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Workshop

(W-01 — W-02)

W-01

Workshop 1: Comparative analysis of human brain and spinal cord anatomy using high resolution imaging techniques

Gülgün Şengül*, Emel Ulupınar**, Uğur Toprak***

**Anatomy of Brain Stem and Spinal Cord in Rat and Human; **Cross-Sectional Anatomy of the Human Brain; ***Normal and Pathological Neuro-Radiological Imaging*

The nervous system, with its complex morphological and functional properties, can be studied in its different subdivisions, the central (CNS) and peripheral nervous (PNS) systems being the most common. In this course, the anatomical localizations, relationships and connections and macroscobic and microscobic and sectional anatomy of the CNS structures will be studied. Recent advances in technology have enabled the intricate anatomy of the human brain with neuroradiological imaging techniquesThese techniques show the normal anatomy as well as the pathologies of the human brain. In this course, npreviously dissected neuroanatomy specimens will be studied in detail with neororadiological images of normal and pathological structures using high resolution imaging, for graduate neuroscience students.

W-02

Workshop 2: Experimental models for neurological and neuropsychiatric diseases

Tayfun Uzbay*, Ertuğrul Kılıç**, Güven Akçay***, Dilara Nemutlu****

**Experimental Models for Neuropsychiatric Diseases: General Principles, Behavioral Tests and Model Examples for Anxiety, Depression and Schizophrenia; **Ischemia-Reperfusion and Trauma Models; ***Experimental Epilepsy Models; ****Experimental Parkinson Models*

Conferences

(C-01 — C-06)

C-01

The logistics of protein supply at synapses

Erin M Schuman

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The complex morphology of neurons, with synapses located hundreds of microns from the cell body, necessitates the localization of important cell biological machines, including ribosomes, within dendrites and axons. Local translation of mRNAs is important for the function and plasticity of synapses. Using advanced sequencing and imaging techniques we have updated our understanding of the local transcriptome and identified the local translatome- identifying over 800 transcripts for which local translation is the dominant source of protein. In addition, we have explored the unique mechanisms neurons use to meet protein demands at synapses, identifying surprising features of neuronal and synaptic protein synthesis.

C-02

Reassessment of visual thalamus synaptic circuitry using volumetric reconstructions and statistical modeling

Alev Erişir, Alex Briegel, Erin Maher

Department of Psychology, University of Virginia, Charlottesville, VA, USA

Relay cells in the lateral geniculate nucleus (LGN) are responsible for sending visual information from the retina to the cortex, but only after integrating several other inputs that impinge on the same dendrites, including from inhibitory and modulatory axons from interneurons, cortex and the brainstem. How the visual information is modified before it reaches cortex would depend on co-innervation of dendrite segments with axons of distinct origins. Taking advantage of unique morphological and morphometric properties of geniculate inputs from these distinct origins, we reconstructed terminal boutons on relay cell dendrites in serial blockface electron microscopy (SBEM) image stacks, and used Bayesian mixture modeling to reveal putative origin of terminals and their spatial organization. This approach allowed us to categorize dendrite segments that might belong to X-type and Y-type relay cells, and to sort terminal boutons forming the geniculate synaptic circuitry on geniculate relay cells into eight distinct classes based on a combination of morphological properties and volumes. Our results revealed that retinal and cortical synapses on X-type cells are segregated from each other and clustered on distinct portions of the dendritic tree, while such a spatial specialization was not evident on putative Y-type cells. In this talk, I will present our approach to tease our synaptic circuitries using small-scale SBEM stacks, and discuss the potential impact of hypothesis based 3D reconstruction studies for understanding synaptic networks of the brain.

C-03

AI-based imaging methods for the next-generation biomedical solutions

Ali Ertürk

Director, Institute for Tissue Engineering and Regenerative Medicine, Helmholtz, Munich; Adjunct Professor, Rochester University, New York, USA

Ertürk lab develops and implements technologies to speed up biomedical research. In particular, we focus on new imaging approaches to visualize intact biological specimens (such as whole mouse organs and bodies, entire human organs, organoids, and engineered tissues) at the cellular and molecular level without sectioning. This enables among others to visualize cancer metastasis, infections, inflammation, neurodegeneration, and drug targeting down to singe cells in intact mice. We combined whole sample imaging with artificial intelligence and engineered tissues of human diseases for personalized drug development.

C-04

Spreading depression: brain's antiepileptic protective mechanism

Cenk Ayata

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Spreading depression (SD) is an intense depolarization wave that can be seen in all central nervous systems from insects to human. SD is believed to play a role in the pathophysiology of both migraine aura and brain damage. Yet, how and why SD has survived evolutionary selection pressure is unknown. In this session, the phenomenon of SD, its induction by epileptic seizures, the inhibitory effect of these induced SDs on seizure activity, and prevention of new seizure generation will be discussed. The teleological interpretation of this antiepileptic effect and potential role in migraine pathophysiology will also be discussed.

C-05

Engineering brain activity patterns for therapeutics of disorders

Mehmet Fatih Yanık

ETH Zurich, Institute for Neuroinformatics, Zurich, Switzerland

Brain networks are disrupted in numerous disorders. Existing treatment options often cannot address such complex dysfunctions. We first show that the aberrant brain-wide activity patterns can be completely corrected by targeting distinct network motifs with multiple neuromodulators using a vertebrate model of human epilepsy and autism. Our systematic approach rescues behavior unlike any other treatment. With methods promising future therapeutic use, next we discuss how cortex-wide network activity patterns can be captured chronically at single neuron resolution with minimal invasiveness using ultra-flexible electrodes. Finally, we show how specific molecular targets in different brain circuits can be non-invasively and spatially targeted in mammals using focused-ultrasound drug aggregation and uncaging, and we demonstrate how chronic anxiety can be ameliorated in a rodent model using these technologies by drug delivery to specific focal brain circuits.

C-06

The "common currency" of brain and mind – A spatiotemporal approach

Georg Northoff

University of Ottawa, Institute of Mental Health Research, Royal Ottawa Mental Health Centre, Ottawa, Ontario, Canada

Much has been learned about the neural correlates of various cognitive and affective functions of the brain in recent years. However, the neural mechanisms of mental features like consciousness, self, and mind-wandering including their changes in mental disorders remains yet unclear. I here propose a novel approach that goes beyond the prevailing cognitive framework. Building on various lines of empirical data, I suggest a spatiotemporal approach. I demonstrate in my talk various examples how temporal dynamic and spatial topography are shared as "common currency" by both the brain's neural activity and the mental features.

Panels

(PS1 — PS4)

Panel 1

PS-1

Changing technology in a changing world – Digital transformation in health: theory and practice

Murat Aydın Sav[1], Hakan Sarbanoğlu[2], Antonio Di Ieva[3], Özgür Teke[4]

[1]Department of Medical Pathology, Faculty of Medicine, Yeditepe University, Istanbul, Turkey; [2]Chevron Corporate Information Architect, Self-Employed Semi-Retired, Self-Employed Speaker/Consultant (Digital Transformation); [3]Professor of Neurosurgery, Computational NeuroSurgery (CNS) Lab, Macquarie University, Sydney, Australia; [4]Sales Manager, Virasoft Software Inc., Istanbul, Turkey

Digital Transformation and Big Data Management in Health – Digital transformation and the use of big data is the expression of a huge amount of information created by digitizing everything, combined and analyzed by certain technologies; increasingly involved in preventing potential outbreaks, treating disease, reducing costs, treating cancer, monitoring patients, monitoring hospital costs, deciphering health lawlessness and fraud, telemedicine, and medical imaging by using health data in health production. Image Analysis is a process that starts from fractals to deep learning - critical structuring in the theoretical infrastructure of digital transformation used in radiology and pathology through fractals. A data augmentation method based on the Generative Adversarial Network (GAN), one of the artificial intelligence applications used in visual analysis, has been developed. GAN provides a new opportunity to alleviate the problem with relatively small samples by converting the discrete distribution of training samples into a new continuous distribution and producing synthetic samples with high accuracy according to the predicted new sample distribution. Digital Pathology and Application Areas - Digital applications in image-based radiology and pathology are involved in the production of fast and reliable information. In digital pathology, tissues prepared by classical methods for microscopy are translated into digital images with the help of scanners. They are converted into countable values using software developed for morphometric analysis. Digital Pathology in Diagnostic Neuropathology - Due to the inevitability of working online in the pandemic, there is an increasing investment within the pathology community. It has been used since 2010, in large healthcare institutions with several hospitals, pathologists use for tele-consulting and reporting during the production of the report; is used in national/international congresses. It is an area of the Industrial Revolution 4.0, is a step towards a faster, more reliable, more accessible, and questionable period of health production, applications.

Keywords: digital transformation; artificial intelligence; deep learning, fractals, digital pathology

Panel 2

PS-2

Neuro-COVID

Hayrunnisa Bolay[1], Betül Baykan[2], Arzu Aral[3]

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COVID-19, which starts as a viral infection, is an immune system disease that progresses with hyperinflammation; and the prognosis and mortality are determined according to the severity of the inflammatory response. Among the many systems affected by the disease, the central nervous system and the brain are particularly prominent targets. Anosmia, paralysis, cranial nerve deficits, encephalopathy, delirium, meningitis, and seizures are some of the neurological complications of COVID-19 caused by SARS-CoV-2. It is still difficult to distinguish precisely which of these are due to the cytopathic effects of SARS-CoV-2, the exaggerated cytokine response it triggers, and/or the accompanying hyper-coagulopathy. One of the most common neurological complications of COVID-19 is headache, and the possible underlying pathophysiological mechanism includes activation of peripheral trigeminal nerve endings by SARS-CoV-2 directly or via vasculopathy and/or hypoxia with increased proinflammatory cytokines in the circulation. It is known that various neurological findings, especially head and widespread body pain, chronic fatigue, and cognitive decline, continue for a long time in the Long-COVID process that develops after COVID-19. All these effects; With the addition of pathologies such as depression, anxiety disorder, OCD, insomnia, and cognitive decline that developed during the pandemics, COVID-19 will be among the main topics that await to be clarified in both basic neuroscience research and clinical neurology practice for a longer period. In this panel, the pathophysiology and clinic of COVID-19 will be evaluated from the perspective of the central nervous system.

After evaluating the effects of SARS-CoV-2 on the brain and central nervous system via neuroimmunological mechanisms, the speakers will interactively discuss the neurological complications caused by the disease, especially headache, both by their own questions and by questions from the audience.

Panel 3
Chronobiology and Circadian Rhythm Disorders: A Multidisciplinary Perspective

PS3-1
Sleep-wake physiology and circadian rhythms

Serpil Çeçen

Department of Sports Physiology, Pendik Training and Research Hospital, Marmara University, Istanbul, Turkey

Sleep is an indispensable part of life, the mechanism of which is still not fully illuminated today. It is described as a reversible loss of consciousness in which there is little or no response to an external stimulus. However, from the second half of the 20th century, it has been observed that human sleep is a highly complex, highly organized physiological condition affected by many internal and external factors. Today, it is accepted that sleep is not a passive state of unconsciousness. On the contrary, it is a dynamic cerebral process that has an essential function in restoring physical and mental functionality. In maintaining a healthy life, quality is as essential as sleep. Sleep is a natural process that ensures energy protection in all mammals and the development and repair of the nervous system. Adulation is associated with many components of the biological structure, especially the nervous system, which controls automatic functions, behaviour, cognitive functions and intracellular mechanisms. It is known that sleep homeostasis, which deteriorates during the healthy ageing process, increases morbidity and even causes mortality. Circadian rhythm is defined as a repetition of biochemical, physiological and behavioral rhythms on living things within a day of a rotation of the earth that lasts about 24 hours around its axis but can range from 20 to 28 hours. The term circadian consists of a combination of circa (approximate) and dies (day) and refers to approximately one day. The period for a single cycle of rhythm is defined as a period. The sleep-wake cycle in humans is the most basic and decisive circadian rhythm. Man is a "diurnal" creature that exhibits the acuity of daytime life and does most activities such as stretching, exercising, working during the day and resting at night. Today, with the development of technology and the shift work that modern life offers to people, the night work system negatively affects circadian rhythm, disrupts energy balance and increases the risk of developing many metabolic diseases such as obesity, diabetes and heart disease.

PS3-2
Sleep, circadian rhythms, psychiatric disorders in childhood and adolescence

Aliye Tuğba Bahadır

Department of Child and Adolescent Psychiatry, School of Medicine, Marmara University, Istanbul, Turkey

Sleep is very important for the healthy continuation of neurodevelopment, normal daily functioning, emotional information processing and emotion regulation. In many of the psychiatric disorders seen in childhood and adolescence, problems such as inability to fall asleep, difficulties in maintaining sleep, waking up too early in the morning, hypersomnia, disruption of sleep-wake rhythm, and restless sleep can be encountered. Difficulties in the regulation of sleep and circadian rhythms can be encountered in many psychiatric disorders such as attention deficit hyperactivity disorder, autism spectrum disorders, depression, bipolar disorder, psychotic disorders, anxiety disorders, seasonal affective disorder, substance use disorders, that start in childhood and adolescence and some of which can continue lifelong. Problems related to sleep and circadian rhythms can be a part of the complaints or factors that increase the complaints related to the aforementioned psychiatric disorders, and also may cause difficulties in the management and treatment of these disorders. Further investigation of chronotherapeutic treatment approaches such as bright light therapy, sleep deprivation, sleep phase advance, melatonin, melatonin agonists in the treatment of sleep and circadian rhythm problems in childhood and adolescence psychiatric disorders would be beneficial. The relationship between circadian rhythm disruptions and psychopathology in many psychiatric disorders remains a mystery. It is promising to see that the causal relationships between circadian rhythm disruptions and psychiatric disorders are starting to be investigated with animal model studies. As the molecular mechanisms of circadian rhythm disruptions are better understood, treatments specific to brain-related disorders and personalized treatments can be developed.

PS3-3
Childhood epilepsy, sleep and circadian rhythms

Dilşad Türkdoğan

Department of Child Neurology, School of Medicine, Marmara University, Istanbul, Turkey

Cortical excitability is subject to a circadian regulation. This sensitivity, which rises in the morning, decreases in the evening. Epilepsy occurs with increased pathological excitability, and the occurrence of seizures is closely related to the circadian rhythm. Genes related to circadian rhythm such as ARNT and CLOCK genes are less expressed in epileptic tissues. Seizure types occur at different times according to the circadian rhythm. While frontal lobe seizures increase during sleep, seizures originating from other regions are more common during the daytime and wake-

fulness. On the other hand, epilepsy and seizure intensity negatively affect sleep. Seizure medications can also indirectly increase this effect. Another relationship between epilepsy and sleep occurs with 'sudden death'. Here, the underlying genetic factors of epilepsy, especially ion channel gene defects, are blamed without an environmental cause to explain the death.

Panel 4
Past, Present and Future of Neuroscience

PS4-1
30 years of Hacettepe University Neurological Science PhD Program

Turgay Dalkara

Institute of Neurological Sciences and Psychiatry at Hacettepe University, Ankara, Turkey

PS4-2
Brief history of national neuroscience meetings (2001–2021)

İsmail Hakkı Ulus

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Neuroscience is a multidisciplinary science investigating the nervous system, and one of fastest advancing research areas and receiving great interests every days. Such as, 40–50 thousands of neuroscientist from different disciplines are participating the annual meeting of the Society for Neuroscience (SfN, USA) every year since first meeting at 1971. In Turkey, a group of neuroscientist came together at the Uludag (5–8 April 2001) in response to open invitation of 5 senior neuroscientists (Dr. Cumhur Ertekin, Dr. Yücel Kanpolat, Dr. Turgay Dalkara, Dr. Pekcan Ungan and Dr. İsmail H. Ulus) as a member of the TUBITAK-Brain Research Planning and Coordination Committee (TUBITAK-BRPCC) to discuss "*Today and Future of Neurosciences in Turkey*". In this Uludağ's meeting, participating neuroscientists reached to agreement for organization of National Neuroscience Meeting (NNM) annually. Nineteen NNMs organized and carried out at different cities since 2002. The first meeting organized at Eskişehir (16–20 May 2002) and 19th NNM (this meeting) will be held at Istanbul on 21–23 November 2021. The Neuroscience Society of Turkey (NST) and Brain Research Society (BRS) took responsibility for organization of NNMs. First seven NSMs successfully organized collectively by NST, BRS, T-BRPCC and the local executive committee of the host University. By starting at eighth NNM organized alone by either NST or BRS together with local committee of the host University (*see* **Table PS4-2**). After 20 years' experience and 19 meetings, NMS is institutionalized and known widely at national as well as international arena with very high reputation. NMS is serving fruitful scientific interactions and collaborations environment for neuroscientists each year with its wide range coverage of different areas of neuroscience. Detailed information on 19 NNMs are available at Web Page of NST and BRS.

Table PS4-2

Brief history of national neuroscience meetings.

Meeting	Date	City	Host University	Organizer(s)
1. USK	16–20 Mayıs 2002	Eskişehir	Osmangazi	NST+BRS
2. USK	16–20 April 2003	Bursa	Uludağ	TUBITAK-BRPCC
3. USK	7–11 April 2004	Denizli	Pamukkale	NST+BRS
4. USK	29 March–2 April 2005	Mersin	Mersin	NST+BRS
5. USK	10–14 April 2006	Zonguldak	Karaelmas	NST+BRS
6. USK	9–13 April 2007	Safranbolu	Karaelmas	NST+BRS
7. USK	16–20 April 2008	Adana	Çukurova	NST+BRS
8. USK	18–22 April 2009	Bolu	Abant İzzet Baysa	İBRS
9. USK	13–17 April 2010	İstanbul	Yeditepe	NST
10. USK	9–12 April 2011	İstanbul	Istanbul	BRS
11. USK	28 April–1 May 2013	İzmir	Ege	NST
12. USK	29–31 May 2014	İstanbul	Bahçeşehir	BRS
13. USK	30 April–1 May 2015	Konya	Selçuk	NST
14. USK	26–29 May 2016	Ankara	Ankara	BRS
15. USK	7–10 May 2017	Sakarya	Sakarya	NST
16. USK	20–23 May 2018	İstanbul	Istanbul Technical	BRS
17. USK	4–7 April 2019	Trabzon	Karadeniz Teknik	NST
18. USK	6–9 November 2020	Online	Bilkent	BRS
19. USK	21–23 November 2021	Online	Yeditepe	NRS

PS4-3

Nobel Prizes: two warm and touchy subjects and future perspectives

Gürkan Öztürk

Department and Research Institute for Health Sciences and Technologies (SABITA), International School of Medicine, Istanbul Medipol University, Istanbul, Turkey

This year's Nobel Prize in Physiology / Medicine was awarded in neuroscience. David Julius and Ardem Patapoutian, both from USA, shared the the price for their discoveries on TRP and Piezo channels which can be defined under the general title "somatic senses". While both of the channels are non-specific cation channels, the TRP family with more than 30 members dates back earlier. We understand that in fact these channels are at the heart of sensory system as we see them from temperature to pressure and from pain to taste sensations. Both laureates have significantly contributed to this subject. However, we owe most of what we know about Piezo channels that answered a long lasting question of how cations enter the cell upon mechanical stimualiton to Patapoutian. Piezo family has two members and we detect them from muscle spindles to central nervous system neurons. Piezo is the most important actor of mechanobiology which has become very popular in recent years. In this presentation, basic biology of TRP and Piezo channels will be discussed and it will be concluded by a brain storm where potential neuroscience subjects that could bring future Nobel Prizes will be opened to voting.

Symposia

(S1 — S3)

Symposia 1

Regulation of Feeding by Hypothalamic Circuits

S1-1

Restriction of food intake by dorsomedial hypothalamus

Caner Çağlar

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Leptin deficient ob/ob mice eat excessively and their food intake is considerably suppressed by leptin injection. Leptin exerts its effects in part by modulating the activity of AGRP and POMC neurons in the arcuate nucleus as well as other brain regions. In order to identify novel sites of leptin action, we used the phosphotrap method to molecularly profile leptin responsive neurons in the hypothalamus and brain stem. In addition to identifying several known and novel neural populations that are responsible for mediating leptin`s effect on food intake, we also found that neurons in the dorsomedial hypothalamus (DMH) expressing Ppp1r17 are activated in ob/ob mice but do not express leptin receptor that are indirectly suppressed by leptin treatment. While these data initially suggested that these neurons would activate food intake, we in fact observed the opposite. Chemogenetic excitation of Ppp1r17 neurons decreased food intake and body weight in ob/ob mice while chemogenetic inhibition of Ppp1r17 neurons increased food intake and body weight. Similarly, in a scheduled feeding protocol that elicits Food Anticipatory Activity (FAA), mice ate more when Ppp1r17 neurons were inhibited and less when they were activated without altering food anticipatory activity, body temperature and oxygen consumption. These data suggest that Ppp1r17 neurons in DMH play a key role in restricting excessive food intake and leptin suppresses their activity indirectly by reducing food intake. These results reveal that pathways that increase food intake can activate neural populations that can restrain food intake as a compensatory mechanism. This finding has potential implications for an understanding of binge eating and other nutritional disorders.

S1-2

Regulation of food intake by μ-opioid receptors on AgRP neurons

Yavuz Yavuz

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Food intake is regulated by two complementary impulses as homeostatic and hedonic food intake. Homeostatic food intake regulates energy balance by regulating food intake following the decrease in stored energy. In contrast, hedonic or reward-based food intake increases the desire to consume palatable foods, resulting in a relative abundance of energy. One of the modulators that have a strong stimulating effect on this pathway is opioids. Opioids increase palatable food intake by stim-

ulating the hedonic pathway. However, the mechanisms of action of opioids on the homeostatic pathway have not been fully elucidated. In this context, we investigated opioid modulation of Agouti-related peptide (AgRP) neurons, which are located in the arcuate nucleus (ARC) of the hypothalamus and are critical in homeostatic nutrient uptake and energy metabolism. In this study, we aimed to characterize the possible functional changes of μ-opioid receptor agonist on AgRP neurons by using AgRP-Cre mouse, by electrophysiological and Ca^{+2} activity imaging methods. DAMGO dramatically reduced the firing frequency of AgRP neurons and hyperpolarized the resting membrane potential ex vivo. In addition, DAMGO significantly reduced the frequency of excitatory post-synaptic currents to the AgRP neurons without changing the frequency of inhibitory post-synaptic currents. In ARCAgRP-PVH synaptic connection experiments using the optogenetic technique, the synaptic peak amplitude decreased significantly after drug administration. Five days after intraperitoneal administration of DAMGO (1 mg/kg/day), food consumption tended to increase. DAMGO treatment significantly decreased the distance travelled by the animals without altering their speed. Furthermore, we used fiber photometry technique to monitor the in vivo Ca^{+2} activity of AgRP neurons. When DAMGO was administered to mice that were fasted for 16 hours, Ca^{+2} activity in AgRP neurons was significantly reduced. These findings show that μ-opioid agonism is effective in modulating the activity of AgRP neurons, which have an important role in appetite regulation.

S1-3

Regulation of leptin sensitivity and energy homeostasis by histone deacetylase 6

Işın Çakır

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Obesity and overweight affect more than one third of the world population, and are significant risk factors for type II diabetes, cardiovascular diseases and cancer. A hallmark of diet-induced obesity is hyperleptinemia. Leptin is produced mainly by the adipose tissue in proportion to the size of the fat depots, and acts through its receptors expressed predominantly in the central nervous system (CNS). Leptin administration to leptin deficient mice reduces food intake and increases energy expenditure, resulting in profound weight loss. Despite their hyperleptinemic states, obese rodents and humans maintain their increased adiposity, and show a blunted response to exogenous leptin administration, which has been characterized as leptin resistance. Methods that can augment leptin sensitivity may represent safe and effective means for treating obesity. Using genetic and pharmacological tools, we show that inhibitors of the cytosolic enzyme histone deacetylase 6 (HDAC6) act as potent anti-obesity agents. Treatment of diet-induced obese (DIO) mice with a specific HDAC6 inhibitor (Tubastatin A) suppresses food intake and reduces obesity with fifty percent decrease in fat mass, accompanied by significantly reduced hepatic steatosis and improved systemic glucose homeostasis. Tubastatin does not induce weight loss in DIO HDAC6 KO mice, and a structural inactive analogue of tubastatin is ineffective in reducing body weight. Mechanistically, peripheral -but not central- inhibition of HDAC6 confers central leptin sensitivity, and the anti-obesity effect of tubastatin is significantly attenuated in animals defective in the central leptin-melanocortin circuitry, including the db/db and MCR4 KO mice. Tubastatin appears most active, as assessed by inhibition of tubulin deacetylation and the biodistribution of the drug, in adipose tissue. Fat-specific HDAC6 knockout mice are partly protected from diet-induced obesity, and have a significantly compromised response to tubastatin-induced weight loss. Our results suggest the existence of an HDAC6-regulated adipokine that serves as a leptin-sensitizing agent, and identify this pathway as a potential target for development of novel therapeutic approaches against obesity.

S1-4

Dopamine receptor 1 in the AgRP-neurons control the size of rewarding meals

Ali Deniz Güler

Departments of Biology and Neuroscience, University of Virginia, Charlottesville, VA, USA

My lab seeks to understand how hypothalamic energy balance circuits incorporate reward-based dopaminergic signaling. The effortless availability of tasty, calorie-rich foods, in both industrialized and developing countries has led 1.3 billion people to become overweight, with a third of those considered clinically obese. Since the discovery of insulin and leptin as peripheral anorexigenic signals that interact with the central nervous system, there have been remarkable advancements in understanding the role of hypothalamic and hindbrain circuits in regulating energy balance. However, these discoveries have yet to bear fruit in the battle against overconsumption. In this presentation, I will discuss one aspect of this complex neurocircuitry, which controls the size of a rewarding meal. I will present unpublished data demonstrating that the stimulation of dopamine receptor 1 (Drd1) and agouti-related peptide (AgRP) co-expressing arcuate hypothalamic neurons is sufficient to induce feeding while genetic ablation of Drd1 in the AgRP neurons attenuates meal sizes during consumption of rewarding foods. These results put Drd1 signaling in the AgRP neurons as a potential integrator of the hedonic and homeostatic energy intake neurocircuits and define a new mechanism that influences overconsumption of rewarding foods.

Symposia 2
Neuroscience Application Areas: Aviation, Cyber Security and Neuroarchitecture

S2-1
Neuroergonomics: applications of neuroscience in aviation psychology and ergonomics

Murat Perit Çakır

Department of Cognitive Science, Informatics Institute, Middle East Technical University, Ankara, Turkey

Recent advances in sensor technologies, signal processing methods, and computing have made it possible to monitor the neurophysiological processes of aviators in ecological settings. Measurements obtained during simulated and real-flight settings have demonstrated the potential of using portable EEG, fNIRS, eye tracking, and physiological sensors to monitor pilots' mental and physiological states in various flight scenarios. The presentation will provide an overview of studies employing various neurotechnologies for the real-time and offline monitoring/evaluation of pilots' cognitive workload levels, attentional states in multitasking situations, and skill acquisition during training. The studies will serve as a context for discussing technological affordances, methodological issues, and the potential of these neurotechnologies for designing innovative human-machine interfaces in aviation.

S2-2
The use of neuroscience in information and communication technologies: end user applications and cyber security perspectives

Cengiz Acartürk

Department of Cognitive Science, Informatics Institute, Middle East Technical University, Ankara, Turkey

The computer systems that brought Information and Communication Technologies (ICT) to the present day, especially for the use of researchers, were developed as data processing-oriented systems that did not include the concept of user in their first designs in the 1970s. The concept of “user” was introduced as a system component with a “subject” feature in order to process user data separately from each other and to ensure the security of the data in multi-user systems. With the emergence of operating systems aimed directly at end users, this concept appears with names such as "user account". One of the important assumptions in the development process of Information and Communication Technologies is that the “user subject” on the computer system is not integrated with the "human" using this subject. In other words, computers cannot know which users are using their user accounts, or even whether they are real people. Today, this subtle distinction is an assumption that many users go unnoticed. Although this assumption is covered by a number of biometric methods such as fingerprint and face recognition, the use of biometric information in operating systems for end users is quite new and these methods are used within the framework of limited applications such as computer login. In this talk, it will be discussed how this assumption, which has continued for nearly half a century of Information and Communication Technologies, may change in the coming years, how human machine teaming may shape our daily life, how neuroscientific data can be integrated with end-user operating systems and social media, and the individual and social situations that these technologies can create. In particular, in today's world where data such as end users' eye movements and brain activities are targeted by social media companies, how we can protect the data of ourselves and those around us, not only as researchers, but also as individuals and citizens, how to ensure the efficiency of personalization and how the privacy of the data that provides personalization can be ensured and ensured? In this talk, international initiatives in this field, especially international formations related to neuroscientific rights, will be discussed.

