

# 5<sup>ο</sup> ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΓΝΩΣΙΑΚΗΣ ΕΠΙΣΤΗΜΗΣ

17-20 Μαΐου 2018

Λεύκες – Πάρος



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ  
Εθνικό και Καποδιστριακό  
Πανεπιστήμιο Αθηνών

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# ΓΕΝΙΚΕΣ ΠΛΗΡΟΦΟΡΙΕΣ

## Τόπος Διεξαγωγής

Κοινοτικό Μέγαρο Λευκών  
Λεύκες, Πάρος

## Ημερομηνίες Διεξαγωγής

Πέμπτη 17 Μαΐου 2018 – Κυριακή 20 Μαΐου 2018

## Οργάνωση

Ελληνική Εταιρεία Γνωστικής Επιστήμης

Email συνεδρίου: [CogSci2018@gmail.com](mailto:CogSci2018@gmail.com)

Ιστοσελίδα Συνεδρίου:

<http://helleniccognitivesciencesociety.gr/> [Δραστηριότητες → Συνέδρια]

## Εγγραφή

Η Γραμματεία θα βρίσκεται στο χώρο διεξαγωγής του Συνεδρίου καθ'όλη τη διάρκεια.

## Ομιλίες - Δοκιμή Προβολών

Οι ομιλητές παρακαλούνται να προσκομίσουν το αρχείο με την παρουσίασή τους στην αίθουσα παρουσιάσεων 15 λεπτά πριν την έναρξη της συνεδρίασης, στην οποία ανήκει η παρουσίασή τους.

## Αναρτημένες Ανακοινώσεις

Τα posters θα πρέπει να αναρτηθούν το πρωί της δεύτερης μέρας του Συνεδρίου και να απομακρυνθούν με τη λήξη του Συνεδρίου με ευθύνη των συγγραφέων τους.

## Διαλείμματα Καφέ

Καφές, αναψυκτικά και σνακ θα διατίθενται στο χώρο του συνεδρίου κατά τη διάρκεια των επίσημων διαλειμμάτων.

## Βεβαίωση Παρακολούθησης

Οι εγγεγραμμένοι σύνεδροι μπορούν να παραλάβουν τη βεβαίωση παρακολούθησης την Κυριακή 20 Μαΐου, κατά τη λήξη του Συνεδρίου.

## **ΕΠΙΤΡΟΠΕΣ**

### **ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΠΙΤΡΟΠΗ ΣΥΝΕΔΡΙΟΥ**

- Σπυριδούλα Βαρλοκώστα [τμήμα Φιλολογίας, ΕΚΠΑ]
- Αργυρώ Βατάκη [Ινστιτούτο Γνωσιακής Έρευνας και Τεχνολογίας]
- Στέλλα Βοσνιάδου [τμήμα ΙΦΕ, ΕΚΠΑ]
- Ελένη Ζιώρη [τμήμα ΦΠΨ, Πανεπιστήμιο Ιωαννίνων]
- Σμαράγδα Καζή [τμήμα Ψυχολογίας, Πάντειο Πανεπιστήμιο]
- Φίλιππος Καργόπουλος [τμήμα Ψυχολογίας, ΑΠΘ]
- Κωνσταντίνος Μουτούσης [τμήμα ΙΦΕ, ΕΚΠΑ]
- Δρακούλης Νικολινάκος [τμήμα ΙΦΕ, ΕΚΠΑ]
- Πέτρος Ρούσσος [τμήμα Ψυχολογίας, ΕΚΠΑ]
- Ειρήνη Σκαλιόρα [Ίδρυμα Ιατροβιολογικών Ερευνών Ακαδημίας Αθηνών]
- Ειρήνη Σκοπελίτη [ΤΕΕΑΠΗ, Πανεπιστήμιο Πατρών]
- Ελπίδα Τζαφέστα [τμήμα ΙΦΕ, ΕΚΠΑ]

