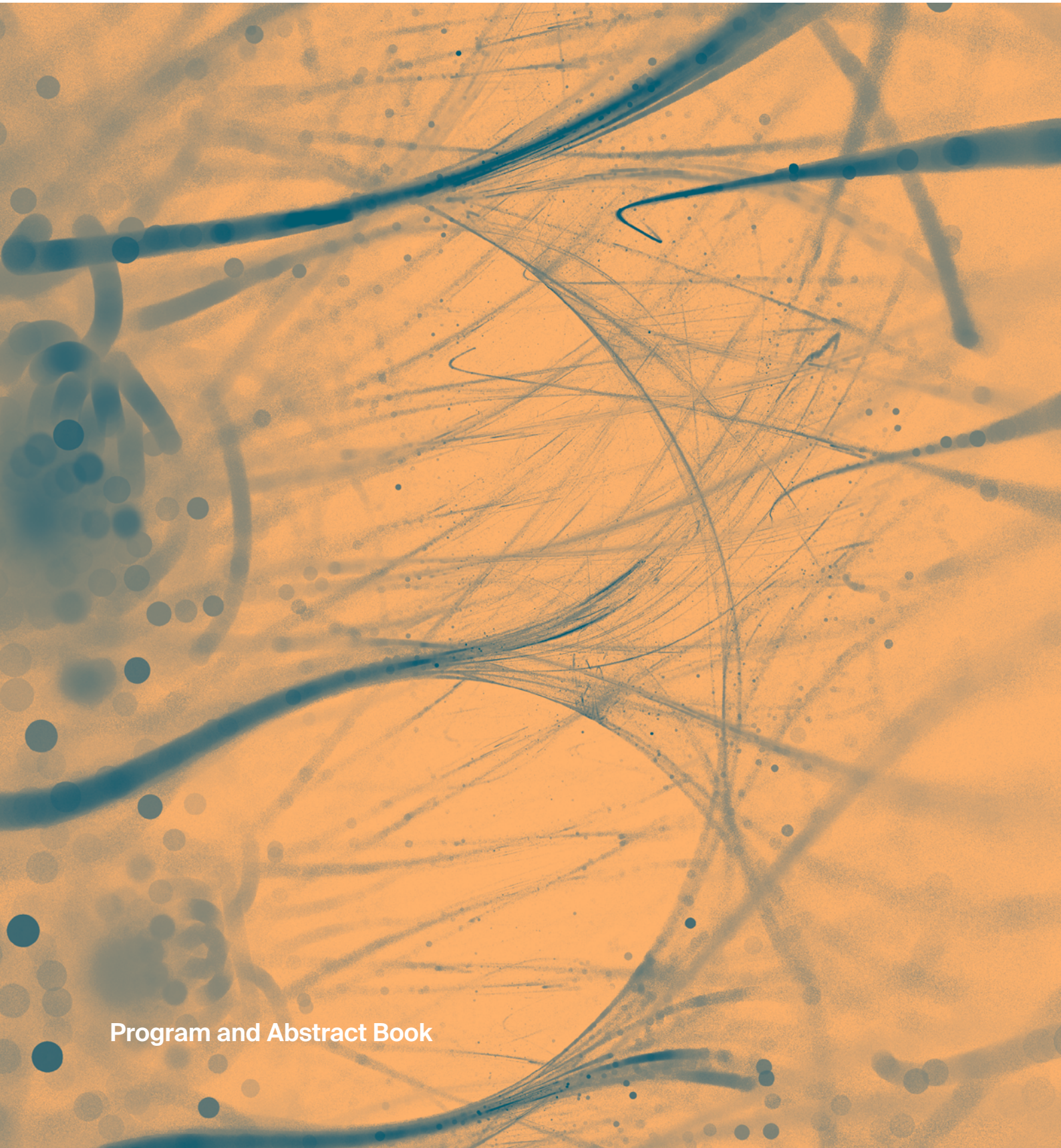
IECBS 2024 Conference

The 4th International Electronic Conference on Brain Sciences

23–25 October 2024 | Online



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The 4th International Electronic Conference on Brain Sciences

23–25 October 2024 | Online

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Welcome from the Chair

Dear colleagues,

It is our pleasure to invite you to join the 4th International Electronic Conference on Brain Sciences (IECBS 2024) after the strong success of the previous annual online conference. IECBS 2024 will be held online from 23 to 25 October 2024.

The field of neuroscience is one of the most important frontiers in biomedical studies, as many of the details that control brain function are still not well understood. This makes the study of the nervous system very exciting and fast moving. This conference will address a variety of research topics which reflect some of the current areas of focus. Topics of the conference will be organized around the following sessions:

- S1. Behavioral Neuroscience
- S2. Systems Neuroscience
- S3. Neurotechnology and Neuroimaging
- S4. Neuropsychology
- S5. Neurodegenerative Diseases
- S6. Cognitive Neuroscience
- S7. Clinical Neuroscience
- S8. Molecular and Cellular Neuroscience
- S9. Neurorehabilitation

The scope of this online conference is to bring together well-known worldwide experts who are currently working on brain sciences and to provide an online forum for presenting and discussing new results.

All accepted abstracts will be published on the conference website. You are required to submit an abstract (200 – 250 words). Please see the abstract guidelines in "Instructions for Authors".

On behalf of the Organizing Committee, we cordially invite you to join us at the 4th International Electronic Conference on Brain Sciences (IECBS 2024).

We look forward to your contributions.

Prof. Dr. Stephen D. Meriney
Conference Chair
Department of Neuroscience,
University of Pittsburgh, USA

brain sciences

an Open Access Journal by MDPI

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- **Rapid Publication**: manuscripts are peer-reviewed and a first decision is provided to authors approximately 12.9 days after submission; acceptance to publication is undertaken in 2.5 days (median values for papers published in this journal in the first half of 2024).
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Journal Webpage: https://www.mdpi.com/journal/brainsci
Impact Factor: 2.7 (2023); 5-Year Impact Factor: 3.0 (2023)

Keynote Speakers

Prof. Dr. Patricia A. Broderick

The City College of New York, United States

Prof. Dr. Gerry Leisman

Faculty of Social Welfare and Health Sciences Haifa University, Israel

Prof. Audrey Bowen

University of Manchester, United Kingdom

Dr. Peii Chen

Center for Stroke Rehabilitation Research, United States

Prof. Dr. Pierluigi Zoccolotti

Sapienza University of Rome, Italy

Assoc. Prof. Tracy Butler

Weill Cornell Medicine, United States

Invited Speakers

Prof. Dahlia Kairy

University of Montreal and Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal (CRIR), Canada

Dr. Francesco Latterini

University of Montreal and Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal (CRIR), Canada

Dr. Alessandra Swarowsky

Department of Physical Therapy, AdventHealth University, Florida

Prof. Vincent P. Clark

University of New Mexico, United States

Prof. Paolo Solla

University of Sassari, Italy

Program at a Glance

	Day 1	Day 2	Day 3
Morning	**Session 5.** Neurodegenerative Diseases **Session 3.** Neurotechnology and Neuroimaging	**Session 1.** Behavioral Neuroscience	
Afternoon	**Session 4.** Neuropsychology **Session 9.** Neurorehabilitation	**Session 7.** Clinical Neuroscience **Session 8.** Molecular and Cellular Neuroscience	**Session 6.** Cognitive Neuroscience **Session 2.** Systems Neuroscience

IECBS 2024 Program

23 October 2024 (Wednesday)

Session 5. Neurodegenerative Diseases
Session 3. Neurotechnology and Neuroimaging

Time: 9:00 (CEST, Basel) | 03:00 (EDT, New York) | 15:00 (CST Asia, Beijing)

CEST Time	CST Time	Speaker	Title
9:00-9:10	15:00-15:10	*Welcome from the session chair* *Assoc. Prof. Carla Masala*	
9:10-9:30	15:10-15:30	Invited Speaker **Prof. Paolo Solla**	Olfactory Impairment as predictor of REM Sleep Behavior Disorder (RBD) in Parkinson's Disease
9:30-9:45	15:30-15:45	Selected Speaker **Kadir Uludag**	Virtual Reality for Schizophrenia Symptom Regulation
9:45-10:00	15:45-16:00	Selected Speaker **Iasmina Honceriu**	Anti-dementia effects of mansorin a, mansonone g, and 6-paradol in the okadaic acid-induced zebrafish model of alzheimer's disease
10:00-10:15	16:00-16:15	Selected Speaker **Ephraim Chidi Ezeigbo**	Distinct Huntington's aggregates differently impact viability and motility of C. elegans; Atomic force Microscopy
10:15-10:25	16:15-16:25	*Welcome from the committee* *Dr. Sarah C. Hellewell*	
10:25-10:45	16:25-16:45	Invited Speaker **Prof. Vincent P. Clark**	Brain Stimulation Guided by Neuroimaging to Improve Memory
10:45-11:00	16:45-17:00	Selected Speaker **Dr. Moses O. Sokunbi**	Speech Generation using BCI
11:00-11:15	17:00-17:15	Selected Speaker **Vincenzo Ronca**	Simulation study on novel processing algorithms for ocular artifacts' detection and correction from electroencephalographic technique
11:15-11:30	17:15-17:30	Selected Speaker **Vsevolod Lyakhovetskii**	Methods for estimating the similarity of contours of gray matter in mammalian spinal cord transverse sections

Session 4. Neuropsychology
Session 9. Neurorehabilitation

Time: 14:00 (CEST, Basel) | 08:00 (EDT, New York) | 20:00 (CST Asia, Beijing)

CEST Time	CST Time	Speaker	Title
14:00-14:10	20:00-20:10	*Welcome from the session chair* *Prof. Dr. Pierluigi Zoccolotti*	
14:10-14:40	20:10-20:40	Keynote Speaker **Professor Audrey Bowen**	Can consensus methods help build an evidence-based clinical pathway for identifying and managing spatial neglect?
14:40-15:10	20:40-21:10	Keynote Speaker **Dr. Peii Chen**	Current approaches to treat spatial neglect
15:10-15:40	21:10-21:40	Keynote Speaker **Prof. Dr. Pierluigi Zoccolotti**	Open and emerging issues on spatial neglect
15:40-15:55	21:40-21:55	Selected Speaker **Juan Fraile Ramos**	Addressing education inequality to combat dementia in Sub-Saharan Africa: Nigerian women in the eye of the storm
15:55-16:10	21:55-22:10	Selected Speaker **Francesca Conca**	Mapping the effect of psycholinguistic variables on picture naming: insights from an FDG-PET study on neurodegenerative diseases
16:10-16:20	22:10-22:20	*Welcome from the session chair* *Dr. Christina Danielli Coelho De Morais Faria*	
16:20-16:40	22:20-22:40	Invited Speaker **Professor Sylvie Nadeau & Professor Dahlia Kairy**	Program ENSEMBLE!- Training with innovative technologies based on rehabilitation research: challenges and opportunities for patients, clinicians and researchers

16:40-17:00	22:40-23:00	Invited Speaker **Professor Alessandra Swarowsky**	Challenges for implementing the Parkinson's disease clinical practice guideline
17:00-17:15	23:00-23:15	Selected Speaker **Paula da Cruz Peniche**	Predictors of adopting healthy lifestyle behaviors: a cross-sectional study to target secondary stroke prevention in a middle-income country
17:15-17:30	23:15-23:30	Selected Speaker **Siddhi Sunil Tamanekar**	Dual Task Neglect System: AR-Gamified Assessment and Rehabilitation Application for Hemispatial Neglect
17:30-17:45	23:30-23:45	Selected Speaker **Jordana de Paula Magalhães**	Immediate effects and perceptions of cane use in individuals with Parkinson's Disease

24 October 2024 (Thursday)

Session 1. Behavioral Neuroscience

Time: 9:00 (CEST, Basel) | 03:00 (EDT, New York) | 15:00 (CST Asia, Beijing)

CEST Time	CST Time	Speaker	Title
9:00-9:10	15:00-15:10	*Welcome from the committee* *Dr. Lalitha Kurada*	
9:10-09:25	15:10-15:30	Selected Speaker **Romina Fucà**	Deciphering the Spatial Location of Paintings in the 'Kunsthaus Hamburg': An Algorithmic and Philosophical Exploration Using Blurred Images
09:25-09:40	15:25-15:40	Selected Speaker **Evgeniy Machnev**	Error Monitoring in an Ecologically Valid Context: Exploring Event-Related Potentials
09:40-09:55	15:40-15:55	Selected Speaker **Archange Michel Emmanuel MBOUNGOU MALONGA**	Prototype behavioural test of memory in Wistar rats exposed to valproic acid: AME Memoriavers maze
09:55-10:10	15:55-16:10	Selected Speaker **Ebrahim Ismaiel**	Inter-brain synchronization during nonverbal social interactions: Mini-Systematic review of the last six years 2019-2024

Session 7. Clinical Neuroscience
Session 8. Molecular and Cellular Neuroscience

Time: 14:00 (CEST, Basel) | 08:00 (EDT, New York) | 20:00 (CST Asia, Beijing)

CEST Time	CST Time	Speaker	Title
14:00-14:10	20:00-20:10	*Welcome from the session chair* *Dr. Robert Emmett Kelly and Dr. Dejan B. Budimirovic*	
14:10-14:40	20:10-20:40	Keynote Speaker **Assoc. Prof. Dr. Tracy Butler**	Lewy Body Dementia, with a focus on a very useful new diagnostic technique that involves a non-invasive skin test
14:40-14:55	20:40-20:55	Selected Speaker **Fairuz Jayyusi**	The Efficacy of Medical Interventions for Free-Floating Thrombus in Cerebrovascular Events: A Systematic Review
14:55-15:05	20:55-21:05	*Welcome from the session chair* *Prof. Dr. Patricia A. Broderick and Dr. Stefano Casalotti*	
15:05-15:35	21:05-21:35	Keynote Speaker **Prof. Dr. Patricia A. Broderick**	Amyloidosis is a neurodegenerative disease: Neuromolecular Imaging the Tau Peptide LIVE with a Quantum Polymer Sensing System based on the Broderick Nanoprobe: Parkinson's Disorders and the epilepsies
15:35-15:50	21:35-21:50	Selected Speaker **Karina Gilizhdinova**	24-hydroxycholesterol prevents pronociceptive effects of ATP in the rat trigeminovascular system
15:50-16:05	21:50-22:05	Selected Speaker **Shraddha Tripathi**	LncRNA JINR1 regulates neuronal cell death and flavivirus replication by regulating the miR-216b-5p target gene.
16:05-16:20	22:05-22:20	Selected Speaker **Wafaa TAHA**	The correlation between prenatal depression, inflammation, and gut microbiota: an integrative analysis
16:20-16:35	22:20-22:35	Selected Speaker **Agbonlahor Okhuarobo**	Inhibition of CYP2D enzyme in the brain reduces oral oxycodone induced conditioned place preference in rats

25 October 2024 (Wednesday)

Session 6. Cognitive Neuroscience
Session 2. Systems Neuroscience

Time: 14:00 (CEST, Basel) | 08:00 (EDT, New York) | 20:00 (CST Asia, Beijing)

CEST Time	CST Time	Speaker	Title
14:00-14:10	20:00-20:10	*Welcome from the session chair* *Prof. Dr. Gerry Leisman*	
14:10-14:40	20:10-20:40	Keynote Speaker **Prof. Dr. Gerry Leisman**	Living the Inverted "U": Connecting Ups and Downs from Fetus to Grave in Movement and Cognition
14:40-14:55	20:40-20:55	Selected Speaker **Francesca Conca**	The precuneus is tuned to words that refer to time, not to space, whereas the IPS has no preferences
14:55-15:10	20:55-21:10	Selected Speaker **Alberto Zani**	A Functional Neuroimaging Study on the Sensitivity of Decision Making and Mental Workload to Hypoxia
15:10-15:20	21:10-21:20	*Welcome from the session chair* *Prof. Dr. Konstantin V. Slavin*	
15:20-15:35	21:20-21:35	Selected Speaker **CHITARANJAN MAHAPATRA**	A mathematical model to study the stochastic synaptic noise dynamics in subthalamic neuron electrophysiology concerning Parkinson's disease
15:35-15:50	21:35-21:50	Selected Speaker **Jinsung Wang**	The effects of different types of unlearning on savings following visuomotor adaptation
15:50-16:05	21:50-22:05	Selected Speaker **Jose Joaquin Merino**	Maraviroc, a CCR5 chemokine blocker, enhanced corticosterone release in a postraumatic stress disorder model in rats: effects of chronic stress and fear on hippocampal CCR5/RANTES axis.