S2-3
Neuroarchitecture: how do we design the built environment that is informed from neuroscience?

Burcu Ayşen Ürgen

Department of Psychology, Aysel Sabuncu Brain Research Center, The National Magnetic Resonance Research Center (UMRAM), Bilkent University, Ankara, Turkey

We spend most of our daily life in buildings such as apartments, work places, shopping centers, hospitals, and restaurants. Despite their importance in our lives, cognitive neuroscience research to date has primarily focused on how the human brain processes the objects and people in these environments, rather than the built environment itself. However, in recent years, there has been a growing number of interdisciplinary studies that span neuroscience and architecture. The goal of this research is twofold: On the one hand, cognitive neuroscientists would like to understand the neural processes that underlie the perception of the built environment, which will hopefully lead to a better understanding of human experience in built environments. On the other hand, architects would like to use the scientific knowledge generated by cognitive neuroscience to guide them in building better spaces that humans can live in. In fact, there are already interdisciplinary academic groups and conferences in place, such as the Academy of Neuroscience for Architecture (ANFA), which bring together neuroscientists and architects. In this talk, I will highlight the growing body of work in this interdisciplinary area, and introduce some of the studies we have been working on that include the neural basis of aesthetic experience in architectural spaces, attentional mechanisms in architectural spaces, and claustrophobia.

Symposia 3
Applications of Nanobiotechnology in Neuroscience

S3-1

Nano-drug delivery applications in management of neurological diseases and brain tumors

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New drug discovery studies for the central nervous system (CNS) are challenging due to the complex nature of the brain, drug side-effects and impermeable blood-brain barrier (BBB). Thus, nanotechnology has received great attention in recent years to improve drug delivery to the central nervous system (CNS). It has a great potential to affect the treatment of neurological disorders, mainly Alzheimer's disease, Parkinson's disease, brain tumors, and stroke. Many studies on neurodegeneration have shown that nanopharmaceuticals have been successfully used in the treatment of CNS disorders. In overcoming the BBB with nanoparticulate drug delivery systems, intravenous and intranasal routes which are non-invasive drug delivery routes are commonly utilized. Furthermore, different formulation/functionalization strategies such as enhancing the surface properties of nanoparticles by targeting or coating materials or combining different properties of nanostructures in one nanoparticulate system such as hybrid nanoparticles, are implemented the nanoparticulate drug delivery sytems in order to provide more effective therapy. Also, better understanding of nanoparticulate interactions with BBB and brain tissues and preclinical studies on more relevant and large animal models could accelerate translational research of CNS-targeted nanopharmaceuticals.

Keywords: central nervous system, nano-pharmaceuticals, neurological disorders

S3-2

Exosomal delivery of therapeutic modulators through the blood–brain barrier

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Nowadays, a large population around the world, especially the elderly, suffers from neurological inflammatory and degenerative disorders/diseases. Current drug delivery strategies are facing different challenges because of the presence of the BBB, which limits the transport of various substances and cells to brain parenchyma. Additionally, the low rate of successful cell transplantation to the brain injury sites leads to efforts to find alternative therapies. Stem cell byproducts such as exosomes are touted as natural nano-drug carriers with 50–100 nm in diameter. These nanosized particles could harbor and transfer a plethora of therapeutic agents and biological cargos to the brain. These nanoparticles would offer a solution to maintain paracrine cell-to-cell communications under healthy and inflammatory conditions. The main question is that the existence of the intact BBB could limit exosomal trafficking. Does BBB possess some molecular mechanisms that facilitate the exosomal delivery compared to the circulating cell? Although preliminary studies have shown that exosomes could cross the BBB, the exact molecular mechanism(s) beyond this phenomenon remains unclear. In this review, we tried to compile some facts about exosome delivery through the BBB and propose some mechanisms that regulate exosomal cross in pathological and physiological conditions.

Keywords: blood brain barrier, exosome, modulator

S3-3

3D hydrogel organoid platforms for the representation of neurological disease models

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Modeling tissue with using hydrogels enables us to model various types of diseases and gives usability to examine cellular behaviors under different conditions.One of the most rapidly emerging tools of nanoscience and nanotechnology is microfluidic chips and organoid platforms. With the increase of alternative production techniques and improved capacity of manufacturing devices, it became possible to create microfluidic channels and chips with high resolution and excellent accuracy which can be used as organoid platforms. In this research, to create a three dimensional cell culture environment, a microfluidic chip was used. To create the three dimensional scaffold structure, Gelatin Methacrylate (GelMA) was synthesized. With using ultraviolet light and photoinitiator a three dimensional hydrogel structure was built. With this method, an alternative and easier strategy, compared to other techniques used to create hydrogels inside of microfluidicchips was proposed. Chemical compounds of synthesized GelMA was identified with fourier transform infrared spectophotometry (FTIR), surface morphology was observed with field emission electronmicroscopy (FESEM), and structural properties was analyzed with atomic force microscopy (AFM). Inside of the produced GelMA hydrogel structure, a neurovascular co-culture was created, and cellular viability of the hydrogel created

inside of microfluidic chip was compared with the hydrogel created outside of the chip. Swelling performance of the hydrogel inside of microfluidic chip was observed visually and permeability of this hydrogel was examined with a migration study as a proof of concept. Results show that synthesized GelMA has desired biomechanical properties with more than 80% cellular viability while being structurally stable, and it was shown that even if its produced inside of microchips and organoid platforms, it still has the same biomechanical properties.

Keywords: organoid platforms, microfluidic channels, hydrogels, cell culture, neurovascular coculture

S3-4

The role of gold nanoparticles in drug delivery to the brain: preclinical experiences

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Recent studies have shown that gold nanoparticles (GNPs), one of the inorganic nanoparticles, can play an important role in the transport of drugs to the brain and in bioimaging due to their appropriate shape and size. Although it has been reported that they have low phototoxicity and are used safely, it should be taken into account that GNPs may still cause hepatobiliary toxicity. It has been shown that GNPs reduce the production of proinflammatory cytokines by inhibiting tumor necrosis factor and NF-kB pathways in various neurogenerative diseases, including epilepsy. On the other hand, it has been suggested that GNPs suppress the production of oxidant agents in microglial cells. When GNPs are used together with PEG-anthocyanin, they can both reduce amyloid beta1-42-induced neuroinflammation and play a role in inhibiting neuronal apoptosis. In the meantime, GNPs have also been shown to enable L-DOPA to effectively cross the blood-brain barrier (BBB). Moreover, it has been shown that when used alone, GNPs can alleviate septic conditions in experimental animal models. In previous studies of our group, the transport pathways of GNPs tagged with transferrin or glucose across BBB and the predominantly targeted brain regions have been demonstrated. Experimental work from our group has also shown that GNPs tagged with transferrin or glucose significantly enhances the transport of oligonucleotides to the brain. Subsequently, it has been demonstrated that glucose-tagged GNPs increase the transport of the antiepileptic drug lacosamide to the brain and thus play a role in reducing seizures in an animal model of temporal lobe epilepsy. The ability of GNPs, which have a much smaller diameter compared to other nanoparticles, to easily pass through the BBB provides significant benefits in carrying drugs to the brain in experimental models, and thus GNPs account for novel promising agents to be used effectively for brain drug delivery in clinical settings.

Keywords: blood brain barrier, drug delivery, gold nanoparticles

Oral Presentations

(O-01 — O-76)

O-01

Axillary microbiota is associated with cognitive impairment in Parkinson's disease patients

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Objective: Cognitive impairment (CI) is among the most common non-motor symptoms of Parkinson's disease (PD) with substantially negative impact on patient management and outcome. The development and progression of CI exhibits high interindividual variability which requires better diagnostic and monitoring strategies. PD patients often display sweating disorders resulting from autonomic dysfunction which has been associated with CI. As the axillary microbiota is known to change with humidity level and sweat composition, we hypothesized that axillary microbiota of PD patients shifts in association with CI progression thus can be used as proxy for classification of CI stages in PD.

Methods: In this study, the axillary microbiota compositions of 103 PD patients (55 PD patients with dementia (PDD) and 48 PD patients with mild cognitive impairment (PD-MCI)) and 26 cognitively normal healthy controls (HC) were determined through next generation sequencing based 16S rRNA gene sequencing. Then, the relationship between axillary microbiota and cognitive impairment stages was examined using bioinformatic analyses. Statistical analyses were conducted in R 3.6.1 and $p<0.05$ was accepted for statistically significant difference. The study was approved by the ethics committee of the Istanbul Medipol University with authorization number 10840098-604.01.01-E.3958.

Results: It has been found that axillary microbiota profiles differentiate HC, PD-MCI and PDD groups based on differential ranking analysis. In addition, phylogenetic factorization revealed that the depletion of Anaerococcus, Peptoniphilus and W5053 genera is associated with PD-MCI and PDD. Moreover, functional predictions suggested significant increase of myo-inositol degradation, ergothioneine biosynthesis, propionate biosynthesis, menaquinone biosynthesis, and the proportion of aerobic bacteria and biofilm formation capacity in parallel to CI.

Conclusion: Findings of the study suggest that alterations in axillary microbiota are associated with CI in PD. Thus, axillary microbiota holds potential to be exploited as a non-invasive biomarker in the development of novel strategies.

Keywords: 16S sequencing, armpit, axillary microbiota, Parkinson's disease, cognitive impairment, dementia

O-02

Visual scanning in patients with Alzheimer's disease and mild cognitive impairment

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Objective: It was aimed to examine the visual scanning patterns of Alzheimer's disease (AD) dementia, mild cognitive impairment (MCI) and healthy controls (HC).

Methods: 30 AD dementia according to McKhann et al.'s (2011) criteria, and 32 amnestic MCI according to Albert et al.'s (2011) criteria and 32 HC were included in the study. All cognitive doimains were administered to participants. Eye movements were recorded with Eyelink 1000 Plus. In this task consisting of 32 trials, the fixation screen for 1000 ms, the stimulus screen for 3000 ms were presented. Participants were asked to view the pictures. The mean age of AD, MCI and HC was 72.70±7.83, 70.69±6.91 and 68.59±6.24, respectively, the mean years of education were 9.33±4.71, 9.69±4.92 and 11.69±2.95, respectively, and the gender ratio (F/M) was 15/15, 18/15 and 21/11, respectively. The ANOVA was used to compare visual scanning measurements between groups, and post-hoc tests were performed with Bonferroni correction for pairwise comparisons.

Results: AD, MCI and HC were found to be similar in terms of age, education and gender (p>0.05). A statistically significant decrease was observed in the number of fixations (p=0.005) and saccades (p=0.004) in AD compared to HC. The number of fixation and saccade of MCI were found to be statistically similar to those of AD and HC (p>0.05). Number of mean fixation and saccade were significantly associated with general cognition (r=0.357, p<0.001), memory (r=0.278, p=0.007), executive functions (r=0.263, p=0.011), visuospatial functions (r=0.281, p=0.007) and language (r=0.242, p=0.020) composite z-scores.

Conclusion: AD performed less eye movement to the salient regions of the picture. Past studies have indicated that ignoring the informative parts of visual stimuli in AD patients may be associated with a decrease in visual attention.

Keywords: Alzheimer's disease, mild cognitive impairment, visual scanning, visual exploration, free viewing

O-03

Volumetric examination of brain areas related to the sense of smell and taste in neurodegenerative diseases and investigation of their relation to the level of endocannabinoids in peripheral blood serum

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Objective: The aim of this study was to determine the volumes of primary brain areas related to smell and taste by MR imaging in Alzheimer's disease (AD) and Parkinson's disease (PD) patients and healthy controls, and examine the volumetric changes by comparing with the results of smell/taste questionnaire and tests and also endocannabinoids (ECs) levels.

Methods: 15 AD's patients with mild and moderate cognitive impairment, 15 PD's patients, and 15 healthy controls who applied to the Neurology Clinic of the Faculty of Medicine, Mustafa Kemal University. participated in this study. Smell and taste questionnaire was administered to the participants and taste identification test was investigated by Sniffin' Sticks' Odor Identification Test and Burghart Taste strips. ECs levels were analyzed by ELISA in the blood serum taken from the participants.

Results: Left bulbus olfactorius (p=0.004), left amygdala (p=0.004), left hippocampus (p=0.008), left anterior cingulate cortex (p=0.018) and right insula (p=0) volumes were lower in AD patients compared to healthy subjects. Left bulbus olfactorius (p=0.004) and left hippocampus (p=0.010) volumes were also lower in PD patients compared to controls. The volume reduction in the left rolandic operculum cortical area and taste disorder correlation was determined (p=0.044). EC levels were found to be significantly higher in both AD (p=0.000) and PD (p=0.016) compared to the control. In PD, the taste area right gyrus frontalis inferior /pars opercularis volume and EC levels were correlated (p=0.014). Correlation was also found between odor test score and EC levels.

Conclusion: Our findings mentioned that there are volumetric changes in the odor and taste areas in brain in AD and PD patients. It was observed that ECs play a role in these volumetric changes and the corrupted smell and taste perception in patients (p=0.000).

Keywords: smell/taste disorder, Sniffin' Sticks test, Burghart Taste test, neurodegenerative disease, endocannabinoid

O-04

Neuroimaging of brain functionality and connectivity in women with temporal lobe epilepsy or schizophrenia

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Objective: The etiology of temporal lobe epilepsy (TLE) or schizophrenia (SCZ) is not fully known. Both disorders, as shown in recent studies share similar clinical, neuropsychological and neuroimaging findings which might indicate also similarities in the brain structure and connectivity. TLE and SCZ symptoms may result of impaired connectivity and functionality of the medial temporal lobe. Our aim was investigate brain connectivity matrices of TLE or SCZ patients using diffusion tensor imaging (DTI) and neuropsychological tests (NPT) and compare the findings with healthy controls (HC).

Methods: Thirteen women of each group (TLE, SCZ, and HC), thirty nine in total were included in the study. The left temporal lobe epilepsy were included because of the similarities with schizophrenia patient symptoms. All groups was evaluated in terms of sociodemographic data, NPT, fractional anisotropy (FA) for white matter integrity and connectivity matrixes. Based on the Destrieux atlas for the nomenclature of junctional matrices, 74 anatomical labels were made in each hemisphere. P<0.05 findings were considered as significant.

Results: Our results showed that TLE and SCZ have similar impairments in cognitive functions based on connectivity matrices. The FA in the corpus callosum (CC) genus was found to be decreased in TLE, which is associated with cognitive and executive functions. This might be due to the stress effect exposed at an early age. Differences in the pathways associated with the temporal and frontal lobe and the limbic system were

also observed like arcuate fasciculus (AF) and cingulum (CI). These findings were associated with impairment in executive functions.

Conclusion: This study may improve our understanding of the effects of TLE and SCZ diseases based on brain connectivity and related cognitive functions. Connectivity matrices may help us better understand neurological and psychiatric diseases that have not yet caused structural change, better interpret their symptoms and identify more accurate treatment approaches.

Keywords: temporal lobe epilepsy, schizophrenia, diffusion tensor imaging, connectivity matrix, neuropsychological tests

O-05

Effect of prefrontal transcranial direct current stimulation on working memory in healthy individuals

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Objective: Working memory is a cognitive function which is essential for maintaining many activities of daily living. Working memory performance decreases with age and deteriorates in numerous neuropsychiatric diseases. Mixed results have been reported regarding the effect of transcranial Direct Current Stimulation (tDCS) on working memory. The effects of 2 milliAmper (mA) tDCS administration on working memory have been observed to be better, similar or worse than 1 mA tDCS administration in a variety of studies. The present study aimed to assess the effect of 1,2,3 mA and sham tDCS on working memory in healthy individuals.

Methods: In this randomized double-blind sham-controlled crossover study, 16 healthy participants were randomized to four different orders of administration and administered 4 sessions of 1–2–3 mA or sham tDCS over the left dorsolateral prefrontal cortex (DLPFC) separated by one week. The DLPFC was chosen on account of strong relationship with working memory and easy applicability. Verbal 3-back test was administered before and after every tDCS sessions to assess working memory. Repeated measures analysis of variance (Rm ANOVA) tests were applied to compare group differences.

Results: Mean age was 20.33 (18–30). No baseline difference was observed in working memory performance among four groups. Rm ANOVA indicated a significant interaction between tDCS*Stimulation Type (p=0.007). 3 mA tDCS resulted in higher d' scores (p=0.013) while sham tDCS resulted in lower working memory performance (0.029), possibly due to anticipation anxiety. There was no difference in d' scores after 1 mA (0.227) and 2 mA tDCS (0.238).

Conclusion: In the present study, the enhancing effect of 3 mA tDCS on working memory was observed for the first time while no effects of 1 mA and 2 mA tDCS on working memory were found. The present findings support the previous results that different current densities of tDCS might have resulted in different working memory outcomes.

Keywords: cognition, noninvasive brain stimulation, transcranial direct current stimulation, working memory

O-06

Examination of right hemisphere bias in the chimeric faces task according to handedness

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Objective: Chimeric faces used for the detection of cerebral lateralization are created by dividing two different faces vertically from the midline and combining them into a single face. Chimeric faces studies have been generally carried out with right-handed subjects, and a left visual field(LVF)/right hemisphere(RH) bias has been found in the participants mostly. The aim of this study is to examine LVF/RH bias in the Chimeric Faces Task by comparing right and left-handed subjects' performance.

Methods: A total of 158 university students (118 right-handers/109 females) with a mean age of 20.77±1.76 years and whose handedness was evaluated according to the Edinburgh Handedness Inventory participated in the study. The original Chimeric Faces Task (Levy et al., 1983) was administered. In this task, photos of nine people with happy and neutral expressions combined by cutting and reversed, which is also used for providing mirror images to create 36 chimeric faces. Participants were asked to decide which face was happier from two chimeric faces, representing a different half-visual field, one half smiling one half neutral on the same page, and then a laterality quotient (LQ) was calculated for each participant. A positive LQ score shows a right visual field(RVF)/left hemisphere(LH) bias while a negative LQ score indicates a LVF/RH bias.

Results: The findings showed that the mean handedness score was +75.25±15.62 for the right-handers and -74.25±17.67 for the left-handers. In terms of LQ scores, a marginally significant difference was found (p=.046) between right-handers (M=-.23±.54) and left-handers (M=.014±.70).

Conclusion: Consistent with the literature, the results indicate that a LVF/RH bias in the Chimeric Faces Task for the right-handers. Although the LQ scores in the left-handers represent a RVF/LH bias, it is observed that left-handers did not show a certain visual-field bias as clearly as right-handers exhibited. It is thought that left-handers use more bilateral processing during the task.

Keywords: chimeric faces, cerebral lateralization, handedness

O-07

Event-related theta responses during the hand lateralization cognitive task in amputees

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Objective: Hand lateralization cognitive task is a useful tool for assessing individuals' body image. There are clinical studies showing body perceptions can change depending on limb loss in amputees for different reasons. Considering EEG studies, studies evaluating the EEG oscillations are limited. Based on this, our study aimed to evaluate the event-related EEG brain oscillations revealed during the hand lateralization cognitive task in amputees.

Methods: Thirteen right-dominant healthy and 9 amputees in total, 6 bilateral and 3 left, participants were included in the study. EEG recordings were made from 32 channels with the BrainAmp MR Plus device with a sample rate of 500 Hz and band limits of 0.01–250 Hz. Hand lateralization cognitive paradigm, in which right-hand and left-hand images were presented in different postures, was applied as a stimulus during EEG recording. Event-related power spectrum analysis was performed in the theta frequency band separately for right- and left-hand images. Repeated measures ANOVA were used for statistical analysis.

Results: StimulusXGroup interaction was statistically significant (p=0.048). When left-hand visual stimuli were given in healthy controls, the event-related theta power revealed in the first 200ms was higher than that of right-hand visuals. In amputees, no difference was detected between theta power spectra given to right-hand and left-hand visual stimuli. Group difference and LocationXGroup interaction weren't significant (p>0.05).

Conclusion: The increase in theta power observed in response to left-hand images in healthy controls was thought to be related to the cognitive attention maintained for responding to left-hand images. Similar results were not achieved in amputees. There are studies reporting that theta response is crucial for visual processing and evaluating body image. As a result, it can be deduced that there may be changes in the theta responses related to the EEG Event due to the negative effects of body image in amputees.

Keywords: EEG, brain oscillations, theta, hand laterality task

O-08

Do emotion regulation skills affect working memory performance? Functional near infrared spectroscopy (fNIRS) study

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Objective: This study aims to examine the effect of emotion regulation (ER) skills on working memory (WM) performance with its behavioral dimension and related neurophysiological structures and processes.

Methods: The study is applied with 32 people (avarage of age is 24.01±3.01; average of education year is 16.00±2.14). During the experiment, as emotional stimulation, a horror video was watched between the 2-back pre- and post-test (measurement of WM performance). Participants were divided into two group according to the ADFES-BIV score. Between the low ADFES-BIV score group and the high ADFES-BIV score group were examined differences in WM (working memory) performance before/after emotional stimulation. To analyze brain regional activation, used NIRS analysis.

Results: Independent groups t-test was applied for behavioral performance decline in the WM task after emotional stimulation between groups with low and high ER. According to the regression analysis, the ADFES-BIV score explains 33.6% of the decrease in the WM performance after emotional stimulation. In fNIRS analysis, when brain regional activation of the group with high ADFES-BIV score was subtracted from the group with low ADFES-BIV score, a significant difference was observed in the mPFC and right/left dlPFC regions (p<0.5).

Conclusion: To conclude, with good ER have less disruption in WM performance than those with poor emotion recognition. This study has results showing that a better emotion regulation skill can be a determinant for better WM performance. This differentiation supports our main hypothesis with behavioral data and neuroimaging findings. During the WM task, hyperactivation was observed in the right/left dlPFC and mPFC regions of the group with high ER scores compared to the low group. This study indicates that a better emotion regulation skill may be a determinant for better WM performance. Considering these findings, it can be thought that neuromodulatory interventions to be applied over the described neuroanatomical regions may have an effect on improving ER and WM.

Keywords: working memory (WM), emotion regulation (ER), fNIRS, n-back task, STAI

O-09

Research of cognitive skills of healthy individuals during painful stimulus with electroencephalogram

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Objective: Pain is known for its negative impact on several cognitive performances, especially working memory. TENS is a method that is used as a painkiller in clinics, we used it to induce pain. In the current study, it is hypothesized that when we provide pain formation with TENS, there could be negative impacts on working memory. The research aims to examine possible cognitive changes caused by TENS-induced pain and their indications in EEG delta responses.

Methods: EEG recordings of 18 healthy participants were performed during the N-back (verbal version) paradigm using a 32-electrode cap. Two types of stimuli were presented during the n-back task: target to which participants had to pay attention and non-target. EEG recordings were performed during the TENS stimulation as the "painful condition" and without TENS stimulation, and the delta responses revealed in the two conditions were compared by analyzing the power spectrum.

Results: There was a significant stimulus type*pain condition interaction ($p<0.05$). Accordingly, there was no change observed in the delta responses to the target stimulus depending on the TENS stimulation, while delta responses to the non-target stimulus increased during the TENS stimulation.

Conclusion: According to the preliminary results of the study, the delta response difference between target and nontarget stimuli diminished in the painful condition. In the literature, this response difference which occurs from the higher responses to the target stimulus than the nontarget's is considered as a sign of the proper cognitive processing. We may conclude that the "pain condition" affects the neuronal response of cognitive processing.

Keywords: EEG, pain, delta

O-10

The relationship between cognitive control and flexibility with fear of COVID-19

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Objective: COVID-19 not only affects physical health, but also affects mental health by causing fear on various issues due to the uncertainty it has. Cognitive control, on the other hand, refers to the ability of people to adapt flexibly and quickly to ever-changing environments, to avoid irrelevant information, and to focus on information that is relevant to a specific goal. In this study, it was aimed to evaluate the relationship between the mechanisms of cognitive control and flexibility and the fear of COVID-19 that comes with the pandemic process.

Methods: 224 (134 females, 85 males, 5 queer) volunteers between the ages of 18–55 participated in the study. Covid-19 fear scale, Beck Anxiety scale and Cognitive control and flexibility scale which assess participants' ability to control their unwanted thoughts and emotions and the ability to cope with challenging situations were applied to the participants. The relationship between variables was examined with Pearson correlation analysis.

Results: The mean age of the participants was (M=37.07, SD= 11.81), and the mean total education year was found as (M=16.63, SD=4.33). In our study, fear of COVID-19 was negatively correlated with the cognitive control/flexibility scale ($r=-0.220$, $p<0.001$). Also, it was positively correlated with anxiety ($r=0.416$; $p<0.001$). The regression model which included Beck anxiety and cognitive control/flexibility scale total scores was found to be significant in predicting fear of COVID-19 ($R^2= 0.175$, $F(2,221) = 23.454$, $p<0.001$).

Conclusion: In this study, it was reported that people who are more afraid of COVID-19 have lower cognitive control/flexibility and higher anxiety. Apart from examining how individuals are affected by the pandemic process, the determination of the psychological risk factors of the epidemic has also become a very important issue. In this context, more studies are needed.

Keywords: fear of COVID-19, cognitive control/flexibility, anxiety

O-11

The relationship between cognitive errors and anxiety during the COVID-19 pandemic: the mediating effect of cognitive control and flexibility

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Objective: The COVID-19 pandemic affecting the world changed our lifestyles, and working styles. Social isolation has psychological and cognitive consequences. It was aimed at examining the mediating effect of cognitive control and coping flexibility on emotions and the relationship between individuals' anxiety and cognitive errors during the COVID-19 pandemic.

Methods: The sample of the study consisted of 818 participants, 494 female and 314 male participants, aged between 18 and 81. The mediation effect was applied with the bootstrap technique with 5000 resampling options using the Process macro developed by Hayes (2018).

Results: Significant correlation between cognitive errors and anxiety ($r=-.23$, $p<.05$), cognitive control over emotions ($r=.44$, $p<.05$), coping flexibility ($r=.20$, $p<.01$) has a relationship. Significant correlations were found between anxiety and cognitive control over emotions ($r=-.29$, $p<.01$), coping flexibility ($r=-.09$, $p<.05$). According to the mediation analysis made with cognitive control; the indirect effect of anxiety on cognitive errors is significant; coping flexibility mediates the relationship between anxiety and cognitive errors ($\beta=-.002$, 95% [-.0049, -.0002]. When the mediating effect of cognitive control on emotions is

examined; the indirect effect of anxiety on cognitive errors is significant; Cognitive control over emotions mediates the relationship between anxiety and cognitive errors (β=-.017, 95% [-.0216, -.0122]. Coping flexibility has a low mediating effect.

Conclusion: The Covid-19 pandemic affects people's psychological and cognitive health. In this study, it was considered important to increase the cognitive flexibility and control skills of individuals with psychological support process to reduce the cognitive errors of individuals affected by anxiety, and cognitive errors in areas, including concentration and memory in daily life. This study will contribute to the field by guiding the planning of health policies and necessary interventions.