### **ΟΡΓΑΝΩΤΙΚΗ ΕΠΙΤΡΟΠΗ ΣΥΝΕΔΡΙΟΥ**

- Σμαράγδα Καζή [τμήμα Ψυχολογίας, Πάντειο Πανεπιστήμιο]
- Κωνσταντίνος Μουτούσης [τμήμα ΙΦΕ, ΕΚΠΑ]
- Πέτρος Ρούσσος [τμήμα Ψυχολογίας, ΕΚΠΑ]
- Ειρήνη Σκαλιόρα [Ίδρυμα Ιατροβιολογικών Ερευνών Ακαδημίας Αθηνών]
- Ειρήνη Σκοπελίτη [ΤΕΕΑΠΗ, Πανεπιστήμιο Πατρών]
- Αμαλία Τσακίρη [τμήμα ΙΦΕ, ΕΚΠΑ]

# ΠΡΟΓΡΑΜΜΑ

**Πέμπτη 17 Μαΐου 2018**

17.00-18.00:	<b>Εγγραφές</b>
18.00-19.00:	<b>Κεντρική ομιλία 1</b> <b>Invisible Adaptation: the effect of awareness on perceptual mechanisms</b> Konstantinos Moutousis <i>Department of Philosophy &amp; History of Science, University of Athens</i>
19.00-20.00:	<b>Θεματική Συνεδρία 1</b> <b>Language – Affect</b> <b>Προεδρείο: Πέτρος Ρούσσος</b> <b>Lexical stress is not underspecified: evidence for the representation of stress from eye-tracking</b> <i>Angeliki Andrikopoulou<sup>1</sup>, Athanassios Protopapas<sup>1,2</sup>, &amp; Amalia Arvaniti<sup>3</sup></i> <sup>1</sup> Department of History and Philosophy of Science, University of Athens <sup>2</sup> University of Oslo, Norway <sup>3</sup> Department of English Language and Linguistics, University of Kent, UK <b>Πρώιμη Μορφολογική κατάτμηση κατά την οπτική λεξική αναγνώριση: αλήθεια ή μύθος;</b> Σοφία Λούη <sup>1</sup> & Αθανάσιος Πρωτόπαπας <sup>2</sup> <i><sup>1</sup>Τμήμα ΙΦΕ, Πανεπιστήμιο Αθηνών, <sup>2</sup>University of Oslo, Norway</i> <b>Affect in Humans, Nonhuman Animals, and Robots</b> Petros A. M. Gelepithis <i>Faculty of Medicine, University of Crete</i>
20.00-21.00:	<b>Κεντρική Ομιλία 2</b> <b>Implicit Learning: Its nature, properties and measurement</b> Eleni Ziori <i>Department of Philosophy, Education and Psychology, University of Ioannina</i>

## Παρασκευή 18 Μαΐου 2018

<b>10.00-11.00:</b>	<b>Κεντρική ομιλία 3</b> <b>Behavior, Mind, Consciousness, Value: The old and the new riddle of consciousness</b> Philip Kargopoulos <i>School of Psychology, Aristotle University of Thessaloniki</i>
<b>11.00-12.30:</b>	<b>Θεματική Συνεδρία 2</b> <b>Multisensory Perception</b> <b>Προεδρείο: Ειρήνη Σκαλιόρα</b>  <b>Intentional binding in multisensory event sequences: The role of intentionality, causality, and temporal predictability</b> Vassilis Thanopoulos <sup>1,2</sup> & Argiro Vatakis <sup>1,2</sup> <i><sup>1</sup>Department of History and Philosophy of Science, University of Athens</i> <i><sup>2</sup>Cognitive Systems Research Institute</i>  <b>Intentional binding in naturalistic multisensory events: The role of semantic relatedness</b> Penelope Bounia <sup>1</sup> , Vassilis Thanopoulos <sup>1,2</sup> & Argiro Vatakis <sup>1,2</sup> <i><sup>1</sup>Department of History and Philosophy of Science, University of Athens</i> <i><sup>2</sup>Cognitive Systems Research Institute</i>  <b>Aging effects on the multisensory perception of the body</b> Amalia Tsakiri <sup>1</sup> , Vicky Karadima <sup>1</sup> , & Argiro Vatakis <sup>1,2</sup> <i><sup>1</sup>Department of History and Philosophy of Science, University of Athens</i> <i><sup>2</sup>Cognitive Systems Research Institute</i>  <b>A behavioural evaluation of inverse effectiveness as a function of stimuli quality and synchrony</b> Lydia Liapi <sup>1</sup> , & Argiro Vatakis <sup>1,2</sup> <i><sup>1</sup>Department of History and Philosophy of Science, University of Athens</i> <i><sup>2</sup>Cognitive Systems Research Institute</i>
<b>12.30-13.30:</b>	<b>Καφές &amp; Αναρτημένες Ανακοινώσεις 1</b>