Session 1. Behavioral Neuroscience

sciforum-098092: Inter-brain synchronization during nonverbal social interactions: Mini-Systematic review of the last six years (2019-2024)

Ebrahim Ismaiel

Department of Medicine and Surgery, University of Parma, Parma, Italy

During social communication, individuals adapt their behavior based on the actions of the other person. Nonverbal communication, particularly through gestures, is a crucial aspect of this interaction. Gesture imitation helps individuals perceive similarity, synchronize with others, learn, and recognize patterns. This review aims to highlight the most recent studies between 2019 and 2024 that used hyperscanning configurations during social interaction to investigate inter-brain synchronization. The selected papers are selected based on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) and addressed based on paradigms and findings. The studies indicated that increased brain synchronization is linked to improved social interactions during eye contact, especially between parents and infants. Eye contact can modulate neural synchronization and enhance cooperation and competition. In humans, certain brain regions, including the frontopolar area and dorsolateral prefrontal cortex (dlPFC), are activated when observing hand actions in videos, while areas like the orbitofrontal cortex, dorsomedial prefrontal cortex, anterior cingulate cortex, and amygdala play a role in social gaze. In bats, the power of brain activity varies across different frequency bands, with low-frequency bands being more active during rest and high-frequency bands being more active during active behaviors. In conclusion, the reviewed studies underscore the importance of inter-brain synchronization in facilitating social interactions. Eye contact plays a significant role in modulating neural activity and promoting both cooperation and competition. Understanding the neural mechanisms underlying these interactions, across both humans and animals, can provide deeper insights into the complexities of social behavior and communication.

sciforum-098407: Deciphering the Spatial Location of Paintings in the 'Kunsthaus Hamburg': An Algorithmic and Philosophical Exploration Using Blurred Images

Romina Fucà [1,2,*] and Serena Cubico [1]

[1] Dept. of Management, University of Verona, 37129 Verona, ITALY
[2] Dept. of Law & Communication Science, University of Macerata, 62100 Macerata, ITALY

This study reconstructs the spatial layout of the Kunsthaus Hamburg using blurred photographs and transparent originals to gain insights into memory, perception, and cognition. We investigate mental models and visual representations during museum navigation in the 2009 and 2019 visits by employing a philosophical behavioural approach based on vignettes' logics—scenarios exploring cognitive processes in constructing hypothetical stories. The study examines factors influencing deviations from planned routes, cognitive mechanisms behind selecting perspectives in photographs, and environmental awareness at image capture.

A hierarchy way of finding the orientation (HWO) algorithm breaks down the space into a hierarchy of nodes (rooms) and edges (pathways), determining the initial position within the museum based on the first clear photograph and the known layout. A hierarchical map categorizes nodes and edges by importance and connectivity, with major sections forming the top level and individual rooms forming the lower levels. Random forests classify images of rooms and predict the sequence of rooms visited based on features extracted from clear photographs. A labelled dataset of fifty room photographs was used to train the random forest model, which then classified the blurred photographs and combined this with the HWO algorithm to predict the sequence of rooms visited.

The study acknowledges biases such as inaccurate architectural measurements and the Halo effect. Insights from Rehkämper (2006) and Guilherme (2019) were applied to understand the interplay between mental models, expectations, and new information. This framework for reconstructing spatial layouts from blurred photographs provides insights into the spatial cognition and the dynamic nature of mental models.

sciforum-101850: Error Monitoring in an Ecologically Valid Context: Exploring Event-Related Potentials

Evgeniy Machnev [1,*], Aleksandr Kirsanov [2] and Darya Momotenko [1]

[1] Scientific Center for Cognitive Research, Sirius University of Science and Technology, Russia
[2] Sport science department Sirius University of science and technology Sirius Federal territory, Russia

This study attempts to identify the error-related negativity (ERN) and correct response negativity (CRN) during e-sport video game match (Dota 2). A game environment requires players to make rapid decisions in a dynamic, evolving, and competitive context with no fixed restrictions on the range of possible actions. Combined with the ability to extract relevant information directly from the digital environment, the implementation of this approach may contribute to solving the problem of the ecological validity of experimental design in cognitive neuroscience.

Game recording files were utilized to obtain objective information regarding the timing and characteristics of game situations To implement this approach, work on the synchronization of EEG time series and the obtained dataset was conducted.

A particular type of game situation was selected for analysis, the objective of which is to strike a character controlled by the game algorithm in a timely manner. The ERN and CRN amplitudes were calculated as the difference between the most negative deflection in the -25–150 ms time window, associated with the moment of action completion by the controlled game avatar, and the preceding positive deflection.

The results of the paired t-test showed a significant difference between the amplitudes of ERN and CRN ($t(10) = 2.82$, $p = 0.018$). These empirical findings are consistent with observations, primarily obtained in laboratory conditions, indicating that the ERN amplitude is more pronounced in response to errors than the CRN amplitude is in response to correct actions.

sciforum-095847: Fright, Fight and Flight: Influence of Amygdala on Business Economic Decisions

Col Prof Dr Jyotirmaya Satpathy

Visiting Professor, The Management University of Africa, Nairobi, Kenya

Introduction

The plotting of neuron-coordinated 'economic' choice direction has witnessed remarkable progress since the turn of the century. Gaps in the understanding of neuron-centered substitutions introduce a behavioral examination of business 'actors', 'representations' and 'maxims' that are at the epicenter of the 'perceptive mosaic', with a focus on the neurotrajectory. The field of cognito-administration examines this via 'cognito - strategic monikers' (CTMs) to test how the brain ('Cognitive Miser') performs in higher cognitive capacities.

Hypothesis

Studies generally overlook the impact of aAmygdala function on entrepreneurs' well-being and economic decision-making quality.

Aim

This paper explores the amygdala's influence beyond its well-known emotional processing and stress response. The size of the population is 50.

Methods

We utilize a combination of stress tests and controlled lab studies (the electrocardiogram stress test, stress echocardiogram, echocardiogram stress test) with cardio tracking to explore the 'tripod' concept. Results suggest a link between high amygdala activity, stress, and negative outcomes like mental health issues, communication breakdowns, and hindered economic decision-making.

Results

Results indicate that the amygdala plays the role of a 'tripod' in economic decision-making and high levels of stress, and that amygdala activation contributes to mental health disorders, interpersonal conflicts and communication breakdowns, hindering economic decision-making.

Conclusions

The expanding paradigm of the brain's wiring graph ('Cognitive Miser') calls for establishing a probable cause–consequence' linkage proof between neurobiology and business decisions. Researchers ought to recognize 'drivers' (the frontal cortex, orbito-frontal cortex, front cingulate cortex and ventro-medial prefrontal cortex) that make an 'economic' choice mosaic'. Unaddressed issues show how 'economic' decisional progressions negate brain hallways ('Cognitive Miser') and how the brain considers information to make an 'economic' choice.

sciforum-104022: Prototype behavioural test of memory in Wistar rats exposed to valproic acid: AME Memoriavers maze

Archange Michel Emmanuel MBOUNGOU MALONGA

Student at the Faculty of Health Sciences of Marien NGOUABI in Congo

Introduction

AME's Memoriavers maze presents the spirit of different memory-related behavioural tests in the same environment. Memoriavers originate from the Latin memoria, which is a function that allows us to integrate, retain, and retrieve information in order to interact with our environment, while others come from the multiverse, which is a set of infinite metaverses operating side by side. Alterations in memory and neurological development caused by valproic acid have been documented, as has neurotoxicity in rodents.

General objective

To evaluate a prototype behavioural memory test in Wistar rats treated with valproic acid.

Materials and methods

A total of 48 male and female Wistar rats were divided into three groups: (1) the distilled water group, (2) the VPA 200 mg/kg group, and (3) the VPA 400 m/kg group. The products were administered daily by gavage for sixty days. After treatment, the rodents were subjected to behavioural tests in AME's home-made Memoriavers maze. Rats were selected from each batch to be mated with untreated rats. The young mated rats were subjected to the same maze.

Results

Various variables, such as the number of errors, exploration time, distance travelled, and others, were recorded. The results of the rats exposed to VPA and their offspring showed a significant drop in success rate and performance. Anxiety and stress were revealed during testing in VPA-treated rodents.

Conclusions

The AME Memoriavers maze showed a decrease in memory-related performance and behavioural abnormalities in Wistar rats treated with valproic acid at the doses studied.

sciforum-098473: Recent Paradigms of Human Mate Selection: An Brain–Behavior Perspective

Srinwanti Bandyopadhyay * and Chayan Munshi

Ethophilia Research Foundation, Santiniketan, 731235, India

Introduction

Humans have complex neuronal mechanisms associated with intricate psychological perspectives in respect to mate selection. The neuropsychological manifestations responsible for mate choice behavior are manipulated by chronic exposure to extensive erogenous content on digital social media, which initiate erratic behavioural patterns during mate choice. In this research work, confusion is considered a fundamental behaviour where humans face difficulties in decision-making. In our assessment, we tried to indicate that confusion is one indecisive behavioral pattern which can eventually affect mate choice in young adult humans.

Method

This study is a fundamental observational assessment of human erratic behaviour followed by an open questionnaire, responded to by 150 people . The population comprised young adults between the age of 18 and 30 years.

Results

Results strongly indicated confusion in selecting mating partners. The surveyed population demonstrated an increased confusion index in females compared with that in males.

Conclusions

We conclude that confusion is a potential marker of erratic behavior in humans. With the significant shift from analogue to digital lifestyles, the human population is encountering extensive virtual ‘attractive’ data which have created a big dataset for stimulating content, leading to confusion while selecting a partner. Digital social platforms are influencing complex thought processes, thus altering normal reproductive behaviour in humans. The brain–behavior–digitalization axis in today’s world is challenging the evolutionary aspects of human interaction, which is manifested in recent human behavioral patterns, many of which are an issue of concern for society.

sciforum-092878: Simulating Brain Chaos through Electrical Circuits

kaouther selmi [1,*], Kods BACHTA [2] and Kais BOUALLEGUE [2]

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[2] Institut Supérieur des Sciences Appliquées et de Technologie de Sousse (ISSATs), University of Sousse, Sousse 4003, Tunisia

Understanding the intricate and dynamic nature of brain disorders, such as epilepsy, Parkinson's disease, and schizophrenia, presents a formidable challenge due to their inherent chaotic properties, which defy conventional analytical approaches. In response to this challenge, our research introduces a groundbreaking methodology aimed at simulating the chaotic behavior characteristic of these neurological conditions using advanced electrical circuit models. By conceptualizing the interactions among neurons and synapses as electrical components within our model, we endeavor to unravel the complex underlying mechanisms driving these disorders. Leveraging insights from chaos theory and drawing upon the rich toolkit of electrical engineering, our simulation framework offers a novel perspective on the ways in which disruptions within neural circuits manifest as pathological states, shedding light on the intricate dynamics of brain diseases. Through rigorous numerical simulations and thorough analysis, we illustrate the efficacy of our approach in deciphering the chaotic dynamics inherent in these disorders, thus laying the foundation for the development of innovative therapeutic interventions. Furthermore, our research underscores the paramount importance of fostering interdisciplinary collaboration between the fields of neuroscience and electrical engineering; as such, synergistic partnerships hold the key to unlocking new frontiers in understanding and effectively treating complex neurological disorders, thus paving the way for improved patient outcomes and enhanced quality of life.

sciforum-098470: Study Of The Influence Of 24-Hydroxycholesterol Level On The Development Of Epilepsy In Mice

Ruslan Rossomakhin *, Kamilya Gizetdinova, Lubov Kovaleva and Alexey Yakovlev

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Oxysterols are products of cholesterol oxidation and play important roles in a number of processes, including signaling, development, metabolism, membrane homeostasis, inflammation and immune function. It has been demonstrated that 24S-hydroxycholesterol (24-OHC) can modulate neuronal functions, with potential relevance to the hyperexcitability underlying seizures. 24-OHC is produced in a brain by the CYP46A1 enzyme from cholesterol. The goal of our study was to investigate the relationship between the serum levels of 24-OHC in mice and the development of seizures in a kindling animal model induced by pentylenetetrazol (PTZ).

Outbred mice were injected with subthreshold dosages of PTZ (35 mg/kg) every other day for 30 days. Seizure activity was assessed using the Racine scale. To achieve a reduction in cholesterol 24-OHC levels in the brain, we used the inhibitor of CYP46A1, voriconazole (60 mg/kg, n=10), and for increasing 24-OHC levels, we used a low dose of efavirenz (0,09 mg/kg, n=10). We also included a control group control group (n=10). Voriconazole was injected peritonial for 5 days before PTZ treatment, and efavirenz was delivered perorally for 2 weeks before PTZ treatment. Both substances had a maintenance course during PTZ treatment.

During voriconazole treatment, the onset of epilepsy was delayed and the number of ensuing seizures was decreased compared to those in vehicle-treated mice. The augmentation of 24-OHC levels induced high-grade and -intensity seizures. The duration and onset of seizure did not change compared to that in the control group.

Thus, the experimental data show that changing 24S-hydroxycholesterol levels in the blood of mice may contribute to the development of PTZ-induced seizures.

sciforum-101859: Therapeutic potential of *Centella asiatica* in the intergenerational effect of childhood stress on depressive-like behaviors

Amanda Gollo Bertollo *, Kelli Maria Kreuz, Jesiel de Medeiros, Maiqueli Eduarda Dama Mingoti, Brunna Varela da Silva, Laysa Anacleto Schuh, Marina Kipper, Paula Dallagnol, Rafael Antonio Narzeti and Zuleide Maria Ignácio

Laboratory of Physiology Pharmacology and Psychopathology, Graduate Program in Biomedical Sciences, Federal University of Fronteira Sul

Introduction

Relevant factors underlying major depressive disorder (MDD) are childhood stress and a lack of social support, which are mimicked in animal models by maternal deprivation (MD) and social isolation (SI). The objective was to evaluate depressive-like behaviors in rats subjected to MD and SI and in the female offspring, and to assess the treatment with Centella asiatica and madecassic acid.

Methods

This study assessed the effects of MD and SI stress on young adult Wistar male and female rats from the first-generation and non-stressed offspring of stressed mothers. Forced swimming and open-field tests were conducted in 92-94 days, and the possible therapeutic effect of *Centella asiatica* (30 mg/kg) hydroalcoholic extract and madecassic acid (10 mg/kg) administered by gavage for fourteen days was investigated. Data were analyzed using ANOVA and Tukey's post hoc test (p 0.05).

Results

In the forced swimming test, immobility time was higher in the stress + saline group compared to the stress-free control group, and all treatments reversed this depressive-like behavior in the first phase. In the second phase, immobility time was higher in the offspring + saline group compared to the control group, and treatment with *Centella asiatica* in males and *Centella asiatica* and madecassic acid in females reversed this behavior.

Conclusions

Stress in the first generation causes depressive-like behavior in rats, which *Centella asiatica* and madecassic acid can counteract. Mothers' childhood stress can have intergenerational effects on their children, and treatments with *Centella asiatica* and madecassic acid reduced depressive-like behaviors in stressed mothers and their offspring.

Session 2. Systems Neuroscience

sciforum-103591: A mathematical model to study the stochastic synaptic noise dynamics in subthalamic neuron electrophysiology concerning Parkinson's disease

Chitaranjan Mahapatra [1,2,3]

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A mathematical model is formulated to examine the stochastic synaptic noise dynamics within subthalamic neuron electrophysiology, particularly concerning Parkinson's disease. By simulating the stochastic processes underlying synaptic noise, the model serves as a tool to explore the intricate dynamics of subthalamic neurons, contributing to the elucidation of Parkinson's disease mechanisms. Utilizing the stochastic Ornstein–Uhlenbeck process, we represent excitatory synaptic conductance and integrate it into a comprehensive whole-cell model to generate spontaneous and evoked cellular electrical activities. This single-cell model incorporates numerous biophysically detailed ion channels, depicted by a set of ordinary differential equations in Hodgkin–Huxley and Markov formalisms. Consequently, this approach effectively induces irregular spontaneous depolarizations (SDs) and spontaneous action potentials (sAPs), mirroring electrical activity observed in vitro. The model reveals that alterations in the ability to reach the action potential threshold are observed, alongside significant decreases in input resistance and increased firing rates of spontaneous action potentials. Additionally, background synaptic activity can modify the input/output characteristics of nonneuronal excitatory cells, providing further insights into the role of synaptic noise in modulating neuronal behavior. These findings are critical, as the subthalamic nucleus (STN) plays a central role in the motor circuitry affected by Parkinson's disease, and its abnormal activity is a hallmark of the disease. The stochastic model serves as a robust platform for simulating disease conditions and testing potential interventions, ultimately contributing to a better understanding of how synaptic noise influences neuron behavior and the pathophysiology of Parkinson's disease.

sciforum-098862: Effect of knee joint fixation on human postural stability

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Introduction

The analysis of motor strategies includes only ankle and hip strategies, without considering the possible role of the knee joint, although coordinated control of knee joint movements plays a significant role in maintaining posture stability.

Methods

Electromyography and stabilometry parameters were recorded in healthy subjects with and without knee joint fixation. The tests included: eye-open test (control), Romberg test, and "Target" test.

Results

Stabilometry results of control and knee fixation were compared. Knee fixation reduced the total power of pressure center oscillations in all tests except for the Romberg test with closed eyes, in which some shift of the spectrum to higher frequencies was observed. At the same time in the test "Target" both in norm and at knee fixation the spectrum shifted to the zone of higher frequencies, the changes were less pronounced in the experimental group. At restriction of knee joint mobility there was a decrease in the activity of the anterior tibial muscle. During visual deprivation in the Romberg test, the electrical activity of the tibial muscle decreased. When registering electromyograms from the cambaloid muscle, there was a tendency to a decrease in activity in tests with fixation of knee joints.