Keywords: cognitive errors, cognitive status, anxiety, cognitive flexibility, cognitive control

O-12

Neural transmission mechanism between hemispheres is highly associated with cognitive skills in healthy adults

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Objective: Aim is to provide quantitative indicators by means of EEG synchronization levels between right and left hemispheres in detecting cognitive skills in healthy adults who are grouped with respect to their management forms on both perception and expression of the emotions

Methods: In order to determine the groups having clearly different cognitive abilities, the scores are considered in psychometric questionnaires in the LEMON database. The resulting list provides the individuals who often and rarely use of two contrasting emotion regulation strategies. Then, spectral coherence and information theory are applied to their surface EEG recordings in eyes-closed state. Short EEG segments are assumed to be modeled by Auto-Regressive model. The resulting estimations are investigated by using Adaboost classifiers and logistic regression modelling between the groups.Data analysis is performed in MATLAB2021Ra. LEMON database can be found on following web page: http://fcon_1000.projects.nitrc.org/indi/retro/MPI_LEMON.html

Results: The highest comparison performances (99.44\% classification accuracy, $p<0.05$ statistical difference) are produced by spectral synchronization levels into full-frequency band (0.5–40.5 Hz).

Conclusion: The specified Brodmann areas are stated for the recording sites that are found to be more sensitive to cognitive skills diversity. This matching of Brodman numbers with meaningful EEG recording sites reveals that emotion management strategies, i.e. cognitive skills are highly associated with the neural transmission mechanism at the specified cortices responsible for associative memory and cognitive perception.

Keywords: brain biophysics, EEG synchronization, cognitive neuroscience

O-13

Classification of hierarchical/topological network indices of the brain with deep learning models in adults having different cognitive/behavioural skills in emotion regulation

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Objective: The aim is to provide quantitative indicators that show strong correlation between spontaneous brain functions compatible with neural activities and cognitive/behavioural emotion regulation abilities in healthy adults.

Methods: EEG-based and undirected Graph Theoretical (GT) models are combined with deep learning models. Resting-state 62-channel surface EEG series, recorded from 60 healthy adults in eyes-closed and eyes-open states, are downloaded from a database called LEMON. Individuals' psychological test scores, associated with Emotion Regulation Questionnaire (ERQ) and Cognitive ERQ, are also available at LEMON. Effective connectivity matrices are estimated in six separate frequency intervals (full-band, delta, theta, alpha, beta, gamma) by examining Directed Transfer Function in order to eliminate volume conduction effect originated from large number of recording electrodes. Individuals having contrasting cognitive skills and the others having contrasting behavioural skills are determined into four groups. Their stimulus-free effective network indices are computed by using 'brain connectivity toolbox' in MATLAB2021Ra platform.The groups are classified with deep learning models with respect to not only states (eyes-closed and eyes-open) but also frequency specification.

Results: The most useful classification performances are obtained with combined six brain network indices that refer hierarchical (modularity, global efficiency), and topological (clustering coefficients, local efficiency) information processing as well as intensity/speed of information flow across the cortical regions in discrimination of cognitive (96.05\%) and behavioural (89.66\%) abilities in full-band specific eyes-closed EEG.

Conclusion: The results reveal that sensation-perception-appreciation mechanism of the brain depends on modifiable cognitive/behavioral emotion regulation abilities in terms of GT network indices based on electrophysiological recordings.

Keywords: brain biophysics, EEG, graph theory, cognitive neuroscience, deep learning, effective connectivity

O-14

Cognitive differences between multilinguals and monolinguals in terms of motor learning

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Objective: This study deals with the cognitive differences between multilinguals and monolinguals in terms of motor learning.Cognitive abilities in monolinguals and multilinguals are considered different and are an important aspect of motor functioning in an individual.

Methods: Two study groups of 20 participants in each group involving healthy individuals of both genders between the ages of 18–50 were enrolled.Monolinguals were Turkish speakers while multilinguals were Turkish+/-English+/-French speakers. English and French proficiency were tested using LexTale test and a score of more than 50% was considered as a cut-off for the study.Participants were evaluated by using a neuropsychological battery of tests including Fitt's Law (eye-hand coordination, motor control, tracking mobility and information processing speed),Wisconsin Card Sorting Task (attention, perseverance, abstract thinking, set shifting, working memory),Stroop Test (attention, response inhibition, information processing speed), Corsi Block Test (visuospatial memory) and Task Switching Cued (cognitive flexibility) versions available on an online platform.Their motor learning ability was tested by learning and playing three different Xbox Kinect games on Day 1,3,5 and 7. Prior gaming experience with gaming consoles such as Xbox, Playstation and Nintendo Wii were kept as a variable in the study and participants playing more than 3 times a week were excluded from the study. Analysis was performed using SPSS version 26.

Results: Multilinguals showed better performance on some of the Neuropsychological tests such as Fitt's mean response time (p=0.000) and Corsi test (p=0.003) but no significant differences on the WCST (perseveration error, p=0.583), ST (stroop effect, p=0.905) or Task Switching cued (task switch cost,p= 0.895; task interference, p=0.832). However, multilinguals performed exceptionally better than monolinguals in all sessions of Xbox Kinect games with all results significantly better than monolinguals (p=0.000).

Conclusion: It can be concluded that multilinguals have certain cognitive advantage over monolinguals in working and visuo-spatial memory, sensory-motor control, information processing speed and motor learning.

Keywords: monolingual, multilingual, ExerGames, motor learning, kinect

O-15

The relationship between speech disorder profiles of school-age children with different clinical diagnoses

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Objective: Language and speech disorders are common in preschool and school-aged children, their profile affected by their developmental level, cognitive status and the presence of a special condition. Speech production features provide direct information on how cognitive load affects pronunciation. Our study aimed to describe the relationship between speech disorder profiles and cognitive functions of school-age children.

Methods: 58 children aged 6–10 (mean 8.3) who applied to the outpatient clinic between 9/2020 and 6/2021 with the complaint of speech disorder were included in the study (EC:9/20, PNo.89). Diagnostic groups were specific learning disability (n=23; mean age 8.4), fluency disorder (n=18; mean age 8.2), and pragmatic communication disorder (n=17; mean age 8.0). Evaluation tools were Draw-a-Person (DPT), Raven Colored Progressive Matrices (RCPM-T), and Ankara Articulation (AAT) tests. Language abilities were obtained retrospectively from Counseling and Research Center (CRC). Receptive and expressive language performances were not considered as they were compatible with chronological age.

Results: Mental age score of children with specific learning disability, stuttering and pragmatic communication disorder in DPT test were 7.9; 7.3; 6.5 and AAT Standard Score averages were 84, 98 and 89. RCPM-T scores were, 16.7; 21.8; 16.8, respectively and their durations 358.3; 264.7; 328.4 sec.

Conclusion: Although DAP test results in all groups are below the average age, lowest performance were children with pragmatic communication disorder. Speech disorders are most common in children with specific learning disabilities and least in children with stuttering. According to the RCM-T, the most successful group for score/duration is children with stuttering. Cognitive functions are not frequently evaluated in school-age children with speech disorders, and as a result of our study, it is necessary to consider cognitive functions for an effective therapy plan for children with different clinical diagnoses.

Keywords: speech disorder, specific learning disability, autism, stuttering

O-16

Effect of personality on EEG and fNIRS measurements during joint action

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Objective: When two or more people perform a task together, it is called joint action. Joint action is an important part of social life and the underlying neural mechanisms have not yet been fully explained. In this study, our aim is to examine the changes in electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS) measurements of the participants during joint action and to investigate how these changes are affected by the personality traits of the participants.

Methods: Sixty-two participants were studied in thirty-one same-gender couples. Participants completed the 0-back, 1-back, 2-back and 3-back levels of the n-back task once alone in the room and once with two people. Response time, percent correct response, EEG, fNIRS, and electrocardiography

(ECG) data were collected from participants in both cases. For personality assessment, Ten Item Personality Inventory (TIPI, Romero et al., 2012) was translated into Turkish and applied to the participants. In TIPI assessment, participants are evaluated under the headings of Extroversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness.

Results: As n-back level increases, effect of workload increase was measured on reaction times, response accuracy, heart rate, heart rate variability, oxygenation change as measured in fNIRS, decrease in alpha band across parietal electrodes and increase in theta band across frontal electrodes in EEG. Comparison of these measures across joint and alone action with TIPI scores yielded the following: (i) Extroverts' measures indicated lower mental workload during joint action, (ii) More agreeable a person, less mental workload during joint condition, (iii) Conscientiousness: Highly conscientious participants were slower to react and made fewer errors, (iv) Emotional stability had the strongest relation to heart rate, participants with lower emotional stability experienced largest increase, (v) Openness did not have a significant effect.

Conclusion: Changes in EEG, ECG and fNIRS measurements across joint and alone action were affected by the personality traits of the participants.

Keywords: joint action, electroencephalography (EEG), functional near-infrared spectroscopy (fNIRS), cognitive neuroscience, social cognition

O-17

Event-related delta and theta responses during visual and emotional oddball paradigms

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Objective: Emotion-cognition interaction is still not fully understood. It seems important to investigate electrophysiological responses to better understand the mechanisms underlying this interaction. Therefore, in this study, it is aimed to study the event-related power and phase responses in delta and theta frequency bands that occur during visual and emotional oddball paradigms.

Methods: 20 healthy young volunteers (21.40±1.31) participated in the study. Oddball paradigms including target, non-target, and distractor stimuli were designed for this study. Each participant firstly completed a visual oddball paradigm using color screens (white, light gray, and dark gray); then they also completed 2 different oddball paradigms using emotional pictures (positive, negative, and neutral). While participants paid attention to white screens as target stimuli in the first paradigm; positive and negative pictures were the target stimuli in the second and third paradigms, respectively. The EEGs were recorded during the experiment. Event-related power spectrum and phase-locking analyses were performed for the delta (1–3,5 Hz) and theta (4–7 Hz) frequency bands. Statistical analyses were conducted with repeated measures ANOVA.

Results: The Task X Stimuli interaction was found statistically significant for power spectrum and phase-locking values in the delta and theta frequency ranges ($p<0.05$ for all comparisons). Non-targets elicited higher phase-locking responses than negative and positive targets. In addition, negative target stimuli elicited higher power responses than positive distractors. On the other hand, no significant difference was found between positive target stimuli and negative distractors in terms of power responses.

Conclusion: The differentiation of phase-locking and power responses in response to 2 different stimulus types (color and emotional pictures) indicated that emotional and non-emotional cognitive processes have different electrophysiological basis. Moreover, even when negative stimuli are presented as the distractors, they elicited similar power responses with the positive target stimuli; and this result showed the influence of negative emotion on cognitive processes.

Keywords: delta, emotion, event-related oscillations, theta

O-18

Neural bases of decision making and metacognition in episodic memory: event-related potentials results

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Objective: It is still unknown whether decision-making and metacognitive judgments are different neural bases. The study aims to investigate the event-related potentials (ERPs) elicited by different types of recall decision (yes, no) and metacognitive judgment (feeling of knowing; FOK) during the episodic memory task.

Methods: 15 healthy and right-handed university students (13 female) aged between 18–25 were recruited. Classical recall-judgment-recognition paradigm was used for the episodic memory task. First, participants were instructed to encode the word pairs. Second, the first word of each pair was presented, and the participants were asked to recall the second word of the pair by choosing one of the three options for decisions/judgment, namely, "Yes," "No," and "FOK"; I do not remember at the moment, but I can remember it in the future). Lastly, a multiple-choice test was used for recognition phase. Results for the judgment phase were presented only for this presentation. Stimulus presentation, recording, storage, and analysis were carried out using a 64 channel EEG/EP NeuroScan system.

Results: ERP grand averages were calculated for the "Yes," "No" decisions, and the "FOK" judgments for Fz, Cz, and Pz channels. Results of variance analysis showed that different types of decisions elicited N100 and P200 peaks, and "Yes" decisions had earlier N100 and P200 latency than "No" decisions and "FOK" judgment ($p<.05$). Also, we observed parietal slow-wave response (at 400–900 ms), which significantly differed in terms of decision/judgment types ($p<.05$). The amplitude of slow-wave for "Yes" decisions was smaller than the "No" decision and the "FOK" judgment ($p<.05$).

Conclusion: The results are discussed based on the findings of studies showing that different types of recall decisions and FOK judgments in episodic memory are associated with different ERP components, and the frontal and parietal areas have different relationships with these decision/judgment types.

This study was supported by the Scientific and Technical Research Council of Turkey TÜBİTAK (Project no: 120K914).

Keywords: decision-making, recall, metacognition, episodic memory, event-related potentials

O-19

Investigation of the effect of perceptual uncertainty on the decision-making process by event-related potentials

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Objective: The neural basis of the effect of uncertainty during visual perception on the decision-making process has not yet been clarified. This study aims to examine the effect of the uncertainty during the visual perception on decision-making and metacognitive processes using the event-related potentials (ERP).

Methods: 15 participants (13 female) aged between 18–25 were recruited. All participants were right-handed and had no neurological or psychiatric history. 100 object photos were used, while 75 were distorted by adding digital noise and 25 were white noise. Participants were instructed to decide whether they saw a 'meaningful object' in the photos, using the "Yes", "Feeling of Knowing (FOK; I don't remember right now, but I can recognize it in the future if it is given in multiple-choice test)" and "No" decision options. Stimulus presentation, recording, storage, and analysis were performed using 64-channel Neuroscan systems.

Results: Grand averages were calculated for the "Yes", "FOK" and "No" decisions for Fz, Cz and Pz electrodes. Variance analysis showed that these decisions elicited N100, P200, and negative slow wave (NSW, 400–900 ms). The "Yes" decisions significantly differed from other decisions ($p<.05$). The lowest amplitude in the N100 response, the highest amplitude in the P200 response, and the highest amplitude in the NSW response was obtained for the "Yes" decision ($p<.05$). The "Yes" decision for the NSW differs significantly from the others ($p<.05$). This difference was prominent in the frontal and central areas.

Conclusion: The results align with previous ERP studies examining the relationships between stimulus uncertainty and decision-making in visual perception. Our results also indicated that perceptual decision-making and metacognitive judgments are differently related to different areas of the brain.

This study was supported by the Scientific and Technical Research Council of Turkey TÜBİTAK (Project no: 120K914)

Keywords: visual perception, stimulus ambiguity, decision making, metacognition, ERP

O-20

Age-related alterations in gamma oscillations during multistable perception

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Objective: Multistable stimuli elicit spontaneous perceptual reversals between multiple internally generated perceptual alternatives. Rate of perceptual reversals appear to be related to gamma activity and older adults report significantly slower reversal rates compared to young adults. Aim of this study was to investigate whether reversal-related gamma responses were altered in older adults.

Methods: Electroencephalography (EEG) of 12 young (M= 24.33 SD=2.43) and 12 older adults (M=61.17 SD=3.93) were recorded during a multistable perception and a control task. Wavelet convolution was used to extract time-frequency power within 28–48 Hz range. Reversal-related time-frequency power modulation relative to baseline intervals (i.e. event-related spectral perturbations) were used in analyses. One set of analyses were conducted on participants' dominant low gamma (28–37 Hz) and high gamma (38–48 Hz) frequencies, and another was conducted by using 40 Hz as the center frequency for all participants.

Results: Fixed 40 Hz center frequency did not reveal any age differences in neither of tasks. Dominant gamma analyses have shown stronger and earlier posterior low-gamma responses in older adults during multistable perception. Older adults also had higher high-gamma responses over anterior areas compared to young adults. However, gamma responses were not different between the age groups during the control task.

Conclusion: Impaired top-down perceptual integration might have increased the bottom-up processing of external visual information to facilitate reversals in older adults. Age-related shift in dominant gamma frequency have shown to influence the results significantly depending on the analytical procedure. It has been once again shown that it is critical to account for individual variability in EEG frequencies, especially when

studying subject variables that are known to influence dominant frequencies. We can conclude that our results indicated compensatory gamma responses in older adults.

Keywords: multistable perception, aging, electroencephalography, gamma oscillation, dominant frequency

O-21

Multisensory mismatch responses in audiotactile integration

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Objective: Detection of deviant and novel cues is a crucial evolutionary aspect that allows us to redirect our attention to the changes in our environment. Detecting changes in various sensory modalities happen fast and with precision in the acquisition process of sensory stimuli. In multisensory environments, dominantly relying on information from a sensory modality is a common phenomenon. The effect of auditory domination was observed in audiotactile interactions. However, the mismatch response - a response to deviant stimuli that is observed in Event Related Potentials (ERPs) - in presence of audiotactile stimuli has not been investigated. In the auditory domain, mismatch negativity has been found to be a response which peaks at about 150 to 250ms to the onset of change in the stimuli which is identified in the negative side. In the somatosensory domain, mismatch negativity has been identified as a positive component which peaks at about 190 to 290ms after the onset of change in the tactile stimuli. Following previous behavioral findings regarding auditory dominance, we hypothesised that the auditory mismatch negativity to be more prominent than the somatosensory mismatch negativity when audiotactile stimuli patterns are disrupted.

Methods: In the present study, we investigated the effect of auditotactile integration on mismatch responses using an oddball paradigm. We recorded the EEG responses in three conditions; (1) auditory deviance, (2) somatosensory deviance and (3) simultaneous auditory and somatosensory deviance. The deviance is created by using different stimuli durations for the oddball trials.

Results: We found that somatosensory mismatch responses were significantly different than auditory mismatch responses. Also auditory deviance in multisensory condition (3) did not significantly differ from auditory deviance condition (1). Moreover somatosensory deviance significantly differed from multisensory deviance condition

Conclusion: These results indicate that, auditory processing dominates the novelty detection. Also, in the presence of auditory stimuli, multisensory integration changes the somatosensory novelty detection responses.

Keywords: auditory perception, tactile perception, multisensory integration, novelty detection

O-22

Evaluation of cognition with the eyelink: visual search and saccadic eye movements in healthy control

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Objective: The aim of this study is to determine the normative data of eye movements and visual scanning models for healthy individuals between the ages of 18–77.

Methods: Six age groups as 18–27, 28–37, 38–47, 48–57, 58–67, 68–77+ and 76 subjects were included in the study. A neuropsychological assessment, which assesses five cognitive domains, was applied to the subjects. Fixation, prosaccade, antisaccade and free search paradigms were applied in the evaluation of eye movements. Pupil size, microsaccade frequency, amplitude, latency, peak velocity, expectant saccade, correct saccade, and corrected saccade were analyzed. The relationship between cognitive functions and eye movements has been evaluated.

Results: In antisaccade, correct saccade ($p<0.001$), corrected saccade($p<0.001$),anticipatory saccade ($p=0.02$), latency ($p<0.001$), amplitude ($p=0.04$), uncorrect saccade ($p=0.008$) are statistically significantly different. Statistically significant difference was found in prosaccade total correct ($p=0.028$) and latency ($p<0.001$). A statistically significant difference was found in the frequency of microsaccades ($p=0.011$) and pupil size ($p=0.015$). In the 18–27, executive functions were highly negatively correlated with anticipatory saccade ($r=-0.633$, $p=0.049$), and corrected saccade latency ($r=-0.830$, $p=-0.003$). In the 28–37, a high level of positive correlation was observed between executive functions and microsaccade amplitude ($r=0.697$, $p=0.025$). In the 38–47, a high level of negative correlation was found between memory and antisaccade amplitude ($r=-0.636$, $p=0.048$), and latency ($r=-0.685$, $p=0.029$). There is a high level of positive correlation between executive functions and antisaccade amplitude ($r=0.770$, $p=0.009$) in the 48–57. In the 58–67, there is a high level of positive correlation between visuospatial memory and microsaccade peak velocity ($r=0.610$, $p=0.007$). In the 68–77+, there is a high level of positive correlation between attention and peak velocity ($r=0.767$, $p=0.016$).

Conclusion: As our knowledge, there is no study examining the relationship between comprehensive cognitive functions and eye movements by age. It has been observed that the decline in cognitive functions that occur with increasing age affects eye movements such as anticipatory ($p<0.05$), correct saccade ($p<0.001$), and corrected saccade ($p<0.001$). Looking at the correlation in eye movements,the relation between antisaccade and cognitive functions is quite evident based on age. This study is a pioneering study to present cognitive functions and eye movement profiles based on age.

Keywords: cognitive functions, eye movements, normative data, saccade, visual search

O-23

The effect of using virtual reality application before normal vaginal delivery on pain in participants with different personality structures

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Objective: It has been observed in the recent literature that virtual reality applications have started to be used as a complementary application to various interventional methods in medicine. In this study, it was aimed to observe how various relaxing environment experiences watched with virtual reality glasses during the latent phase of normal vaginal birth affect the personality traits of individuals.

Methods: The study was conducted with a total of 37 laboring women hospitalized in Acıbadem Maslak Hospital Obstetrics and Perinatology unit between November 2020 and June 2021. The environments were white winter, blue ocean, green meadows, blue deep, red fall. Patient satisfaction with the use of VR was assessed by a Virtual Reality Satisfaction Survey and the pain level was assessed by Virtual Analog Scale. The personality traits determined by Big Five Personality Inventory. In order to measure the relationship between the variables done with linear regression analysis and descriptive statistics within the SPSS 25.0 statistical program.

Results: A total of 37 pregnant women aged between 18–42 (median: 31; sd: 2.73) were included in the study. In the linear regression analysis, it was seen that the virtual environment named white winter, which was chosen at the top of the factors determining virtual reality satisfaction, was effective (p=0.033) (β=8.61) (SE=3.89). The pain level measured after the virtual reality application was also statistically non-significant (p=0.065). As a result of descriptive statistics made on personality inventories, the mean scores of Extraversion (2.48±1.40), meanness of agreeableness (2.37±1.23), mean scores of self-control (2.27±1.48), mean scores of neuroticism (-0.78±1.68) and openness(1.37±1.55) was found.

Conclusion: As a result, it was observed that the level of satisfaction with virtual reality and the selected environment image were related. Although this relationship is thought to depend on different personality inventories, a statistically significant result could not be reached due to the lack of sample.

Keywords: big five personality traits, non-pharmacological treatment, pain, virtual reality

O-24

The link between impulse buying and set-shifting, inhibition, and selective attention

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Objective: This study aims to examine the relationships between impulse buying tendency and set-shifting, planning, and resisting distractors.

Methods: The participants consist of 67 people, including 33 women and 34 men being an average age calculated as 21.61. The following tests were administered respectively: Wisconsin Card Sorting Test to measure participants' set-shifting, Stroop Test TBAG Form to measure resisting distractors., Tower of London Test to measure planning. Besides,Impulse Buying Scale adopted to measure the impulse buying tendency.

Results: The dataset was analyzed through the structural equation model (SEM) by using AMOS 23.0 program. With the first model was obtained from the data of all participants. According to results of first model, planning (β=.40; p=.00) was significant in directly to predict impulse buying tendency; however, importance of set- shifting and resisting distractors were not significant for all participants. According to analysis, the first model was indicated goodness of fit [χ^2 (15, n= 67) = 15.70, p=.40; χ^2/df=1.00; RMSEA=.03; CFI=1.00; NFI=.90]. Likewise, latent variables of set-shifting and planning predicted with female participants, Stroop Test TBAG Form 5th Section Correction score predicted male participants in SEM.

Conclusion: This study is one of the few studies examining the relationship between impulse buying and executive functions. According to the results, individuals who have low planning skills have a higher tendency to make a sudden purchase in the shopping environment. In previous studies, no study examining the relationship between impulsive buying tendency and inhibition was found, and this finding provides a new contribution to the literature.

Keywords: impulse buying, inhibition, set-shifting, neuropsychological tests, selective attention

O-25

Effect of transcranial direct current stimulation on categorical perception of speech sounds

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Objective: In the present study, we aimed to investigate the effect of transcranial direct current stimulation (tDCS) applied over the left auditory cortex on the categorical perception of speech sounds. The study was planned with the hypothesis that stimulation of the left auditory cortex with anodal tDCS would increase phonetic categorization task performance, while cathodal stimulation would have a disrupting effect.

Methods: 46 (female: 22; male: 24; mean age=23.05; sd=3.15) healthy volunteers between the ages of 18–35 were included in our study [groups: anode (n: 16), cathode (n: 14), sham (n: 16)]. All participants performed the task of phonetic categorization within the framework of baseline performance. Subsequently,

the participants received tDCS of 2 mA for 30 minutes. After the end of the fifteenth minute of the current, the phonetic categorization task was started again.

Results: The response time, category boundary and slope parameter did not differ significantly in the comparison between the groups. Within group comparisons, a significant increase was observed in the category boundary value, cathode group and sham group (Cathode t=-2.209, p=.046; Sham: t=-3.178, p=.006), response time was significantly shortened in the anode group (Z =-2.223, p=.026).

Conclusion: The application of tDCS over the left auditory cortex as a single session did not show a significant effect on the parameters related to the categorical perception of speech sounds compared to sham stimulation. While there was a significant increase in the category boundary value in the cathode and sham groups, there was an increase in the anode group and there was no study on this subject in the literature, so it should be repeated with a higher number of participants and it should be investigated whether this effect is a variable depending on the repetition of the task. It is consistent to the literature that anodal stimulation causes a shortening in response time.

Keywords: auditory cortex, categorical perception, transcranial direct current stimulation, voice onset time

O-26

Neural underpinnings of biological motion perception away from selective attention

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Objective: Under selective attention, biological motion (BM) perception is supported by a network of regions including motion and form sensitive occipito-temporal cortex, parietal regions, posterior superior temporal sulcus, and premotor cortex. In addition to established reviews and frameworks on how BM is important for social adaptation and survival, there are also behavioral studies supporting the incidental processing of BM. However, the neural underpinnings of how BM processing occurs when it is away from focus of selective attention lack thorough examination. The aim of this current fMRI study is to investigate the perception of BM when the focus of attention is directed at the foveal task while a task-irrelevant BM stimulus was shown at the periphery.

Methods: Participants (n=31) underwent an fMRI study in which they performed a visual detection task at the fovea, while the attentional load of the task was manipulated. Meanwhile, an intact or a scrambled BM stimulus was shown at the periphery at random times. Participants were explicitly told to ignore these peripheral stimuli and perform the main task as correctly as possible.

Results: Both univariate analysis and multivariate pattern analysis results show that motion-sensitive areas in the occipito-temporal cortex were activated in the presence of task-irrelevant BM stimulus even when attention was directed away from it. Furthermore, during low attentional load condition, the regions that differentiated BM from no distractor conditions were more than that of high attentional load condition.

Conclusion: Thus, our results show that BM is processed at occipito-temporal regions even when it is shown away from the focus of attention, and it is modulated by attentional load.

Keywords: attentional load, biological motion, fMRI, selective attention

O-27

Muscial background effect on cognition: Mozart *vs* silence

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Objective: The study was done to compare and analyse the impact of background music "Mozart vs. Silence" on cognition. research over the years shows an intwined effect of background music over our cognitive abilities as the research is being conflicted with results both showing negative and positive effect. our study will focus on Mozart classical piece (Eine kleine Nachtmusik, k.25) vs silence, the main objective of this study is to show the cognitive effect of background listening to Mozart and silence and compare their effect

Methods: The analysis of the effects of Mozart vs. Silence on the cognitive function, has been conducted in two phases; the first phase will have the participants toke a cognitive battery. (PsyTool) that includes task switching, Stroop, Wisconsin card sorting, Fitts law, and Corsi block while being in silence. after a week the same test but this time Mozart in the background. twenty-two females, thirteen males were enrolled in the study. the data was analyzed using SPSS 25.

Results: The participants test results were compared between Silence and Mozart in the background, the difference of task switching incongruent (p=0.033), Stroop congruent (p=0.004), Stroop incongruent (p=0.008). between both conditions were statistically significant while Corsi block and Fitts law and Wisconsin's results were insignificant.

Conclusion: The Mozart session showed little to no difference compared to the silence session in Wisconsin card sorting, Fitts law, Corsi block and a better performance in stroop congruent, stroop incongruent, task switching incongruent. Wisconsin is used to measure attention, cognitive flexibility, working memory, abstract thinking and set shifting while task switching is used for attention shifting, goal retrieval, task set reconfiguration processes, inhibition of prior task set. It can be concluded that classical background music has certain cognitive advantage over silence conditions in executive functions but not in all the domains.

Keywords: music, cognition, Mozart effect, background music, neuropsychological assessment

O-28

Comparing the response of a model neural population to intracortical microstimulation and tactile stimuli

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Objective: Intracortical microstimulation (ICMS) is a promising method for somatosensory prosthesis. We tested how similar a hypothetical neural population responds to tactile and ICMS stimuli.