13.30-14.30:	<p><b>Κεντρική Ομιλία 4</b></p> <p><b>Neuroimaging evidence for a deviance in the control of intra-subject variation of reaction time in schizophrenia</b></p> <p>Nikolaos Smyrnis <i>Psychiatry Department, University of Athens</i></p>
18.00-19.30:	<p><b>Round Table</b></p> <p><b>Can we ever hope to find a naturalistic explanation for consciousness?</b></p> <p>Organizer: Irimi Skaliora</p> <p>Discussants:</p> <p>Wolf Singer <i>Max Planck Institute for Brain Research, Frankfurt</i></p> <p>Philip Kargopoulos <i>School of Psychology, Aristotle University of Thessaloniki</i></p> <p>Konstantinos Moutousis <i>Department of Philosophy &amp; History of Science, University of Athens</i></p> <p>Nikolaos Smyrnis <i>Psychiatry Department, University of Athens</i></p>
19.30-21.00:	<p><b>Θεματική Συνεδρία 3</b></p> <p><b>Psychophysics</b></p> <p><b>Προεδρείο: Κωνσταντίνος Μουτούσης</b></p> <p><b>The role of change in interval duration judgements</b> Vasilis Kotsaris<sup>1</sup>, &amp; Argiro Vatakis<sup>1,2</sup> <sup>1</sup><i>Department of Philosophy and History of Science, University of Athens</i> <sup>2</sup><i>Cognitive Systems Research Institute</i></p> <p><b>Learning to read with a simulation of artificial vision: Experienced-related Changes in Performance on a reading task</b> Katerina-Eleonora K. Rassia<sup>1</sup>, &amp; John S. Pezaris<sup>2,3</sup> <sup>1</sup><i>Department of Philosophy and History of Science, University of Athens</i> <sup>2</sup><i>Department of Neurosurgery, Massachusetts General Hospital, Boston</i> <sup>3</sup><i>Department of Neurosurgery, Harvard Medical School, Boston</i></p> <p><b>Investigating the Relationship between Face Recognition Ability and False Memories from Misinformation in the Context of Individual Differences</b> Viktor Melikopoulos<sup>1</sup> &amp; Afroditi Papaioannou-Spirouli<sup>2</sup> <sup>1</sup><i>MSc in 'Clinical Cognitive Neuropsychology, University of Strasburg-Scientific College of Greece</i> <sup>2</sup><i>ΚυΨέλη Research Center, Department of Psychology, Scientific College of Greece</i></p>