Conclusions

At restriction of knee joint mobility the system of balance regulation improves due to activation of vestibular and proprioceptive afferent systems.

sciforum-101603: Elucidation of conserved genes and pathways in C. elegans as an animal model for Alzheimer's disease: A System bioinformatics approach

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Introduction

Alzheimer's disease (AD) is a neurodegenerative disorder that is primarily characterized by progressive cognitive decline and memory impairment. *Caenorhabditis elegans* (*C. elegans*), a nematode worm, is a valuable model organism because of its simplicity, genetic traceability, and well-mapped nervous system.

Methods

This study employs a systematic bioinformatics approach to identify and analyze conserved genes and pathways related to AD within the genomes of humans and *C. elegans*. Proteins altered in AD were obtained from NeuroPro (https://neuropro.biomedical.hosting/), including 4743 proteins.

Results

A total of 1642 genes in *C. elegans* orthologous to the most dysregulated AD-related genes in humans were identified, and the GO terms and pathways were compared to study the conserved pathways between the two species. A PPI network of dysregulated genes was constructed to infer the functions of AD-related orthologous genes in *C. elegans*. Orthologous gene protein–protein interaction (PPI) network analysis for dysregulated first neighbor genes reveals the hubs and important key regulators in *C. elegans* for upregulated genes are as follows: isw-1, enol-1, ruvb-2, tpi-1, eftu-2, ruvb-1, gpi-1, pgk-1, ubq-1, and let-716 for upregulated genes and rps-9, rps-18, rps-22, ubq-2, utx-1, T26E3.7, aco-2, rla-0, eef-1G, and tsfm-1 for downregulated genes.

Conclusions

Functional enrichment analysis and pathway mapping revealed the significant conservation of cellular mechanisms. Our findings highlight the utility of *C. elegans* as a model for AD, emphasizing the potential of bioinformatics in accentuating conserved biological processes and novel intervention strategies.

sciforum-098089: The effect of disuse on the functional condition of neuromotor systems in rats

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An important and urgent problem of neuroscience and medicine is the understanding of the mechanisms of reorganization of motor function under conditions accompanied by a restriction on the functional use of skeletal muscles. The aim of the study was to assess the condition of the neuromotor apparatus of the rat's calf muscles in conditions of simulated disuse.

All experiments were carried out in strict accordance with generally accepted bioethics norms. The animals were divided into experimental groups: unilateral compression of the sciatic nerve (n=5); unilateral tenotomy (n=5); antiorthostatic hanging (n=5). After 7 days, the electromyographic characteristics of the gastrocnemius, soleus, and tibialis anterior muscles were recorded. Data from intact animals served as a control (n=5). An increase in the reflex excitability of spinal cord motor neurons and a violation of the reliability of synaptic transmission were detected, regardless of the procedure for modeling disuse of the muscle. The transformations were more pronounced in the neuromotor apparatus of the extensor muscles. In addition, in nerve injury and tenotomy, changes were also recorded in the contralateral (undamaged) motor system.

Thus, the disuse of skeletal muscle initiates the transformation of the functional state of all links of symmetrical neuromotor systems. The main reason for the detected effects is assumed to be the restriction of peripheral afferentation, including support, and the activation of intraspinal bilateral connections.

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sciforum-098400: The effects of different types of unlearning on savings following visuomotor adaptation

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When humans encounter the same disturbance twice, they adapt to it faster during the second exposure. To examine how subconscious learning systems contribute to this savings process, previous studies have suppressed explicit awareness of the perturbation by gradually increasing its magnitude during initial learning. This has produced mixed effects, with some studies demonstrating faster relearning, and others observing no acceleration during relearning. Here, we examined whether these differences might be due to the nature of a de-adaptation period that separates two learning periods. To test this idea, we manipulated the magnitude of washout errors by de-adapting participants abruptly, gradually, or by removing feedback entirely. Empirical analyses indicated that the different classes of washout errors had a profound effect on savings: large washout errors nullified the ability to save, whereas small errors or the absence of error protected savings. Model-based analyses suggested that changes in learning rates were mediated by an increase in sensitivity to error that could be reversed by experience with oppositely oriented washout errors. This suggests that the experience of error produces both a facilitation of learning for similar errors and a reduction in learning for dissimilar errors. The latter can abolish the expression of savings following gradual adaptation.

Session 3. Neurotechnology and Neuroimaging

sciforum-088555: Advancements in Neuroimaging Techniques: A Window into the Brain's Complexity

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Title: Advancements in Neuroimaging Techniques: A Window into the Brain's Complexity
Authors: [Your Name], [Your Affiliation]
Session: Neurotechnology and Neuroimaging (S3)
Keywords: magnetic resonance imaging; positron emission tomography; neurodegeneration; nanotechnology; optical coherence tomography

Abstract:

Introduction

Neurological disorders present a significant healthcare challenge globally, necessitating continuous advancements in diagnostic and therapeutic approaches. Neuroimaging techniques have emerged as indispensable tools for unraveling the complexities of the brain and understanding the pathophysiology of various neurological conditions.

Methods

This research conducted a systematic review of recent literature studies to explore the latest advancements in neuroimaging techniques and their applications in neurological disorders. Key methodologies included in the review were magnetic resonance imaging (MRI), positron emission tomography (PET), nanotechnology, and optical coherence tomography (OCT).

Results

Our analysis revealed significant progress in neuroimaging technologies, particularly in MRI and PET, enabling earlier and more accurate diagnoses of neurological disorders. Nanotechnology has facilitated targeted drug delivery systems, offering promising therapeutic interventions for neurodegenerative diseases. Additionally, OCT has provided insights into neurodegeneration mechanisms, aiding in the development of novel diagnostic and monitoring strategies.

Conclusions

The findings underscore the critical role of neuroimaging techniques in advancing our understanding of neurological disorders. These advancements hold immense potential for improving patient care through early detection, precise diagnosis, and targeted interventions. Continued research and innovation in neuroimaging are essential for addressing the complex challenges posed by neurological diseases and enhancing clinical outcomes.

sciforum-098457: Investigation of hippocampal pathway plasticity with a focus on plasticity dependent on the synchrony of dendritic activity, Hebbian plasticity, and homeostatic plasticity

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Brain plasticity plays a critical role in the coordination of brain functions, particularly considering that the hippocampus is one of the most important areas in the brain. This study aims to investigate and analyze the hippocampal pathways using three types of plasticity and two computational methods. In this research, the rules of Hebbian plasticity, homeostatic plasticity, and plasticity dependent on the synchrony of dendritic activity have been used. Python programming language and Nest library are also among the tools of this project.

The first method is using the Leaky Integrate-and-Fire (LIF) model. For this purpose, we have used biological neural networks in which neurons are considered as nodes, synapses as connections, and different types of plasticity as network properties. This method can simulate connectivity among neurons as well as their activity. The second method uses a directed random graph model to simulate only the connectivity of the circuit.

In both simulations, the number of neurons, the excitation and inhibition balance, and the connection probability have been chosen carefully to reflect the real properties of the circuit. Both models show agreement with the connectivity pattern of the hippocampus obtained from experimental studies. The strength of connections matches the experimental results of the hippocampus in the first model. In contrast, due to the lack of activity simulation in the second model, the strength of network synapses differs from experimental results as it is a mathematical model and aims to partially reflect the properties of biological neural networks.

sciforum-101500: Visualization of multichannel surface electromyography as a map of muscle component activation

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Introduction

Modern methods of analyzing surface electromyography (sEMG) from a matrix of electrodes allow for detailed muscle activation maps and interaction detection. While these activity maps show muscle response, they do not reveal muscle coordination during different gestures. Creating muscle component activity maps can aid in the development of rehabilitation programs and the creation of bionic prostheses by identifying signal localization in specific muscles.

Methods

This study was conducted with healthy subjects (N=5). Trigno avanti sEMG sensors (n=8) (Delsys Inc, USA) were used, arranged in a circle on the superficial muscles of the forearm. The gestures chosen for visualization were fist clenching, finger extension, and thumb elevation.

Results

When analyzing the data associated with the muscle component activation maps for the five subjects, it is possible to observe differences in the pattern of muscle co-activation depending on the gesture. During fist clenching, the largest contraction amplitude is observed in m. extensor carpi ulnaris and m. palmaris longus. For finger extension, the greatest activity was observed in m. extensor carpi ulnaris and m. extensor digitorum. Finally, for thumb elevation, m. extensor carpi radialis longus and m. extensor carpi ulnaris were the most involved, and m. palmaris longus was also consistently active. The other selected muscles were not activated, indicating precise muscle coordination to perform the different gestures.

Conclusions

Forearm muscles are differentially involved in muscle signal formation. The segmentation of muscle signals allows for specific signal acquisition for further use in prosthetics and rehabilitation.

sciforum-100588: A meta-analysis on the influence of transcranial direct current stimulation (tDCS) on the processing of implicit associations (IATs)

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Implicit prejudices are often costly to the self and others since implicit prejudices can impair cognitive functioning, social interactions, physical health, and psychological wellbeing (Brondolo et al. 2012; Gendler 2011; Maina et al. 2018). A variety of different interventions have therefore been used in an attempt to decrease implicit prejudice in participants including psychopharmacology, interpersonal and imaginary contact, cognitive and emotional training, and adopting alternative perspectives through virtual embodiment (Maister et al. 2015; Paluck et al. 2021; Terbeck et al. 2012). Recently, brain stimulation techniques such as transcranial direct current stimulation (tDCS) have also been used with the goal of decreasing implicit prejudice in participants (Wang et al. 2019; Yuan et al. 2023). But how effective, if at all, is tDCS at decreasing implicit prejudice? The purpose of this research is to address this question by systematically reviewing all relevant studies that compared the influence of tDCS versus sham stimulation on implicit prejudice as measured by a variety of implicit association tests (IATs). Using a random effects model, this meta-analysis found a very small effect for the use of tDCS versus sham stimulation on decreasing implicit associations in women ($k = 28$, SMD = -0.140, $p = 0.026$). Yet this research found a small effect for the use of tDCS versus sham stimulation on increasing implicit associations in men ($k = 28$, SMD = 0.252, $p = 0.012$). Here I discuss the results of this research on tDCS and implicit associations, its practical value, along with limitations and prospects for future work.

sciforum-098257: A meta-analysis on the influence of transcranial direct current stimulation (tDCS) on the processing of implicit associations (IATs)

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University of Illinois Urbana-Champaign

Implicit prejudices are often costly to the self and others since implicit prejudices can impair cognitive functioning, social interactions, physical health, and psychological wellbeing (Brondolo et al. 2012; Gendler 2011; Maina et al. 2018). A variety of different interventions have, therefore, been used in an attempt to decrease implicit prejudice in participants, including psychopharmacology, interpersonal and imaginary contact, cognitive and emotional training, and adopting alternative perspectives through virtual embodiment (Maister et al. 2015; Paluck et al. 2021; Terbeck et al. 2012). Recently, brain stimulation techniques such as transcranial direct current stimulation (tDCS) have also been used with the goal of decreasing implicit prejudice in participants (Wang et al. 2019; Yuan et al. 2023). But, how effective, if at all, is tDCS at decreasing implicit prejudice? The purpose of this research is to address this question by systematically reviewing all relevant studies that compare the influence of tDCS versus sham stimulation on implicit prejudice, as measured by a variety of implicit association tests (IATs). Using a random effects model, this meta-analysis found a very small effect for the use of tDCS versus sham stimulation on decreasing implicit associations in women ($k = 28$, SMD = -0.140, $p = 0.026$). Yet, this research found a small effect for the use of tDCS versus sham stimulation on increasing implicit associations in men ($k = 28$, SMD = 0.252, $p = 0.012$). Here, I discuss the results of this research on tDCS and implicit associations, its practical value, and its limitations and prospects for future work.

sciforum-098253: An AI implementation for forecasting fMRI time series

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Introduction

Artificial Intelligence (AI) is having a revolutionary impact across various sectors, transforming industries, enhancing capabilities, driving innovation and efficiency, and creating new opportunities. In the health sector, AI algorithms have been used to analyse medical images and data more speedily and accurately than humans, aiding in the early detection of diseases such as cancer. It has also been used for the development of personalised treatment plans based on an individual's genetic makeup and lifestyle. Furthermore, surgical robots powered by AI have been used to perform complex procedures with precision. Neuroimaging and AI are converging to offer transformative advancements in understanding the human brain and diagnosing neurological conditions.

Methods

We implement a deep learning neural network model that forecasts the time series of a functional magnetic resonance imaging (fMRI) dataset. However,, applying deep learning models to fMRI is not trivial due to the high-dimensional nature of fMRI images. We execute a long short-term memory (LSTM) recurrent neural network (RNN) model that forecasts the time series of fMRI datasets.

Results

The training of the LSTM-RNN model, which includes the root-mean-squared error (RMSE) and the loss, is shown. Also, a histogram depicting the RMSE and the errors is shown. The mean RMSE over all test observations was calculated, and the predictions were compared with the target values.

Conclusions

We have successfully implemented an LSTM-based RNN model for the forecasting of fMRI time series. The model will enable the prediction of future brain states and facilitate advancements in neuroscience research and clinical applications.

sciforum-085405: Applications of terbium halide-filled single-walled carbon nanotubes in biomedicine

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Terbium halides are interesting compounds that are incorporated inside single-walled carbon nanotubes (SWCNTs). Bioimaging with terbium halide-filled SWCNTs is a very promising field. For applications in bioimaging, it is important to investigate the filling ratio and the yield of the preparation processes of the nanocomposites. The synthesis of filled SWCNTs is a chemical process involving melted substances. The melted terbium chloride ($TbCl_3$), terbium bromide ($TbBr_3$), and terbium iodide (TbI_3) are introduced into the SWCNTs in a high-temperature process. This results in the preparation of the compound-containing nanocomposites. The chemical properties of the filled SWCNTs are investigated with transmission electron microscopy (TEM) and spectroscopy. The TEM shows very interesting incorporated compounds. The p-doping of SWCNTs is investigated in the filled SWCNTs. The interesting properties that accompany these nanocomposites may find applications in nanobiotechnology and bioimaging. In this contribution, we synthesize the terbium halide-filled SWCNTs with melted compounds. We incorporate the substances into the SWCNTs in the high-yield process. The filling ratios of the SWCNTs are very large, as revealed with the TEM. The interesting microstructures of the compounds are found in the TEM images. We demonstrate this with micrographs of the filled SWCNTs. In the terbium halide-filled SWCNTs, the p-doping of SWCNTs is revealed with spectroscopy as modifications of Raman modes. Shifts and intensity variations are observed with the spectra. Therefore, the interesting rare-earth compounds inside SWCNTs form a perspective platform for nanobiotechology, and the bioimaging of cells, tissues, and organs.

sciforum-101527: From Childhood to Old Age: A Magnetoencephalography-Based Review of Motor Control Development

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Background

Motor control (MC) is crucial for coordinating movements, reflected by neural oscillations (NOs) such as movement-related beta desynchronization (MRBD), post-movement beta rebound (PMBR), and movement-related gamma synchrony (MRGS). Magnetoencephalography (MEG) has significantly advanced the study of brain development and MC due to its high temporal and spatial resolution. This study aims to elucidate changes in NOs throughout MC development and explore the underlying mechanisms from childhood to old age.

Methods

A comprehensive literature search using keywords "magnetoencephalography," "motor control," "lifetime trajectory," and "aging" was conducted in Web of Science, PubMed, Scopus, PsycINFO, EBSCO, and Embase up to June 2024. Seventeen relevant studies were analyzed.

Results

A systematic review of MEG studies revealed the following: 1) Childhood to adolescence: MC increases with enhanced MRBD in the primary motor cortex and decreased MRBD in the secondary motor cortex. Movement control improves, accompanied by enhanced PMBR and refined neural populations, leading to weakened MRGS. 2) Adolescence to early adulthood: MRBD, PMBR, and MRGS continue their trends, reaching maturity in early adulthood. 3) Early adulthood to old age: MC declines, but resting beta oscillations and MRBD are stronger than in young adults, while PMBR decreases with age.

Conclusions

MC development follows a trajectory of growth to maturity and eventual decline with age, reflected by changes in NOs. Increased resting beta oscillations and MRBD in older adults suggest compensatory mechanisms, while PMBR and MRGS show age-related changes. Further research is needed to clarify these mechanisms.

sciforum-101442: Magnetoencephalographic Evidence of Ketamine's Efficacy in Alleviating Symptoms of Major Depressive Disorder: A Systematic Review

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This study aimed to analyze the effect of ketamine (KT) on Major Depressive Disorder (MDD) symptoms and explore the underlying neural mechanisms from a magnetoencephalographic (MEG) perspective.

Methods

Databases including EBSCO, PubMed, Embase, and Web of Science were searched for studies on MEG observations of KT intervention in MDD patients, covering publications up to June 2024.