Methods: A neural structure consisting of 400 regular-spiking excitatory and 100 fast-spiking inhibitory Izhikevich neurons was built. Each neuron had an (x,y,z) coordinate. Probability of synapses between neurons was a function of distance between them. All synaptic weights were same in magnitude. The network was driven by either afferent responses or ICMS. Each neuron's spike times were recorded. In Touchsim (a tool to simulate tactile afferents), afferent responses were recorded for vibrotactile stimuli (amplitude: 80 µm, duration: 0.5s, contactor radius: 1 mm) of three frequencies (40Hz, 60Hz, 80Hz) with 20 repetitions. The afferents were connected to model neurons with 0.5 probability. All synaptic weights were same. ICMS trains with duration and frequencies similar to tactile stimuli were constructed. 5 amplitudes between 10–90 µA were tested. Neurons probabilistically responded to ICMS stimuli. The model was simulated with no-stimulus, tactile and ICMS stimuli with 20 repetitions. Simulations for tactile input were combined with those for each ICMS amplitude. Model responses were clustered in no-stimulus, 40Hz, 60Hz and 80Hz with a metric-space approach based on spike times. Clustering performance was measured with transmitted information.

Results: ICMS amplitudes ≤30 µA were always clustered as no-stimulus. ICMS amplitudes ≥50 µA were clustered similar to tactile stimuli (H=2bits), if spike count was considered. When spike times were regarded, success of clustering was degraded for temporal resolutions ≤62.5ms (H≤1.6bits). Clustering success increased for ICMS (H>1.5bits) and decreased for tactile stimuli (H<1.5bits) with higher temporal resolutions.

Conclusion: Model's responses for low-amplitude ICMS were more similar to those for tactile stimuli. Neural responses for tactile and ICMS were differentiated as the ICMS amplitude increased. If clustering performances for different temporal resolutions are considered, comparison of tactile and ICMS stimuli may highly depend on rate coding rather than spike timing.

Keywords: artificial sensation, intracortical microstimulation, somatosensory prosthesis, tactile stimulation, touch

O-29

Evaluation of the effectiveness of primary motor areas in the formation of motor imagery by EEG method

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Objective: Brain-Computer-Interfaces (BCI) provide control of external devices by processing EEG signals. Recorded EEG dataset is mapped on cortical regions using EEG source imaging method. Combinations of source potentials in left and right lobe cortical regions computed from EEG signals are used to achieve the highest classification accuracy in distinguishing motor imagery formation of right extremities.

Methods: BCI Competition III data set IVa from five volunteers is used in this study. The participants are asked to imagine moving their right extremities while their signals are recorded by a 118-channel-EEG. Cortical signals of the regions in the projections of the motor and somatic sensory areas in Brodmann's brain lobes regions are selected and classified. Total 280 (training-and-test) data are presented for each subject. The data is filtered in the mu band (8–13 Hz) before it is mapped onto cortical areas using Brainstorm software with sLORETA method. Common Spatial Patterns (CSP) are used in feature extraction and Support Vector Machines (SVM) are used in classification. Classification results are obtained for right, left lobes and both lobes together.

Results: Cortical source signals corresponding to motor imagery areas are classified in this study. Right extremity primary motor areas are included in each combination. Average signals are obtained over Brodmann fields and average accuracy rates of five subjects 79.47% for right lobe, 81.76% for left lobe, and 84.13% for both lobe combinations.

Conclusion: It is observed that left lobe region source potentials achieve higher accuracy compared to that of right lobe regions' in motor imagination of the right extremities, but even higher classification accuracy is possible by using both right and left regions together. The fact that the left lobe is more successful in imaging the extremities with EEG neuroimaging is compatible with the medical knowledge. The feature extraction and classification results on cortical signals obtained with sLORETA are compatible with general medical knowledge.

Keywords: EEG, brain computer interface, motor imagery, cortical sources

O-30

In silico analysis of single nucleotide polymorphisms in different parts of multiple sclerosis-associated miRNAs

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Objective: Multiple sclerosis (MS) is a central nervous system disease characterized by degeneration of the myelin sheaths of axons in the brain and spinal cord. Immune, genetic and epigenetic factors are effective in the pathogenesis of the disease. miRNAs are small non-coding RNA molecules, approximately 20–23 nucleotides long, that play a role in the regulation of gene expression. In our study, it was aimed to determine the effects of single nucleotide polymorphisms (SNPs) in different regions of MS-related miRNAs by in silico methods.

Methods: The Human microRNA Disease Database (HMDD), which compiles the relationship between disease and miRNAs

with experimental evidence, was used to identify miRNAs associated with MS pathogenesis. The miRNASNP-v3 program was used to identify SNPs in different regions of miRNAs, the SNP2TFBS algorithmic program was used to analyze the effects of SNPs on transcription factor binding sites.The effect of a SNP on transcription factor binding is predicted according to the position weight matrix (PWM) model. The RBP-Var2 web tool was used to determine the effects of SNPs on RNA binding sites and interacting proteins.

Results: 88 miRNAs associated with MS and 1170 SNPs were identified in different regions of these miRNAs. 375 SNPs were shown to down-regulate miRNAs and 79 SNPs to up-regulate, whereas 716 SNPs have mild effects on miRNA regulation. 18 SNPs affect transcription factor binding sites. 106 SNPs alter the miRNA-RBP interaction pattern and have the potential to affect the expression of different miRNAs.

Conclusion: In the current study, it has been shown that SNPs located in different regions of miRNAs affect miRNAs in different ways (expression, processing and interaction with mRNA). Hence, we suppose that candidate target SNPs identified in different parts of miRNA genes have the potential to be used in the management of MS disease in the future.

Keywords: multiple sclerosis, miRNA, SNP, polymorphism, in silico

O-31

Providing joint movement information via a tactile probe moving on the forearm skin

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Objective: Sensory substitution aims to compensate the absence of a damaged sense by conveying related information through an intact sense. The skin as an important target for sensory substitution has been used to deliver somatosensory information from robotic hands used after amputation. In this study, we tested if humans could determine a joint's position via a probe moving on their skin.

Methods: We attached a tactile feedback device with a tactile probe moving in proximo-distal axis on the forearm of the healthy subjects (with intact limbs, no history of skin/neural diseases). The position and speed of the probe coincided with those of a virtual pendulum moving on a 180° arc (with no delays). Two movement distances (25 and 50mm) for tactile probe and two movement speeds (30 and 180°/s) for the pendulum were tested. 5 subjects (3 females, 2 males) were asked to stop pendulum at a target position, which is varied from trial to trial, under different feedback conditions (no-feedback as a control test, visual feedback, volar/dorsal tactile feedback). The difference between the positions of target and the pendulum was used in the analysis.

Results: The least error was observed in visual feedback condition (3.54±2.19°). The highest error was observed in no-feedback condition (59.7±11.5°). In tactile feedback conditions, the average errors observed for volar and dorsal skin surfaces were 47.3±9.1° and 39.8±12.7°, respectively, for 50-mm movement distance, and 57.9±13.2° and 54.8±7.5°, respectively, for 25-mm movement distance. Repeated measures ANOVA showed that the pendulum speed had no significant effects on the error ($p=0.645$). Feedback method was a significant factor ($p<0.001$), but only tactile feedback conditions with a 50-mm movement distance had significantly lower error compared to no-feedback condition (volar: $p=0.026$; dorsal: $p=0.006$).

Conclusion: Results showed that tactile feedback on the forearm skin may improve the experience of a robotic arm user compared to no sensory feedback condition.

Keywords: sensory feedback, sensory substitution, somatosensory prosthesis, tactile feedback, proprioceptive feedback

O-32

Investigation of the impact of lead on neuronal cell culture in acute and chronic period and evaluating responsible enzymes in silico

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Objective: Lead is heavily used in industry. Despite its extensive use, effects of different doses of lead are not exactly known on neurons. We aim to compare the effects of lead in acute and chronic period and find out the mechanisms which are responsible from our findings with in silico methods.

Methods: Neuroblastoma N2A cell line is exposed to 10–2 M, 10–3 M, 10–4 M, 10–5 M, 10–6 M, 10–7 M, 10–8 M, 10–9 M, 10–10 M, 10–11 M and 10–12 M doses of lead in acute (24 hours of exposure) or in chronic (72 hours of exposure) period. After exposure, WST-1 viability assay is performed. Following WST-1 assay, DCFDA/ H2DCFDA general oxidative stress test was performed. In silico analysis are done by Autodock 4 (with Autodock Tools 1.5.6) using Lamarckian genetic algorithm.

Results: Chronic group had higher viability results when compared to acute except 10–11 dose. This difference was statistically significant in 10–4 and 10–5 doses. Both acute and chronic group had increased viability in non cytotoxic doses compared to control. Oxidative stress on the other hand, was decreased in lead treated groups compared to control. To further understand the mechanism behind this peculiar situation, we performed docking analysis among lead acetate, anti-apoptotic or proliferation inducing proteins and calmodulin. Our results show Pb is prone to bind proteins BCL2 and CD1, inducing further proliferation.

Conclusion: We show increased viability results in lead concentrations which we indicate as non cytotoxic (for acute10–7 - 10–11 M; for chronic 10–5–10–11 M) and we show significant reduction of oxidative stress in lead treated groups when compared to control. With our in silico analysis, we suggest CD1 and BCL-2 might be responsible from those effects.

Keywords: lead (Pb), viability, oxidative stress, in silico, docking

O-33

A new opinion on brain and cavernous sinus hemodynamics

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Objective: Maintaining healthy brain hemodynamics is important for neuron survival. Arteria carotis interna (ACI) takes part the structure of Circulus arteriosus cerebri (Circle of Willis). The sinus durae matris is the structures formed between dura mater laminaes and provide venous drainage of brain. ACI the main artery of brain, passes through sinus cavernosus which forms one of these venous pools. During this transition; while there is arterial blood in the lumen of ACI, its outer surface is in contact with venous blood from brain. We aimed to detect the receptor differences of ACI in this highly specialized anatomical region of the skull base. We compared the results with the cervical part of the same artery.

Methods: We performed the study on 10 human cadavers and scanned CGRPR, TRPV4, ASIC3 and ACTHR receptors using confocal microscopy technique.

Results: We determined TRPV4 receptor positivity in the tunica media and tunica adventitia layers of the cavernous segment of ACI. We did not detect similar positivity in the cervical part of the ACI. In the receptor scan we made in terms of CGRPR; while we detected positivity in the tunica media layer of the cavernous segment, we found positivity in the tunica intima layer of the cervicalis segment of the ACI. We did not detect any positivity for ASIC3 and ACTHR receptors in both parts of the ACI.

Conclusion: We observed various differences in receptors between ACI segments. While the outer surface of the ACI in the cervical region did not show any receptor positivity, we detected TRPV4 receptor positivity along the tissue contour of vessel in the cavernous sinus. The presence of vasomodulatory receptors on the outermost surface of the cavernous ACI suggests a possible neurophysiological reflex in maintaining brain hemodynamics.

Keywords: internal carotid artery, cavernous sinus, brain hemodynamics

O-34

The human central cervical nucleus – chemoarchitecture

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Objective: The central cervical nucleus (CeCv) is a precerebellar nucleus located in the gray matter of the upper cervical spinal cord segments within the limits of lamina 7, and adjacent to lamina 10. The spinocerebellar projections of the CeCv neurons project to the contralateral cerebellum via the superior cerebellar peduncle. In this study, we investigated in detail the chemoarchitecture of the human spinal cord.

Methods: 10% formalin-fixed C1-C4 segments of the human spinal cord were cut on a cryostat at a thickness of 30 µm. Sections were stained using acetylcholine, calcitonin gene-related peptide, enkephalin, GABA, glutamate, glycine, noradrenaline, serotonin, and substance P immunohistochemistry. Sections were imaged under light microscopy and analyzed using ImageJ. Ege University Medical Research Ethics Committee approved all procedures (21.8.2020/E208475).

Results: We observed that CeCv neurons were immunoreactive for acetylcholine, calcitonin gene-related peptide, enkephalin, GABA, glutamate, glycine, noradrenaline, serotonin, and substance P in C1 to C4 segments of the human.

Conclusion: The chemoarchitecture of the human spinal cord was revealed for the human with detail. We observed similarities in the literature for a small number of immunohistochemical studies performed in the rats and mice.

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Keywords: central cervical nucleus, human, spinal cord

O-35

Investigation of the effect of different doses of sulfite on hippocampal synaptic plasticity

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Objective: In our study, the effects of different doses of sulfite on learning and memory were evaluated by behavioral experiments and LTP recordings. The role of ACh in the effects of sulfite on learning and memory, and its possible mediating mechanisms were investigated

Methods: 3-month-old 60 male albino Wistar rats were divided into three groups. Distilled water was given to control group, sodium metabisulphite at dose of 100 mg/kg and 260 mg/kg was given to the sulphite groups for 35 days by gavage. Behavioral changes were evaluated using the Morris Water Maze, Open Field and New Object Recognition test. Heparinized blood samples were taken from the abdominal aorta after the recording of LTP. After perfusion, hippocampi were separated. Plasma S-sulfonate levels in blood, ACh, Arc

and synapsin levels, AChE and ChAT enzyme activities in hippocampus were measured.

Results: It has been observed that the total distance and average velocity performed in the Open Field test and Morris Water Maze prop trial were increased, the discrimination index in the New Object Recognition test decreased in the sulphite applied groups. ACh in the sulphite applied groups were found to be increased. While AChE activity decreased significantly in the sulphite applied groups, ChAT activity increased significantly. EPSP slope (S260:126.63±1.68; S100: 153.52±2.01; C: 157.41± 1.72) and PS amplitude (S260:126.63±1.68; S100: 153.52±2.01, C:177.52±2.01) of the field potentials obtained in sulphite applied groups decreased. This deterioration was found to be accompanied by a decrease in Arc (S260: 0.42±0.07; S100: 0.77±0.14, C:1.45±0.31;p<0.01) and synapsin 1 (S260:0.52±0.05; S100:0.86±0.14, C:1.63±0.21; p<0.01) expression.

Conclusion: In conclusion, it has been shown that sulphite intake in adult rats impairs learning and spatial memory, and this impairment may be mediated by the cholinergic signal pathway. It is considered that the decrease in Arc and synapsin expression may play a role in the mechanism underlying the impairment in LTP responses caused by toxicity.

Keywords: sulfite, learning and memory, acetylcholine, hippocampus, LTP

O-36

Investigation of the effects of nuclear receptor Rev-Erbα/β on cell survival after *in vitro* oxygen glucose deprivation

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Objective: Rev-Erbα/β, acts as a nuclear receptor, has many important functions, especially in regulation of circadian rhythm, metabolism, inflammation, glial activation and macrophage function. Recent studies have shown that Rev-Erbα/β has essential effects on the neurodegenerative disorders. In this project, for the first time, the effects of Rev-Erbα/β on cell survival were investigated after the oxygen glucose deprivation (OGD) model performed in mouse Neuro2A (N2A).

Methods: Lv-Rev-Erbα and Lv-Rev-Erbβ lentiviruses were produced to increase protein expression of Rev-Erbα or Rev-Erbβ by molecular cloning studies. In addition, sh-Rev-Erbα and sh-Rev-Erbβ lentiviruses produced to inhibit protein expression of Rev-Erbα or Rev-Erbβ. Then Lv-GFP (vehicle for Lv-Rev-Erbα and Lv-Rev-Erbβ), Lv-Rev-Erbα, Lv-Rev-Erbβ, Lv-Rev-Erbα/β (Lv-Rev-Erbα + Lv-Rev -Erbβ), scRNA (vehicle for sh-Rev-Erbα and sh-Rev-Erbβ), sh-Rev-Erbα, sh-Rev-Erbβ or sh-Rev-Erbα/β (sh-Rev-Erbα + sh- Rev-Erbβ) lentiviruses were administered to N2A cells. After virus administration cell viability analysis was performed after 24 hours of reperfusion following eight hours of OGD. TUNEL staining was performed to identify apoptotic cells. Statistical analyzes were analyzed using one-way analysis of variance (ANOVA), with the least significant difference test in the post-hoc test (least significant difference, LSD test).

Results: It was observed that Lv-Rev-Erbβ and Lv-Rev-Erbα/βincreased cell survival (p<0.01), sh-Rev-Erbα and sh-Rev-Erbα/β decreased (p<0.05) cell survival after OGD. Apoptotic cells after OGD were detected by TUNEL staining, and the number of apoptotic cells in the groups treated with Lv-Rev-Erbα, Lv-Rev-Erbβ or Lv-Rev-Erbα/β was found to be statistically significant (p<0.01) compared to the control group. In addition, a statistically significant (p<0.01) increase in the number of apoptotic cells was observed in the groups treated with sh-Rev-Erbα, sh-Rev-Erbβ or sh-Rev-Erbα/β.

Conclusion: Results showed that Rev-Erbα/β, which has an essential role in the regulation of circadian rhythm, has crucial effects on cell survival and DNA fragmentation after OGD.

This study is supported by the Scientific and Technical Research Council of Turkey TUBITAK (219S913).

Keywords: nuclear receptor, oxygen glucose deprivation, Rev-Erbα/β

O-37

Investigation of Hif-1α expression on medulla and cervical spinal cord in acute hypoxic ventilatory response

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Objective: Acute hypoxic ventilatory response (HVR) is an augmentation of ventilation (V) during a hypoxic stimulus in minutes. It includes increases in ventilation components as respiratory frequency (fR) and tidal volume (Vt). During a short-term period of sustained hypoxia requires changes in gene expressions in the central nervous system (CNS) on neural circuits of controlling breathing. HIF-1α induces in hypoxia responsive genes and activating transcription. Here we hypothesized that physiological response to acute HVR inhibited to Hif-1α expression on CNS.

Methods: In this study, 3-months-old, 21 male Sprague Dawley rats were used. Acute HVR was measured whole body plethysmography (WBP) different hypoxia levels [severe(s); 10%O_2 (n=9) and moderate(m); 13%O_2 (n=8)]. After WBP measurement rats were perfused before harvesting medulla transverse section between the calamus scriptorius and 1 mm above cervical spinal cord C1 and mid cervical spinal cord C3–C5 segment from each group. Total RNA from tissues homogenates was isolated using TRIzol RNA extraction method. Complementary DNA(cDNA) was synthesized from obtained RNA samples. To evaluate mRNA expressions of the identified genes of Hif-1α and Hif-1β in reverse transcription

polymerase chain reaction (rt-qPCR). CT values were analyzed using the delta–delta CT method and the data normalized with control group (n=4). 1-way or 2-way ANOVA tests was used for comparisons between groups. p<0.05 was determined as statistical significance level.

Results: fR was higher in sHVR then mHVR both acute hypoxia (p<0.02) and normoxia (p<0.01). There was no significant difference in Vt.V was higher in sHVR then mHVR both acute hypoxia (p<0.03) and normoxia (p<0.02). Hif-1α expressions were significantly lower both acute hypoxia groups [mHVR (p<0.0232) and sHVR (p<0.0152)] then control group.

Conclusion: HVR have a complex mechanism that ranges from physiological response due to hypoxia in different patterns. We can understand this complication from the fact that subjects show different responses to it via expression of other Hifs. The interaction of Hifs in moderate to severe sustained hypoxia on sensory end-region on medulla and motor response on cervical spinal cord and the contribution of Hifs expressions on HVR need to be studied.

Keywords: acute hypoxic ventilatory response, Hif-1, medulla, servical spinal cord

O-38

Identification of the inflammatory response makers across lifespan in zebrafish *(Danio rerio)* following copper sulfate treatment

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Objective: Neuroinflammation is a major contributor to neurodegenerative disease and aging increases that risk. Different genetic factors, obesity and environmental toxins also contribute to increased oxidative stress, neuroinflammation and finally neurodegenerative disease. Previous work has shown that the central nervous system initiates responses to neuroinflammation. Macrophages, T cells, astrocytes and microglia are important suppliers of this response mechanism. Zebrafish *(Danio rerio)* are a useful model organism for investigating microglial responses to neuroinflammation. The purpose of this study was to evaluate the effect of copper sulfate ($CuSO_4$) treatment on the levels of various inflammatory markers.

Methods: Initially, embryos at 3 days post-fertilization (dpf) were exposed to 10 uM $CuSO_4$ for either 4 or 24 hours in E3 medium. $CuSO_4$ caused a significantly higher expression level for COX-2 [F(1.20)= 5.08, p=.04] and nf-kb [F(1.19)= 4.27, p=.05] regardless of duration of treatment. Il-8 mRNA expression level was significantly higher in 10 uM $CuSO_4$ in the 4 hour-treated condition compared to 24 hour-treated [F(1.20)= 6.34, p=.02]. In order to determine how the age of the animal interacts with the pro-inflammatory response,36 month-old adult fish were treated with 25 uM $CuSO_4$ in tank water for 1 hour.

Results: Preliminary analysis of the zebrafish brain although not significant demonstrated levels of TNF-a (F(3.11)= 2.11, p=.16) and mTOR (F(3.12)= 1.29, p=.32) proteins increased in response to $CuSO_4$ treatment.Taken together the results show that the pro-inflammatory response is detected at both the gene and protein expression levels and copper sulfate is an efficient inflammatory agent for both zebrafish embryos and adults in order to determine interactions with age.

Conclusion: In embryos, COX-2 and nf-kb initiate inflammatory responses with Il-8 cytokine levels increasing earlier than other pro-inflammatory cytokines.Whereas in the adult TNF-a is an important mediator of this response. Finally, it is clear that age is another factor contributing to differences in the inflammatory response.

This study was supported by the Scientific and Technical Research Council of Turkey TÜBİTAK grant number 119S660.

Keywords: neuroinflammation, chronic inflammation, pro-inflammatory cytokines, aging

O-39

Effects of *in vitro* oligomeric amyloid beta [Aβ(1-42)] treatment upon mouse embryonic stem cell-derived cortical neurons with enhanced TrkB signaling compared to control conditions

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Objective: Alzheimer's disease (AD), a neurodegenerative disease causing memory loss and cognitive decline, has a significant burden on individuals and society. There is no cure for it, and its etiology is not well understood. Previous work demonstrated the importance of neurotrophin signaling for AD. In cortical neurons, one of the most affected neuron types in AD, neurotrophin family member Brain-Derived Neurotrophic Factor (BDNF), and its receptor TrkB (Tropomyosin receptor kinase B) are known to play critical roles in cellular processes. Many studies aim to enhance BDNF-TrkB signaling against AD. Our group has identified a three amino acid residue (KFG), conserved in all Trk receptors, to be critical for Trk signaling since its deletion leads to the increase of TrkB protein and signaling. The goal of this study was to determine the effects of enhanced TrkB signaling in cortical neurons compared to controls.

Methods: This study utilized mouse embryonic stem cells (mESCs) in which the KFG site was deleted from TrkB using CRISPR-Cas9 methodology (TrkB-ΔKFG) and WT mESCs.

Both were differentiated to cortical neurons, and then fully characterized. TrkB protein levels were also analyzed in comparison to controls. Afterward, they were treated with oligomeric amyloid beta [Aβ(1–42)] for cell viability and biochemical analyses.

Results: Differentiation of cortical neurons from mESCs was optimized and characterized, using markers such as Sox-2, Beta-III-Tubulin, and Tau5, with Western Blotting and Immunocytochemistry. Aβ(1–42) treatment leads to differential effects on TrkB-ΔKFG and WT cortical neurons, especially on cell viability. The effects on biochemical pathways are being investigated.

Conclusion: Differentiation of cortical neurons from WT and TrkB-ΔKFG mESCs has been optimized and the resulting cells were characterized. Neurons with TrkB-ΔKFG receptor exhibited higher survival upon Aβ(1–42) treatment when compared to WT neurons, in both different time points and peptide concentrations.

This study was supported by the Scientific and Technical Research Council of Turkey TÜBİTAK under project number 118Z805.

Keywords: mouse embryonic stem cells, Alzheimer's disease, amyloid beta

O-40

The functional evaluation of 10-hydroxy-2-decenoic acid's regenerative effect on mouse sciatic nerve crush model

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Objective: To investigate the regenerative effect of 10-hydroxy-2-decenoic acid (10-HDA), the bioactive substance of royal jelly, in experimental sciatic nerve crush injury with sensory and motor function tests.

Methods: Forty 8–10 weeks old, 40 (10 mice/group) male Balb/c mice were used. All applications were made via oral gavage for 30 days. Control group: Sciatic nerve was not damaged, animals were given saline. Sham group: Crush damage was given, saline was administered. 30 mg 10-HDA group: Crush damage was given, 30 mg/kg 10-HDA was given. Crush damage was given in the 60 mg 10-HDA group, 60 mg/kg 10-HDA was administered. Hot plate test was applied before and after damage. At the end of the study, motor nerve conduction (MNC) examination and electromyography test were performed. Kruskal-Wallis test was used to compare groups, Friedman test was used to compare in-group times. Statistical significance level was taken as 5%.

Results: At the hot plate test, there was no significant difference between the pre-injury groups. After the damage, significant function loss occurred in the crush groups compared to the sham group ($p<0.05$). Best sensory function response post treatment was obtained in the sham group, then the treatment groups. The weakest response was in the crush group ($p<0.05$). There was no significant difference between the treatment groups. The MNC examination and electromyography test showed that the nerve conduction velocity was faster in the sham group than in the other groups ($p<0.05$). There was no significant difference between the treatment and the crush groups. Initial latency was the fastest in the sham group, then in the treatment groups, and the slowest in the crush group ($p<0.05$). There was no significant difference between the treatment groups. No significant difference was found between the groups for compound muscle action potential.

Conclusion: 10-HDA supports sensory nerve regeneration in the sciatic nerve crush injury model.

Keywords: 10-hydroxy-2-decenoic acid, neuroregeneration, peripheral nerve injury

O-41

A molecular mimicry for the spike protein of SARS-CoV-2 and human olfactory receptor

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Objective: SARS-CoV-2 is the cause of COVID-19. In addition to respiratory system, cardiovascular and nervous system is affected. Anosmia is among the symptoms of COVID-19. Spike protein of SARS-CoV-2 plays role on cell entry. Since molecular mimicry is one of the mechanisms of pathogenic organisms, we hypothetized the presence of molecular mimicry for the olfactory receptors and the spike protein. The aim of the present study is to investigate the presence of molecular mimicry for the spike protein and the human olfactory receptors.

Methods: The protein data was downloaded from the ftp servers of European Bioinformatics Institute (ftp://ftp.ebi.ac.uk). The software used for downloading and processing the data were: wget, gunzip, tar, vi, Imagemagick, enscript and R. Clustal Omega (ver.1.2.4) used for alignment and IUPred2A for intrinsically disordered proteins with the bash commands of GNU/Linux for the study.

Results: Presence of molecular mimicry for the olfactory receptor named O7E24 and the spike protein was found. The amino acids of the short linear motif playing role for the molecular mimicry was; Val-Gly-Tyr-Leu (VGYL) and the number of these amino acids were 275-278 on the O7E24 and 267-270 on the spike protein.

Conclusion: Molecular mimicry is an important mechanism for the evolutionary arms race of many pathogens including viruses. Here we show that VGYL short linear motif play role on the molecular mimicry of spike and the O7E24 olfactory receptor. This short linear motif was previously reported for the spike protein but its presence and role on the olfactory receptor was not reported before which showed the role of O7E24 olfactory receptor on the anosmic effect of SARS-CoV-2.

Keywords: COVID-19, SARS-CoV-2, anosmia, molecular mimicry

O-42

A piecewise Izhikevich neuron model exhibiting the nonlinear dynamical properties of inferior olive cells

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Objective: Inferior Olive (IO) cells, which provide one of the two main inputs of the cerebellar cortex, are thought to encode error in motor movements despite their the low frequency spiking regime. In this study, a low computational model that can exhibit the nonlinear dynamical properties of IO cells is designed and the usability of the networks created with the model in error coding is tested.