## Σάββατο 19 Μαΐου 2018

<b>10.00-11.00:</b>	<b>Κεντρική Ομιλία 5</b> <b>Social transmission on fear: the effect of social interaction of fear conditioning by-proxy</b> Irimi Skaliora <i>Biomedical Research Foundation of the Academy of Athens</i>
<b>11.00-12.30:</b>	<b>Θεματική Συνεδρία 4</b> <b>Time Perception</b> <b>Συντονισμός: Ελπίδα Τζαφέστα</b>  <b>The interplay of dynamic gaze and emotion on time estimation</b> Aikaterini Christodoulou <sup>1</sup> & Argiro Vatakis <sup>2</sup> <i><sup>1</sup>Department of Psychology, Panteion University of Social and Political Sciences</i> <i><sup>2</sup>Cognitive Systems Research Institute, Athens</i>  <b>Metricality and rhythm complexity interactively modulate visual rhythm perceptual learning</b> Nadia Paraskevoudi <sup>1</sup> , & Argiro Vatakis <sup>1,2</sup> <i><sup>1</sup>Department of Philosophy and History of Science, University of Athens</i> <i><sup>2</sup>Cognitive Systems Research Institute</i>
<b>12.30-13.30:</b>	<b>Καφές &amp; Αναρτημένες Ανακοινώσεις 2</b>
<b>13.30-14.30:</b>	<b>Θεματική Συνεδρία 5</b> <b>Cognitive Science general</b> <b>Προεδρείο: Αμαλία Τσακίρη</b>  <b>Causality and probability in causal maps</b> Georgia Rovatsou <i>MSc Cognitive Science, University of Athens</i>  <b>Self-deception and illusion of fairness in bargaining games</b> Konstantinos Armaos <i>CREED Lab, Tinbergen Institute, University of Amsterdam</i>  <b>Aspects of Performance Spectatorship: “embodied simulation” and “embodied language”</b> Evi Prousalι <i>Faculty of Theatre Studies, University of Athens</i>

<p><b>18.00-19.00:</b></p>	<p><b>Κεντρική Ομιλία 6:</b>  <b>Cortical dynamics and mechanisms of predictive coding</b>  Wolf Singer  <i>Max Planck Institute for Brain Research, Frankfurt</i></p>
<p><b>19.00-20.30:</b></p>	<p><b>Symposium</b>  <b><i>New mechanism and the system approach to biological complex systems</i></b>  Organizer: Stavros Ioannides  Discussants: Irimi Skaliora &amp; Konstantinos Armaos</p> <p><b>Self-organized criticality and the brain</b>  Michael Vinos<sup>1,2</sup> &amp; Irimi Skaliora<sup>2</sup>  <sup>1</sup><i>Department of Philosophy and History of Science, University of Athens</i>  <sup>2</sup><i>Biomedical Research Foundation of the Academy of Athens</i></p> <p><b>To decompose or not to decompose... phenomena in Cognitive Science</b>  Amalia Tsakiri-Vinos  <i>Department of Philosophy and History of Science, University of Athens</i></p> <p><b>Defending methodological mechanism</b>  Stavros Ioannidis  <i>Department of Philosophy and History of Science, University of Athens</i></p>



## Κυριακή 20 Μαΐου 2018

<b>10.00-11.00:</b>	<b>Κεντρική Ομιλία 7</b> <b>Oh, that evil artificial intelligence</b> Elpida Tzafestas <i>Department of Philosophy and History of Science, University of Athens</i>
<b>11.15-13.15:</b>	<b>Θεματική Συνεδρία 6</b> <b>Language - Cognitive Disorders</b> <b>Συντονισμός: Ειρήνη Σκοπελίτη</b>  <b>The meaning of force in High-functioning Autism Spectrum Disorder adolescents</b> George Kaliampos <sup>1</sup> , Sofia Mavropoulou <sup>2</sup> , Vassilis Kollias <sup>3</sup> , Denis Vavougiou <sup>4</sup> <i><sup>1</sup>Department of Special Education, University of Thessaly</i> <i><sup>2</sup>School of Early Childhood &amp; Inclusive Education, Queensland University of Technology</i> <i><sup>3</sup>Department of Primary Education, University of Thessaly</i>  <b>Θεραπευτικές ιδιότητες του γραπτού λόγου και μεταγνώση των μαθητών κατά την παραγωγή αφηγηματικών κειμένων</b> Βιργινία Παπατρέχα, Ιωάννης Σπαντιδάκης, Ελένη Βασιλάκη <i>Παιδαγωγικό Τμήμα Δημοτικής Εκπαίδευσης, Πανεπιστήμιο Κρήτης</i>
<b>13.15-13.30:</b>	<b>Λήξη Συνεδρίου</b>