Results

In total, 14 RCTs from the United States, involving 351 MDD subjects aged 18-65, were included. The studies, mainly published after 2016 in molecular and biological psychiatry journals, used the DSM-IV criteria for MDD diagnosis. KT was administered at 0.5 mg/kg, with a placebo of 0.9% saline, for a duration of less than 40 minutes. KT significantly improved depression, anxiety, psychotic symptoms, and suicidal ideation, as evidenced by reductions in Montgomery Depression Rating Scale scores. MEG findings indicated the following: 1) AMPA-mediated glutamatergic transmission increase; 2) increased anterior cingulate gyrus (ACC) activation correlating with rapid antidepressant response; 3) prefrontal ACC involvement negatively correlated with symptom improvement during increased working memory load; 4) increased functional connectivity of the anterior striatum; 5) hydroxyketamine levels correlated with gamma power and antidepressant efficacy; 6) baseline gamma power predicted post-dosing gamma power and antidepressant efficacy; 7) decreased connectivity between the amygdala and temporal insula; 8) prefrontal ACC–eft amygdala connectivity negatively correlated with symptom changes; 9) increased δ-α and δ-γ connectivity in responders, and decreased connectivity in non-responders; and 10) fusiform M170 component association with antidepressant effects.

Conclusions

KT improves depression and enhances resting functional connectivity in MDD patients; however, the involved frequency bands are inconsistent and the findings lack reproducibility.

sciforum-098676: Methods for estimating the similarity of contours of gray matter in mammalian spinal cord transverse sections

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Subject of study: We focused on images of transverse sections of the mammalian spinal cord belonging to its various segments.

Aim of study

We selected optimal methods for assessing the similarity of images of transverse sections of the spinal cord obtained earlier in different histological studies.

Method

We assessed the similarity of images of transverse sections of the spinal cord with the help of (a) Jaccard index (the size of the contour's intersection divided by the size of the contour's union), (b) metrics of distance between gray matter contours, (c) correlations between gray matter contours, and (d) the difference between gray matter contours based on Hu moments (a set of seven numbers calculated using central moments that are invariant to image transformations).

Main results

Jaccard index and metrics of distances between contours allowed us to successfully determine the degree of similarity of sections obtained from the same animal. Hu invariant moments are suitable for the successful recognition of images of spinal cord segments obtained from various sources.

Practical significance

The results suggest that the automated identification of spinal cord segments can be based on a comparison of histological or tomographic images of transverse sections of the spinal cord with some databases containing a set of reference images of particular segments. Such comparisons may be performed with the help of the contour similarity methods based on the Hu invariant moments. This work was supported by the Russian Science Foundation, project №21-15-00235.

sciforum-096819: Simulation study on novel processing algorithms for ocular artifacts' detection and correction from electroencephalographic techniques

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Electroencephalographic (EEG) techniques are widely used in cognitive science, neuroscience, psychophysiology, and brain–computer Interface (BCI) research due to their non-invasive nature, portability, and high temporal resolution. However, EEG signals often suffer from contamination by non-brain electrical activities such as those from eye movements (EOG), muscles (EMG), and the heart (ECG), necessitating preprocessing to maintain a high signal-to-noise ratio (SNR) for accurate analysis. This research evaluates techniques for mitigating artifacts from oculomotor activities, particularly saccades, which are more challenging to remove than eye blinks. The primary methods for correcting these artifacts are regression-based techniques and Independent Component Analysis (ICA). Regression methods like the Gratton algorithm use EOG channels but can introduce contamination, while ICA methods such as AMICA require substantial computational resources and the careful selection of EEG channels. Moreover, recent advancements in algorithms have focused on identifying and correcting ocular artifacts in out-of-lab applications, using data from a low number of channels. Notably, EEGANet, based on Generative Adversarial Networks (GANs), stands out as a promising approach. It requires an initial training and optimization process using EOG channels. EEGANet's performance was compared to Gratton, AMICA, SGEYESUB, REBLINCA, and MWF using publicly available datasets, with evaluation metrics including Pearson's correlation, mutual information, and frequency correlation. The results revealed that EEGANet showed a superior correction performance over frontal EEG channels, effectively identifying and correcting both horizontal and vertical eye saccade artifacts. It preserved the EEG signal's spectral characteristics across theta, alpha, and beta frequency bands, indicating minimal impact on the signal's neurophysiological content.

sciforum-101738: Speech Generation using BCI

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In this project, we aimed to develop a Steady-State Visually Evoked Potential (SSVEP)-based brain-computer interface (BCI) speller system to enable communication for individuals with severe physical disabilities. We utilized SSVEPs, a type of signal read from the occipital lobe of the brain in response to visual stimuli, to create an accessible and reliable solution for people with paralysis.

Our methodology involved several key components: a flicker-based data gathering interface, signal processing, and AI modeling, a prediction and auto-complete program, and a text-to-speech (TTS) API. We first worked on publicly available datasets then we gathered our own dataset using a G.Tec Unicorn Hybrid Black 8-channel EEG headset, then developed an AI model based on an unsupervised Transformer model to accurately interpret the user's intended selections.

The results of our project demonstrate the effectiveness of our SSVEP speller system. We were able to achieve 93% accuracy through our AI model on the available BETA dataset, which outperformed state-of-the-art methods. Additionally, the incorporation of prediction and auto-complete functionalities in our fully functional website further enhanced the user experience. We believe our work can provide a lifeline for severely disabled individuals, giving them a voice and improving their quality of life by reducing social and mental isolation.

sciforum-098475: State of the Art in the Collection of Physiological and Biometric Data in VR Simulations of Nature and Architectural Design in Urban Spaces: Impact on Well-being

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The use of physiological and biometric data collection devices in urban space design research has emerged as a cutting-edge approach, particularly for understanding the importance of incorporating natural elements into city living environments to promote the health and well-being of their inhabitants. This study explores state-of-the-art advanced sensor technologies, such as heart rate monitors, galvanic skin response detectors, and eye-tracking and electroencephalography devices, to collect real-time data on human interactions with nature in places where concrete predominates. By analyzing these responses, researchers can quantify the restorative and health-promoting effects of nature, which are often difficult to measure through traditional survey methods. The precision, immediacy, and integration of data obtained through these new data collection technologies have boosted experimental research in this field, allowing a more nuanced understanding of the effects and variations in individual cognitive and emotional responses and contributing relevant neuroscientific, behavioural, and psychological insights. This comprehensive view of human interactions with urban nature highlights the potential of physiological and biometric devices as a source of information from their users to optimize urban planning and policy decisions aimed at creating healthier and more liveable cities. This work also addresses challenges such as data privacy, ethical considerations, and the need for interdisciplinary collaboration. Overall, the use of these innovative technologies represents a significant advancement in the quest to harmonize urban development with the natural environment, ultimately improving the quality of life of urban populations.

Session 4. Neuropsychology

sciforum-101878: Addressing education inequality to combat dementia in Sub-Saharan Africa: Nigerian women in the eye of the storm

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The unique metabolic profile of Sub-Saharan Africans and African Americans predispose them to a higher prevalence of type 2 diabetes (DM-2) and a 2-to-8fold increased risk of developing dementia compared to Caucasians. This increased risk places a significant strain on health systems. The development and progression of DM-2 are influenced by intrinsic factors such as sex, epigenetics, ethnicity, diet, and lifestyle, as well as extrinsic factors like socioeconomics, cultural nuances, and the environment. However, the complex relationship between diabetes and dementia is not fully understood; thus, further research efforts are needed. Our research group has identified educational level as a key risk factor for dementia, with Nigerian women being particularly affected. In this work, we studied both healthy individuals and those with DM-2 to search for a continuum between educational levels and cognitive function, and to establish education as a trigger factor for dementia prevalence. Our findings demonstrate that lower educational levels correspond to poorer cognitive function test results. Moreover, since women disproportionately have lower educational levels, their cognitive test results deviated more significantly from typical values. This study highlights the critical connection between education and dementia risk, emphasizing the urgent need to address gender education inequalities, particularly in sub-Saharan populations like Nigeria. By improving educational opportunities for women, we can potentially reduce the prevalence of dementia and enhance the overall quality of life in these communities. Addressing this issue is not only a matter of public health, but also a step toward achieving social equity and improving the resilience of health systems.

sciforum-098493: Cross-Linguistic Differences in Healthy Speakers: A Comparative Study of English, Chinese, and Italian Groups

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Introduction

Cross-linguistic studies offer unique and new insights into the relationship between language and cognition and the impact of linguistic differences on the diagnostic process in neurological conditions. However, differences in speech production among healthy speakers have been scarcely investigated. We aim to address cross-linguistic variability in the connected speech production of English, Chinese (Mandarin and Cantonese), and Italian speakers using a picture description task.

Methods

Thirty-nine sex-, age-, and education-matched subjects (thirteen for each language) described the Picnic scene from the WAB battery. Twenty-eight linguistic features encompassing phonological, lexico-semantic, morpho-syntactic, and discourse/pragmatic domains were then coded using a semi-automated computerized language analysis program (CLAN). The frequency of each feature was compared across the three groups.

Results

While the majority of features were similar across languages, we identified differences among English, Chinese, and Italian speakers. Specifically, we found reduced production of prepositions, conjunctions, and pronouns, and increased adverb use in the Chinese-speaking group compared to the groups speaking the other two languages. English participants produced a higher proportion of prepositions, while Italian speakers produced significantly more conjunctions and empty pauses than the other groups.

Conclusions

Our results support the role of cross-linguistic studies in capturing language-specific nuances in spoken production and highlight the need for linguistically tailored tools for the assessment of language performance.

sciforum-101928: Inducing an Autonomous Sensory Meridian Response (ASMR) with Electroencephalography as a Novel Intervention to Improve Mental Function

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The autonomous sensory meridian response (ASMR) is a tingling sensation in the scalp, neck, and back caused by sensory stimuli triggering the parasympathetic response. With a wide genre of popular online videos created to induce ASMR, viewers have claimed benefits such as improved sleep and relaxation. This study investigates the potential of ASMR to revolutionize productivity, mood, and stress-management in a fast and affordable way. To do so, single-case experimental design was utilized, which turns an observational case report into a hypothesis tested under controlled conditions to highlight an individual's distinct changes in state. Tests were administered over eight weeks to comprehensively quantify effects of ASMR on mental function, including assessments for mood, memory, and executive function; a smartwatch; and a wearable electroencephalography headset. This indicated gradual improvement in executive function (medium effect size) and long term memory (large effect size) across the testing period as well as immediate improvement of mood (medium effect size) and activation of the parasympathetic response following each intervention. Furthermore, wavelet transform analysis demonstrated statistically significant increase in the power of alpha and delta waves during intervention, which was supported by in silico validation via a convolutional neural network. This model can now be applied to detect the unique brain activity during ASMR stimulation on larger populations, making cognitive enhancement by novel biofeedback interventions time-efficient and globally accessible. Overall, this experiment is the first to demonstrate the physiological basis of ASMR's potential to improve cognitive function, therefore encouraging a preventative approach to mental health care.

sciforum-098369: Mapping the effect of psycholinguistic variables on picture naming: insights from an FDG-PET study on neurodegenerative diseases

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Picture naming involves mapping a visual input to a semantic representation and linking it to a word form for spoken output (Catricalà et al., 2020). Naming performance is affected by the properties of the words/pictures, but previous studies have failed to univocally identify the naming stage(s) and the brain regions affected by each variable. We explored the impact of the main variables on behavioural performance and brain metabolism in neurodegenerative patients.

A total of 178 neurodegenerative patients were administered the CaGi picture naming test (Catricalà et al., 2013) and underwent a FDG-PET scan. We extracted the components underlying the variables' structure with principal component analysis. We calculated the impact of each variable/component on the patients' performance, adopting an item-level procedure (de Marco et al., 2023) and correlating the obtained measures with the brain metabolism extracted from 11 regions of interest.

Four components emerged, namely word form, visual, lexical, and semantic. Stimuli with a simpler word form (short and with many phonological neighbours) and lexical structure (acquired early in life, frequent, and familiar) were named correctly more often, while more difficult ones induced semantic errors.

Gradual specialization emerged across regions, with the anterior temporal lobe contributing to multiple naming stages; the posterior fusiform gyrus supporting visual, semantic, and lexical properties; and the middle posterior temporal and inferior frontal gyri representing an interface between lexico-semantics and phonology.

These results go beyond one-to-one correspondence between a variable and a unique naming stage/brain area, suggesting that the same brain area can support relatively different naming stages depending on the network into which it is embedded.

Session 5. Neurodegenerative Diseases

sciforum-097571: Detection of Alzheimer's Disease from EEG Signals Using Machine Learning: A Comparative Study with XGBoost, SVM, and Naive Bayes

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The early detection of Alzheimer's disease (AD) is crucial for effective intervention and management. This study aims to detect AD using electroencephalogram (EEG) signals analyzed through advanced machine learning techniques. The dataset, provided by researchers from Florida State University, consists of EEG recordings from 24 healthy controls and 24 patients diagnosed with AD using a 19-electrode recorder in accordance with the international 10–20 system. The recordings were captured using the Biologic Systems Brain Atlas III Plus workstation. EEG signals were preprocessed to remove noise and artifacts, and features were extracted using a finite impulse response (FIR) filter in the double-time domain, focusing on changes in the power spectrum associated with AD. These features were then used to train and test three machine learning classifiers: the support vector machine (SVM), naive Bayes, and XGBoost. Among these, the XGBoost model demonstrated the highest accuracy, achieving a remarkable 96% accuracy in distinguishing between AD patients and healthy controls. The superior performance of the XGBoost model underscores the potential of EEG signal analysis combined with machine learning for the early detection of Alzheimer's disease. This approach provides a non-invasive and cost-effective diagnostic tool and offers significant promise for improving the timely diagnosis and management of AD. This study highlights the efficacy of leveraging advanced signal processing and machine learning techniques in the field of neurodiagnostics, paving the way for innovative solutions in the detection and monitoring of neurodegenerative diseases.

sciforum-097938: Anti-dementia effects of mansorin a, mansonone g, and 6-paradol in the okadaic acid-induced zebrafish model of alzheimer's disease

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Introduction

Dementia is a clinical syndrome mainly characterized by progressive cognitive decline. Alzheimer's Disease (AD), the most prevalent type of dementia, is a priority in research as stated by the World Health Organization, given the annual surge of AD cases and its high economic impact. With unknown causes, dementia remains incurable. Mansorin A (MA), mansonone G (MG), and 6-paradol (PD) are plant-derived compounds with potential in AD treatment.

Methods

MA, MG, and PD were administered chronically *via* immersion in concentrations of 1, 3, and 6 μg/L to the novel okadaic acid-induced zebrafish model of AD obtained by immersion of animals in 10 nM okadaic acid. A battery of behavioral tests was conducted to assess the effect of administered substances on short-term recognition and spatial memory (Novel Object Recognition and Ymaze tasks, respectively) and anxiety (Novel Tank Diving and Novel Object Approach tests) in the animal model. Following, biochemical analysis was conducted to assess the oxidative stress and acetylcholinesterase levels in the brain. *In silico* analysis of absorption, distribution, metabolism, and excretion (ADME) parameters was also performed.

Results

The obtained results indicate promnesic, anxiolytic, and acetylcholinesterase inhibitory properties of MA, MG, and PD, as well as antioxidant effects by increasing the activity of catalase, superoxide dismutase, reduced glutathione, and glutathione peroxidase while reducing the levels of carbonylated proteins and malondialdehyde. Analysis of ADME parameters indicates that MA, MG, and PD are blood-brain barrier permeant and are drug-like molecules.