Methods: A piecewise Izhikevich model is used to simulate the properties of IO cells with low-dimensional equation system. The model parameters were determined by approximating the I-V characteristic of the Izhikevich model to detailed Hodgkin-Huxley model of IO cell. A different parameter set was chosen to obtain two Hopf bifurcations below the resting potential. A circular topology network was created with IO cells making gap junction connections. A chaotic current input generated by Rossler equations with high variability was applied to the network and the output PSTH (peristimulus time histogram) was compared with the input signal. Finally, using the IO network to code feedback error, an inverse model of the motor movement of a two-joint arm was formed using supervised learning method in a simple cerebellum network.

Results: While the model exhibits low frequency spikes, subthreshold oscillations also emerge due to the parameters below the resting potential. The model could generate post-inhibitory spikes in accordance with the electrophysiological properties of neurons. Despite the low frequency regime, IO cell population was able to encode signals with higher variability and training of a cerebellum network was possible with a learning error of 0.5 over 15 steps.

Conclusion: Results show that despite its low dimensionality, the model could simulate the properties of IO cells. Since the computational cost of the model is lower than HH models, it may be preferred in realistic models of large scale cerebellum spiking neural networks.

Keywords: cerebellum, inferior olive neurons, Izhikevich neuron model, spiking neural networks

O-43

Comparing the effects of two flavonoid isomers galangin and apigenin on mitochondrial biogenesis in SH-SY5Y human neuroblastoma cells

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Objective: Mitochondrial dysfunction has long been associated with neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease and Amyotrophic lateral sclerosis. There is increasing evidence that defects in mitochondrial biogenesis contribute to mitochondrial dysfunction observed in neurodegenerative diseases. Therefore, stimulating mitochondrial biogenesis with natural compounds may be an effective strategy for the development of new neuroprotective agents. In this study, we aimed to investigate the effects of two natural compounds galangin and apigenin on mitochondrial biogenesis.

Methods: The IC50 and non-toxic doses of galangin and apigenin were determined by MTT assay. The catecholaminergic SH-SY5Y human neuroblastoma cells were treated with either 1 µM galangin or 1 µM apigenin for 24 hours and mtDNA copy number and mitochondrial mass were measured by real-time qPCR and MitoTracker assay, respectively. The Student's t-test was used for statistical analysis.

Results: The IC50 values of galangin and apigenin were calculated as 43 µM, and 16 µM, respectively. Treatment of SH-SY5Y cells with 1 µM apigenin for 24 hours significantly increased mtDNA copy number and mitochondrial mass. However, 1 µM galangin treatment did not significantly affect the mtDNA copy number and mitochondrial mass in SH-SY5Y cells.

Conclusion: Our results suggest that apigenin is more potent than the isomeric flavonoid galangin in inducing mitochondrial biogenesis in SH-SY5Y cells and that apigenin deserves further investigation as a potential neuroprotective agent in experimental models of neurodegenerative diseases.

This study was supported by the Scientific and Technical Research Council of Turkey TUBITAK (Grant Number: 118S548).

Keywords: neurodegenerative diseases, mitochondrial biogenesis, SH-SY5Y

O-44

Effects of post weaning social isolation on homecage activity and hypothalamic arcuate kisspeptin neuron function in Kiss-CRE tansgenic mice

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Objective: Adolescence is an important period where individuals have cognitive, emotional and social development. The onset of puberty involves activation of the hypothalamo-pituitary-gonadal (HPG) axis which is a part of the adolescence period. Kisspeptin is a neuropeptide product of KISS-1 gene. The kisspeptin/GPR54 system is known to be an essential regulator for the activation of the HPG axis. We aimed to investigate effects of Post Weaining Social Isolation (PWSI) on hypothalamic Arcuate (ARC) kisspeptin activity by electrophysiological and immunoflouresence techniques, and homecage activity using specially designed cages in transgenic mice.

Methods: Kiss-CRE transgenic mouse line was used. On the post-natal 21st day, the mice were placed in social isolation for

three weeks. Homecage activity were recorded after isolation period using specially designed cages integrated with Infra-Red motion sensors and Arduino software. GFP-Adone-Associated Virus was injected into the hypothalamic ARC regions of mice to visualize the kisspeptin neurons. Electrophysiology was recorded from ARC kisspeptin neurons of these mice. Expression of kisspeptin, neurokinin B and dynorphin neuropeptides in ARC were determined by immunoflouresence technique. Data were analysed by One-Way ANOVA. Experimental procedures were approved by the Yeditepe University Animal Research Ethics Committee.

Results: Female mice in the isolated group were more active than the other groups in the nocturnal phase ($p<0.005$). It was observed that PWSI significanly reduced firing frequency of the ARC kisspeptin neurons of mice in the isolated group ($p<0.001$), PWSI significanlty increased peak amplitude of inhibitory post-synaptic current in social groups ($p<0.0001$). Neurokinin B and dynorphin expression were higher in isolated group while kisspeptin expression was found to be lower ($p<0.05$).

Conclusion: Findings of the present study suggest that social isolation exposed during adolescence suppressed the functions of ARC kisspeptin neurons and affected the homecage behavior of Kiss-CREtransgenic mice. Eary social isolation induced Kisspeptin inhibition may affect reproduction functions and behavioral development.

Keywords: social isolation, kisspeptin, electrophyiology, behavior

O-45

Agomelatine attenuates cisplatin-related neurobehavioral impairment by modulating hippocampal BDNF and nNOS in adult rats

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Objective: Cisplatin, which is used in cancer treatment, often causes weakening in learning and memory functions. Increasing evidence suggests that agomelatine may play a key role in regulating cognitive functions. The aim of this study was to investigate the potential protective effects of agomelatine in rats with cisplatin-induced memory impairment.

Methods: 32 Sprague Dawley adult male rats were used in the study. Animals were divided into four groups (n=8): control, agomelatine, cisplatin, agomelatine+cisplatin. Agomelatine (40 mg/kg) was administered by oral gavage daily for 28 days. Cisplatin (5 mg/kg) was given once a week for four weeks. After drug administration, spatial memory was evaluated with the Morris Water Maze and exploratory behavior was evaluated with the new object recognition test. Brain-derived neurotrophic factor (BDNF) level in the hippocampus was determined by ELISA. Neuronal Nitric Oxide Synthase (nNOS) analysis was performed by immunohistochemical staining. The data were evaluated with the SPSS 22.0 program. One-way ANOVA followed by the post hoc tukey test was used for the analyses.

Results: Cisplatin impaired memory performance in the acquisition trials and probe test of the spatial memory test. However, agomelatine treatment decreased the escape latency in the acquisition phase ($p<0.05$), but did not significantly affect the time spent in the target quadrant in the probe test ($p>0.05$). Cisplatin decreased total exploration time and recognition index in object recognition test ($p<0.05$, $p<0.01$, respectively). While agomelatine treatment increased the discovery time ($p<0.05$), it did not affect the discrimination index ($p>0.05$). While cisplatin decreased BDNF level in hippocampus, agomelatine treatment increased BDNF ($p<0.05$). On the other hand, while cisplatin increased the nNOS positive score in the hippocampus, agomelatine treatment decreased it ($p<0.05$).

Conclusion: These data indicate that agomelatine could alleviate cisplatin-induced cognitive impairment in adult rats through a mechanism that regulates hippocampal BDNF signaling and nNOS activity.

Keywords: agomelatine, cisplatin, learning and memory, hippocampus, brain-derived neurotrophic factor

O-46

Effect of glucagon like peptide -1 receptor agonist on depression and anxiety-like behaviors in ovariectomized rats: modulation of BDNF/CREB, Nrf2 and lipocalin-2

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Objective: Bilateral oophorectomy prior to the age of natural menopause increase risk of developing dementia, anxiety, and depressive type disorders in women. Depressive- and anxiety like behaviors have also been demonstrated in ovariectomized rodents. Glucagon-like peptide-1 receptor agonists (GLP-1RA) have been shown to possess neuroprotective effects by reducing oxidative stress and neuroinflammation and, preventing synapse loss. The objective of the present study was to evaluate the effect of GLP-1RA on behaviour, oxidative stress, neuroinflammation and BDNF signaling in the hippocampus of ovariectomized rats.

Methods: Female young Wistar rats were divided into 5 groups of 8 animals each: Sham-operated control, Control+ GLP-1RA treated, ovariectomized (OVX), OVX+fluoxetine (20 mg/kg, p.o), OVX+GLP-1RA (Liraglutide, 150 µg/kg for 15 day, sc). Bilateral ovariectomy was performed to initiate surgical menopause in rats. Liraglutide administered six weeks after ovariectomy. Open field test and elevated plus-maze test were used to evaluate anxiety-like behaviors, and forced swimming test was used to evaluate depression-like behavior. At the end of the experiment, blood glucose levels and body weight gain were measured. The levels of nrf2, lipocalin-2, BDNF and CREB in the hippocampal tissue were measured by ELISA. Malondialdehyde (MDA)and glutathione leves were also evaluated.All tests were done by one blind researcher.Statistical analysis was evaluated with ANOVA and Bonferroni tests.

Results: Eight weeks post-OVX, rats exhibited anxiety- and depressive like behaviours compared with the control groups. These changes in behaviour states were associated with increased lipocalin-2 and MDA levels in ovariectomized rats. Moreover BDNF, CREB and Nrf2 levels decreased significantly in hippocampus in OVX rats. GLP-1 RA treatment limited the reduction of BDNF,/CREB/Nrf2 levels in hippocampus, maintaining it at control levels. GLP-1RA treatment also prevented the depression- and axiety like behavior symptoms.

Conclusion: Our results suggest that the antidepressant and axiolytic effect of GLP-1RA may be related to maintaining BDNF/CREB/Nrf2 levels in the hippocampus, reducing oxidative stress and lipocalin-2 levels.

Keywords: GLP-1, ovariectomy, depressive behavior, BDNF, lipocalin-2

O-47

System identification of smooth pursuit tracking behavior during rheotaxis of zebrafish

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Objective: We developed a unique experimental setup that facilitates system identification of smooth pursuit tracking behavior of freely swimming zebrafish during rheotaxis. This system is a speed-controlled flow tunnel, where the movements of the fish can be tracked using a camera. We placed an obstacle into the water to block the flow in certain regions, where the energy consumption of the zebrafish was drastically reduced. Fish prefer swimming behind this obstacle to avoid drifting in the stream. We moved the obstacle on sinusoidal trajectories to stimulate the fish. Then, we conducted data-driven system identification to examine zebrafish's smooth pursuit tracking performance.

Methods: We built a Brett-type flow tunnel to observe the rheotaxis behavior of zebrafish. We used honeycomb filters to obtain a test area with laminar flow. In this test area, we moved the stimulant obstacle using a linear actuator and recorded the response of the fish to this stimulant using a camera placed underneath the test area. The entire experimental setup runs in real time on the Robot Operating System (ROS). We used DeepLabCut to digitize the movements of the fish. We then estimated the frequency response of the fish using input--output data.

Results: We developed a real-time data collection system that allows accurate control of stimulant position and detection of fish movement with submillimeter resolution. As expected, zebrafish successfully performed the smooth pursuit tracking performance. Our results suggest that the behavioral response of zebrafish exhibits second-order system characteristics similar to those of the weakly electric fish.

Conclusion: Due to its modular nature, our experimental setup enables the independent application of visual and vibrational stimuli, which are typically concomitantly generated by the movement of the obstacle. Thanks to this unique feature, we plan to use this setup to study the dynamics of multisensory integration in zebrafish.

Keywords: zebrafish, rheotaxis behavior, system identification, smooth pursuit tracking

O-48

The effect of a combination of ketogenic diet and regular voluntary exercise on depression and anxiety-like behaviors

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Objective: Ketogenic diet (KD) or exercise is known to improve anxiety and depression-like behaviors in rodents when applied separately. However, the effect of KD-E on these behaviors is unknown. Experts recommend that diet is combined with exercise for treatment of many metabolic diseases, including obesity and diabetes. The aim of this study is to investigate the effects of the combination of KD with voluntary exercise on anxiety and depression-like behaviors

Methods: 32 male-adult BALB/c-mice were divided into 4 groups: (1) KD-E (n=8), (2) KD (n=8), (3) E (n=8) and (4) Control (n=8). Mice were administered diet and voluntary exercise in the running wheel cage for 6 weeks. At the end of

the feeding and exercise period, anxiety and depression-like behaviors were evaluated with elevated plus maze (EPM) and open field (OFT) and forced swimming test (FST). BHB, insulin and glucose levels were measured in plasma.

Results: The runnig distance of KD-E groups is more than E group ($p<0.001$).When compared with control group; KD-E ($p<0.01$), KD ($p<0.05$) and E ($p<0.01$) groups spent less time at the edges of OFT, KD-E ($p<0.05$), KD ($p<0.05$) and E ($p<0.01$) groups spent less time in closed arms of EPM and both KD-E ($p<0.01$) and E ($p<0.01$) groups decreased in immobility time in FST. BHB levels increased in KD-E ($p<0.05$) and KD ($p<0.01$) groups. Glucose levels decreased in KD and E groups ($p<0.01$ for both). Insulin levels decreased in KD-E, KD and E groups. While there was a negative correlation ($r=-0.409$, $p<0.05$) between time spent at the edges of OFT and BHB levels, a positive correlation ($r=0.419$, $p<0.05$) was found between closed arms and glucose levels. There was a negative correlation ($r=-0.454$, $p<0.05$) between immobility time and BHB levels, while positively correlated with insulin ($r=0.445$, $p<0.05$) (Two-way-ANOVA and Bonferroni and Pearson Correlation are used for analysis).

Conclusion: In this study, we demonstrated that KD-E improved anxiety and depression-like behaviors. We observed that this improvement was correlated with increase in BHB and decrease in glucose and insulin levels.

Keywords: ketogenic diet, exercise, anxiety and depression, BHB

O-49

An unpredictable neuroecological consequence of global warming: animals may not be adapting to rising carbon dioxide levels

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Objective: Unlike other odors, CO_2 is found everywhere in the air that animals breathe. However, depending on the temperature, altitude, season and different time periods of the day, the CO_2 concentration can show instantaneous changes. In addition, the average amount of CO_2 in the world's atmosphere has continued to increase since the 18th century due to the intense use of fossil fuels. But we still don't know whether this change in the atmosphere is important to animals, and if yes, whether and how animals adapt to this change.

Methods: To investigate the phenomenon, we performed electrophysiological and behavioral experiments on wild type, transgenic as well as mutant flies. For behavioral experiments we used ~60 flies per trial for n=8 trials. For electrophysiological experiments we used 8 animals for each set of condition and analyzed the data by using student's t-test.

Results: Through experiments, we found that flies are able to detect atmospheric CO_2 concentrations. Given the choice, flies prefer air with lower atmospheric CO_2 levels. On the other hand, blocking synaptic release from CO_2 receptor neurons abolished this selection. Electrophysiological recordings hypothesize that CO_2 receptors actively sample environmental CO_2 concentrations near atmospheric levels; similar to ambient temperature receptors does that for active sampling of temperature.

Conclusion: Our results suggest that the CO_2 receptors of Drosophila have evolved a very high sensitivity in order to gauge ambient levels of CO_2 in their environment to find the best habitats. This interpretation has important implications for CO_2 sensing insects and other animals as CO_2 levels are still on the rise everywhere. As a result, our finding might have a significant impact in predicting the effects of climate change on insect behaviors.

Keywords: olfactory system, Drosophila, carbon dioxide, neuroecology, global warming

O-50

Investigation of effects of methylphenidate on puberty onset and reproductive functions in male and female rats and their reversibility

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Objective: Methylphenidate (MPH) is a central nervous system stimulant blocking the dopamine and noradrenaline reuptake. It is used for attention deficient hyperactivity disorder (ADHD) treatment in children and adolescents. This study aimed to investigate the effects of chronic MPH administration on the reproductive functions in both male and female rats and the reversibility of those effects.

Methods: Sprague-Dawley rats from both sexes were administered with 5 mg/kg of MPH or physiological saline orally from postnatal day (PND)21 to either PND60 or PND90. In addition, recovery groups (drug cessation) in which stopped receiving MPH from PND60 to PND90 were included. Puberty onset was investigated and reproductive organs were dissected for histological analyses. One-way or Two-way ANOVA followed by Tukey's multiple comparison test and Student's t-test were utilized for statistical analysis. $P<0.05$ was considered statistically significant. Experimental protocol was approved by the local animal research ethics committee.

Results: Results showed a slight but significantly early puberty ($p<0.01$), slight decrease in testosterone levels in treated groups to increase again in the recovery group in male rats ($p>0.05$). Using the semi-quantitative examinations, seminiferous tubules were found degenerated, and Leydig and Sertoli cells were affected in the MPH-treated groups, and all the findings were improved in

the recovery group. In females, a significant delay in puberty onset was observed ($p<0.05$). Estradiol levels were decreased in MPH-treated group up to PND90 compared to control group and a surge in luteinizing hormone levels was detected in recovery group ($p<0.05$). Histological findings by using same semi-quantitative examinations showed morphological deterioration in the basement membrane of the ovaries of MPH-treated groups and more atretic follicles. These findings were improved in the ovaries of the recovery group.

Conclusion: This study demonstrates that 5 mg/kg MPH could alter the onset of puberty and affect the reproductive functions. However, effects on reproductive functions are reversed when the drug is ceased.

Keywords: methylphenidate, ovary, puberty, sex hormones, testes

O-51

Effects of bicuculline on brain energy metabolism in septic encephalopathy

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Objective: Sepsis is defined as an increased and irregular inflammatory response of the host; the release of inflammatory mediators with the disruption of the balance of excitatory-inhibitory neurotransmitters and energy metabolism in the CNS causes septic encephalopathy. It is reported that while there is a decrease in appetite due to cachexia that develops following the infection, the resulting energy need directs the metabolism to use the stores. It is a new view that the increased GABA inhibition in sepsis has an important role and suppresses the anti-inflammatory cholinergic system. In our study, we aimed to examine the effects of AMP, ADP, ATP, Creatine and Creatinephosphate levels, on brain tissue in rats administered bicuculline (GABAA receptor antagonist).

Methods: Sprague dawley adult male rats were divided into 4 groups; control, LPS, Bicuculline, LPS+Bicucullline. The encephalopathy model was created with lipopolysaccharide (LPS), a glycolipid molecule obtained from gram-negative bacteria. After 24 hours from injection, the rats were decapitated under anesthesia and their brain tissues were taken. AMP, ADP, ATP, creatine, creatine phosphate levels were investigated by HPLC in brain tissues homogenized in acid medium. Results were statistically analyzed using ANOVA and tukey test. The statistical significance limit was accepted as $p<0.05$.

Results: It was observed that AMP, ADP and ATP levels decreased significantly in encephalopathy group ($p<0.000$; $p<0.000$; $p<0.05$; respectively). However, although a partial increase in AMP and ADP levels was observed with bicuculline applied encephalopathy group, it was determined that they did not reach the levels seen in the control. It was observed that creatine levels were not affected, but keratin phosphate levels decreased significantly in sepsis ($p<0.05$) and significantly improved with bicuculline application ($p<0.05$).

Conclusion: It was determined that Bicuculline had a healing effect, but it was less effective in adenosine group molecules than creatine group molecules. Our studies on the illumination of energy metabolism continue.

Keywords: sepsis, encephalopathy, bicuculline, GABA, energy

O-52

Reduced folate carrier 1 protein is expressed in blood-retina barrier and might have a role in retinal ischemia

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Objective: The blood-retina barrier (BRB) is composed of an inner and an outer part. Outer BRB is formed by retinal pigment epithelium. The iBRB (iBRB) consists of microvascular endothelium covered with pericytes, glial cells, resembling the blood-brain barrier. Transcriptomic studies determined Reduced Folate Transporter1 (RFC1) in brain mural cells. The existence and importance of the RFC1 in iBRB is unknown. We aimed to elucidate if RFC1 protein was present in iBRB, and have roles in retinal ischemia.

Methods: We used whole mount retinas, and trypsin digest preparation to get only retinal microvessels from adult Swiss albino mice. We induced 1-hour retinal ischemia by applying FeCl3 to central retinal artery (n=6). Administered single dose of competitive RFC1 inhibitor methotrexate(MTX) intravitreally (n=6), 1-hour before ischemia(n=6), and sham operated (n=6). RFC1, endothelium (CD31), pericytes (PDGRFR-beta, CD13, NG2), tight junction protein occludin, and basement membrane protein Collagen-4 were determined immunohistochemically, and examined with confocal microscope. Vessels were labeled with lectin; nuclei with Hoechst-33258.

Results: RFC1 protein is present in endothelium and pericytes of iBRB. RFC1 levels significantly upregulated in iBRB after retinal ischemia and MTX administration, compared to controls ($p<0.05$). Retinal ischemia reduced Occludin and Collagen-4, whereas MTX administration before ischemia prevented decrease.

Conclusion: For the first time, we showed that RFC1 protein is present in retinal microvascular endothelial cells and pericytes. RFC1 protein is changed by retinal ischemia. Our study suggests that RFC1 may have roles in the maintenance of iBRB and the pathophysiology of retinal ischemia. Our preliminary findings with genetic modifications against RFC1 also suggested this effect was RFC1 mediated.

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Keywords: reduced folate carrier 1, RFC1, pericyte, blood-retina barrier, retinal ischemia

O-53

Investigation of possible anti-inflammatory, antioxidant and neuroprotective effects of niacin in mild traumatic brain injury model

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Objective: Niacin (nicotinic acid or vitamin B3) is a water-soluble vitamin. In this study, it was aimed to examine the possible effects of niacin on inflammation, oxidative stress and apoptotic processes observed after traumatic brain injury (TBI).

Methods: Wistar albino male rats were randomly divided into control (n=9), TBI (n=9), TBI + niacin (500 mg/kg, dissolved in saline; n=7) groups. TBI was performed under anesthesia by dropping a 300-grams weight from a height of 1 meter onto the skull. Y-maze and object recognition tests were performed to evaluate hippocampal functions, as well as neurological examination and tail suspension test before and 24 hour after TBI. Rats were decapitated afterwards. In brain tissue, luminol- and lucigenin-enhanced chemiluminescence levels, with ELISA method cytokine and plasminogen activator inhibitor-1 (PAI-1) levels were measured. Also, histopathological damage was scored in brain tissue with hematoxylen-eosin staining.

Results: After TBI, luminol ($p<0.001$) and lucigenin ($p<0.001$) enhanced chemiluminescence levels increased, and decreased with niacin treatment ($p<0.01$–$p<0.001$). An increased score was obtained with trauma in the tail suspension test ($p<0.01$). The number of entrances to the arms in the Y-maze test decreased compared to pre-traumatic values ($p<0.01$). In the object recognition test, discrimination ($p<0.05$) and recognition index ($p<0.05$) decreased with trauma. Niacin treatment did not change the outcomes in behavioral tests. IL-10 levels decreased with trauma ($p<0.05$) and increased with niacin treatment ($p<0.05$). PAI-1 levels increased with trauma ($p<0.05$) and decreased with niacin treatment ($p<0.01$). The histological damage score ($p<0.001$) increased with trauma, and decreased in the cortex ($p<0.05$) and hippocampal dentate gyrus ($p<0.01$) after niacin treatment.

Conclusion: Niacin treatment after TBI caused a decrease in the generation of reactive oxygen derivatives, which were increased with trauma along with an increase in the anti-inflammatory IL-10 level, which was decreased with trauma. Additionally, niacin treatment ameliorated the histopathological damage that was caused by trauma.

Keywords: anti-inflammation, niacin, oxidative stress, traumatic brain injury

O-54

Investigation of possible anti-inflammatory, antioxidant and neuroprotective effect of apigenin in mild traumatic brain injury model

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Objective: Apigenin is a plant flavone proven to have a number of biological properties such as anti-inflammatory, antioxidant, and antimicrobial effects. In this study, it was aimed to examine the possible anti-inflammatory, antioxidant and neuroprotective effects of apigenin in mild traumatic brain injury (TBI) model.

Methods: Wistar albino male rats were randomly assigned to control (n=9), TBI (n=9), TBI + vehicle (n=8), and TBI + Apigenin (20 and 40 mg/kg, immediately after trauma; n=6 and n=7) groups. TBI was performed by dropping a 300 g weight from a height of 1 meter onto the skull under anesthesia. Neurological examination and tail suspension test applied before and 24 hours after trauma, as well as Y-maze and object recognition tests, after that rats were decapitated. In brain tissue, luminol- and lucigenin-enhanced chemiluminescence levels and with ELISA method cytokine levels were measured. Histological damage scoring was performed. Data was analyzed with one-way ANOVA

Results: After TBI, luminol ($p<0.001$) and lucigenin ($p<0.001$) levels increased, and lucigenin levels decreased with 20 mg api-

genin treatment (p<0.01). The tail suspension test score increased with trauma (p<0.01). According to the pre-traumatic values, the number of entrances to the arms (p<0.01) in the Y-maze decreased after trauma (p<0.01). In the object recognition test, discrimination (p<0.05) and recognition indexes (p<0.05) decreased with trauma. No improvement was observed with apigenin treatment in behavioral tests. IL-10 levels, one of the anti-inflammatory cytokines, decreased with trauma (p<0.05), and increased with 20 and 40 mg Apigenin treatment (p<0.001 and p<0.01, respectively). The histological damage score in cortex were decreased in apigenin 20 mg treatment group (p<0.05).

Conclusion: Apigenin treatment after mild TBI in rats showed a decrease in the level of lucigenin, which increased with trauma, and an increase in the IL-10 levels, which was decreased with trauma. Additionally, apigenin 20 mg treatment ameliorated the trauma-induced damage in the cortex.

Keywords: apigenin, inflammation, oxidative stress, traumatic brain injury

O-55

Comparison of the protective effects of antioxidant silymarin and thymoquinone in the cerebral ischemia-reperfusion model in rats

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Objective: Despite significant advances in the treatment of cerebrovascular diseases, they continue to be a significant cause of morbidity and mortality globally. Ischemia-reperfusion models are used to evaluate novel treatment strategies for ischemia-induced cellular damage. The purpose of this study was to examine the effects of silymarin, a known antioxidant, and thymoquinone, an active ingredient in the black cumin that is frequently used in herbal medicine, and the combined use of these compounds, on apoptosis and biochemical oxidative stress markers in cerebral ischemia reperfusion-induced rats.

Methods: 49 male Wistar albino rats were used in 5 groups. 1-Sham (SHAM) (n=7); 2-Ischemia-reperfusion (REP) (n=12); 3-Silymarin (200 mg/kg)+Ischemia-reperfusion (SIR) (n=9); 4-Thymoquinone (3 mg/kg)+Ischemia-reperfusion (TIR) (n=11); 5-Silymarin (200 mg/kg)+thymoquinone (3 mg/kg)+Ischemia-reperfusion (STIR) (n=10). For 14 days, ingredients were applied. On the 14th day, cerebral ischemia was induced for 30 minutes under general anesthesia by bilateral carotid artery ligation. 24 hours after reperfusion, euthanasia was performed.

Results: Apoptosis was determined via anti-caspase-3 antibody and TUNEL method. Total antioxidant (TAS) and total oxidant (TOS) levels in serum samples were used to calculate the oxidative stress index (OSI). In the ischemic frontal cortex sections, neurons and gliacells were degenerated also TUNEL and caspase-3(+) cells ratios were increased. Both TUNEL(+) and caspase-3(+) cell counts were significantly decreased in the SIR, TIR, and STIR groups compared to the REP group (p<0,05). However, there was no significant difference between these groups. While TAS values increased significantly in the SIR and TIR groups compared to the REP group (p<0,05), there were no significant difference in TOS or OSI values.

Conclusion: The study's findings indicated that apoptosis was significantly increased in frontal cortex of REP group. Although the use of silymarin and thymoquinone as a prophylactic against cerebral ischemic damage improved some morphological parameters, the combination of silymarin and thymoquinone had no additional benefit against apoptotic cell death. And even though TAS values, a biochemical marker of oxidative stress, increased, this was not reflected in OSI values.