# Αναρτημένες Ανακοινώσεις

**ΠΑΡΑΣΚΕΥΗ 18 ΜΑΪΟΥ 2018**

## **Gaze and head contingency in visual prosthetic systems: A proposed artificial vision study**

Nadia Paraskevoudi<sup>1</sup> & John S. Pezaris<sup>2,3</sup>

<sup>1</sup>*Department of Philosophy and History of Science, University of Athens*

<sup>2</sup>*Department of Neurosurgery, Massachusetts General Hospital, Boston*

<sup>3</sup>*Department of Neurosurgery, Harvard Medical School, Boston*

## **Thinking and feeling inside the cockpit. Approaching the construct of emotion and cognition interaction in civil aviation accidents**

Spyros Stavrakis-Kontostavlos<sup>1,2</sup>, Andreas Nidos<sup>1,2</sup>, & Petros Roussos<sup>1</sup>

<sup>1</sup>*Department of Psychology, University of Athens*

<sup>2</sup>*Pine Assessment & Development*

## **The effects of early life seizures in combination with peripubertal stress on cognition and brain structure during adulthood**

Salvanou Vasiliki, Peta Charoula & Skaliora Irini

*Biomedical Research Foundation of the Academy of Athens*

## **Η επίδραση της ημικρανίας-έντασης στη χωρική προσοχή σύμφωνα με την κοινωνική συναισθηματική προσαρμοστικότητα**

Ζωή Κυριακίδου<sup>1</sup>, Μαρία Ζαννίκου<sup>1</sup>, & Δημήτρης-Δήμος Μητσικώστας<sup>2</sup>

<sup>1</sup>*City Unity College*

<sup>2</sup>*Αιγινήτειο Νοσοκομείο*

## **The importance of a reliable and fast cognitive assessment in Multiple Sclerosis and the Montreal Cognitive Assessment as an effective tool.**

E. Gasparatos, M. Zannikou, P. Patrikelis & S. Gatzonis

<sup>1</sup>*City Unity College*

<sup>2</sup>*Νευροχειρουργική Κλινική Νοσοκομείου Ευαγγελισμός*

# Αναρτημένες Ανακοινώσεις

**ΣΑΒΒΑΤΟ 19 ΜΑΪΟΥ 2018**

**Modeling the cognitive-cultural parameters that affect the integration of heterogeneous populations in a social system**

Georgia Dede & Georgios Mitkidis

*Department of Philosophy and History of Science, University of Athens*

**Improving reading comprehension through the enhancing of strategies for the production of communicative texts**

Irini Gaki, Ioannis Spantidakis, Eleni Vasilaki,  
& Aggeliki Mouzaki

*Department of Primary Education, University of Crete*

**Adaptation to the Greek population of the Metacognitive Awareness of Reading Strategies Inventory (MARSİ) version 1.0**

Aristea Mavrogianni<sup>1</sup>, Eleni Vasilaki<sup>1</sup>, Ioannis Spantidakis<sup>1</sup>, Eleni Papadaki-Michailidi<sup>1</sup>, & Michalis Linardakis<sup>2</sup>

<sup>1</sup>*Department of Primary Education, University of Crete*

<sup>2</sup>*Department of Preschool Education, University of Crete*

**Examining explanatory co-existence through dual process theories by eye tracking methodology**

Athina Karamanidou & Dimitris Pnevmatikos

*Department of Primary Education, University of Western Macedonia*

**Executive Functions of Children with Autistic Spectrum Disorder (ASD): A pilot study of conceptual parameters and therapeutic intervention**

