural control and minimize the demand for neural resources.

## BIBLIOMETRIC MAPPING OF NON-INVASIVE BRAIN STIMULATION TECHNIQUES (NIBS) FOR FLUENT SPEECH PRODUCTION

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**Objectives:** The objective of this study is to conduct a bibliometric coupling analysis of research on the use of non-invasive brain stimulation (NIBS) for the motor aspects of speech. The analysis aims to identify trends, patterns of collaboration, and shifts in research focus over the past three decades.

**Methods:** Data were collected from Elsevier's Scopus database for a global literature analysis on NIBS and speech fluency. Search parameters were used to extract relevant articles based on titles and abstracts. The collected data were analyzed using VOSviewer software for visual representations of bibliometric maps, keyword co-occurrence, and citation patterns. A total of 363 documents were initially acquired, with selection criteria applied to narrow down the analysis to a final subset of 253 documents. The data were divided into two time segments, spanning from 1994 to 2011 and from 2012 to 2023.

**Results:** The analysis revealed distinct shifts in research focus over the decades. From 1994 to 2011, the primary focus was on the use of transcranial magnetic stimulation (TMS) to explore neural mechanisms underlying speech production and perception. In contrast, from 2012 to 2023, there was an increased emphasis on the application of NIBS techniques for the treatment of speech and language disorders, such as post-stroke rehabilitation, stuttering, aphasia, and neurodegenerative diseases. Geographical analysis showed a decentralization of the research field, with the United States, Germany, the United Kingdom, and Australia consistently contributing the most articles. Keyword co-occurrence and citation patterns demonstrated the diffusion of NIBS in various speech research subfields.

**Discussion:** In conclusion, this bibliometric analysis provides valuable insights into the evolution of research on NIBS for the motor aspects of speech. The study highlights the transition from exploratory physiological descriptions to therapeutic applications in the field. The emergence of techniques like transcranial alternating current stimulation (tACS) and transcranial random noise stimulation (tRNS) offers new opportunities for investigating speech motor control. Researchers should consider these emerging methods in their investigations, and the findings of this analysis can guide future research directions and contribute to a deeper understanding of the neurobiology of speech production.

## ANALYSIS OF BRAIN ACTIVATION DURING OBSERVATION OF MOTOR ACTIVITY, VOLUNTARY MOVEMENT OR MENTAL PRACTICE IN INDIVIDUALS WITH PARKINSON'S DISEASE: CROSS-SECTIONAL STUDY

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**Objectives:** To evaluate the neurophysiological correlations of brain activation during motor activity, motor observation, and imagery in the upper limbs using qEEG and fNIRS in individuals with Parkinson's Disease.

**Methods:** Cross-sectional study with 40 patients aged between

40-80 years (average 62) Sex: M 33% and H 67% Median: H&Y 2. With motor deficit related to hand function Activity: Assessed by EEGq / fNIRS. - EEGq: 60 repetitions, 20 attempts for each 8s long. fNIRS: 1 attempt and 30 minutes of motor tasks in random order. The assessment consists of (opening and closing the hand): Observation of action, motor imagery, and motor execution.

**Results:** Analysis of alpha power (8-13) Hz in the contralateral motor cortex Analysis of variations in oxy Hb and deoxy Hb concentrations ANOVA revealed a significant main effect between experimental conditions ( $F(2, 5.66)$ ,  $p=0.009$ ).

**Discussion:** We await the completion of the collection. It is possible that damage to the nigrostriatal pathways affects brain connectivity for actions without voluntary movement such as image and observation, impairing the motor planning of the action.

## CASE REPORT: REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION IN THE TREATMENT OF GENERALIZED ANXIETY DISORDER

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**Objectives:** Generalized Anxiety Disorder (GAD) is a prevalent condition characterized by intense anxiety, incessant worries, and debilitating physical symptoms. Resistance to conventional treatment and dysfunctions observed in the dorsolateral prefrontal cortex (DLPFC) add complexity to the management of GAD. We present a case report aiming to explore the effectiveness of Repetitive Transcranial Magnetic Stimulation (rTMS) as a first-choice treatment for GAD.

**Methods:** A female patient, 31 years old, presented concerns such as fear of dying and financial concerns associated with physical symptoms such as chest pain, palpitations, and gastrointestinal episodes for 3 months. Panic attacks were weekly and short-lived, disrupting daily activities and socialization. Given the resistance to pharmacotherapy, we opted for inhibitory rTMS treatment at F4 (1Hz), comprising 20 sessions of 20 minutes each.

**Results:** There was a marked improvement in panic attacks, only one attack during treatment, and a considerable decrease in the fear of death.

**Discussion:** Based on this report, the rTMS approach through the F4 inhibitory protocol showed potential as an effective treatment for GAD as the first treatment option in a young patient resistant to the use of psychiatric medications. rTMS is a non-invasive therapy, well tolerated and without side effects commonly observed in drug treatment.