Keywords: silymarin, thymoquinone, apoptosis, oxidative stress, cerebral ischemia-reperfusion

O-56

Determination of changes in total cell and neuron number in male rat cerebellum with intermittent adolescence alcohol exposure model: a simple, fast and reliable total cell and neuron counting method isotropic fractionator

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Objective: The quantitative studies are important in neuroscience, but a neuroscientist knows to obtain numerical results is difficult. Although reliable and effective stereological counting methods are accepted, they are time-consuming, sophisticated methods, requiring expensive hardware and computer. In 2005, Suzana Herculano-Houzel presented a simpler, faster, inexpensive and reliable method, Isotropic Fractionator. She used it to calculate number of neuronal cells for different species. Also it is used in neurodegenerative diseases. In this study, we applied this method to reveal effects of alcohol on the numbers total cell and neuron in young cerebellum.

Methods: In this study, the intermittent alcohol drinking model was applied to adolescent male (alcohol group=12; 3.0 g/kg, intragastrically, 20% ethanol w/v and control group=12; equal amount of saline from P25 to P38. Two hours after last intraperitoneal alcohol intake, the rats were perfused, their cerebellum removed and weighed. Nine cerebellums from both alcohol and control groups were suspended according to the isotropic fractionator. Whole cells were labeled with DAPI and neurons with AntiNeun immunocytochemically. It was count-

ed on fluorescent microscope with hemocytometer. Paraffin sections from other cerebellums were prepared. Neurons were labeled with AntiNeun, astrocytes with GFAP and oligodendrocytes with Olig2 antibodies. These cells were photographed. Optical density was measured with ImageJ program.

Results: When the counting results were evaluated statistically, no significant change was observed at the total cell and neuron numbers in the cerebellum of rats. But according to immunohistochemical evaluations astrocyte activation was determined in the alcohol group ($p<0.01$).

Conclusion: Our results are compatible with literature shows that the method was applied correctly. By this method is possible to count in shorter time and cheaper than stereological counting methods. Our study has contributed to the use of the isotropic fractionator method at both national and international quantitative studies.

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Keywords: isotropic fractionator, total cell number, total neuron number, total glia number, alcoholic neurodegeneration

O-57

Effects of sucrose and modified sugars on the cerebrum and cerebellum

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Objective: Fructose has become an important component of our diet in the form of high fructose corn syrup (HFCS) due to the high price and technological disadvantages of sucrose. It is unknown whether HFCS has more serious metabolic consequences on the nervous system compared to consumption of sucrose. In our study, the changes that may occur in the cerebrum and cerebellum of rats by the consumption of sucrose and modified sugar were examined.

Methods: 300–350 g, 24 adult male Wistar albino rats were divided into 4 groups. Group I (control) (n=6): Drinking water was given ad libitum. Group II (n=6):10% sucrose was given ad libitum with drinking water. Group III (n=6): 10% HFCS was given ad libitum with drinking water. Group IV (n=6):10% invert sugar was given with drinking water ad libitum.On the 90th day, animals were sacrificed and half of the removed cerebrum and cerebellum tissues were placed in 10% formalin for histopathological evaluation.The other half was used in molecular analysis.

Results: Normal histological morphology was observed in control.No obvious pathology was observed in the gray matter in any groups.In GroupII, disorganization of the white matter was most evident, with loss of neurokeratin and eccentrically located axons and axonal degeneration.Although similar findings were seen in Groups III and IV, the white matter of Group III had better organization than II and IV. While 5 nucleotidases and dipeptyl peptidase (DPP) were significantly increased in the brain in Group II compared to the control, Super oxide dismutase (SOD) in the cerebellum was significantly increased in GroupII compared to the control ($p<0.05$).

Conclusion: According to these data, the most adverse effects on cerebrum and cerebellum tissues occurred in Group II. The reason fructose groups are not as effective as sucrose may be due to the generally low blood concentration levels and blood-brain barrier crossing because fructose is rapidly broken down in the gut and liver and is easily excreted by the kidney. More work on subject is needed.

Keywords: high fructose corn syrup (HFCS), sucrose, invert sugar, brain, cerebellum

O-58

Dose-dependent effect of ciproxifan on kidney in rats with cerebral ischemia-reperfusion

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Objective: The severity of dysfunction developing after ischemia and reperfusion is an indicator of the damage that occurs in many events that lead to cell death. Ischemic injuries in vital organs, like the heart, brain, and kidneys, can contribute to increased morbidity and mortality. Histamine H3 receptors are expressed in neurons, at a pre-synaptic level, and on distinct endocrine cell types. Ciproxifan has been shown to cause vigilance and consideration in animal studies and release histamine. In rats with cerebral ischemia-reperfusion injury, we investigated whether different doses of ciproxifan had an effect on the kidneys, depending on gender.

Methods: A total of 64 male and female Wistar Albino rats were used in 4 groups. No surgical procedure was applied to the control group (Group 1) and designed to collect normal histological parameters. Sham group (Group 2) were given DMSO for 7 days and administered cerebral ischemia for 15 min. Respectively, in Group 3 (10 mg/kg) and Group 4 (30 mg/kg), ciproxifan was administered for 7 days/single dose and administered 15 minutes of cerebral ischemia. Rats in each group were perfused after 24 hours of reperfusion and kidney tissues were removed.

Results: Necrotic tubular structures in the cortex layer of kidneys and glomerular damage in the kidney corpuscle were

observed in Group 2. Intense cellular infiltration was observed in the interstitial area. A few necrotic tubular structures were observed in the cortex layer of Group 3 and Group 4. It was observed that the kidney corpuscle had a normal histological structure. Decreased damage was observed in the cortex layer of Group 3 and Group 4 compared to Group 2.

Conclusion: Ciproxifan has a certain protective effect on the kidney. Ciproxifan exposure did not cause gender-dependant changes in kidney tissue. We suggest that targeting the histaminergic system may help counteract the effect of the ischemia-reperfusion.

Keywords: kidney, ciproxifan, ischemia

O-59

The effect of very low frequency electromagnetic field on post-seizure cognitive functions in an experimental model of pentylenetetrazole-induced epilepsy in rats

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Objective: In this study, our aim was to investigate the effects of very low frequency electromagnetic field (EMF) on cognitive functions caused by epileptic seizures in rats with experimental epilepsy model with pentylenetetrazol (PTZ).

Methods: Four groups were formed using Wistar Albino 24 male rats. Four groups were designed from randomly selected male rats. These groups are: 1- Sham (n=6), 2- EMA (n=6), 3- PTZ (n=6) and 4- PTZ+EMA (n=6) groups. EMA at 50 Hz frequency and 5 mT intensity was applied to the EMA groups for 7 days. Seizures were recorded with an acute single dose (45 mg/kg) PTZ injection to the pentylenetetrazole groups. Cognitive function tests (passive avoidance and open field test) were performed in all groups. Hippocampal and cortex tissues were biochemically evaluated using ELISA method for total oxidant level (TOS) and total antioxidant level (TAS) analysis.

Results: In learning and short-term memory tests, a significant difference was determined in the PTZ and EMF+ PTZ groups compared to the sham group ($p<0.001$). It was observed that the total oxidant level (TOS) in the hippocampus increased in both PTZ groups (PTZ and EMF + PTZ) compared to the sham group ($p<0.001$).

Conclusion: Extremely low frequency electromagnetic field (ELF-EMF) has a reducing effect on cognitive functions caused by epilepsy.

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Keywords: pentylenetetrazole, epilepsy, cognitive function, electromagnetic field, rat

O-60

Investigation of the anticonvulsant effect of *Aaronia melanocarpa* in kindling epilepsy model induced with pentylenetetrazole

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Objective: The effects of *Aronia melanocarpa*, which has a high antioxidant content, on chronic epilepsy are not yet known. In this study, it was aimed to investigate the anticonvulsant effect of *A. melanocarpa* in experimental epilepsy induced by pentylenetetrazole (PTZ).

Methods: 24 Wistar Albino (4–5 months old, 300–350 g) male rats were randomly divided into three groups. To establish the PTZ kindling model, rats in all groups (n=8) were injected with PTZ (35 mg/kg, ip.) every two days, a total of 15 times. 30 minutes before the PTZ injections, saline [SA, 0.1 ml, ip. and 1 ml, oral gavage (og.)] for Group 1; SA (0.1 ml, ip.) + A. melanocarpa extract (150 mg/kg, og.) for Group 2 and SA (1 ml, og.) + diazem (1 mg/kg, ip.) for group 3 were administered. In the 16th and 17th injections, the PTZ dose was increased to 45 mg/kg and 50 mg/kg, respectively, and the 5th stage (generalized tonic–clonic seizure) was seen twice in the PTZ group, and the model was confirmed. After each PTZ injection, animal behavior was recorded for 30 minutes. Seizure scores of the groups were determined according to the Racine scale. Mortality percentages were also calculated. Data analyzes were evaluated using the Kruskal Wallis-Mann Whitney U test in the SPSS 21.0 program.

Results: *A. melanocarpa* ($p=0.025$) and diazem ($p=0.001$) decreased the seizure score compared to the control group. While the mortality rate due to PTZ was 37.5% in the control group, no death was observed in the other treatment groups.

Conclusion: This study is the first to demonstrate the anticonvulsant effect of *A. melanocarpa* in the PTZ kindling model. Our findings point to the anticonvulsant activity of *A. melanocarpa* in a model of chronic epilepsy. *A. melanocarpa* may have the potential to develop a new drug for the treatment of epilepsy.

Keywords: *Aronia melanocarpa*, chronic epilepsy, pentylenetetrazole, rat

O-61

Therapeutic effects of transcranial direct current stimulation on neuroinflammation in an experimental model of chronic epilepsy

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Objective: Epilepsy is a serious neurological disease that causes social, psychological and economic problems all over the world. In our study, we aimed to investigate the effects of transcranial Direct Current Stimulation (tDCS) application on neuroinflammation in rats with chronic temporal lobe epilepsy (TLE) model.

Methods: 18 male Wistar rats, each of which weighs 250–300 g, were divided into three groups as Control, Epilepsy and Epilepsy+tDCS groups, with 6 rats in each group. In chronic TLE model, rats were administered 60 mg/kg (ip) PTZ on the first day. Then, 35 mg/kg PTZ was injected into these groups every other day until ignition was achieved. Epilepsy + tDCS group, 30 minutes on days without PTZ injection (2nd, 4th, 6th, 8th, etc.) 1 mA anodal tDCS was given. Novel object recognition and Y-maze tests were used to evaluate learning and memory, and open field test was performed to evaluate locomotor activity. The expressions of GFAP and nNOS in the thalamus tissue, degeneration and necrosis in neurons, and hyperemia in vessels were evaluated semi-quantitatively by histopathological, immunohistochemical and immunofluorescence methods.

Results: In behavioral experiments data, a significant decrease was observed in Epilepsy group compared to Control group, while a significant increase was observed in Epilepsy+tDCS group compared to Epilepsy group ($p<0.05$). Compared to control group, moderate degeneration, mild necrosis, moderate hyperemia in meningeal and parenchymal vessels, and moderate GFAP and nNOS expressions were observed in the neurons of epilepsy group. It was determined that tDCS stimulation decreased moderate levels of degeneration, necrosis, meningeal and hyperemia, and GFAP and nNOS expressions in epilepsy+tDCS group compared to epilepsy group.

Conclusion: In our study, it was shown that tDCS application in chronic epilepsy has therapeutic and neuroinflation-reducing effects on neuroinflammation.

This project was supported by Coordination Unit of Scientific Research Projects of Hitit University (Project number: TIP19001.21.003).

Keywords: epilepsy, learning and memory, neuroinflammation, PTZ, tDCS

O-62

Evaluation of dendrite morphology in Wistar and genetic absence epileptic (GAERS) rats

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Objective: The intense synaptic activation seen in the postsynaptic cells in the epileptic region of the brain causes morphological changes on neurons during the seizure. The neuronal structures in which these morphological changes occur are dendrites and dendritic spines, having an important role in synaptic transmission. The aim of the study was to examine the morphological features of dendrites and dendritic spines of pyramidal neurons in somatosensory cortex and hippocampus of Wistar and GAERS (Genetic Absence Epilepsy Rats from Strasbourg) rats.

Methods: GAERS (n=4) and Wistar (n=4) rats were included in the study. Rats were transcardial perfused. Brain tissues were stained using the FD Rapid GolgiStain Kit. Coronal sections of 200 µm thickness were obtained with cryostat. Pyramidal neurons in the somatosensory cortex and the hippocampus were examined using light microscope and Neurolucida 360 software. Neuron body, branching and length of apical and basal dendrites and shapes and densities of dendritic spines were analyzed. Statistical analysis was performed using GraphPad Prism and unpaired t test.

Results: According to preliminary results of our study are evaluated statistically, the number of primary dendrites ($p=0.0207$, $p=0.0492$), the total number of dendrite nodes ($p=0.0279$, $p=0.0114$), the total number of dendrite terminations ($p=0.0044$, $p=0.0052$), the total dendrite length ($p=0.0032$, $p=0.0021$) and the dendritic spine density ($p=0.0015$, $p=0.0251$) of the somatosensory cortex and the hippocampus were significantly higher in GAERS rats, respectively.

Conclusion: The increase in the number of dendrites, dendrite branches, lengths, and dendritic spine densities in the deep layers of the somatosensory cortex was consistent with the studies performed in the superficial layers of related region in GAERS rats. The increase in the number of dendrites, dendrite branches, lengths and dendritic spine densities in the hippocampus are the parameters analyzed for the first time in hippocampus of GAERS rats.

This study was supported by Marmara University Scientific Research Projects Commission (TYL-2021-10244).

Keywords: absence epilepsy, dendrite, dendritic spine, GAERS

O-63

Anti-inflammatory and electrophysiological effects of fingolimod in penicillin-induced acute epileptic seizure model

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Objective: We investigate the electrophysiological and anti-inflammatory effects of fingolimod on an experimental penicillin-induced acute epileptic seizure model in rats.

Methods: After ethical statement was obtained, thirty two male Wistar rats, 200–250 gr, were divided into four groups (n=8): control (epilepsy) group, positive control group (epileysy+diazepam), drug (fingolimod+epilepsy) group, synergy group (epilepsy+

diazepam+fingolimod). The animals anesthetized with urethane (1.25 g/kg), and epileptiform activity was induced by intracortical injection of penicillin (500,000 IU). After electrophysiological recording for 120 minutes, IL-1β, TNF-α, IL-6 were evaluated by ELISA in the serum of sacrificed animals. The results were statistically analyzed with the SPSS 25.0 package program.

Results: There was no improvement in spike wave activity and spike amplitude in acute epileptic seizure induced with a single dose of fingolimod penicillin. Fingolimod decreased serum IL-1β ($p<0.05$); fingolimod and diazem together reduced IL-6 ($p<0.05$), but no change in serum TNF-α values was observed.

Conclusion: Although a single dose of fingolimod does not have a curative effect on EEG in acute seizures, the reduction in serum IL-1β value even with a single dose highlights chronic applications. Different results may have been obtained in the literature due to the acute-chronic model, dose differences and central tissue evaluation. In addition, co-administration of diazepam and fingolimod created a synergistic negative inotropic effect, causing mass deaths in the synergy group, revealing that the use of diazepam and fingolimod is contraindicated.

Keywords: penicillin induced epilepsy model, rat, fingolimod, antiinflammatory, electrophysiology, acute seizure

O-64

Orexin type-2 receptor agonist affects spike-and-wave discharges of genetic absence epilepsy rats from Strasbourg

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Objective: Orexin, a neuropeptide, regulates sleep and wake rhythms through orexin-1 and orexin-2 receptors and is produced from the lateral hypothalamus neurons. Orexin receptors are strongly expressed in layer 6b cortical neurons in the rodent brain, and some of these neurons have extensive intracortical and thalamic projections. YNT-185 as a non-peptide orexin type-2 receptor agonist has been investigated in several studies related to sleep. In this study, we tested the hypothesis that different concentration of YNT-185 might have a modulatory role on spike-and-wave discharges (SWDs) of genetic absence epilepsy rats from Strasbourg (GAERS).

Methods: We inserted an ICV guide cannula and bilateral electroencephalography (EEG) recording electrodes on skull of GAERS (n=9) under ketamine and xylazine anesthesia. After a one-week recovery period, 3-hour basal EEG recordings were obtained from the animals. Next day, the doses of 100 nmol/10uL (n=5) and 300 nmol/10uL (n=4) YNT-185 were administered to GAERS and then 3-hour of EEG was obtained. EEG signals were recorded with Powerlab-8S EEG recording system and analyzed with LabChart-8.0 Windows program. Two-way ANOVA and Dunnett's post-hoc test were used ($p<0.05$ was considered significant).

Results: The injection of ICV 100 nmol/10uL YNT-185 statistically decreased the cumulative duration of SWDs (2746,36s) and duration of each SWD when compared to baseline recording of SWDs (2082,22s) ($p<0.05$). There was no statistically significant difference between baseline and 300 nmol/10uL YNT-185 groups in the cumulative duration of SWDs (2082,22s) and duration of each SWDs.

Conclusion: The findings showed that a suppressive effect of orexin on SWDs in GAERS for the first time suggesting that neuropeptidergic signaling may have a modulating effect on absence seizures. The challenge is to determine whether this effect is mediated on cortical or subcortical level. The number of animals will be increased in the 300 nmol YNT-185 group in the next future.

Keywords: YNT-187, orexin, absence epilepsy, GAERS, EEG

O-65

Antiepileptic effect of agatoxin IVA in pentylentetrazol (PTZ)-induced epilepsy model

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Objective: Epilepsy is a neurological disease characterized by recurrent seizures. Approximately 70% of epilepsy patients respond to antiepileptic drugs, while 30% are resistant to treatment. Omega agatoxin IVA is a neurotoxin that inhibits calcium entry into the presynaptic terminal and partial exocytosis of synaptic vesicles by blocking presynaptic voltage-gated calcium channels. In our study, the antiepileptic effects of omega agatoxin IVA and the cellular mechanisms caused by these effects were examined histologically.

Methods: In our study, n=5 Wistar albino rats weighing 290–320 grams were used in each group (Ethics Committee No: 2018/7 SUDAM). The rats were divided into three groups, and ωAga IVA (ip) was given at doses of 0.1 and 0.5 nM, 3 days a week, and 0.9% NaCl was given to the control group. A subconvulsive dose of PTZ (35 mg/kg, ip) was administered 30 minutes after the injection. After each PTZ injection, the rats were observed for 30 minutes, and their epileptic activity (myoclonic, clonic, or tonic convulsions) was recorded. BDNF and Cleaved caspase-3 expressions were evaluated immunohistochemically in the brain prefrontal cortex, striatum, hippocampus, and thalamic nucleus areas. GraphPad Prism5 was used for statistical analysis and calculations.

Results: 0.5 nM dose of w-Aga IVA prevented the development of kinding due to PTZ ($p<0.05$). It was observed that BDNF expression decreased in the groups injected with PTZ ($p<0.0001$). BDNF expression was more intense in the AGA injected groups compared to the other groups ($p<0.05$). Cleaved caspase-3 expression was significantly increased by the effect of PTZ ($p<0.05$), and this expression was lower in the groups that received AGA injection ($p<0.05$).

Conclusion: AGA partially inhibits neuron damage caused by epilepsy and can create an antiepileptic effect by delaying apoptosis of neurons. However, functional experiments are needed in the further stages of our study, and the prospective experimental setup continues.

Keywords: epilepsy, PTZ, Agatoxin, BDNF, cleaved caspase-3, immunohistochemistry

O-66

Analysis of polymorphisms in miRNAs deregulated in epilepsy by various bioinformatics methods

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Objective: Epilepsy is a disease characterized by recurrent seizures resulting from sudden and abnormal discharges of cortical neurons in the central nervous system. Head trauma, metabolic abnormalities, genetic and epigenetic factors are implicated in the pathogenesis of the disease. miRNAs are small non-coding RNA molecules that regulate gene expression. Single Nucleotide Polymorphisms (SNPs) found in various regions of epilepsy-associated miRNAs can alter the function and expression of miRNAs. In this study, the computational analysis of the epilepsy-associated miRNA SNPs and determination of their effects were aimed.

Methods: The Human microRNA Disease Database (HMDD) database was used to determine the miRNAs associated with the pathogenesis of epilepsy. The miRNASNP-v3 program was used for SNPs in different regions of miRNAs, the SNP2TFBS web tool was used to determine whether the investigated SNPs affect transcription factor binding sites, and the RBP-Var2 program was used to determine the effects of SNPs on RNA binding sites and the proteins with which they interact.

Results: In the current study, 472 SNPs were determined in different regions of 32 miRNAs associated with epilepsy. 154 SNPs down-regulate miRNAs, 39 SNPs up-regulate, and 279 SNPs have mild effect on miRNA regulation. 4 SNPs (rs533507157, rs72631827, rs551930279, rs41280052) affect transcription factor binding sites. 2 SNPs (rs72631827, rs41280052) alter the miRNA-RBP interaction pattern and have the potential to affect the expression of different miRNAs.

Conclusion: Our findings showed that SNPs in different regions of miRNAs affect expression of miRNAs, processing of miRNAs, interaction with mRNA and function of miRNAs. Our study demonstrated that SNPs in different sites of miRNAs (promoter region, seed region, RBP-binding motifs, pre-miRNA region) can be associated with epilepsy.

Keywords: epilepsy, miRNA, SNP, RNA-binding proteins

O-67

Electrophysiological examination of the effects of *Ginkgo biloba* components on absence seizures in WAG/Rij rats

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Objective: We have previously shown that *Ginkgo biloba* extract EGb 761 increases absence seizures in WAG/Rij rats, a genetic animal model of absence epilepsy. In this study, it was aimed to determine the active components of EGb 761 that may be responsible for the pro-absence effect in WAG/Rij rats using *in vivo* electrophysiological method.

Methods: The active components of EGb 761, ginkgolide A, B, C and bilobalide 6 mg/kg, were administered intraperitoneally for 7 days to 33 male WAG/Rij rats, 6–8 months old, weighing 275±23 g, in which EEG electrodes were placed. EEG was recorded from WAG/Rij rats at baseline, 1st dose, and 7th dose period for 4 hours. Evaluation of absence seizures was made on the number and duration of spike-wave discharges (SWDs). Data were analyzed using Friedman and Wilcoxon tests. The study was conducted with the permission of SBÜ Animal Experiments Local Ethics Committee 2017–1054.

Results: When the 180 min EEG recording time of ginkgolide A ($p=0.028$ after the seventh dose), ginkgolide C ($p=0.046$ after the first dose; $p=0.046$ after the seventh dose) and bilobalide ($p=0.028$ after the first dose; $p=0.043$ after the seventh dose) was compared with the basal activity, it was determined that the number of SWDs increased significantly. On the other hand, ginkgolide B did not show a significant effect on the number ($p=0.6$ after the first dose; $p=0.249$ after the seventh dose) and duration ($p=0.753$ after the first dose; $p=0.345$ after the seventh dose) of SWDs.

Conclusion: According to the findings, it was concluded that the pro-absence effect of EGb 761 in WAG/Rij rats, a genetic animal model of absence epilepsy, was mediated by the active components ginkgolide A, C and bilobalide.

This study was supported by the Scientific and Technical Research Council of Turkey TÜBİTAK (Project no: 115S348).

Keywords: *Ginkgo biloba*, EGb 761, absence epilepsy, WAG/Rij rat, spike-wave discharge

O-68

Predicting the psychophysical responses of rats by using epidural field potentials from the sensorimotor cortex

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Objective: Neuroprostheses are promising for patients with spinal cord injury, locked-in syndrome or amyotrophic lateral sclerosis. In this preliminary study, epidural field potentials (EFP) were recorded from sensorimotor cortices of awake behaving rats. Machine learning algorithms were used to predict psychophysical responses.

Methods: 16-channel surface electrodes were implanted to record EFPs on the hindlimb representation of sensorimotor cortex in two rats. The psychophysical task required pressing the right lever when a vibrotactile stimulus was presented and the left lever for the stimulus-off trials. The stimuli were mechanical vibrations presented on the glabrous skin. EFPs were analyzed in different frequency bands by using wavelet transforms. Band powers from separate channels were input as features in multinomial logistic regression (MLR), k-nearest neighbor classifier (kNN), linear discriminant analysis (LDA), and support vector machine (SVM) algorithms. Accuracy, recall, and precision values were compared across different models.

Results: Lever presses could be predicted with accuracies over 70% in all algorithms. SVM provided the highest accuracy (80%), good recall (74%) and precision (77%). For one subject, class (right/left) recall rates were statistically higher than the chance level (all p's>0.018). For the other subject, recall for the right lever was significantly high (p's<0.001), but it was low for the left lever due to high bias for right lever (B"=-0.08). Psychophyical sensitivity of this rat was medium (A'=0.57). The other subject which was modeled better has a similar psychophysical sensitivity (A'= 0.60), but an almost zero bias (B"= -0.01).

Conclusion: This study shows that rat behavior in a psychophysical task can be predicted quite good by EFPs. The results emphasize that models can represent behavioral responses well even if the psychophysical sensitivity (A') is low. Thus, EAP signals can be utilized in neuroprostheses for movement.

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Keywords: sensorimotor cortex, epidural field potentials, psychophysics, machine learning

O-69

Assessment of neuronal damage in convulsions developed in animals treated with antimuscarinic and given food after fasting for 24 hours

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Objective: Convulsions in animals induced by various methods may evolve into repetitive spontaneous seizures and may cause neuronal damage. Convulsions developed in mice and rats fasted for 2-days or less and then treated with an antimuscarinic and given food may also cause similar histological changes since they may evolve into recurrent or long lasting seizures during or after the experiments. To evaluate this suggestion in animals treated with atropine and given food after 24-h of fasting, immunofluorescence staining for glial fibrillary acidic protein (GFAP) was performed besides Fluoro-Jade C staining on hippocampal sections to investigate the relationship between convulsions and astrocyte reactivation.

Methods: BALB/C mice (n=24) fasted for 24-hours were administered saline or atropine. Twenty minutes later, animals given food pellets and observed for 30 minutes. Incidance and onset of convulsions were determined. Mice scored according to the convulsion stages and decapitated at 7th day. GFAP positive astrocytes were counted at the dentate gyrus. Fisher's exact test, one-way ANOVA was used to determine the frequency of convulsions and the stained cells respectively.

Results: The incidance of convulsions was significantly higher in atropine group compared to control group (p<0.001). The percentages of GFAP positive cells in the dentate gyrus were found 16.86% in control group, 21.67% in stage 1–2 and 19.55% in the stage 3–4–5 group. There was no statistically significant difference between the groups [F(2,22)=2.331; p=0.94].

Conclusion: Hippocampal astrocyte degeneration could not be detected in convulsions triggered by food intake in fasted mice treated with atropine. The findings were in agreement with the findings showing that the number of Fluoro-Jade C positive neurons in animals with stage 3–4–5 convulsions was indistinguishable from the number of Fluoro-Jade C positive neurons in control animals and animals with stage 1–2 convulsions.

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Keywords: atropine, convulsion, astrocyte, GFAP, neuropathology

O-70

Effects of chronic high fat diet on role in feeding behavior and morphological properties of POMC neurons in the hypothalamic arcuate nucleus

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Objective: Obesity has become one of the most important health problems worldwide. The fundamental cause of obesity is the energy imbalance between calorie intake and expenditure. The hypothalamic arcuate nucleus (ARC) proopiomelanocortin

(POMC) neurons play an important role in energy balance and satiety feeling. High calorie diets are known to cause hyperphagia and promote obesity. Therefore, we have investigated effects of high fat diet on POMC neurons. Projections of POMC neurons in the hypothalamus and feeding behavior were analyzed.

Methods: Adult male and female transgenic POMC mice were used in this study. Adaptations of POMC-satiety neurons in mice models exposed to chronic high-fat diet was investigated by using cutting edge technological methods such as pharmacogenetics (n=18) and confocal microscopy (n=8). Serum leptin levels were measured by ELISA. Blood glucose concentrations were also determined. Student's t test and Mann Whitney U test were used for statistical analyses.

Results: There was no significant difference in axonal density of the POMC neurons to paraventricular nucleus (PVN) of hypothalamus and lateral hypothalamus (LH) in the high-fat diet group compared to chow diet group. Blood glucose values did not significantly change among the groups. However, serum leptin levels significantly decreased ($p<0.05$) and eating behavior increased ($p<0.05$) following activation of POMC neurons in mice exposed to a high-fat diet for three months.