Triantafyllia Bozini, Alexandra Theodoropoulou, Erifylli Tsirempolou, & Angeliki Gena

*National & Kapodistrian University of Athens*

KONSTANTINOS MOUTOUSIS

*Department of Philosophy & History of Science, University of Athens*

## **Invisible Adaptation: the effect of awareness on perceptual mechanisms**

One of the most intriguing questions in sensory perception is the way awareness influences the processing of sensory information. Conscious access to the properties of physical stimulation is considered to be a crucial factor in determining perception, but what happens to sensory input that fails to elicit a conscious percept? Is it possible to find traces of its processing in behavioural experiments? There are two classic methods to test this: priming and adaptation-aftereffects. Here we choose the latter to investigate into the fate of visual motion information that is presented to the subjects without them being aware of its direction. We use random dot displays in which one can vary the percentage of dots moving in the same direction and thus the signal-to-noise ratio (coherence) of the motion stimulus. In this way we can manipulate the physical strength and thus the visibility of the motion stimuli during adaptation, and then test the effect of such manipulations upon the magnitude of the dynamic motion aftereffect (MAE). In this aftereffect, a random dot movie with 0% coherence (pure noise) presented after adaptation (test) is perceived to be moving in a direction opposite to the direction of the adaptation stimulus. In order to 'hide' the adaptation stimulus from awareness, the former is presented peripherally and crowding with similar flankers is used to make its direction of motion 'invisible' to the subjects. In this way we can manipulate both the physical strength and the awareness level of the stimulus independently, and thus investigate separately the effect of different levels of both, during adaptation, to the strength of the following perceptual aftereffect. In order to dissect the effects of the perceptual characteristics and the physical attributes of stimulation on the magnitude of the MAE, we use conditions in which suprathreshold adaptation stimuli are physically identical but perceptually discrete and vice versa. We also use conditions in which the adaptation stimulus is subthreshold, either because of its low physical intensity (motion coherence) or because of crowding. Our results show that crowding, which severely impairs direction discrimination, also reduces the strength of the MAE, which is quantitatively measured using a motion nulling technique. On the other hand, the strength of the MAE is also depended upon the strength of the physical stimulus, even in cases that are perceptually identical but physically different (due to crowding). Finally, the MAE still persists with perceptually subthreshold adaptation stimuli, both in cases of low coherence with no crowding as well as in cases of higher coherence with crowding. Our results indicate that the visual system indeed processes stimuli which are hidden from the awareness of the subject, and that the strength of adaptation is determined independently by both the physical intensity of the stimulus as well as the level of awareness that it invokes. The relevance of these

results to previous behavioural studies on the MAE and on crowding, as well as brain imaging studies on the role of visual area V5 (the ‘motion’ area of prestriate cortex) will be discussed.

ELENI ZIORI

*Department of Philosophy, Education and Psychology, University of Ioannina*

## **Implicit Learning: Its nature, properties and measurement**

Implicit learning (namely, learning without conscious awareness) is a complex phenomenon, and therefore a hotly debated topic in cognitive psychology for almost fifty years since Arthur Reber (1967) first introduced the term. After defining this multifaceted phenomenon and providing some examples of its everyday manifestations, I will present some common experimental tasks that researchers use in order to study implicit learning, focusing mainly on the paradigm of artificial grammar learning, a fairly versatile paradigm that allows an instantiation of a wide variety of theories of learning, including theories based on rules, similarity, and associative learning. A brief discussion of the types of knowledge structures that can be acquired implicitly will follow. Next, I will discuss the fundamental issue of how we can detect implicit (unconscious) and explicit (conscious) knowledge using different measures, which are supported by different theories of consciousness. The particular way of defining conscious awareness is intrinsically related to the methodological issue of distinguishing between conscious and unconscious learning, and determines the methods for measuring the (un)conscious status of our knowledge. Among the measures that are based on different theories of consciousness are objective measures, free verbal reports, subjective measures based on confidence ratings, awareness reports of people’s structural knowledge, and measures of strategic control. After describing the different methodological tools that researchers in the implicit learning field have used for distinguishing between conscious and unconscious learning, I will present some of the properties of unconscious knowledge confirmed by theoretical and experimental data. An issue that has aroused different viewpoints is whether implicit learning is a passive and unselective learning process (e.g. Hayes & Broadbent, 1988) or whether it may interact with people’s prior knowledge, goals and expectations (e.g., Sun, 2000; Ziori & Dienes, 2008). Research data will be presented whereby implicit learning is shown to be elicited by meaningful stimuli activating prior knowledge as well as by rewarding and thus highly motivating stimuli. The particular research data will also provide evidence of another property of unconscious knowledge, namely its resistance to attention distraction by dual tasks and time pressure.