Conclusions

The results pose MA, MG, and PD as promising anti-AD agents.

sciforum-096306: Calculation of Synergy to Discover the Multitarget Potential of Novel Combinations of Betanin, Betaine, and Quercetin against Alzheimer's Disease

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Alzheimer's disease (AD) is a rising pandemic that is estimated to affect up to 139 million people in 2050 along with other dementias. The failure of using mono-target therapy against Alzheimer's has shifted the focus towards multi-target approaches. Phytocompounds have complex chemical structures that enable them to target multiple pathways of disease. Our previous studies and studies from several other groups have emphasized the use of individual phytocompounds like Quercetin, Betanin, and Betaine for the treatment and management of AD. So, we hypothesized about a combinatorial therapy approach by making dual combinations of Quercetin, Betanin, and Betaine. We tested the antioxidant, anti-inflammatory, and anti-acetylcholinesterase potential of the individual compounds, as well as dual combinations, by performing in vitro assays. We then performed an enzyme (AChE) kinetics analysis to identify the mechanism of inhibition employed by each compound against AChE. From the results obtained, we calculated the drug–drug interaction-like synergy between these drug combinations by using mathematical models of their synergy. In this way, we were able to find combinations with higher antioxidant, anti-inflammatory, and anti-AChE activity, even when the dose was reduced. We then performed network pharmacology-based identification of multiple gene and pathway targets for our compounds in humans against AD. We conclude that these combinations have excellent multi-target potential and should be further tested in AD models to better understand their effects on AD pathology.

sciforum-098227: Distinct Huntington's aggregates differently impact viability and motility of *C. elegans; Atomic force Microscopy*

Ephraim Chidi Ezeigbo * and Justin Legleiter

West Virginia University

A broad range of neurodegenerative diseases, including Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's disease (HD), are associated with the aggregation of proteins into amyloid fibrils. For many amyloid-forming proteins, the aggregation process proceeds through a complex mixture of intermediates predominately comprising oligomers. Due to thecomplex heterogeneity associated with amyloid formation, it is difficult to assign specific toxic functions to different aggregate species, particularly when expressing aggregating proteins within cells or organisms. To overcome this challenge, a mutant Huntington protein [htt-exon1(46Q)], which readily aggregates and is associated with HD, was employed as a model system to create a protocol that exposes the N2 strain of *C. elegans* to well-characterized, specific aggregates to assess toxicity. Viause of controlled aggregation conditions and separation techniques, uniform populations of htt-exon1 (46Q) aggregates were obtained and characterized using atomic force microscopy and dynamic light scattering. Upon exposure to these different aggregate populations, the viability and motility of *C. elegans* were determined. Htt- exon1 (46Q) oligomers represented the most potently toxic aggregate form. Fibrils did not invoke any toxicity in N2 worms; however, exposure of *C. elegans* resulting in them expressing a nonpathogenic htt fragment that does not aggregate results of reduced viability. To demonstrate the utility of this approach, several additional experiments were performed with oligomers. First, chemically cross-linking htt-exon1 (46Q) oligomers and stabilizing oligomers via the incorporation of truncated small peptides derived from the first 17 amino acids of Huntington's disease induced toxicity differently. These representative methods of controlling the type of aggregate species introduced into a living system to assess toxicity and methods that alter that toxicity are discussed.

sciforum-104693: In vivo and In vitro characterization of gelatin/beeswax nerve conduit with placental stem cells in peripheral nerve injury

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Peripheral nerve damage is recorded as the most common traumatic consequence of accidental injuries; this leads to a low quality of life. The poor efficacy of treatments makes treating cases of peripheral nerve injury a challenge. Several studies have been conducted in order to elevate the situation. Tissue engineering techniques, biomaterial scaffolds, suturing, cell-based therapies, growth factors and exosomes are already being used. In this study, a nerve conduit was developed using a 1.25 mm silicone tube that was dipped 6 times in 10% gelatin solution of Na2HPO4 and 3 times in raw beeswax, prepared using double broiler method at a constant rate of 30 seconds cross-alternatively. It was dried for 24 hours and then characterized using scanning electron microscopy, high-performance liquid chromatography, FTIR-IR, electrical conductivity, cytotoxic assay and cell viability and tensile strength tests. Male wistar rats were used as animal models of peripheral neve injury, and the nerve conduit of gelatin/beeswax was applied and placenta cells were injected into it. The animals were analyzed for behavioral , physiological, managemental and activity changes at a gap of 3 weeks regularly. Histological changes were also observed that showed remarkable regeneration, axonal growth and activity restoration. This study aims at providing an efficient biomaterial treatment for peripheral nerve injury to enhance quality of life in patients.

sciforum-105060: Maraviroc, a CCR5 chemokine blocker, enhanced corticosterone release in a post-traumatic stress disorder model in rats: the effects of chronic stress and fear on the hippocampal CCR5/RANTES axis.

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Contextual fear conditioning (CFC) is a stress behavioural paradigm that resembles many characteristics of post-traumatic stress disorder (PSTD). It is well documented that PTSD is associated with inflammation; however, there is limited information on how inflammation contributes to the progresison and development of PTSD. Because PTSD is difficult to treat, the understanding of the inflammatory mediators involved in this pathology could favour better interventions against its resilience. In fact, higher IL-6 levels in CFC of susceptible rats prior to trauma can increase the PTSD susceptibility in rats. In this study, we have evaluated whether PSTD fear learning may increase CCR5/RANTES levels by chronic stress restraint (21 days of restraint, 6 h/day) and/or fear learning; these chemokines (CCR5/RANTES) were quantified by ELISA in synaptosomes from the hippocampus and rat prefrontal cortex. This PSTD model increases CCR5/RANTES at 24 h post-training, but chronic stress did not affect these chemokine levels. We also evaluted whether the CCR5 blockade by maraviros (a CCR5 chemokine blocker) before CFC training is able to prevent fear behavior and also normalize RANTES, IL-6, or cortisol release as compared to CFC-trained rats. Maraviroc (a CCR5 chemokine blocker) enhanced corticosterone release in this PSTD paradigm. The CCR5 blockade by mararviroc enhanced corticosterone release, which suggests a neurohormonal regulation of the CCR5 chemokine receptor in the rat hippocampus.

sciforum-098838: Monomyelic amyotrophy. A clinical case

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Introduction

Monomelic amyotrophy (Hirayama disease) is a rare form of non-progressive motoneuron disease caused by necrotic lesions of the anterior horns of the spinal cord. Purpose of the study. To evaluate the condition of the patient's leg muscles by electromyography.

Methods

A 17-year-old young man with complaints of weakness and fatigue in both hands (more pronounced on the right side) and weakness in legs when bending the head was examined. Clinical and neurological, electrophysiologic analysis, MRI of the head and neck while performing functional tests were performed. To assess muscle strength, the patient performed maximal dorsal flexion of the foot on himself, head straight and head down, while EMG was recorded from the anterior tibial muscles of both legs.

Results

MRI data revealed characteristic signs of monomyelic atrophy. Atrophy of the hand muscles on the right side, fascializations were clinically revealed. During neck flexion, there was weakness 4b in the extensors of the feet after 1 minute. The amplitude of the motor response of the tibialis anterior muscle during head tilt on the right decreased by 4 times, and on the left by 6 times, with a more pronounced decrease in strength in the upper extremities in the right arm than in the left. According to the literature, the "classical" variant of monomyelic amyotrophy is not characterized by sensory disorders, pyramidal symptoms, and involvement of leg muscles.

Conclusions

The use of electrophysiological methods of investigation along with neuroimaging methods allowed to establish a more accurate picture of the course of the disease.

sciforum-101884: Neuroprotective Epigenetic and DNA-Damage-Repairing Molecular Mechanisms of *Centella Asiatica* Extract (CAE) on Experimentally Induced Parkinsonism in Aged Sprague--Dawley Rats

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Introduction

Parkinson's disease (PD) is a degenerative disease causing motor and non-motor symptoms. Animal models reproducing the main cellular processes of PD, such as oxidative stress (OS), neuroinflammation, and DNA damage, which leads to dopaminergic neuronal loss. Studies documented that *Centalla asiatica* herbal extract enriched with antioxidants exerts cytoprotective effects against aging and age-related neurodegenerative diseases.

Materials & Methods

The present study was designed to investigate whether the CAE would ameliorate MPTP-induced neurotoxicity in aged SD rats. Aged male SD rats (26 months old) were divided into three groups: control, MPTP alone (20mg/kg b.wt, i.p, twice at 20 min intervals), and MPTP with CAE (300mg/kg b.wt and/or quercetin (QN) (100mg/kg b.wt, orally) for 21 days. We invesitgated the aqueous extract of CAE based on OS biomarkers , inflammation, oxidative DNA damage (8 OHdG), DNA, ATP, GSH, neurotransmitter (NT) levels, and DNA repair enzymes in discrete brain regions associated with PD.

Results

MPTP-intoxicated rats elicited a highly significant elevation in the concentration of $NO^{\bullet}$ (a biomarker of OS), inflammation (IL-6, IL-1β, and TNF-α), 8-OHdG, XO, nitric oxide synthase, NADPH oxidase, and PARP-1 (p0.001) when compared with controls. There was a significant decrease in total antioxidant capacity, ATP, GSH, DA, NE, and SN contents with animals treated with MPTP. The co-administration of CAE and/or QN significantly (p0.01) decreased biomarkers of OS and inflammation, as well as DNA repair enzymes, and significantly increased NT levels.

Conclusions

Knowledge of the epigenetic and molecular mechanisms involved in the neurodegeneration in this model is the key to identifying potential therapeutic targets for PD with antioxidants.

sciforum-086522: The effect of silicic acid and alcoholic beer intake on the excretion of chromium and vanadium and their deposition in the brains of mice chronically exposed to aluminium nitrate

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The effect of aluminium (Al) exposure and silicon (Si) intake on the levels of chromium (Cr) and vanadium (V) in mouse brains was studied. Six-week-old male NMRI mice were divided into four groups. Three groups received $Al(NO_3)_3$ at a dose of 450 μg/ml for three months; meanwhile, the fourth group only received deionised water. The first group received aluminium nitrate (Al group); the second group aluminium nitrate and silicic acid (50 mg/ml); and the third group aluminium nitrate and commercial beer. Metals were monitored by ICP-OES in the right hemibrain, faeces, urine and blood. V was only detected in the faecal samples, being significantly higher in the Al group (4.132 vs. 3.383, 3.100 and 3.315; groups 4, 2 and 3, respectively; all in μg/g; *p*-value=0.038). Conversely, lower and significantly lower levels of Cr were detected in the faeces (2.867 vs. 3.155, 2.270 and 2.550 μg/g; *p*-value=0.296) and blood (0.187 vs. 0.158, 0.197 and 0.211 μg/l; *p*-value=0.013) in the Al group, respectively, as well as in the urine (0.00047 vs. 0.00069, 0.00060, 0.00065 μg/μmol creatinine; *p*-value=0.311), suggesting a potential effect of Al intoxication on the metabolism of Cr. These unknown effects might explain the lower levels of Cr that were detected in the intoxicated animals' brains (0.346 μg/g). Thus, the intoxicated animals that were provided with Si showed Cr brain levels slightly higher than those in the Al group (0.360 and 0.352 vs. 0.346 μg/g; *p*-value=0.552). The consumption of beer/silicic acid appears to partially block the negative effects of aluminium ingestion on the normal metabolism of chromium.

sciforum-099668: Virtual Reality for Schizophrenia Symptom Regulation

kadir uludag

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Virtual reality (VR) has emerged as a promising tool for managing and regulating the symptoms of schizophrenia, offering innovative approaches to supplementing the traditional therapeutic interventions. By creating immersive, computer-generated environments, VR provides individuals with a safe and controlled space to engage in therapeutic exercises.

One novel VR method involves social skills training, which addresses the challenges individuals with schizophrenia often face in social interactions. VR simulations can recreate real-life scenarios, allowing patients to practice social cues, communication skills, and emotional recognition in a supportive environment. By repeatedly engaging in these simulated interactions, individuals can improve their social functioning and reduce anxiety in real-world social situations.

Another application of VR in schizophrenia treatment is cognitive remediation. Cognitive deficits are common in schizophrenia and can significantly impact daily functioning. VR-based cognitive training programs provide interactive exercises that target attention, memory, problem-solving, and decision-making skills. Through repeated practice and feedback within a virtual environment, individuals can enhance their cognitive abilities, leading to improved overall functioning and quality of life.

Additionally, VR has shown promise in treating hallucinations and delusions, core symptoms of schizophrenia. Virtual reality experiences can be tailored to replicate specific hallucinatory experiences, allowing individuals to confront and gain control over their perceptions. By gradually exposing patients to simulated hallucinations, therapists can guide them through coping strategies and cognitive restructuring techniques, ultimately reducing the distress associated with these symptoms.

sciforum-103796: Voice signal analysis for early detection of Parkinson's disease using machine learning techniques

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The early detection of Parkinson's disease (PD) is crucial for its effective management and treatment, as it can significantly slow disease progression and improve quality of life. One promising approach for early diagnosis is the analysis of voice signals, which can reveal subtle changes in phonetic features associated with PD. This study explores the use of machine learning techniques to identify PD at an early stage by leveraging a dataset from the UCI Machine Learning Repository, consisting of 147 phonetic samples from PD patients and 48 from healthy controls. The methodology involved preprocessing the data, selecting relevant features using a genetic algorithm, and addressing class imbalance with the Synthetic Minority Oversampling Technique (SMOTE). Principal Component Analysis (PCA) was employed for dimensionality reduction, followed by the application of Support Vector Machines (SVMs) and k-Nearest Neighbor (KNN) classifiers. Cross-validation was performed to evaluate model performance. The results indicate that the KNN classifier achieved the best accuracy of 96.11%, demonstrating its superior capability in distinguishing between PD patients and healthy individuals based on voice features. The high accuracy suggests that voice signal analysis, combined with advanced machine learning techniques, is a promising avenue for the early detection of Parkinson's disease. This research underscores the potential of non-invasive diagnostic tools in clinical settings, paving the way for further studies to refine and validate these methods for broader applications.

Session 6. Cognitive Neuroscience

sciforum-097906: Impact of Emotional Arousal and Stimulus Processing on Inhibitory Control: Insights from Virtual Reality

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Background

According to the dual-competition framework, inhibitory control is influenced by emotional arousal, with highly arousing stimuli potentially impairing response inhibition due to increased cognitive resource allocation toward stimulus processing. This study aimed to investigate how stimuli depicting fearful scenes affected inhibitory processing compared to non-fearful stimuli. Virtual reality (VR) was utilized to enhance emotional intensity, and two versions of the Go/No-Go task were employed: one with explicit processing of stimuli and another with masked stimuli requiring implicit processing.

Methods

Stimuli selection involved an image evaluation process, resulting in two task versions for the Go/No-Go paradigm. Sixty-four participants were randomly assigned to conditions involving exposure or no exposure to VR, combined with task version variations. Participants performed inhibitory tasks under these conditions to assess differences in inhibitory control influenced by stimulus type and processing method.

Results

Fear stimuli with higher arousal levels significantly impaired response inhibition compared to non-fearful stimuli. Explicit stimulus processing in the Go/No-Go task also showed greater inhibition impairment than implicit processing. Additionally, prior exposure to stimuli in VR conditions affected response times, indicating extended processing demands for inhibitory tasks.

Conclusions

This study confirmed that stimulus intensity, particularly emotional arousal, played a critical role in modulating inhibitory control. Fearful stimuli and explicit stimulus processing significantly reduced the ability to inhibit responses. Moreover, VR-induced stimulus exposure extended processing times, highlighting implications for understanding inhibitory processes under varying emotional and environmental conditions.

sciforum-101451: Sex differences in hippocampal learning and induced plasticity at CA1 synapses in infancy

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Introduction

We previously reported sex differences in the developmental trajectories of contextual learning function and found multiple critical periods for hippocampal function in male rats. Here, we focus on training-induced hippocampal CA1 synaptic plasticity in early childhood to analyze sex differences.

Methods

Male (n = 27) and female (n = 18) rats at 16-17 days of postnatal age were subjected to a hippocampal-dependent inhibitory avoidance (IA) task. CA1 neurons received inputs from CA3 and the entorhinal cortex (EC) via different synaptic pathways. Brain slices were then analyzed to assess CA1 synaptic plasticity, focusing on changes in the ratio of AMPA receptor- / NMDA receptor-mediated postsynaptic currents, and single-vesicle-induced miniature excitatory and inhibitory postsynaptic currents (mEPSCs and mIPSCs). Behavioral battery tests evaluated sensory, motor, and emotional functions.

Results

IA learning was established in females (P 0.01) but not in males, indicating sex differences in contextual learning ability without changes in basic sensory/motor functions. In the emotional state, females showed more sociability with others than males (P 0.05). Frequency of mEPSCs and mIPSCs decreased in males after learning (P 0.01), whereas mIPSCs frequency increased in females (P 0.05). Furthermore, AMPA/NMDA ratios increased in the CA3-CA1 and ECIII-CA1 pathways after learning, suggesting a predominance of AMPA receptor-mediated synaptic plasticity after learning (P 0.01). Unpaired t-tests were used to analyze the results.

Conclusions

Female infants showed faster development of hippocampal learning and induced plasticity than male infants, indicating a clear sex difference. These findings provide synaptic evidence for sex-specific development of contextual learning and training-induced plasticity at CA1 synapses.

sciforum-096875: A Functional Neuroimaging Study on the Sensitivity of Decision Making and Mental Workload to Hypoxia

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Introduction

Hypoxia, a state of oxygen deprivation, is common in respiratory diseases and brain injuries. It also affects healthy individuals exposed to extreme operating environments, such as high altitude or low barometric pressure situations. While impairments in cognitive processing and novelty detection have been investigated, there is a lack of observations on its influence on decision making and psychomotor workload, and about the neural networks involved in these functions.

Our study investigated the neurofunctional preparatory processes for a single/double choice button press during four different cue-target visuospatial attentional orienting tasks based on Posner's Attention Network Test and the effects of hypoxia on these processes.

Methods

Healthy participants underwent two experimental sessions in which they breathed either ambient air or 12.5% oxygen-reduced air while performing the four cueing tasks. EEG was recorded from 128 scalp sites and event-related potentials (ERPs), intracerebral sources and behavioural responses (RTs) were computed.

Results

Both the amplitude of pre-target ADAN and LDAP ERP components and post-target RTs were lower for the single choice condition. Moreover, hypoxia had detrimental effects on decision making during valid attentional orienting conditions. Activations in the right anterior cingulate cortex, left superior parietal lobule and dorsolateral prefrontal gyri were enhanced under hypoxia for the double-choice decision task.