Conclusion: These findings have shown that chronic high-fat diet consumption reduces serum leptin levels and accordingly, the homeostatic response of POMC neurons is altered.

Keywords: POMC, arcuate nucleus, chemogenetics, high fat diet, leptin, glucose

O-71

Demonstration of the effects of asprosin on the sense of smell in male rats with hidden cookie test

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Objective: Asprosin, a newly discovered glucogenic adipokine, is encoded by the fibrillin 1 (FBN1) gene and is mainly synthesized and released by white adipose tissue during fasting. Asprosin hormone has been reported to increase the sense of smell in wild-type mice through the OLFR734 receptor and shorten the time to find food. In this study, it was aimed to reveal the effects of asprosin on the sense of smell on male rats with a hidden cookie test.

Methods: Twenty-four male Sprague-Dawley rats were randomly divided into 2 groups (n=12) as control and asprosin. Asprosin and saline were intraperitoneally given at a dose of 500 ng/kg and 1 ml/kg to asprosin and control groups, respectively at 14:00 every day for eight weeks. The hidden cookie test was daily performed three times during ad libitum feeding, and the last experiment was repeated 24 hours after fasting. Cookies (Koko Krunch, Nestle) were buried at a depth of 3 cm. They were recorded from 4 angles for 10 minutes. The finding time of the cookie was scored in seconds. T-test was used for the evaluation of the data. In all analyses, $p<0.05$ was considered statistically significant.

Results: In the hidden cookie test, the meantime of the control group was 551.5±23.3 seconds while it was 425.38±38.1 seconds in the asprosin group ($p<0.05$). Twenty-four hours after fasting, the average time in the asprosin group was 238.08±77.4 while it was 359.92±75.3 seconds in the control group ($p>0.05$).

Conclusion: In the hidden cookie test performed when male rats were fed, the hormone asprosin significantly improved the sense of smell, however; It was found that there was no significant difference between the fasted control and asprosin groups. The effects of asprosin on smelling may be species-dependent. Also, further studies including the use of different asprosin doses, are required.

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Keywords: asprosin, smell, hidden cookie test

O-72

Investigation of the microtubule-associated protein tau at the protein and gene levels in various forms of synaptic plasticity

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Objective: Long-term potentiation (LTP) and depression (LTD) refer to a state of potentiation/suppression of synaptic activity. It is known that degree of LTP or LTD can be affected by previous synaptic activity. This phenomenon has revealed the concept of metaplasticity (MP). In this study, phosphorylation of Tau protein and gene (MAPT) expression accompanying synaptic plasticity forms were investigated.

Methods: The study was carried out on 48 Wistar albino male rats with approval of ERU Animal Experiments Local Ethics Committee dated 04.12.2019 and numbered 19/232. The rats were divided into four different groups; unstimulated, high-frequency stimulation (HFS) group, low-frequency stimulation (LFS) group and LFS+HFS group. Field potentials were recorded as excitatory-postsynaptic potential (EPSP) and population-spike (PS) from dentate gyrus of rats under anesthesia. Three different forms of plasticity (UDG, UDB and MP) were induced using appropriate protocols (HFS, LFS, LFS+HFS, respectively). Tau protein was analyzed by western-blot and MAPT gene expression was analyzed by rt-PCR.

Results: Stimulation of perforant pathway by HFS triggered potentiation of EPSP and PS of granule cells in early and late phase, while stimulation by LFS led to early depression of EPSP and a slowly increasing potentiation of PS in late phase. Western-blot analyzes showed increased total-Tau and phos-

pho-Tau (p=0.007) at Thr181 (p=0.038), Ser396 (p=0.001) and Ser416 (p=0.004) residues in response to HFS and LFS+HFS. Gene expression analyzes revealed that MAPT mRNA expression increased in response to LFS, but not to HFS and LFS+HFS, relative to unstimulated hippocampus.

Conclusion: The increased phosphorylation of Tau may mediate to maintenance of LTP. However, if the increase in phosphorylation of Tau cannot be prevented, together with inhibition of the subsequent LTP, this may indicate that the physiological role of hyperphosphorylated Tau in synaptic plasticity can be transformed into pathological processes.

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Keywords: metaplasticity, synaptic plasticity, Tau, MAPK, MAPT

O-73

Sex differences in hippocampal long-term potentiation and long-term depression: the possible role of ERK 1/2

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Objective: High-frequency stimulation(HFS) induced long-term potentiation(LTP) and low-frequency stimulation induced (LFS) long-term depression (LTD) are well-known forms of synaptic plasticity.They are electrophysiological markers of cognitive functions such as learning and memory.The activation of MAPKs may be associated with gender-related memory differences.However, no study has attempted to determine sex differences in plasticity-driven MAPK activation in hippocampus.The aim of this study was to determine whether the levels of ERK1/2 phosphorylation induced by HFS and LFS differ between the hippocampus of female and male rats.

Methods: The study was carried out on 6 male and 6 female Wistar albino rats. In male and female rats; LTP and LTD are HFS, respectively; 100Hz, 1sec, 4 times and LFS. The potential changes in the hippocampal dentate gyrus region were recorded by applying it to the perforating pathway with a 1Hz, 15 min, 900 stimulus. For rt-PCR analyses, the stimulated hippocampi were used in electrophysiological studies. MAPK (ERK1/2, JNK and P38-MAPK) mRNA levels were evaluated.

Results: There was no difference in LTP size in both genders (p>0.05), but female rats showed a higher increase in fEPSP in LTD than male rats. It induced a slowly increasing potentiation of PS in LTD-induced males, while a reverse suppression occurred in females. The pERK1/2 phosphorylation associated with LFS-induced LTD was significantly increased in male rats compared to female rats (p<0.05). MAPK1 mRNA level was significantly reduced in the hippocampus of stimulated (both HFS and LFS) male rats compared to control (p<0.05). MAPK3 and MAPK14 mRNA levels were significantly decreased in both LFS and HFS-induced hippocampus than unstimulated hippocampus in female rats (p<0.05).

Conclusion: It was observed that MAPK1 expression in males increased compared to other gene expression in females, accompanying LTP and LTD.Our findings suggest that sex hormones differentially modulate the expression of LTP and MAPK accompanying LTD.

Keywords: sex-differences, synaptic plasticity, long-term potentiation, long-term depression, MAPKs

O-74

Inhibition of PI3K impairs long term potency and modulates phosphorylation of plasticity related tau

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Objective: Long term potentiation (LTP) refers to the potentiation of synaptic activity that continues for hours or even days. The PI3K/Akt/GSK3β signaling pathway is one of the major signaling pathways regulating the cell cycle and also plays a key role in the modulation of synaptic plasticity. In this study, the relationship between the synaptic plasticity dependent tau activity of GSK3β, which is involved in the cellular functioning of LTP, was investigated in the inhibition of PI3K induced by Wortmanin and LY294002.

Methods: Control (n=8), Wortmanin (n=8) and LY294002 (n=8) group rats under urethane (1.2 g/kg) anesthesia were fixed in the stereotaxic system and excitatory post-synaptic potential (EPSP) and population spike (PS) were recorded from the hippocampus dentate gyrus responses were recorded in response to stimulation of the perforating pathway with high-frequency stimulation (HFS,100Hz,4times).After the baseline recording (15 min), SF, wortmanin, and LY294002 infusion (10 µM) were administered to each group, respectively, simultaneously with YFU by intrahippocampal infusion for 60 minutes. The levels of total and phosphorylated-tau and protein kinases in hippocampus tissues removed after the experiment were measured by western blot method. Wortmanin and LY294002 substances were prepared by dissolving them with SF at the same rate as the control groups.
Results: After high-frequency stimulation, EPSP slope was significantly decreased in the Wortmanin and LY294002 groups compared to the saline infused group (p=0.006 and p=0.008, respectively). In Western blot analyses: total-Tau (p=0.026), p-TauThr181 (p=0.028), pTauSer202/Thr205 (p=0.001), total-GSK3β (p=0.023) and p-GSK3βTyr216 (p<0.001) levels were significantly decreased compared to the group infused with saline. In the hippocampus infused with

LY294002, the levels of p-TauSer202/Thr205 (p=0.003) and p-GSK3βTyr216 (p=0.004) were significantly decreased compared to the group infused with saline.

Conclusion: Study findings indicate that the PI3K/Akt/GSK3β pathway has a critical role in both hippocampal LTP induction and Tau phosphorylation.

Keywords: long term potentiation, TAU, Wortmanin, LY294002

O-75

Alterations on action potential parameters in primary dorsal root ganglion neurons by rosmarinic acid

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Objective: Dorsal root ganglion (DRG) neurons have been considered as a frequently used *in vitro* model for pain. Rosmarinic acid (RA), a bioactive phytochemical, has been shown to demonstrate analgesic effects in the literature. In this study it was aimed to investigate electrophysiological mechanisms underlying its possible analgesic effects via patch clamp technique on primary DRG neurons.

Methods: Male sprague Dawley rats, weighing 150–200 gram, were used for DRG dissection. Primary cell culture was obtained with enzymatic and physical dissociation. Under current clamp mode of the patch clamp technique, the AP threshold was determined using a depolarizing current step of 10 pA for 10 mS from 0 pA to 300 pA and the minimum injected current amplitude that elicit an AP was chosen. Changes in signal are monitored for amplitude, half-width, fast after-hyperpolarization (AHP), AP duration (APD) and medium AHP. Statistical analysis was conducted with Graphpad Instat 3 program, paired t test - two tail was used.

Results: 1 µM RA significantly increased the threshold (control -46.55±2.401 and RA -41.09±1.288, $p<0.05$), and decreased the peak (control 39.54±1.466 and RA 32.66±1.928, $p<0.05$). Results were expressed as mean±S.E.M. Changes on AP duration and AHP were statistically insignificant ($p>0.05$).

Conclusion: AP parameters are considered as indicators for excitability. An increase in threshold, as well as a decrease in the peak, results in a loss of excitability. Within the scope of this study, it is concluded that RA inhibits the excitability of the DRG neurons. Since DRG neurons are the gateway for pain transmission and frequently used as a pain model, the observed inhibition of their excitability emphasize the possibility for the analgesic effects of RA. Further research upon which ion channels are being affected by RA and eventually alters AP parameters, effects of different doses and *in vivo* experiments will be conducted to support the results obtained.

Keywords: action potential, dorsal root ganglion, pain, patch clamp method, rosmarinic acid

O-76

Effects of activation of TRESK channels on ibotenate-induced excitotoxic brain injury and neuroinflammation in newborn rats

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Objective: Etiology of perinatal brain injury resulting in important neurodevelopmental defects is multifactorial, but excitotoxicity is common pathological mechanism caused by triggering factors. TRESK background-potassium channels, which are widely distributed in nervous system, restrict neuronal excitability by facilitating hyperpolarizing potassium outflow. We aimed to investigate effects of activation of TRESK channels by selective activator cloxyquin on ibotenate-induced excitotoxic brain injury and neuroinflammation in newborn rats.

Methods: P5 Wistar-rats (both sexes) were divided into 6 groups (n=6 for histopathological examinations, n=7 for biochemical-analyses): sham-control, ibotenate, ibo+Cloxy-1, ibo+Cloxy-2, ibo+Cloxy-3 and ibo+MK-801(positive-control). Excitotoxic brain injury was induced by intracerebral injection of glutamatergic agonist ibotenate (10 µg). Groups received intraperitoneally 1% DMSO, 0.2, 1 and 5 mg/kg cloxyquin and 1 mg/kg MK-801 (NMDA-receptor antagonist) respectively, 30 minutes before ibotenate injection(vehicle for sham-control). Rats were sacrificed after five days. In coronal brain sections stained with crystal-violet, cortex thickness from outer layer of parietal cortex to the depth where axons are located, thickness of white matter in layer with the following axons, and the cysts in the white matter were measured. Activin-A, IL-1beta, IL-6 and IL-10 levels in brain homogenates were measured using ELISA. Data were compared by one-way ANOVA.

Results: Ibotenate decreased cortex and white matter thickness and caused cerebral lesion ($p<0.001$). While ibotenate also increased levels of activin-A, a marker of brain tissue damage ($p<0.001$), and pro-inflammatory cytokines IL-1beta and IL-6 ($p<0.05$), it decreased anti-inflammatory cytokine IL-10 ($p<0.01$). While cortex/white matter thickness and lesion changes induced by ibotenate were reversed by 5 mg/kg dose of cloxyquin, changes in levels of activin-A, IL-1beta, IL-6 and IL-10 were reversed by three doses of cloxyquin ($p<0.05$). As a positive control, MK-801 reversed all ibotenate-induced changes ($p<0.05$).

Conclusion: Our findings suggest that activation of TRESK channels by cloxyquin prevents glutamergic excitotoxicity leading to perinatal brain injury and related neuroinflammation by impeding neuronal firing.

This study was supported by 2019.08.23.1433(BAIBU-BAP).

Keywords: cloxyquin, excitotoxicity, neuroinflammation, perinatal brain injury, TRESK background potassium channels

Poster Presentations

(PP-01 — PP-23)

PP-01

Effect of Pea3 transcription factor on miRNA expression in NSC-34 motor neuron cells

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Objective: Pea3 transcription-factor from ETS superfamily involves in neural-development and gene-regulation associated with axon elongation. In previous studies, target genes of Pea3 involved in axon-dynamics and differentiation-processes in neurons were determined, but it was not clarified that although Pea3 is an activator, it reduces the expression of many genes. Considering these findings point to a possible microRNA (miRNA) mechanism, that non-coding RNA-fragments are thought to be effective as guiding-molecules in regulations. In this study, it was aimed to investigate the effect of Pea3 transcription-factor on miRNAs (miR-9 and miR-124) which are reported to be effective in neural-development and axonal-pathfinding.

Methods: In the study, NSC-34 (mouse motor neuron) cells were transfected with plasmids as follow; pCDNA3 (blank, control-plasmid), Pea3-VP16 (constitutively-active-fusion) and Pea3-Eng (partially-suppressed-fusion) as three groups to provide different expression levels of Pea3. Total-RNA including microRNAs was isolated from the transfected-cells, followed by cDNA synthesis. Expression data of miRNAs depending on Pea3 were obtained by qPCR, then calculations were made relative to expression of pCDNA3 control group in NSC-34 cells.

Results: According to the results of qRT-PCR, miR-9 expression increased 5-fold and miR-124 expression increased 2.5-fold when Pea3 expression was suppressed by Pea3-Eng in NSC-34 cells. It was determined that the expression of miR-9 did not change and the expression of miR-124 decreased 0.5-fold when Pea3 was over-expressed by Pea3-VP16.

Conclusion: According to findings, it was determined the expression of both microRNAs decreased as the expression of Pea3 increased, but when Pea3 was successfully silenced with Eng and its expression was suppressed, expression of miRNAs significantly increased. Therefore, a negative regulation relationship was suggested between miR-9 & miR-124 and Pea3 expressions. The potential miRNAs and their interactions in Pea3-miRNA-target gene network of axon-dynamics will be continued to be examined by molecular methods to explain this regulation mechanism.

This study is supported by the Scientific and Technical Research Council of Turkey TUBITAK under 2209-A, 2020.

Keywords: axon guidance, miR-9, miR-124, Pea3, gene expression

PP-02

Comparison of the efficiency of different concentrations of alpha-kainic acid in an *in vitro* chemical spinal cord injury model

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Objective: The aim of this study was to determine the efficiency of different concentrations of alpha-kainic acid in *in vitro* m spinal cord injury (mechanical and chemica) models.

Methods: Mechanical injury (scratch model) was created using a 200 µL pipette tip. Different concentrations (50, 25, 12.5 and 6.25 µM) of alpha-kainic acid were applied to NSC-34 cells for the chemical injury models Dual (mechanical and chemical injury) model was also performed.

Results: Closure of the scratch was completed after the 3rd day in the mechanical injury model. Different concentrations (50, 25, 12.5 and 6.25 µM) of alpha-kainic acid were applied on NSC-34 cells for the chemical injury model and observed under light microscopy. Chemical injury was best observed in 12.5 and 6.25 µM alpha-kainic acid. Immunohistochemical stainings for choline acetyltransferase (ChAT), neurofilament (NF-H D9) and synaptophysin (SYP) were applied.

Conclusion: Complete closure of the scratch area occurred after 3 days following mechanical injury to the spinal cord.This study provides for the first time the efficiency of different concentrations of alpha-kainic acid on NSC-34 cells.

Keywords: chemical injury, *in vitro* spinal cord injury, mechanical injury, alpha -kainic acid

PP-03

Motor ability dysfunction of TDP-43 overexpressed rats via viral-mediated gene transfer

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Objective: In recent years, overexpression of TarDNA-binding protein-43 (TDP-43) has been shown as one of the causes

of the formation of cytoplasmic aggregates seen in motor neuron diseases which results in motor behavior disorders. In this study, we aim to investigate motor skills in rats following transduction with viral vectors expressing native TDP-43.

Methods: The experimental group was injected with the viral vector (AAV9-pCMV-TDP43-GFP) containing the cytomegalovirus promoter (CMV), green fluorescent protein (GFP) and native TDP-43 sequences packaged into Adeno-Associative Virus (AAV) serotype-9. The second group was injected with the vector (AAV9-pCMV-GFP) containing the gene sequences encoding GFP. Only saline (SF) was applied to the control group (n=10, each group). Injections were administered to Sprague-Dawley male rats at the postnatal 30th day from the tail vein at a dose of 1.5×1012 gc/ml. The motor skills of the rats were examined 15 days after injection by horizontal ladder rung walking and paw print tests.

Results: Paw print test indicated difference in terms of step distance and foot positioning in experimental group animals. Foot fault scores of experiment group animals were statistically higher for forepaws and hindpaws in the horizontal ladder rung test ($p<0.05$, $p<0.01$). When the mean scores of the animals were examined, it was seen that the experimental group got lower scores in both paws compared to the control group ($p<0.05$, $p<0.01$). Lastly, it was seen that the experimental group got lower scores in terms of total score as well ($p<0.01$).

Conclusion: The results of our study revealed that native TDP-43 gene transduction, led by a neuron-specific promoter, has effects on motor function. This low cost animal model can be used to investigate motor neuron diseases and new therapeutic approaches.

This study is supported by the Scientific and Technical Research Council of Turkey TÜBİTAK (Grant # 1919B012004851)

Keywords: AAV, TDP-43, CMV, horizontal ladder, motor behaviour

PP-04

Investigation of the effects of *Sambucus nigra* in T98 glioblastoma cells: *in vitro* study

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Objective: Glioblastoma is the most common subtype of primary brain tumors in adults and is characterized by high proliferation and aggression indices which are considered the deadliest of human cancers. Cancer and neurons can grow in the same environment, but tumors have toxic effects on neurons and kill neurons. The flowers and fruits of *Sambucus nigra* are known as a traditional medicine for the treatment of various diseases and are widely used in folk medicine. *Sambucus nigra* is a plant with antioxidant, anti-inflammatory and antibacterial properties as well as containing important molecules such as flavonoids, polyphenols and anthocyanins. The aim of our study was to investigate the mechanisms induced in T98G glioblastoma cells using different doses of sambucus nigra.

Methods: T98 glioblastoma cells were obtained from Atatürk University (Erzurum,Turkey) Department of Pharmacology. Cells centrifuged at 1200 rpm were seeded into 96-well plates with fresh medium (antibiotic 1%, FBS 15% and DMEM) and incubated at 5% CO_2 and 37 °C. When the cells increased by 85–90%, *Sambucus nigra* (5, 25, 50, 75, 100 and 200 µg/mL) doses were added to the wells and incubated. After 24 hours, 3-(4.5-dimethylthiazol2-yl)-2.5-diphenyltetrazolium-bromide (MTT) was added and read at 570 nm.Results were analyzed by one-way ANOVA method using SPSS, IBM 21.00 program.

Results: When compared according to MTT results, the survival rate in the control group was defined as 100% and the other groups were graded accordingly. Viability decreased depending on the dose and the lowest viability rate saw at 75, 100 and 200 µg/mL with values of 64.8, 53.1 and 36.3, respectively.These values were found to be statistically significant ($p<0.001$).

Conclusion: In studies of Pereira et all. found that flavonoids in Sambucus nigra could exert proapoptotic effects on cancer cells to inhibit cell proliferation, a promising approach for the development of a new cancer therapy. According to our results, sambucus nigra showed apoptotic effect in T98 glioblastoma multiforme cells.

Keywords: glioblastoma, T98, *Sambucus nigra*, MTT

PP-05

In vitro investigation of the effect of 5-hydroxytryptophan in glioblastoma multiforme

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Objective: Glioblastoma multiforme is the most aggressive of the brain tumors and is the most common histological glioma, accounting for more than 40% of all gliomas. Some studies have linked inflammation and cancer, and a link between this of with them, cyclooxygenase-2 (COX-2), has been proposed as the main target for cancer therapy. 5-hydroxytryptophan (5-HTP) is a naturally occurring amino acid and a precursor to the neurotransmitter serotonin. 5-hydroxytryptophan can inhibit COX-2 expression by converting to 5-methoxytryptophan (5-MTP). Our study aimed to investigate its effects in T98 glioblastoma cancer cells using different doses of 5-HTP.

Methods: T98 glioblastoma cells were obtained from Atatürk University (Erzurum, Turkey) Department of Medical

Pharmacology. Briefly, T98 cells were centrifuged and allowed to grow in an incubator at 5% CO_2 and 37 °C with the addition of fresh medium (antibiotic 1%, FBS 15% and DMEM). When the cells reached 85–90% density, 5-HTP (25, 50, 100, 200, 400 and 800 µg/mL) doses were added to the culture plates and incubated for 24 hours. Then 3-(4.5-dimethyl thiazole 2-yl) It was added with -2.5-diphenyltetrazolium-bromide (MTT) and read at 570 nm. MTT results were analyzed using SPSS, IBM 21.00 program using one-way ANOVA method.

Results: In our control group, viability was defined as 100% and other groups were graded accordingly. Compared to the control group, the lowest viability rates were determined at 400 and 800 µg/mL doses, with 57.6% and 51%, respectively (*p<0.001). These values were found to be statistically significant.

Conclusion: According to the studies of Wu et al., 5-methoxytryptophan produced from mesenchymal stem cells via 5-HTP inhibits cancer cell migration/invasion, cancer growth and metastasis. This and similar studies not only support our studies, but are also promising in cancer treatment.

Keywords: glioblastoma, T98, 5-hydroxytryptophan, MTT

PP-06

Characterization and neural differentiation of Wharton's jelly mesenchymal stem cells

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Objective: The main function of stem cells is to b the repair and rejuvenation of diseased and aging tissues. Their functions were shown to be controlled by transcription factors, cell cycle regulators, signal transduction pathways and miRNAs. Mesenchymal stem cells (MSCs), the basic cells found in connective tissue, are used in various applications as a valuable cell source for tissue engineering and regenerative medicine. This work demonstrates neural differentiation of Wharton's jelly isolated MSCs (WJ-MSCs) for neural tissue engineering applications.

Methods: WJ-MSCs were isolated from rabbit umbilical cord, and were labeled with positive and negative MSC markers and analyzed in flow cytometry. In order to examine the neural differentiation of WJ-MSCs, culture was continued for 21 days in different neural differentiation media contents and immunofluorescence staining was performed using β-III tubulin, O4 and GFAP primary antibodies.

Results: For positive markers, 48.9% of WJ-MSCs expressed CD29, 52.8% expressed CD54, 86.9% expressed CD90 and 67.5% expressed MHCI. For negative markers, 94.4% expressed CD34 and 100% expressed CD45, CD11b and MHCII. After neural differentiation, neural cell-associated β-III tubulin, O4 and GFAP proteins were strongly expressed.

Conclusion: It has been determined that WJ-MSCs are important stem cell sources. The neural differentiation medium was optimized, and WJ-MSCs isolated from rabbit umbilical cord were successfully differentiated into neural cells. Thanks to their high neural differentiation potential, WJ-MSCs are expected to be used in clinical applications for the treatment of central and peripheral nervous system diseases.

The study was ed by Ege University Scientific Research Projects project number FLP-2019-21207 and the Scientific and Technical Research Council of Turkey TUBITAK 1001 project number 118S349.

Keywords: Wharton's jelly, neural differentiation, stem cell, mesenchymal stem cell, neural tissue engineering

PP-07

Effects of cannabinoid and opioid derivatives on ARCAgRP→PVN synaptic connection in AgRP transgenic mice

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Objective: Neurons secreting agouti-related protein (AgRP) are localized in the hypothalamus arcuate (ARC) nucleus and play an important role in food intake and energy expenditure. Manipulation of these neurons causes alteration in food intake. In addition, AgRP neurons play a key role in appetite regulation by sending intense axonal projection to the paraventricular nucleus (PVN). Neuromodulators that influence the strength of this link are also likely to be critical in regulating the appetite mechanism. For this purpose, the effects of cannabinoids, opioids and other appetite-regulating neuromodulators on the synaptic properties of the ARCAgRP→PVN connection were investigated in our study.

Methods: Twenty female and male transgenic AgRP-Cre mice were used. Optogenetics and electrophysiology (patch clamp) methods were used to study ARCAgRP→PVN synaptic connections. For this, we used channel-rhodopsin assisted circuit mapping (CRACM) approach to isolate AGRP axon-evoked synaptic currents from PVN neurons and evaluated impact of various neuromodulators. Data were statistically analyzed by One-way ANOVA. P<0.05 were considered as statistically significant.

Results: In ARCAgRP→PVH synaptic connection experiments using the optogenetic and electrophysiology techniques together, the synaptic peak amplitude decreased significantly after µ-opioid agonist (DAMGO) and leptin administration (p<0.05)

while CB1- cannabinoid agonist (ACEA) and dopamine did not change the synaptic peak amplitude. Also, CB1-cannabinoid antagonist (AM251) increased the strength of this connection ($p<0.05$). None of the drugs administered caused changes in neurotransmitter properties released from AgRP axonal terminals.

Conclusion: In this study, the effects of cannabinoid and opioid derivatives on the axonal terminals of AgRP neurons were investigated for the first time. Our results show that opioids and leptin hormone have strong modulatory effects on ARCAgRP→PVN synaptic connection. Cannabinoids and dopamine did not affect this neural circuit which has an important role in food intake.

Keywords: AgRP, cannabinoid, opioid, optogenetics, electrophysiology

PP-08

Effects of stimulus pre-exposure on conditioned context aversion in CD1 outbred and C57BL/6J inbred mice

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Objective: Although brief pre-exposure to a novel context prior to the delivery of shock is critical for enabling the development of contextual fear conditioning in rodents, no assessment of this effect has been done in conditioned context aversion (CCA). This study investigated whether pre-exposing mice to a novel context facilitates CCA learning in inbred and outbred strains of mice.

Methods: Twelve-week-old CD1 outbred and C57BL/6J inbred male mice were used. Twelve mice of each strain were assigned to the pre-exposure groups (n=24); another twelve were assigned to the non-pre-exposure groups (n=24). Mice in the pre-exposure groups experienced a novel context comprised of tactile, auditory, visual, and odor cues for 5 minutes 24 hours before the conditioning trial. During conditioning, the animals in the experimental groups received an intraperitoneal injection of illness-inducing lithium chloride (LiCl; 6 mEq/kg) and the control groups received NaCl (0.9%). Seventy-two hours after conditioning, a retention test (15 minutes) was conducted by measuring water intake in the trained context. One- and two-way ANOVA were used for statistical analysis.

Results: Among the CD1 outbred mice, there was a statistically significant difference between the pre-exposed LiCl and NaCl groups but not between the non-pre-exposed groups (pre-exposed LiCl vs. NaCl, $p<.05$; non-pre-exposed LiCl vs. NaCl, $p=.30$). Among the C57BL/6J inbred mice, there was no significant difference between the experimental and control groups in either condition (pre-exposed LiCl vs. NaCl, $p=0.656$; non-pre-exposed LiCl vs. NaCl, $p=0.99$).