PHILIP KARGOPOULOS

*School of Psychology, Aristotle University of Thessaloniki*

## **Behavior, Mind, Consciousness, Value: The old and the new riddle of consciousness**

The ancient mythological-theological-metaphysical mystery of the soul and its relations to the body becomes well defined during the Scientific Revolution as a paradox of contradictory beliefs concerning the brain, the mind and their interaction. Cartesian dualism bequeathed to philosophy two epistemological-ontological problems and to psychology its first subject matter (consciousness) and a constant objection that questions any attempt to develop a truly scientific psychology, which led to the point of total abolition of mind and consciousness by behaviorism. The Cognitivist Revolution was founded theoretically on proposing a credible solution to the brain-body interaction by the well known computationalism doctrine that the mental consists of inner representations with enough syntactical structure to be manipulated formally by a computing machine. This view of the mind as a set of routines/programs learned and executed by the biological computer of the brain starts the Cognitive Science program as an interdisciplinary attempt to explain mind with AI at the center and neuroscience on the periphery. Consciousness was left to be treated after the other cognitive functions as lacking special procedures and objects specific to it. The initial Cognitive Science program was variously criticized for technical and theoretical reasons. Chief among the later were the problems of the grounding of knowledge and of the selection of the appropriate program for employment depending on the problematic situation presented to the organism by the environment. It was then thought that perhaps the forgotten function of consciousness, which is both a biological and a cognitive function, might be employed to handle both problems. Consciousness in its turn because of its dual nature (biological and cognitive/intentional) presented serious methodological problems especially in view of its objective subjectivity and its qualitiveness. Biological functions are to be isolated and observed functioning in the nervous system, but a series of philosophical arguments (by Nagel, Kripke, Jackson, Chalmers, Levine) were proposed to show that no 3<sup>rd</sup> person observation of neural function will ever come close to revealing or explaining 1<sup>st</sup> person qualitative, subjective experience. This argument which has its origins in Leibniz is best summarized in the Explanatory Gap Argument: Levine has shown that there are limits to reductive explanation of elements of consciousness considered as essential characteristics of consciousness. It would appear then that the old

ontological psychophysical interaction riddle was resurrected in another form as the epistemological riddle of consciousness, or what we will call the old Riddle of Consciousness. We accept the finds of Levine and agree that there will always be an explanatory gap which will be always growing narrower. We argue however that instead of blocking research, this step allows us to locate with precision the source of the problem “in us” and opens the way for a more complex set of riddles in which behavior, mind, consciousness and value are recognized as complex notions with multiple interrelations to be explored piecemeal within an epiphenomenalist view of consciousness.