Conclusions

Our findings indicate that preparatory processes for a single- or double-choice are associated with the activation of different brain networks more strongly active in the more demanding condition. Overall, hypoxia compromised decision making efficiency. Impaired decision-making erodes accountability, raising ethical concerns about individual responsibility.

sciforum-097898: A Single Session of the Beat Saber VR Exergame Does Not Improve Selective Attention or Attentional Blink: A Pre–Post Study

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Background

Several studies highlight the relevance of video games and virtual reality (VR) training in enhancing various attentional processes, specifically selective attention, cognitive flexibility, and attentional blink. Beat Saber, an action virtual reality game, has been used in previous studies to train visual attention, reporting significant effects on visual attention task scores. In our laboratory, we previously obtained significant improvements in dynamic visual acuity performance following one training session with Beat Saber.

Method

Thirty-nine university students were divided into three groups: (1) those trained with the Beat Saber VR exergame, (2) those exposed to a relaxing video using VR, and (3) a control group without any intervention. All the interventions lasted 20 minutes. A pre–post-intervention study design was implemented, applying two attentional tests: the Flanker task and the attentional blink task.

Results

The factorial ANOVA showed no significant differences between the groups in terms of improvement in the attentional tasks. However, significant differences were observed between the pre- and post-intervention assessments within each group, indicating some overall changes in performance over time, irrespective of the type of intervention. Training duration differences could be the reason for the discrepancies in the visual attention improvements between other studies and ours.

Conclusions

A single session of Beat Saber training does not produce an improvement in selective attention or attentional blink. Despite these results, it is important to continue studying the potential of VR in different contexts and with varied durations and frequencies of training sessions.

sciforum-102119: Brain Tumor Detection Using Convolutional Neural Networks

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Brain tumor detection is crucial for improving patient outcomes through early diagnosis and precise treatment planning. This research presents an in-depth study of advanced methodologies for detecting and classifying brain tumors using cutting-edge imaging techniques and machine learning algorithms. The study emphasizes magnetic resonance imaging (MRI) due to its superior contrast resolution in soft tissues, essential for identifying brain anomalies. Our approach leverages convolutional neural networks (CNNs), a deep learning architecture, for automated brain tumor detection. The model is trained on an extensive dataset of annotated MRI scans, employing data augmentation to enhance robustness and accuracy. The CNN architecture is optimized to extract relevant features and classify different brain tumors, including gliomas, meningiomas, and pituitary adenomas, with high precision. Performance evaluation is conducted using metrics such as accuracy, sensitivity, specificity, and the area under the receiver operating characteristic curve (AUC-ROC) . The CNN-based method demonstrates significant improvements over traditional techniques, achieving an accuracy exceeding 96%. Additionally, the incorporation of transfer learning techniques shows promise for adapting the model to various medical imaging tasks with minimal retraining. This research highlights the critical role of integrating advanced computational methods with medical imaging to improve the accuracy and efficiency of brain tumor detection. The findings contribute to enhanced clinical decision-making and patient care, underscoring the potential for machine learning to revolutionize medical diagnostics.

sciforum-099846: Math anxiety affects conscious and unconscious math performance

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Introduction

Mathematical anxiety (MA) causes worry and fear in performing mathematical tasks, potentially leading to the avoidance of math-related situations and careers. This study aimed to explore the correlation between event-related potentials (ERPs) during conscious and unconscious math performance and the level of MA.

Methods

This research involved 24 participants (13 females, mean age 21.4 years) that were assessed using a shortened MA rating scale (mean sMARS results: 60±19). Single-digit addition problems (large and small) were presented, followed by correct and incorrect answers in two experimental blocks with conscious and unconscious perception of arithmetic tasks. Spearman's rank correlation coefficient was used to analyze the correlation between sMARS results and average ERP amplituded in the 300–400 ms interval after the solution was presented.

Results

A moderate negative correlation (-0.450 r -0.650) was found between MA level and ERP amplitude in fronto-central leads in response to the correct solutions during conscious and unconscious small problem presentation. For the conscious presentation of large problems, a moderate negative correlation (-0.450 r -0.550) was observed. No correlation was found for the unconscious presentation of large problems or incorrect answers.

Conclusions

Increased MA levels corresponded to reduced ERP amplitudes for correct solutions, both consciously and unconsciously. It was previously established that arithmetic skill correlated with P300 amplitude for correct answers. High MA individuals tend to avoid math situations, potentially affecting their ability to extract answers from memory, leading to diminished N400/P300 arithmetic effect in both conscious and unconscious perception.

This study was supported by the RSF (grant № 23-78-01220).

sciforum-100494: Relationship between aging, isolation and lack of activity in society with reduction of polarized molecules in microtubules and appearance of Alzheimer's disease in Orch OR theory

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Background

In Orch OR theory, polarized molecules forming microtubules of brain neurons store information data in the form of quantum fields or spins of electrons and other spinors. The entanglement of molecules, as well as fields and spinors, increases the capacity of the brain to store information data. After a period of time, physical and environmental factors reduce the entanglement between molecules, fields and spins, and some molecules lose their ability to store quantum fields. As a result, the information data stored in these molecules are lost and the person suffers from Alzheimer's disease.

Purpose

To consider (1) the age dependency of Alzheimer's and its relation with polarized molecules in Orch OR model. To consider (2) the effect of the type of social activity on the entanglement between polarized molecules, neuronal signals and, later, Alzheimer's disease

Method

First, some mathematical calculations were carried out, and the dependency of entanglement between polarized molecules in time and electrical signals between neurons has been considered. Then, these theoretical results were tested experimentally by collecting the reports of people and also reports from previous investigations and comparing data with theory.

Result

The results of this study show that with increasing age, the rate of forgetting past events increases and gradually the person suffers from Alzheimer's. However, people who are more socially active and have to be responsible in society suffer from Alzheimer's later.

Conclusions

With increasing age, gradually, polarized molecules that have the task of storing information in the microtubules of brain neurons lose their polarization and as a result, the person suffers from Alzheimer's.

sciforum-098368: The precuneus is tuned to words that refer to time, not to space, whereas the IPS has no preferences

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Quantitative, temporal and spatial processes are proposed to be part of a magnitude system sharing the right intraparietal sulcus (r-IPS) as a common neural substrate (Walsh et al., 2003). Specificities for time and space are reported, identifying a role of the right Precuneus (r-Precuneus) in temporal estimations (Skye et al., 2023). Translating this evidence to the language domain, in line with the extended embodied knowledge framework, studies associated the IPS with the processing of quantity-related concepts (Catricalà et al., 2020). No evidence is available for time- and space-related concepts. Here we investigated the causal role of r-IPS and r-Precuneus in representing time- and space-related concepts using TMS.

Fifty-six time- and space-related nouns, matched for frequency, length, age-of-acquisition, emotional valence, and mean priming effect were selected. Priming to a category label (TIME or SPACE) modulated the neural activation prior to TMS and target presentation. Subjects had to indicate the target's category. Fifty-six congruent and 56 incongruent trials were presented for r-IPS, r-Precuneus, and sham-baseline (Vertex) sites. Twenty-two healthy subjects participated. We performed a repeated measure ANOVA on the priming effect with TMS site as within-subject factor.

For both time- and space-related concepts the r-IPS stimulation abolished the priming effect reported for the Vertex ($p=0.016$), whereas r-Precuneus ($p0.006$) stimulation was effective only for time-related concepts.

In line with the Magnitude theory (Walsh et al., 2003), results highlight the r-IPS as the shared substrate for linguistic stimuli connected to space and time. Instead, the r-Precuneus was tuned only for time concepts, which supports its role in temporal judgements.

Session 7. Clinical Neuroscience

sciforum-101684: Changes in the perception of the Müller-Lyer illusion in schizophrenic patients both at the start and during treatment

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Research in the literature suggests that patients with schizophrenia are particularly susceptible to the Müller-Lyer illusion and consider it a potential marker of vulnerability.

We hypothesized that the perception of the Müller-Lyer illusion might be influenced by the patient's mental state. To test this, we studied 12 patients with schizophrenia, aged 18 to 45 years, at both the second week (after the patient became available for contact and could perform cognitive tests) and the eighth week of therapy. Participants were asked to align two segments on a monitor screen to match in length. They were presented with both neutral segments of equal length and segments configured to produce the Müller-Lyer illusion.

Mental state was assessed using the PANSS scale. Only patients with positive symptom scores of less than 4 points were included in the study. Statistical analysis was conducted using a mixed regression model.

The study results indicated no significant differences in perception between patients at the second and eighth weeks of therapy, suggesting that the mental state during this period did not substantially influence the course of therapy. Our findings suggest that the perception of the Müller-Lyer illusion is not significantly influenced by the severity of the mental state, and that antipsychotic therapy does not appear to impact cognitive functions related to susceptibility to the Müller-Lyer illusion.

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sciforum-100334: Post-Earthquake Mental Health: Exploring Depression and Anxiety in Medical Students After the Kahramanmaras Earthquake

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Introduction

The impact of earthquakes on mental health, including increased depression and anxiety levels, is well known. The 2023 Kahramanmaras earthquake resulted in significant damage and loss of life. However, limited research has focused on the mental health issues related to this earthquake, and it remains unclear whether individuals indirectly affected by the earthquake, such as friends or parents, experience depression and anxiety.

Therefore, this study aimed to investigate the specific effects of the Kahramanmaras earthquake on the mental health of medical students. We specifically examined the levels of depression and anxiety they experienced during this period, considering factors such as gender, hobbies, smoking status, alcohol use, and exercise.

Methods

The study included medical students enrolled at Kars Kafkas University in Kars, Turkey. We used the Beck Depression and Beck Anxiety scales to assess depression and anxiety levels. Participants were categorized into two groups: those with family members affected by the earthquake and those without affected family members.

Results

Our research suggests that university students with family members affected by the Kahramanmaras earthquake may have had higher levels of depression and anxiety compared to unaffected students. Within the earthquake-affected group, close to half of the individuals were discovered to have moderate depression (45.71%).

Conclusions

The study results suggest that individuals who had family members impacted by the earthquake exhibited increased levels of depression and anxiety in contrast to those who did not have affected family members. However, it is important to note that there may be confounding factors influencing these results.

sciforum-101777: Cognitive Assessment for the Prediction of Transcranial Electrical Simulation Effects on Memory Improvement

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Introduction

Neuropsychiatric disorders, including Alzheimer's Disease (AD), impose substantial personal and financial burdens, and despite being one of the leading causes of death globally, treatment strategies are generally ineffective. The MEMORI Study (NCT05077826), a randomized double-blind clinical trial of older adults with and without Mild Cognitive Impairment (MCI), investigated the efficacy of transcranial electrical stimulation (tES) to improve learning and potentially mitigate the effects of dementia. This study investigated whether variation in treatment efficacy can be predicted by cognitive assessments given prior to treatment.

Methods

Cognitive assessments were used to evaluate cognitive function and impairment among participants who received either a sham (0.1 mA) or verum (2.0 mA) dose of tES. This analysis involved computing correlation coefficients to investigate the relationship between these cognitive measures and the scores from the PRETXT discovery learning task after training (Gibson et al., 2020).

Results

In the verum tES group, Trail Making Tests A and B showed significant positive correlations between learning task improvement and training ($r=0.4415$, $p=0.0030$ and $r=0.3270$, $p=0.0324$, respectively). In contrast, the sham tES group showed nonsignificant correlations ($r=0.1453$, $p=0.3468$ for Test A and $r=0.0446$, $p=0.7740$ for Test B).

Conclusions

Trail Making Test scores were found to have a significant correlation with learning task performance in participants receiving verum tES, but not sham. Further research will be needed in order for us to understand this relationship. In the meantime, these results suggest a simple and cost-effective strategy for predicting the beneficial effects of this neuromodulation technique on individual patients.

sciforum-096880: The Efficacy of Medical Interventions for Free-Floating Thrombus in Cerebrovascular Events: A Systematic Review

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Introduction

Since the management of free-floating thrombus (FFT), a critical clinical entity associated with an increased risk of stroke or transient ischemic attack (TIA), is controversial, we performed a systematic review of the efficacy of various medical interventions in the management of FFT and factors associated with FFT resolution and recurrence.

Methods

We included studies from PubMed and EMBASE that reported patients diagnosed with FFT-related stroke or TIA who received anticoagulation or antiplatelet therapy or a combination. The primary outcomes were stroke recurrence and thrombus resolution. Statistical significance was determined at p0.05 using Fisher's exact test, the chi-square test, the Mann–Whitney test, or the Kruskal–Wallis test.

Results

Our review (61 studies) included 179 patients diagnosed with FFT with a median follow-up duration of 7 months. Resolution of the thrombus occurred in 117 (65%), while 20 (12.6%) experienced recurrence, predominantly manifesting as TIAs. The incidence of cardioembolism was greater in the patients with unresolved thrombi (7.7% (n=9), p=0.025). Patients who received combination therapy involving antiplatelet agents, anticoagulants, and statins showed a higher probability of clot resolution ([OR] 11.4; 95% [CI] 1.436-91.91; p=0.021) compared to those treated with anticoagulant or antiplatelet therapy alone ([OR] 1.201; 95% [CI] 0.601-2.40; p=0.604, [OR] 0.780; 95% [CI] 0.317-1.92; p=0.588), respectively. Notably, ulcerated plaques predicted recurrence ([OR] 8.2; 95% [CI] 1.02-66.07; p=0.048).

Conclusions

Combination medical therapy of antiplatelets, anticoagulants, and statins is superior to anticoagulant or antiplatelet therapy alone. Moreover, the identification of ulcerated plaques as a significant predictor of recurrence underscores the importance of targeted interventions in high-risk patients.

Session 8. Molecular and Cellular Neuroscience

sciforum-098281: The impact of a protein phosphatase 2A inhibitor on glioblastoma and neurodegeneration

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Introduction

Protein phosphatase 2A (PP2A) is a potential target for treating inflammation, neurodegeneration, and cancer. Reduced levels of PP2A are associated with neurodegeneration, along with increased levels of endogenous PP2A inhibitors. In cancer treatment, PP2A is a tumor suppressor, the inhibition of which hyperactivates multiple oncogenic signaling pathways and could be lethal to cancer cells particularly in combination with other anticancer drugs.

Methods

The effects of PP2A inhibitor (LB-100) alone and in combination with either Wee1 kinase inhibitor (adavosertib), paclitaxel, or doxorubicin were assessed on primary human glioblastoma grade 4 cells. The methodology included high-throughput imaging with ImageExpress PICO, real-time quantitative cell analysis with xCELLigence, and cell death induction analysis with flow cytometry. We conducted a behavioral study using C57BL/6J mice to assess cognitive deficiencies after treatment with LB-100. The mice received intraperitoneal injections of LB-100 at a dose of 1.5 mg/kg on days 1, 3, and 5, repeated in 5 cycles.

Results

Our initial findings indicate that glioblastoma cells were sensitive to LB-100, while its combinations with adavosertib and doxorubicin were synergistic. Additionally, continuous LB-100 treatment for 3 weeks resulted in significant body weight loss but did not show any noticeable cognitive changes.

Conclusions

It is important to investigate the effects of PP2A inhibition on neurodegeneration to assess its potential as a cancer therapy with minimal impact on cognition.

sciforum-098419: The Role of Non-Coding RNAs in Synaptic Plasticity and Neurodegenerative Diseases—A Review

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Introduction

Non-coding RNAs (ncRNAs), including long non-coding RNAs (lncRNAs) and microRNAs (miRNAs), are essential for synaptic plasticity, critical for learning and memory (Khodayi-Shahrak et al., 2022). The dysregulation of ncRNAs is linked to neurodegenerative diseases like Alzheimer's and Parkinson's, affecting synaptic plasticity and disease progression (Khodayi-Shahrak et al., 2022; Wu & Kuo, 2020). ncRNAs also play roles in disease-specific processes, such as HTT aggregation in Huntington's disease and amyloid-beta plaque formation in Alzheimer's, indicating their potential as diagnostic biomarkers and therapeutic targets.

Methods

Expression profiling: RNA sequencing enables detailed profiling of the ncRNA expression in various tissues and disease states, enhancing our understanding of its roles in disease mechanisms and its therapeutic potential (Beylerli et al., 2020). However, standardizing the data analyses remains challenging (Onoguchi-Mizutani et al., 2023; Beylerli et al., 2020).

Bioinformatics: Tools like UClncR and Pinc predict and annotate ncRNAs from sequencing data, facilitating the exploration of their regulatory networks and disease associations (Schmal et al., 2022; García-Fonseca et al., 2021). Machine learning aids in classifying ncRNA expression profiles, crucial for disease diagnosis and personalized medicine (García-Fonseca et al., 2021; Fagan & Pfeiffer, 2022).