Conclusion: One pairing of a distinctive context with LiCl-induced malaise evoked a conditioned response in CD1 outbred mice, only when animals had prior experience of the context. No such effect was observed in C57BL/6J inbred mice. This suggests that pre-exposure to the conditioned stimulus potentiates CCA learning in CD1 outbred mice.

Keywords: conditioned context aversion, CD1 outbred mice, C57BL/6J inbred mice, lithium chloride, pre-exposure

PP-09

Investigation of effects of hypothalamic arcuate nucleus tyrosine hydroxylase neurons on food intake and behavior in transgenic mice

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Objective: Tyrosine hydroxylase (TH) neurons are localized in the hypothalamik arcuate nucleus (ARC) and are one of the neuron groups are crucial in food intake and energy consumption. It is known that the amount of food consumption increases in mice upon manipulations on these neurons. However, behavioral effects in mice after either chemogenetic or optogenetic stimulation of these neurons have not been investigated. In our study, we examined the possible behavioral alterations that may occur in mice as a result of the chemogenetic modulation of the TH neurons.

Methods: Twenty-five female and male transgenic TH-Cre mice were used. For chemogenetic (chronic) manipulations, hM3D receptor (for activation) and hM4D receptor (for inhibition) genes were injected intracranially into the hypothalamus using adeno-associated virus (AAV). Chronic stimulation/inhibition was performed by administering Clozapine-n-Oxide intraperitoneally before the experiment. Open field test was used to measure locomotor activity and elevated plus maze test was used to measure anxiety-like behavior. Electrophysiology (patch clamp) technique was used to measure electrical activity changes. Student's t test and Mann-Whitney U test were used for statistical analyses.

Results: Upon activation of TH neurons, amount of food consumption increased significantly ($p<0.05$), while the inhibition of these neurons did not change the amount of food consumption. The firing frequency of TH neurons significantly increased upon fasting ($p<0.05$). Activation of these neurons did not affect the locomotor activity, while the speed and distance traveled decreased significantly after inhibition ($p<0.05$). Moreover, in the elevated plus maze test, time spent in the open area decreased significantly in the inhibition group ($p<0.05$), while it did not change this parameter in the activation group.

Conclusion: This is the first study to report behavioral alterations upon activation/inhibition of arcuate TH neurons. Our findings

suggest that manipulations of TH neurons in ARC alter the food intake in transgenic mice, as well as their behavioral patterns.

Keywords: behavioral tests, chemogenetics, electrophysiology, food intake, tyrosine hydroxylase.

PP-10

Effect of long-term social isolation stress on regional activity of the sympatho-adrenal system in male mice

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Objective: The transmission of signals through particulate sympathetic ganglia and to the adrenal medulla is an essential part of several important physiological/physio-pathological processes. Social isolation is a major stress associate with increase in sympatho-adrenal activity. We aimed to determine effect of isolation stress on the regional sympatho-adrenal system activity by measuring tyrosine hydroxylase (TOH) in adrenal gland (AG), superior cervical (SCG), stellate (SG) and celiac ganglia (CG) as index for increased activity during isolation stress.

Methods: Twenty male mice (Swiss albino, 20–25 gram) were housed individually (12 mice) or group of 8 in a controlled environment (22–24 °C, 12 h light-dark) for 3 months. At the end of period, mice were sacrificed and AG, SCG, SG and CG dissected and homogenized in 250–500 µl Tris-HCl buffer (50 mM, pH=7.4) by using glass homogenizer. TOH activity was determined in 50 µl tissue homogenate by using radio-enzymatic method. The mean values of TOH activity from control and isolated aggressive mice compared with Student's t-test.

Results: Nine out of 12 mice became aggressive following social isolation. AG TOH activity in isolated-aggressive mice was 1.5 fold higher than control mice (control: 9.4±0.6, isolated-aggressive: 14.1±1.5 nmol14CO/gland). In isolated-aggressive mice, TOH activity in SCG, SG or CG was 121%, 140% or 122% of respective values observed in control mice.

Conclusion: These data show that the increase in sympatho-adrenal system activity is non-uniform during isolation. The increase activity in AG and/or SG could involve in the increased risk particularly for cardiovascular problem associated with social isolation

Keywords: social isolation, stress, sympathetic system, adrenal gland, aggression

PP-11

Effects of the enhanced TrkA signaling, as compared to controls, in mouse embryonic stem cell derived basal forebrain cholinergic neurons against the *in vitro* neurodegenerative process of Alzheimer's disease

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Objective: Abnormal levels of neurotrophins and their receptors, and defects in neurotrophin signaling have long been correlated with Alzheimer's Disease (AD). Therefore, neurotrophin signaling has been considered a potential therapeutic target in AD. We previously determined that deletion of a conserved KFG region (3 aa) in Tropomyosin receptor kinase (Trk) receptors increases TrkA receptor levels and enhances TrkA signaling. Basal forebrain cholinergic neurons (BFCNs) are among the most affected cell types in AD, and Nerve Growth Factor (NGF) mediated signaling through its receptor TrkA plays crucial roles in these cells. This study aimed to evaluate the importance of enhanced TrkA signaling in BFCN neurons, compared to controls, against the *in vitro* process of AD using the KFG model systems.

Methods: WT and CRISPR-Cas9 gene-edited TrkA-ΔKFG mouse embryonic stem cells (mESCs) were differentiated into BFCNs and treated with oligomeric amyloid beta peptide [Aβ(1–42)]. MTT cell viability analyses were utilized to compare Aβ(1–42)-mediated cell death in TrkA-ΔKFG BFCNs compared to that of WT.

Results: Directed differentiation of mESCs to BFCN has been optimized, and the resulting cells have been extensively characterized using Western Blot and immunocytochemistry analyses, utilizing specific markers. MTT analyses were used to determine the cell viability differences between the WT and TrkA-ΔKFG BFCNs.

Conclusion: Successful generation of BFCNs has been experimentally demonstrated. TrkA receptors are present in both WT and TrkA-ΔKFG BFCNs, and the latter exhibits higher levels. We have tested cell viability differences between WT and TrkA-ΔKFG BFCNs under various concentrations of Aβ(1–42) and time points. At the 24-hour time point upon 10µM Aβ(1–42) treatment, TrkA-ΔKFG BFCNs are more resistant to Aβ(1–42) neuronal death as compared to WT BFCNs (the difference %40.14, p value based on Student's t test is p=0.008). This work involves mESC based neuronal models and does not require an ethics committee approval.

This study is supported by the Scientific and Technical Research Council of Turkey TÜBİTAK (No:118Z805).

Keywords: Alzheimer's disease, dmyloid beta, basal forebrain cholinergic neurons

PP-12

The effect of St. John's Wort *(Hypericum perforatum L.)* extract on locomotor activity in male Syrian hamster *(Mesocricetus auratus)*

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Objective: St. John's Wort *(Hypericum perforatum L.)* is a perennial herb widely known for its therapeutic effects. The aim of this study is to examine the effect of St. John's Wort extract applied at different doses to adult male Syrian hamsters *(Mesocricetus auratus)* on locomotor activity.

Methods: Adult male Syrian hamsters were divided into 4 groups as control and experimental groups (50 mg/kg, 100 mg/kg, 200 mg/kg). Before the experiment, the animals were put on the running wheels for a week and those who showed regular rhythmic activity were included in the experimental group. St John's Wort extract injections were administered intraperitoneally to the animals for 10 days. Locomotor activities were recorded and a double-plot actogram was performed.

Results: Hamsters in the control group showed activities consistent with the 16L photoperiod; rhythmic activities took place in the dark phase. A decrease in activity was observed in the groups administered 50 and 100 mg/kg extract. In addition, phase shift started at these doses. In the group treated with 200 mg/kg St. John's Wort extract, arrhythmia was observed in locomotor activity.

Conclusion: St. John's Wort extract has a significant effect on hamster locomotor activities and as the dose increases, it decreases the rhythmic activity of the animals and causes rhythm disturbance.

Keywords: St. John's Wort, hamster, photoperiod

PP-13

Does epidural magnesium sulphate causes medulla spinalis injury in rabbits?

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Objective: Magnesium is an intracellular ion that has analgesic properties via calcium regulation and N-methyl-D-aspartate receptors. However, the safety of neuroaxial magnesium is not proved. The aim of this study was to investigate the neurotoxicologic effects of epidural magnesium sulphate ($MgSO_4$) on medulla spinalis in rabbits.

Methods: After ethic committee's approval 18 male Albino New Zealand rabbits were enrolled into the study. Epidural catheter was inserted into the sacral canal under ketamine. Development of motor and sensorial block 5 minutes after 1 mL of 1 % lidocaine verified the placement of the catheter. Group Control (n=6): 0.20 mL isotonic saline was administered via epidural catheter. Group M150 (n=6): One mL of 150 mg.mL-1 $MgSO_4$ (~0.6 mmol elemental magnesium) (pH=6.20) was administered via epidural catheter then catheter was flushed with 0.20 mL isotonic saline. Group M450 (n=6): One mL of 450 mg.mL-1 $MgSO_4$ (~1.8 mmol elemental magnesium) (pH=6.10) was administered then catheter was flushed with 0.20 mL isotonic saline. Catheter's placement was localized by laminectomy. Spinal sections were taken between 5 cm rostral and caudal segments from the tip of the catheter. The sections were stained both hematoxylin-eosin and Cresyl violet. The slides were examined using a light microscope.

Results: Nissl body loss, vacuolization, myelin irregularity, gliosis and fibrosis in grey and white matter samples were assessed. There were no signs of histological tissue damage. There was no statistically significant histopathological difference between groups.

Conclusion: This is the first study that investigates spinal cord injury after epidural magnesium administration to our knowledge. These results are important since epidural route is the second most common route for $MgSO_4$. We report that even relatively higher doses of epidural $MgSO_4$ did not cause spinal cord injury. Further studies need to be performed to adapt these findings to clinical practice.

Keywords: magnesium sulphate, medulla spinalis, rabbit

PP-14

The effects of chronic oral ketamine administration on depression-like behavior, types of explicit memory, and c-Fos expression in rats

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Objective: We aim to assess the antidepressant-like effects of low-dose chronic oral ketamine administration, a potential treatment for depression, and its potential cognitive side effects.

Methods: (Experiment 1) 8 female Wistar rats were used and the experimental group (n=4) had ad libitum access to 0.013 mg/ml ketamine in tap water for 15 days. OFT, NORT, and FST, were conducted.(Experiment 2) 18 male Wistar rats were subjected to Chronic Unpredictable Mild Stress (CUMS) for 9 weeks. Starting from the 7th week of CUMS, the experimental group (n=9) received ketamine for 5 weeks as in the first experiment. Throughout CUMS, Sucrose Preference Tests were conducted weekly. After the CUMS period, FST, OFT, EPM, and MWM were performed. Animals were sacrificed following an acute reward paradigm, and c-Fos immunoreactivity in several brain regions was analyzed. All procedures were ethically approved by BUHADYEK. All measures were analyzed using ANOVA and/or t-test in SPSS.

Results: (Experiment 1) Experimental group displayed lower immobility in FST ($p<0.05$) while there were no significant dif-

ferences between the two groups in OFT and NORT. (Experiment 2) Sucrose consumption was higher in the experimental group ($p<0.01$), while there were no significant differences between the two groups in FST, OFT, EPM, and MWM. In the experimental group, c-Fos immunoreactivity was higher in the nucleus accumbens shell (NAsh) ($p<0.05$) and lower in the lateral habenula (LHb) ($p<0.01$).

Conclusion: Experiment 1 shows that chronic oral ketamine administration decreases behavioral despair, while Experiment 2 shows that it can prevent anhedonia as measured from sucrose consumption levels. In both experiments, ketamine created no cognitive side effects. These results suggest that low-dose chronic oral ketamine might be an effective treatment for clinical depression, while LHb and NAsh might be involved in its ameliorative effects on anhedonia.

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Keywords: anhedonia, behavioral despair, c-Fos, depression, ketamine, memory

PP-15

The effect of emotional valence on memory: an event-related potential (ERP) and event-related oscillation (OIS) study

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Objective: Aim of the present study is to examine the effect of visual stimuli with different emotional valence but similar emotional arousal level on recall of neutral-words, by using ERP and ERO. By this way, it is possible to investigate whether the spectral properties of ongoing-EEGs and ERPs can be used to predict the person's memory performance.

Methods: 20 healthy-volunteers between 18–28 years of age were asked to recall freely neutral-words presented after International Affective Picture System (IAPS) pictures or schematic-faces with different emotional valence. Brain electrical potentials during this period were measured by recording EEG from 32-channels.

Results: According to the findings, significantly more words presented following negative schematic-faces were recalled, while a similar memory effect could not be obtained with IAPS pictures. Reaction time (RT) analyses revealed that the RT to negative stimuli was significantly shorter than those to neutral and positive stimuli. Electrophysiological findings showed that ERPs reflect changes due to emotional valence of visual stimuli and recall of words in separate-time-windows. In experiment with IAPS pictures 450–600 ms time window of ERP that follows word displays subsequent memory effect in accordance with literature. ERP changes reflecting the emotional valence of visual stimuli were obtained in 250–300 ms time-window to words that follow schematic faces and in 300–400 and 400– 650 ms time-windows to words that follow pictures.

Conclusion: Because changes due to memory and emotions occurred in distinct time windows of ERPs, neurophysiological counterpart of modulating effect of emotion on memory could not be interpreted. In contrast, the frontal induced theta oscillations that occur in a specific time window between appearance of visual stimuli and words displayed significant increases both before remembered-words and after negative schematic-faces in contrast to non-remembered words and to neutral and positive stimuli. This finding the electrophysiological correlate of the modulation the emotional valence of schematic-faces exerts on encoding of neutral-word.

Keywords: emotional valence, memory, EEG, ERP, ERO

PP-16

Computational indicators of treatment with drug in terms of graphical cortex network indices in child psychiatry

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Objective: is to show the positive effects of 1-month drug treatment applied to 18 pediatric boys with attention deficit/hyperactivity disorder (ADHD) in terms of neurofunctional connectivity indices based on Graph Theory (GT).

Methods: In pre- and post-treatments phases, the mean diagnostic scores of inattention (IA)-hyperactivity-impulsivity (HI) were 17.94–16.83 and 7.44–6.11, respectively according to the Turgay DSM-IV Rating Scale for Destructive Behavioral Disorders. The mean age was 8.72 of boys. Resting-state eyes-opened 16-channel EEG series were recorded from the patients before and after the treatment. EEG trials of 2 min were analyzed into non-overlapped short segments of 2 sec based on GT. The functional brain connectivity matrices of 16x16 were determined into EEG frequency bands by using Statistical Correlation, Spectral Coherence and Phase Synchronization approaches in time, frequency and phase domains. Considering the mean value as threshold, 'brain connectivity toolbox' was applied to the resulting connectivity matrices for estimation of graph theoretic indices referring segregation-integration and modularity of the brain. The frequency band-specific network indices estimated from pre- and post-treatment phases were classified with Support Vector Machines

to observe the impact of treatment. One-way Anova and two-way multiple comparison were used as statistical tests.

Results: Pearson Correlation provided the highest classification accuracy (CA) of 80.74%, when all indices were included in the feature set. Subtracting the modularity index from the features increased CA of 83.79%. Each brain network index provided a statistically significant difference between pre- and post-treatment ($p<0.005$).

Conclusion: In ADHD, drug treatment caused the increase in both segregation and resilience of the brain. The results reveal that functional connectivity between cortical regions was strengthened and neuronal information flow became more effective through drug-treatment. Estimation of network indices from the EEG series is found to be useful in computational psychiatry.

Keywords: brain biophysics, EEG, graph theory, ADHD, child psychiatry

PP-17

Dependency of brain connectivity network indices on emotional perception induced by acoustic stimuli

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Objective: Investigation of functional and effective brain connectivity metrics for recognition of emotions induced by acoustic sounds in terms of Graph Theoretic network indices.

Methods: 19-channel EEG signals, recorded with sampling frequency of 1000 Hz in 30 adults (18–63 years) who listened to acoustic stimuli, were downloaded from OpenNeuro dataset ds002721. Dependency levels are calculated using linear Pearson Correlation (PC) and non-linear Partial Directed Coherence (PDC) methods regarding 6-sec and 2-sec segments into six frequency bands (full band: 0.5–60.5 Hz, delta: 0.5–4.5 Hz, theta: 4.5–8 Hz, alpha: 8.5–16 Hz, beta: 16.5–31 Hz, gamma: 31.5–60.5 Hz). 60% max of dependency matrices is defined as threshold. Using Brain Connectivity Toolbox, six network indices (clustering coefficient, global efficiency, local efficiency, transitivity, assortativity, modularity) are estimated. Different emotional states (fear-anger, happiness-sadness, resting state-fear, resting-anger, resting-happiness, resting-sadness) are classified using a deep learning model in MATLABR2020b.

Results: While PC and PDC performances are similar; higher accuracies in the 70.65%–96.67% interval are found with PDC and 2s segments for all classifications by the deep learning model. In tests, the best performances are %96.67 and %91.79 for classification of happiness vs sadness in accordance with gamma-band specific indices and fear vs anger in accordance with combined indices from each sub-band, respectively.

Conclusion: In psychiatry, fear and anger have been used as diagnostic support for emotion recognition. These emotions are in the same quarter of the affective model according to arousal-valence scales. Regardless, neurotransmitter and hormonal changes playing a role in EEG series are clearly different in these emotions. This difference is shown in terms of brain connectivity indices. Additionally, quantitative results also show that brain segregation, integration, and modularity measures are associated with both perception and cognition in happiness and sadness.

Keywords: brain biophysics, graph theory, psychiatry, EEG, emotion recognition, deep learning

PP-18

The effect of encoding process on the functioning of episodic memory and metacognitive decisions in obsessive-compulsive disorder

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Objective: Studies about memory problems at the obsessive-compulsive disorder (OCD) are controversial. However, it is known that individuals with OCD have problems during episodic memory process and their metacognitive judgments. However, it is not clear that these issues are due to encoding or retrieval processes. Additionally, stimuli that are used in memory tasks are related to OCD symptoms and this causes controversies about the external validity of findings. In that study, it is aimed to investigate the resource of cognitive problems by use of stimuli that are not related to OCD symptoms.

Methods: In the study, there were 55 participants diagnosed with OCD and 44 healthy participants who matched with the OCD group in terms of gender, level of education, and age. The age range of participants is 18–55 (M=28.33). Participants' episodic memory and metacognitive judgments were measured using a classical recall-judgement-recognition paradigm that includes learning word pairs, judgment of learning (JOL), feeling of knowing (FOK), and recognition performances. While half of the word list consisted of familiar words, half of them were unfamiliar.

Results: Multivariate analysis of variance showed that the performance of the OCD group was lower than the control group in terms of metacognitive judgments such as JOL and FOK

judgments (p<.001). Similarly, OCD group's memory performance was significantly lower than controls (p=.011) and reaction time of OCD participants was significantly longer for unfamiliar stimuli compared to controls (p=.004).

Conclusion: These results indicated that reaction time and metacognitive judgments play important role for understanding of cognitive processes at OCD and the problem in memory is related to the process of learning stage.

Keywords: OCD, metacognitive judgments, episodic memory

PP-19

The role of reaction time and metacognitive judgments in understanding memory problem in obsessive-compulsive disorder

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Objective: Although there is no consensus on the results of memory studies in obsessive-compulsive disorder (OCD), it has been shown that patients with OCD have lower performance on tasks involving episodic memory. On the other hand, clinical and experimental observations indicated that patients with OCD have problems in their metacognitive judgments. However, in the previous research, the lack of using non-OCD-related stimuli in memory tasks has not resolved the debate on this issue. This study aims to compare the episodic memory performance and metacognitive judgments about memory performance in OCD using symptom-free stimuli with healthy controls.

Methods: The sample of this study consisted of 99 individuals (55 OCD, 44 controls). The age range of participants is 18–55 (M=28.33). Two groups were matched in terms of gender, level of education, and age. Episodic memory task consists of the stages that involve learning stimulus pairs of words and place photos, recall, recognition, and metacognitive judgments (feeling of knowing and judgments of learning). Half of the target photos to be remembered are familiar (e.g. Maiden's Tower) and the other half are unfamiliar (e.g. a beach photo).

Results: Feeling of knowing and judgment of learning judgments of patients with OCD are significantly lower than the control group. Individuals with OCD performed lower in recognition performances. In addition, the reaction times of the OCD group were found to be longer, especially for unfamiliar stimuli compared to healthy controls.

Conclusion: These results pointed out that individuals with OCD have a problem in episodic memory performance, related metacognitive judgments, and information processing speed, even when symptom-free stimuli are concerned.

Keywords: episodic memory, metacognitive judgments, obsessive-compulsive disorder

PP-20

Do individuals diagnosed with obsessive-compulsive disorder have trouble with face recognition?

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Objective: It has been shown that individuals with OCD have difficulties especially in episodic memory tasks and their memory confidence and metacognitive judgments have lower than healthy individuals. Symptom-related stimuli were used in those mentioned studies. Therefore, it has been discussed that the findings are inadequate to understand the source of the cognitive problems of individuals with OCD in daily life. In this study, it was purposed to find an answer to the current problem, and whether the episodic memory performances of individuals diagnosed with OCD were different from healthy controls were measured with an episodic memory task involving learning familiar and unfamiliar faces.

Methods: The study included 55 individuals diagnosed with OCD whose age range was 18–55 (M=28.33) and 44 healthy adults who were matched with the OCD group in terms of age, level of education, and gender. The episodic memory task consisted of learning familiar and unfamiliar human faces, judgment of learning, and feeling of knowing, and recognition phases.

Results: It was observed that participants with OCD showed lower performance in terms of judgment of learning confidence, recognition, and reaction times. The results varied according to the familiarity of the stimulus.

Conclusion: Consisted with previous studies, our findings showed that the episodic memory performances and metacognitive judgments of individuals with OCD have lower than healthy individuals. Also, their reaction times were slower than healthy controls. Observation of poor performances for faces suggested that the cognitive problem in OCD occurred during the learning/encoding of the stimulus.

Keywords: episodic memory, face recognition, metacognition, OCD

PP-21

Investigation of the association of liver X receptor beta gene *(NR1H2)* rs2695121 single nucleotide polymorphism with autism spectrum disorder: preliminary results

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Objective: Autism Spectrum Disorder(ASD) is a neuropsychiatric disorder that manifests early in life. Broad phenotypic features point to multiple risk factors for ASD. NR1H2 gene encodes Liver X Receptor Beta (LXRb) protein, which plays a central role in brain cholesterol metabolism that has an important role in neuronal development. However, its role has yet to be tackled in ASD patients. In this study, for the first time; we have investigated the possible relationship between rs2695121 single nucleotide polymorhism which has been selected from the regulator regions of the NR1H2 and have been shown to be associated with neuropsychiatric processes..

Methods: A total of 69 children with ASD and 52 healthy children aged 2–18 years, who underwent detailed psychiatric evaluations, were included. Genotyping for NR1H2 gene rs2695121 polymorphism was performed by PCR–RFLP method. Statistical anlayses were done by SPSS 23.0.

Results: The frequency of C allele was 55.1% and 63.5% for the ASD and control groups, respectively; the frequency of T allele was 44.9% and 36.5%, respectively. Allele frequencies were found to be similar in both groups (p=0.235). The genotype frequency distributions were CC: 36.2% (n=25), CT: 37.7% (n=26) and TT: 26.1% (n=18) for the ASD group; CC: 40.4% (n=21), CT: 46.2% (n=24) and TT: 13.4% (n=7) for the control group. There was no significant difference between the two groups in terms of genotype frequencies (p=0.230). In the ASD group, no significant association was observed between symptom areas and disease severity and rs2695121.

Conclusion: Our results suggest that NR1H2 gene rs2695121 polymorphism, previously associated with neurodegenerative processes, is not a risk factor for the development or progression of ASD. In order to elucidate the possible role of LXRb in ASD, further studies evaluating other functional SNPs in the NR1H2 gene and serum LXRb ligand levels in a larger sample size.

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Keywords: autism spectrum disorder, liver V receptor beta, NR1H2 gene, single nucleotide polymorphism, LXRb

PP-22

Saccadic eye movements in individuals with ultra high-risk psychosis and bipolar disorder

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Objective: The purpose of the study is to examine saccadic-eye-movements, and the relationship between eye-movements and motor functions based on the cerebellar connection among individuals with ultra-high-risk of psychosis and bipolar disorder (UHR-P, UHR-BD) and healthy controls (HC).

Methods: The study included 13 UHR-P, 13 UHR-BD and 9 HC. Participants were created by cases meeting clinical-high-risk-criterions in clinical interviews made with The Structured Interview of Psychosis-risk Syndromes (SIPS) and Bipolar Prodrome Symptom Interview and Scale (BPSS). Pro-saccade and anti-saccade paradigms were used to evaluate eye-movements. Eye movement data were recorded from the right eye using an EyeLink-1000-Plus eye-tracker. In addition, Brief-Motor-Scale (BMS) was used to evaluate motor functions of patient.

Results: According to eye-movement outcomes, the latency of pro-saccade far correct responses showed significant difference between UHR-P and UHR-BD (p=0.015). Amplitude of anti-saccade correct responses was found statistically significant between UHR-BD and HC (p=0.049). In UHR-P, there was a strong negative correlation between motor functions and amplitude of pro-saccade far condition. (r=-0.568, p=0.035). There was a strong positive correlation between anti-saccade and pro-saccade correct responds in same group. (r=0.705, p= 0.005). In UHR-BD, very-strong positive correlation was indicated between amplitude of anti-saccade correct respond and amplitude of pro-saccade far condition. (r=0.796, p=0.001). The relationships among other variables were not significant. (p>0.05).

Conclusion: In the literature, there are controversial results about eye movement data in individuals with ultra-high risk. Negative correlation between pro-saccade correct respond and motor scale are confirmed with motor disfunctions thought to be related to cerebellar malformations in individuals with risk group. Correlation, additionally, in between anti-saccade and pro-saccade values in psychosis and bipolar risk groups is compatible with literature. The lack of some relationships between the groups and the limitation in the number of samples are originated from results that are preliminary data of an ongoing study.

Keywords: psychosis, bipolar disorder, eye movement

PP-23

Prestimulus Mu rhythm as an indicator of conflict adaptation in Stroop test

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Objective: The functional state of the sensory and motor structures have great influence on processing of the upcoming stimulus. Stroop test requires participants to solve the conflict between features of the stimulus (color and verbal meaning of the words) and to suppress the dominant verbal content related response alternative. These sub-processes of cognitive control are reported to display adaptive fluctuations depending on the presence of conflict in the previous stimulus, known as conflict adaptation. In this study, we aimed to investigate the conflict adaptation in Stroop test by means of event-related oscillations (EROs) in the prestimulus time window.

Methods: 12 healthy volunteers (6 man, 6 women) participated in the study. 30 channel EEG was recorded while the participants performed computer-based Stroop test. Behavioral responses were collected with button presses. Response-locked EEG sweeps were obtained as 1 sec pre-response and 1.5 sec. post-response time windows. We considered this time window as the prestimulus period for the upcoming stimulus. EROs in 8–35 Hz was calculated by wavelet transform. Cluster-based nonparametric permutation test implemented in the FieldTrip toolbox is recruited for statistical comparison of spatio-temporal features of the frequency components between conflicting and non-conflicting trials.

Results: Response-locked 8–35 Hz total activity was lower in the post-response (100–800 ms) of conflicting stimuli ($p = 0.0347$). This significant difference between conflict and non-conflict conditions was located over sensory-motor cortices, i.e. fronto-central electrodes. Thereby, we considered this attenuation in 9–10 Hz as Mu rhythm desynchronization.

Conclusion: In the Stroop test, the conflicting and non-conflicting stimuli appears randomly with 50% probability. The stronger Mu rhythm desynchronization in the post-response of conflicting stimuli seems to be a substrate of conflict adaptation, such as the enhanced cognitive control and suppression of the dominant response motive ahead of the upcoming stimulus.

Keywords: cognitive control, Mu rhythm, Stroop test, EEG, event-related oscillations