Conclusions

Non-coding RNAs are pivotal in neurodegenerative diseases, impacting synaptic function, neuroinflammation, and disease progression. Advances in RNA sequencing, bioinformatics, and functional studies highlight their potential as diagnostic biomarkers and therapeutic targets. Ongoing research is essential to validate these findings clinically and improve ncRNA-based therapies, promising significant advancements in managing neurodegenerative diseases. Exploring ncRNA modulation by phytochemicals presents a novel therapeutic approach, emphasizing the evolving landscape of ncRNA research.

sciforum-101906: 16Ch BDD-MEA devices: solid tools for the amperometric determination of serotonin released by exocytosis in human platelets

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Introduction

Amperometry is an electrochemical technique that allows the release of oxidizable amines by exocytosis to be studied. Serotonin is a neurotransmitter involved in the control and regulation of motor activity, body temperature, appetite, perception, cognitive function, sexual appetite, emotions and mood. It is important to know how serotonin is released directly in human cells.

Methods

We used novel boron-doped diamond 16-microelectrode array devices ("16Ch BDD-MEA")[1,2] to carry out amperometric measurements of serotonin release by exocytosis from human platelets. These cells store 90% of the blood serotonin. They are an easy cell model obtained from blood samples. We studied serotonin exocytosis in two different types of "16Ch BDD-MEA" devices: opaque on silicon substrates and transparent on quartz substrates.[1,2]

Results

We detected the exocytosis of serotonin as typical positive deflections called secretory spikes. From these spikes, we could extract kinetics parameters such as Imax (maximum oxidation current, in pA), $t_{1/2}$ (spike width at half maximum, in ms), Q (quantum size or spike net charge, in pC) and ascending slope of spike (in pA/ms). Studies were carried out under basal conditions and after loading the platelets with 10 µM serotonin for 2 h to explore the uptake mechanisms.[1,2]

Conclusions

"16Ch BDD-MEA" systems are an effective tool for quantitatively studying exocytosis of neurotransmitter serotonin from human platelets.

References

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sciforum-098462: 24-hydroxycholesterol prevents pronociceptive effects of ATP in the rat trigeminovascular system

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Introduction

Cholesterol is a key element of cell cytoplasmic membranes. Cholesterol can oxidize into oxysterols, including 24-hydroxycholesterol (24-HC), which crosses the blood-brain barrier and affects various systems, embedded in cytoplasmic membranes or directly through membrane receptors. Meningeal afferents of trigeminal (TG) nerve is a site of nociceptive signaling origin in migraine headache. ATP which releases from endothelial cells and nerve endings plays a key role activation TG afferents directly and through degranulation of mast cells (MC). This work addresses the effect of 24-HC on trigeminal nerve afferent activity and MC in meninges of rats.

Methods

TG electrical activity and the morphology of MC were studied in a rat hemi-skull preparation (P30–40).

Results

Application of ATP (100 μM) increases frequency of TG action potentials (APs) 5 times compared to its baseline activity (n = 6). Incubation of hemiskull preparation in 24-HC (1 μM) for 20 or 40 min did not affect the background AP frequency, however decreased ATP effect (AP increased 3 times). MC degranulation promotes release of proinflammatory mediators which directly activate TG afferents or induce sensitization. ATP (100 μM) increased the degree of MC degranulation to 11±3.3% (n=10) compared to control values of 1.9±0.87 (n=5). Preincubation in 24-HC suppressed the ATP effect, reducing the fraction of degranulated mast cells to 5±1.26 (n=4).

Conclusions

24-hydroxycholesterol reduces pronociceptive effects of ATP in TG afferents, and increases the stability of the MC in meninges thus providing protective properties in trigeminovascular system.

The work was carried out with funds from the Strategic Academic Leadership Program (PRIORITY 2030)."

sciforum-101754: Analysis of differentially expressed miRNAs targeting mitochondrial apoptosis genes in glioblastoma compared to astrocytoma

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Glioblastoma (GBM) is the metastatic stage of astrocytoma (ATC) in which several pathways act in a tumorigenic role, including apoptosis, regulated by other underlying mechanisms and molecules such as microRNAs (miRNAs). The aim of this study was to search for differentially expressed miRNAs (DEMs) in GBM when compared to ATC that may be related to the role of apoptosis. miRNAs targeted by apoptosis genes were selected using miRTargetLink 2.0. Apoptosis genes were selected from the MitoXplorer 2.0 platform, with the main aim of analyzing genes from the intrinsic (mitochondrial) pathway. Thus, differential expression analysis (DEA) was performed on 155 GBM samples and 194 ATC samples from TCGA in the R environment to check for differentially expressed miRNAs (DEMs) related to apoptosis genes. We subdivided those that are strongly validated according to miRTargetLink and both strong and weak validation. Three DEMs strongly validated were upregulated (hsa-miR-210, hsa-miR-221, and hsa-miR-145), but none were downregulated. In the broader search, besides the three DEMs highlighted, it is worth mentioning the upregulated hsa-miR-27b, while three were found to be downregulated (hsa-miR-657, hsa-miR-573, and hsa-miR-7158). The target gene in common between the four upregulated DEMs is *BNIP3*, a pro-apoptotic gene, suggesting a suppression of the mitochondrial apoptotic pathway in GBM compared to ATC. Regarding the downregulated genes, no common target genes were found. Thus, in addition to indicating seven target miRNAs to be studied, our work also indicates a target gene that may be correlated with a dysregulation of apoptotic activity in GBM.

sciforum-098465: Carbon monoxide increases TRPV1-mediated activity of rat trigeminal afferents through activation of adenylate cyclase

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Migraine is a prevalent neurological disorder. The anatomical structure responsible for the pain caused by migraine is the trigeminovascular system. Carbon monoxide (CO) is a gas that can induce headache due to its toxicity, but when produced endogenously can regulate cerebral blood flow, nociception and neurotransmission; however, its role in the trigeminovascular system has not been investigated. The aim of our study was to analyze the effects of exogenous CO on the TRPV1 receptor-mediated activity of the rat TG nerve.

Action potentials (APs) of the trigeminal nerve were recorded using na extracellular electrode in a rat hemi-skull preparation. Capsaicin (1 μM) was used as an agonist of TRPV1 receptors; CORM-II (60 μM) was used as a CO donor, and MDL 12,330A (10 μM) was used as an inhibitor of adenylyl cyclase.

In control conditions, trigeminal nerve afferents demonstrated spontaneous regular activity. The application of the CO donor CORM-II resulted in a significant increase in the frequency of APs. The application of capsaicin induced a significant increase in the frequency of APs, which persisted for approximately one to two minutes until the TRPV1 receptors became desensitized. Application of capsaicin after incubation in CORM-II increased the duration of the capsaicine effect to 4-6 minutes. Preliminary inhibition of adenylyl cyclase by MDL prevented this effect.

In conclusion, the CO donor has pro-nociceptive effects on the afferents of the trigeminal nerve, and promotes TRPV1 receptor-mediated activity through adenylate cyclase. Further investigation is necessary to reveal the mechanisms of CO action in the trigemino-vascular system and its impact in nociception.

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sciforum-101752: Differential expression analysis shows upregulated miRNAs that target *PXN* gene in glioblastoma

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Glioblastoma (GBM) is the metastatic form of astrocytoma (ATC), and what is known about its biological mechanism in relation to non-coding RNA (ncRNA) is still unclear, especially in relation to microRNAs (miRNAs). Therefore, this research studies the presence of differentially expressed miRNAs (DEMs) in GBM compared to ATC to assess how these ncRNAs may behave in this type of metastatic neoplasm. Differential expression analysis (DEA) was performed on 155 samples of primary GBM and 194 samples of primary ATC tumor in miRNA data from TCGA. A DESeq2 package was used and DEMs were considered with Log2FoldChange = 1 (downregulated -1 and upregulated > 1), and the p-value was adjusted using the Benjamini--Hochberg (BH) method (0.05). For functional verification and target gene binding, we took the DEMs to miRTargetLink 2.0, and only strongly validated miRNAs were accepted. Three DEMs were found to be upregulated (hsa-miR-210, hsa-miR-27b, and hsa-miR-145), while two were downregulated (hsa-mir-573 and hsa-miR-125b-1). After the input of the DEMs into miRTargetLink 2.0, one gene appears to be regulated by two of the upregulated miRNAs (hsa-miR-145 and hsa-miR-27b): the *PXN* gene. *PXN* is associated with glial cell junction and adhesion, promoting tumor invasion and, in glioma, this gene has been shown to be upregulated. Interestingly, in our study, *PXN* did not show any increase between GBM and ATC, which may indicate no significant difference in expression with the evolution of glioma. Here, we suggest five DEMs and a target gene of two of them that should be further explored.

sciforum-098469: Effect of prenatal hyperhomocysteinemia on the development of NMDA receptors in the hippocampus in the early postnatal period

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Homocysteine is a sulphur-containing amino acid synthesised from methionine. An increase in homocysteine concentration during pregnancy has been linked to an elevated risk of neuropathological diseases. The hippocampus, which plays a pivotal role in numerous functions, represents a crucial area of focus in understanding the effects of hyperhomocysteinemia. This study aimed to investigate the impact of prenatal hyperhomocysteinemia on the development of NMDA receptors in the early postnatal period. The experiment was conducted on Wistar rats. Pups with prenatal hyperhomocysteinemia were born from females who received daily methionine with food. Horizontal slices of the hippocampus were obtained from the rats at age P10-11. CNQX and bicuculline were used to block AMPA and GABA receptors, respectively. The whole-cell patch clamp method was employed to record evoked responses. The stimulation protocol comprised five bursts of five pulses at a frequency of 100 Hz, with an interval of 200 ms between bursts. Biexponential analysis was employed to analyse the decay phase, resulting in a significant reduction in the fast component of decay and an increase in the slow component of decay in the experimental group compared to the control group. Concurrently, no considerable alterations in the amplitudes of peaks normalised to the first peak were observed. The results may indicate a change in the subunit composition of hippocampal NMDA receptors, which may indicate a disruption in the transition from GluN2B and GluN2D (slow) subunits to GluN2A (fast).

sciforum-098385: Excitability of meningeal trigeminal nerve afferents in Dopamine-transporter knock-out (DAT-KO) rats

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Introduction

Migraine is a disorder that comes with severe pain syndrome, and its molecular mechanisms are unstudied. The trigeminal (TG) system is considered a source of pain signals in migraine, since the activation of trigeminal nerve afferents leads to nociceptive signaling and headache. Endogenous neurotransmitters like ATP and serotonin can contribute to nociceptive signaling in this structure, but the role of dopaminergic signaling remains unclear

Methods

The activity of TG afferents was recorded using the isolated rat hemi-scull preparation (male rats, P 40-45, Wistar and DAT-KO groups). To analyze the excitability of TG afferents, we applied a high-potassium-containing solution (KCl 5 mM, 10 mM, 25 mM and 50 mM). KCl induces membrane depolarization and increases the rate of action potential (AP) generation; therefore, it can be used to evaluate the level of excitability.

Results

In rats from the control group (Wistar rats), the minimal concentration of KCl that significantly increased frequency of APs was 25 mM (from 282±60 APs per 5 min to 816±110 APs per 5 min; n= 6; p=0.009). In DAT-KO rats, the baseline frequency of APs was higher at 956±168 APs per 5 min; KCl (5 mM) significantly increased the frequency of APs up to 1349±169.5 APs per 5 min (n=6, p=0.036), as did KCL 10 mM (from 1247±112 APs per 5 min to 3364±1562 APs per 5 min, n=6, p=0.03).

Conclusions

The TG nerve of rats from the DAT-KO group exhibited increased sensitivity to KCL application, indicating higher excitability.

The study is supported by Russian Science Foundation #23-15-00328.

sciforum-103206: Inhibition of CYP2D enzymes in the brain reduces oral oxycodone-induced conditioned place preference in rats

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Aim

Oxycodone is a widely used and misused opioid analgesic. CYP2D metabolizes oxycodone; our aim was to investigate brain CYP2D inhibitor pretreatment on oxycodone reward using conditioned place preference (CPP).

Methods

Male Wistar Han rats were habituated to CPP apparatus for 30 minutes. The next day, rats were allowed to explore the apparatus for 60 minutes. The following day, and mid-way through conditioning, rats were pretreated ICV with the CYP2D inhibitor propranolol or vehicle. The next day rats received oxycodone (3 mg/kg) or water via gavage and were confined to one compartment for 60 minutes. The treatment and compartment were alternated daily. Rats then received two 60 min drug-free post-tests and a state-dependent test (oxycodone 3 mg/kg) over three days. CPP was defined as an increase in time in the oxycodone versus water-paired compartment.

Results

In both experiments, little consistent CPP was observed in post-test 1. However, in experiment 1, in post-test 2, and the state-dependent tests, there was CPP in the vehicle-pretreated rats ($p=0.047$ and $p=0.038$) but not in the inhibitor-pretreated ($p=0.742$ and $p=0.283$) rats. Likewise, in experiment 2, in the post-test 2 and state-dependent tests, there was CPP in the vehicle-pretreated rats ($p=0.021$ and $p=0.001$) but not in inhibitor-pretreated ($p=0.440$ and $p=0.387$) rats. A trend for CPP ($p=0.058$) persisted in the vehicle-pretreated rats but not the inhibitor-pretreated rats for 22 days.

Conclusions

The CYP2D inhibitor blunts oral oxycodone-induced CPP, indicating that variations in the brain CYP2D metabolism of oxycodone may contribute to inter-individual differences in oxycodone misuse liability.

sciforum-101806: LncRNA *JINR1* regulates neuronal cell death and flavivirus replication by regulating the *miR-216b-5p* target gene.

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Introduction

CNS infections caused by flaviviruses, such as Japanese encephalitis virus (JEV) and West Nile viruses (WNV), lead to substantial neuroinflammation and neuronal apoptosis. Recent advancements in high-throughput sequencing techniques have revealed the emergence of numerous long non-coding RNAs (lncRNAs) as key regulators of viral infections. However, the precise role of lncRNAs in governing neuroinflammation and neuronal cell death during flavivirus infection remains inadequately understood. In our previous work, we demonstrated that the lncRNA *JINR1* interacts with RNA binding protein (RBM10) and NF-κB, activating NF-κB target genes to enhance flavivirus-induced neuronal cell death and viral replication.

Methods

Cell culture, virus infection, titration, qRT-PCR, cloning and transfections, ChIP, Western blotting, and the dual luciferase assay were used.

Results and Conclusions

We found that *JINR1* reduces the levels of mature, primary, and precursor miR-216b-5p in human neuronal cell lines. Mechanistically, *JINR1* recruits H3K27me3 marks, reduces H3K4me3, and diminishes RNA polymerase-II recruitment at the miR-216b-5p promoter, thereby transcriptionally inhibiting the expression of miR-216b-5p. Furthermore, through dual-luciferase reporter assays, we demonstrated that *JINR1* acts as a molecular sponge for miR-216b-5p, upregulating GRP78 expression through a competing endogenous RNA (ceRNA) regulatory mechanism. We are the pioneers in elucidating the regulatory function of *JINR1*, which involves suppressing the transcription of miR-216b-5p and serving as a ceRNA. Interestingly, we found that miR-216b-5p negatively regulates virus replication in a human neuronal cell line due to the presence of multiple binding sites in the viral genome.

sciforum-101929: Neuroprotective Effects of Selected Natural Ergogenic Antioxidant Poly(ADP-Ribose)Polymerase-1 Inhibitors Against Experimentally Induced Alzheimer's Disease in Aged Rats

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Introduction

Oxidative stress (OS), inflammation, and ultimate irreversible membrane molecular mitochondrial damages and genome instabilities are implicated in aging and age-related progressive neurodegenerative diseases (NDDs), such as Parkinsonism, Senile Dementia and Alzheimer's Disease (AD). α-Lipoic acid, acetyl-L-carnitine, coenzyme-Q, and niacin are iron-chelating antioxidant ergogenic-aids which play a pivotal role and exert cytoprotective effects against innumerable neurodegenerative diseases (NDDs). The ICV injection of streptozotocin (STZ) leads to neurodegeneration. This present study is used to estimate the neuroprotective effect of selected natural poly(ADP-ribose) polymerase-1 (PARP-1) inhibitors on the biomarkers of OS and genome instability, inflammation, and DNA repair enzymes in STZ-induced neurotoxicity.

Materials and Methods

Male aged albino rats (24 months old, 350 gm body wt) were pretreated with α-lipoic acid and/or, acetyl-L-carnitine, nicotinamide, and coenzyme-Q (started 3 days prior to STZ) (100mg/kg b.wt, i.p for 21 days), followed by bilateral i.c.v injection with the DNA-destabilizing genotoxin STZ (100mg/kg b.wt). At the end of the 21 days, the hippocampus was dissected-out, and relevant biochemical parameters were estimated.

Results

The combined application of ergogenic antioxidants mitigated the toxic onslaught of SZN-induced neurotoxicity and exerted neuroprotection by significantly reducing MDA, 8-OHdG, AChE activity, IL-6, TNF-α, XO, NOS, the augmentation of antioxidants, ATP, DNA and NTs, and the modulation of PARP-1. PARP-1 expression was found to increase exponentially with the severity of OS and was found to decrease significantly with decreased OS.

Conclusions

The combined application of ergogenic antioxidants, such as α-Lipoic acid, acetyl-L-carnitine, coenzyme-Q, and/or niacin, will be effective in the treatment and/or management of progressive NDDS (such as AD).

sciforum-101817: The correlation between prenatal depression, inflammation, and gut microbiota: an integrative analysis

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Prenatal depression represents a common psychological illness that affects women during pregnancy. The gut--brain axis, which encompasses bidirectional communication between the gut and the brain, is postulated to contribute to the development of depression.

This study aims to understand the relationship between intestinal microbiota, inflammation, and depression during pregnancy using a bioinformatics approach.

A total of 220 differentially expressed genes (DEGs) associated with prenatal depression and intestinal inflammation and with a fold change > 1 and an adjusted *p-value* 0.05 were selected from different databases and scientific publications. The genes were analysed using STRING software to construct a PPI network, SRplot was used for GO analysis and for the identification of biological functions, and finally MetaboAnalyst was used for the analysis and interpretation of metabolomics data in biological systems.

The results demonstrated the existence of an interaction protein--protein network comprising 205 genes, which led to the identification of 16 key genes involved in neuroinflammation and immune regulation processes. The key pathways identified included cytokine--cytokine receptor interaction, IL-17, and MAPK signalling. A relationship was predicted between DEG and metabolites such as cortisol, serotonin, and tryptophan in cases of prenatal depression and neuroinflammation. Gut dysbiosis during pregnancy can potentially increase intestinal permeability, which may subsequently trigger immune responses and brain neuroinflammation.

This study has identified pivotal genes that contribute to our understanding of the molecular mechanisms underlying the development of prenatal depression and may serve as potential targets for early detection, prevention, and treatment.

sciforum-098517: The neuroprotective role of Hsp70 in the enhancement of antioxidant defense in the neurons

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Introduction

Proteins in the HSP70 class have been known for their neuroprotective properties for a long time. However, the mechanisms by which they exert their effects are not fully understood. Therefore, we aimed to determine how HSP70 contributes to optimal antioxidant protection of rat cortical neurons during cerebral ischemia/hypoxia.

Methods

We simulated neurodestruction in vitro by adding 80 μmol/L of 1-chloro-2,4-dinitrobenzene (CDNB) (a toxic amount) and 100 μmol/L of glutamate (modeling glutamate excitotoxicity) to neuronal suspensions. Brain thiol–disulfide system status was assessed by fluorimetry according to reduced glutathione and oxidized glutathione content. The spectrophotometric method was used to measure the levels of free SH groups and glutathione reductase, glutathione peroxidase, and glutathione transferase activities. A solid-phase ELISA method was used to determine the HSP70 levels.

Results

When CDNB was administered to the neurons in vitro, there was a decrease in cell viability, a depletion of cytosolic and mitochondrial GSH pools, a significant increase in ROS, and decreased HSP70 levels. Administration of HSP70 to the neurons preincubated with CDNB resulted in an increase in GSH levels and a decrease in ROS. HSP70 administration increased the functional activity of the glutathione system in the neurons.

Conclusions

HSP70, proteins with pronounced neuroprotective properties, mobilize antioxidant resources in the neurons under ischemic/hypoxic conditions, preventing the development of oxidative stress by increasing cytosolic and mitochondrial glutathione levels.

sciforum-101763: The role of the liver--brain axis in a rotenone-induced rat model of Parkinson's disease

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Introduction

Recent studies investigate potential axes between the brain and peripheral organs that could be related to neurodegeneration. Emerging evidence showing the importance of the liver--brain axis in the development and prognosis of neurodegenerative diseases points to the liver as a possible critical organ in the neurodegeneration process. The present study on gene expression in the brain and liver aims to unveil molecular pathways involved in Parkinson's disease (PD).

Method

Basic levels of the cerebral and hepatic expression of genes related to α-synuclein production and transport, oxidative stress, and inflammation were assessed to reveal potential targets involved in the communication of both organs in rotenone-treated rats via a rodent model of PD as compared to control rats. Total RNA was extracted from brain and liver tissue, and the gene expression of *SNCA, Nrf2, NF-κB, DJ-1, Atp13a2, LRRK2, PARK2, LRP-1 PINK1, IFN-γ,* and *TNF-α* was determined by qPCR. Expression levels were normalized to the housekeeping gene, and the relative expression levels of their mRNAs were determined using the ($2^{-\Delta\Delta ct}$) method.

Result

Several genes affected in the liver of the rotenone treatment group, as compared to the control group, also demonstrated altered brain expression.

Conclusions

The study suggests that changes in the liver may be involved in pathological conditions linked to PD and supports research on peripheral markers related to the liver--brain axis in this disease.

Session 9. Neurorehabilitation

sciforum-098432: "Dual Task Neglect System: AR-Gamified Assessment and Rehabilitation Application for Hemispatial Neglect"

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Introduction

Hemispatial neglect post-right middle cerebral artery (MCA) stroke can be effectively addressed with spatial awareness rehabilitation techniques, such as Augmented Reality (AR), which utilize gamification to stimulate the neglected side, enhance patient engagement, and potentially improve outcomes. This study introduces an AR-based Dual-Task Neglect System (DTNS) specifically designed to rehabilitate hemispatial neglect.

Methods

The DTNS comprises two tasks aimed at assessing and rehabilitating hemispatial neglect in real-world settings. Task 1 involves a dragon navigation game where patients use a joystick to guide a dragon toward moving crystals (n=3) of varying speeds and colors, projected into their neglected visual field in real space, which helps clinicians evaluate the extent of neglect. Task 2 is a reward-based rehabilitation coin collection game where patients use touch input to gather coins appearing in real space within a set time. Performance is based on coins collected. Task 1 is reassessed after Task 2 to track improvements. The system's functionality and usability were tested on healthy participants (n=13) aged 17-65, with feedback guiding app refinements. Future work involves testing hemispatial neglect patients.

Results

Younger participants (17-40) found both tasks to be engaging, manageable, and motivating, with no adverse effects observed. Older participants (41-65) also found the tasks engaging, though the coin collection task was considered moderately challenging. All participants perceived DTNS as more motivating and engaging compared to traditional therapies.

Conclusions

The DTNS demonstrates potential as a motivational tool for hemispatial neglect rehabilitation, engaging patients through targeted body movement stimulation and potentially enhancing spatial awareness over time.

sciforum-098396: The influence of neuromodulation effects on the functional state of the neuromotor apparatus of the soleus muscle in middle-aged male rats under conditions of long-term hindlimb unloading

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The study of the nature of motor pathologies is one of the important area in physiology and medicine. The purpose of this work was to assess the functional state of the neuromotor apparatus of the soleus muscle (SM) in middle-aged male rats under conditions of long-term hindlimb unloading (HU). Experiments were carried out in strict accordance with accepted bioethical standards. The animals were divided into 3 groups: hinlimb unloading (HU), HU with magnetic stimulation (HU+MS) and with electrical stimulation of the spinal cord (HU+ES). Parameters of motor and reflex responses were recorded. The threshold of the SM reflex response in the HU group was reduced to 81±8% (p0.05), in the HU+ES group - 77±10% (p0.05), in the HU+MS - 73±16% (p0.05). The amplitude of the SM H-response in the HU group increased to 130±15% (p0.05), in the HU+ES group - 121±9% (p0.05), in the HU+MS group - 120±10% (p0.05). In the HU group, the amplitude of the M response was 73±11% (p0.05), in the HU+ES group - 76±9% (p0.05), in the HU+MS group - 70±15% (p0.05). Thus, during long-term hindlimb unloading, we recorded an increase in the reflex excitability of the spinal motor center of the SM. And also we found that spinal cord stimulation prevented changes in the threshold of the M-response of the SM, but did not exclude a decrease in amplitude. The research was funded by a grant from the Russian Science Foundation and the Academy of Sciences of the Republic of Tatarstan under project No. 23-25-10065.

sciforum-101846: Ecological Assessment of Executive Functions in Grocery Shopping: A Pilot Study for ABI Training

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Introduction

Acquired brain injury (ABI) can significantly impair executive functions (EFs), which are essential for controlling and regulating actions. This impairment makes everyday tasks, such as grocery shopping, particularly challenging for individuals with ABI. This study aims to conduct a pilot investigation to analyze the shopping strategies of control individuals without ABI. The objective is to adapt this ecological assessment method for individuals with ABI and design an EF training program.

Method

For the pilot study, 16 subjects were recruited through word-of-mouth and social networks. The sample included men and women aged 18 to 65 years without brain damage or neurological pathologies. Two tools were implemented to register participant performance. A supermarket plan was uploaded to the Samsung photo editor, where participants' routes were mapped, providing graphical information about their performance. A list of products was created on Notion to record which products were collected and when, facilitating detailed analysis of participant performance during the shopping task.

Results

The mean and standard deviation of section entries (M=1.42, SD=0.5), products acquired (M=12.9, SD=3), and total shopping time (M=16.11, SD=4) were obtained. The use of these tools enabled precise tracking of participant actions, confirming the feasibility of the method.

Conclusions

The method of ecologically evaluating EF and shopping strategies, supported by these tools, is feasible and provides valid information for cognitive skills training in ABI individuals. This pilot study offers promising results for future interventions.

sciforum-098585: Heart Rate Variability and Adaptation Capabilities of Badminton Players of Different Ages

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Heart rate variability (HRV) analysis is one of the actively developing areas of physiology and functional diagnostics, as it allows the functional condition of the vegetative status, as well as the condition of adaptation mechanisms under stress loads, to be objectively assessed. The aim of the study is to investigate changes in heart rate variability in badminton players of different age groups during an orthostatic test. Electrocardiograms were recorded using a PowerLab (ADInstruments) installation throughout the study protocol. Processing was performed using the built-in ECG analysis module in the Lab Chart Pro 8.0 software. The effects of HRV changes were assessed every 10 seconds. In the age groups of 8-10 years (n = 16) and 17-19 years (n = 10), HF waves prevailed at rest in 68% and 80% of the subjects, and LF waves were recorded in 12% and 20% of the subjects, respectively. During the active orthostatic test, a decrease in parasympathetic effects and an increase in sympathetic effects on the heart were observed in all age groups. This was most clearly manifested in the age group of 17-19 years. VLF waves decreased during the active orthostatic test at 8-10 years and did not change in athletes aged 17-19 years. The results obtained demonstrate the high information content of the active orthostatic test in assessing the functional and adaptive reactions of badminton players in response to physical activity, and they may be associated with the specifics of the sport and the length of training.

sciforum-105525: Immediate effects and perceptions of cane use in individuals with Parkinson's Disease

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Introduction

Assistive devices are commonly prescribed for individuals with Parkinson's Disease (PD), but a lack of evidence and information on individuals' perceptions limits their prescription in clinical practice. The aim of this study was to investigate the immediate effects and perceptions of cane use in individuals with PD.

Methods

An ongoing clinical trial (CAAE: 75158123.2.0000.5149) included individuals with PD, ≥40 years, on stable antiparkinsonian medication, able to walk independently and use a cane. Participants were given a cane and instructed on its use. They were assessed using the 10-meter walk test (speed, cadence, step length) and the Timed Up and Go (TUG) test under randomized conditions (with and without cane) and asked about perceived changes, necessity, and satisfaction with the device (Quebec User Evaluation of Satisfaction with Assistive Technology). Descriptive statistics, Wilcoxon, and paired t-tests were used (α=5%).

Results

A total of 15 individuals were included. Statistically significant differences were found for cadence (without: 1.85±0.23 steps/second; with: 1.61±0.68 steps/second; p=0.02) and TUG (without: 9.73±1.87 seconds; with: 11.42±1.65 seconds; p≤0.001). Most participants reported no perceived difference in fear of falling (60%) or gait performance (53%) with the cane. The perceived need for a cane increased from 20% before the study to 47% afterward. 'Effectiveness' was the item with the lowest satisfaction.

Conclusions

The immediate use worsened mobility. Although the perception of need has increased among individuals, the majority reported not perceiving changes with the use of the device. Future studies should consider the effect of device training on these outcomes.

sciforum-105374: Knowledge of post-stroke individuals and the use of stroke as a predictor of adopting healthy lifestyle behaviors

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Introduction

Recurrent stroke contributes to the high global burden of stroke. Consequently, stroke secondary prevention has been considered a priority solution to reduce the global stroke burden. Stroke secondary prevention should include health education to encourage the adoption of healthy lifestyle behaviors. However, it is unclear which aspects of stroke knowledge should be addressed in these educational efforts. This study aims to identify whether knowledge variables about stroke are predictors of the adoption of healthy lifestyle behaviors post-stroke.

Methods

This is a cross-sectional study that included individuals post-stroke from a Brazilian metropolis using the Stroke RiskometerTM App. Binary logistic regression models (α=5%) were employed. Dependent variables included smoking, alcohol consumption, diet, physical activity, and the simultaneous adoption of four healthy behaviors. Independent variables included knowledge about what stroke is, its signs and symptoms, risk factors for its occurrence, and the individual's opinion that they may have a new stroke.

Results

A total of 75 individuals (63±13 years; 50% male) were included. The results demonstrated that having knowledge about the risk factors for stroke occurrence was a significant predictor for physical activity participation (B: 1.08, Odds Ratio (OR): 2.95, 95% Confidence Interval (95%CI): 1.03-8.41, p=0.043) and for the simultaneous adoption of four healthy behaviors (B: 1.45, OR: 4.27, 95%CI: 1.15-15.82, and p=0.030).

Conclusions

It is important to identify individuals who do not have knowledge about the risk factors for stroke and provide educational actions when the objective is to promote physical activity and the simultaneous adoption of all healthy lifestyle behaviors in secondary stroke prevention actions.

sciforum-105373: Predictors of adopting healthy lifestyle behaviors: a cross-sectional study to target secondary stroke prevention in a middle-income country

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Introduction

Recurrent stroke contributes to the global stroke burden, particularly in low- and middle-income countries like Brazil. Consequently, secondary stroke prevention, centered on adopting healthy lifestyle behaviors, is a priority solution to reduce the global burden of strokes. While predictors of the adoption of healthy behaviors post-stroke have been studied in high-income countries, identifying these predictors in middle-income countries can help target individuals for secondary prevention and develop focused interventions. This study aims to investigate whether sociodemographic and clinical risk factors for recurrent stroke predict the adoption of healthy lifestyle behaviors post-stroke in a middle-income country.

Methods

This is a cross-sectional study that included individuals post-stroke from a Brazilian metropolis using the Stroke RiskometerTM App, from September 2021 to February 2023. Binary logistic regression models (α=5%) were employed. The dependent variables were as follows: four separate healthy lifestyle behaviors and their simultaneous adoption. The independent variables were as follows: age, sex, cardiac conditions, hypertension, diabetes, body mass index, and emotional stress or depression.

Results

In total, 81 individuals (63±14 years) were included in the study; they had the following characteristics: 22% spent ≥2.5 hours in physical activity/week, 68% consumed ≥2 servings of fruits and/or vegetables/day, 88% were non-smokers, 95% reported safe alcohol consumption, and 16% adopted all four healthy behaviors. Individuals who did not experience emotional stress or depression were more likely to not smoke (B=1.896, p=0.04) and older individuals were less likely to adopt all four healthy behaviors (B=-0.072, p=0.02).

Conclusions

Emotional stress or depression and age were predictors of adopting healthy behaviors post-stroke in a middle-income country. These variables should be targeted in prioritizing individuals for secondary stroke prevention and in developing interventions.

sciforum-105363: Telehealth intervention involving the HEARTS Technical Package and the use of an activity monitor to increase physical activity level post-stroke: protocol for a feasibility randomized controlled trial

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Introduction

Insufficient physical activity is a common risk factor for recurrent stroke in individuals post-stroke. The HEARTS Technical Package, developed by organizations like the World Health Organization, is a potential resource for promoting physical activity post-stroke. It aligns with secondary stroke prevention recommendations, addresses barriers/facilitators for physical activity post-stroke, and can be implemented remotely. However, evidence about its use to promote physical activity post-stroke by telehealth is absent. Furthermore, while activity monitors are used in physical activity interventions, their effectiveness post-stroke is primarily studied in-person. Therefore, this study aims to investigate whether the telehealth intervention involving the HEARTS Technical Package and the use of an activity monitor to increase physical activity level post-stroke is feasible, and to estimate parameters for conducting a fully powered randomized controlled trial (RCT).

Methods

A feasibility RCT study, with blinded assessment, assigned 24 individuals post-stroke (diagnosed ≥6 months), who were aged ≥18 years, inactive, able to walk 10 meters independently, and with medical approval to participate in physical activity, to an experimental (n=12) or a control group (n=12). Both groups carried out a theoretically-informed telehealth intervention, for 12 weeks, based on the HEARTS Technical Package. The experimental group had additional use of an activity monitor.

Results

The outcomes include the feasibility of recruitment, intervention, and measurement, as well as clinical outcomes.

Conclusions

The proposed intervention meets secondary stroke prevention recommendations and will be implemented via telehealth, aiming to overcome barriers to in-person interventions. This study will inform future phases of conducting an RCT.

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