NIKOLAOS SMYRNIS

*Psychiatry Department, University of Athens*

### **Neuroimaging evidence for a deviance in the control of intra-subject variation of reaction time in schizophrenia**

The deficit of information processing speed reflected in the increase of reaction time (RT) in sensorimotor speeded decision-making tasks is among the most replicated findings in schizophrenia. In a series of studies focusing on intra-individual variability of RT in patients with schizophrenia, a specific increase of intra-individual variability (ISV) was observed for those patients that separated them from patients with other psychotic disorders. In this study we present results from a neuroimaging study from our group investigating the hypothesis that the increase in RT-ISV in schizophrenia stems from a deficit in the executive control of attention. We used a two-choice reaction time task with varying degrees of attentional demand and confirmed that patients had increased RT-ISV compared to controls. This increase though was not related to the attentional demand of the task. The increased attentional demand in this task resulted in the activation of a network of prefrontal and parietal cortical areas. The activity of this network was not different between patients and controls and more importantly the activity of these areas was not predictive of the differences in RT-ISV between patients and controls. This difference was successfully predicted by the activity of a different area in the dorsolateral prefrontal cortex that has been related to inhibitory motor control. We thus conclude that the increase variability in RT in schizophrenia is not related to the executive control of attention but might be related to the control of motor behavior in these patients.

IRINI SKALIORA

*Biomedical Research Foundation of the Academy of Athens*

## **Social transmission on fear: the effect of social interaction of fear conditioning by-proxy**

Reacting promptly in the presence of threats is critical to survival, and the ability to identify cues that predict danger greatly supports us in this direction. Learning about potentially harmful events permits us to establish associations between external cues and emotional/motivational states such as fear. Fear can be acquired through direct experiences or indirectly, through social transmission. Much of our knowledge regarding the neurobiological mechanisms of fear learning comes from an extensive animal literature on Pavlovian (classical) fear conditioning - an established model of direct fear learning. The consistency in the physiological expression of conditioned fear elicited by the basic protocol indicates that mechanisms of emotional learning are analogous across species (LeDoux, 1996). More importantly, neuropsychological and neuroimaging techniques in the research of human fear conditioning have replicated the existing animal models (Delgado et al., 2006).

Hence, applying models of observational fear learning to genetically modified rodents would facilitate the study of the neural mechanisms underlying the social transmission of fear-related information. Here, we examined fear conditioning by-proxy (FCbP) in normal animals and animals lacking the  $\beta 2$  subunit of the nicotinic acetylcholine receptor (nAChR). Naïve C57BL/6 and  $\beta 2^{-/-}$  mice (FCbP) were exposed to a previously fear-conditioned (FC) cage-mate during the presentation of the conditioned stimulus (tone; Day 2). On the following day, FCbP mice were tested for fear reactions to both tone and context (Day 3) and we assessed the contribution of several factors to the estimated fear response. Although FCbP animals of both genotypes displayed no contextual fear, they showed significant differences in cued-fear: 30% wild-type mice froze to the stimulus, while none of the  $\beta 2^{-/-}$  mice did. Interestingly, only wt mice that exhibited enhanced social interaction with the FC animal during tone presentation (Day 2) expressed fear to the tone (Day 3). These results suggest that (i) mice are able to acquire information about possible danger through social interaction; (ii) the efficiency of social transmission of fear depends on the interaction pattern between animals during cue presentation; and (iii)  $\beta 2^{-/-}$  mice display different interaction pattern compared to wt mice and are unable to acquire such information. These data further indicate that  $\beta 2$ -containing AChRs influence observational fear learning indirectly, through their effect on social behavior.



WOLF SINGER

*Max Planck Institute for Brain Research (MPI),  
Ernst Strüngmann Institute (ESI) for Neuroscience  
in Cooperation with Max Planck Society  
Frankfurt am Main, Germany*

## **Cortical dynamics and mechanisms of predictive coding**

It is proposed that the evolution of cortical structures in the vertebrate brain (neocortex and hippocampus) introduced novel computational principles that differ radically from those realized in the nervous systems of molluscs and insects and those exploited in contemporary AI systems. A hall mark of cortical architectures is recurrence, the dense and reciprocal coupling among distributed feature specific neurons. Such networks engage in high dimensional non-linear dynamics exhibiting oscillatory activity in widely differing frequency ranges and complex correlation structures. Analysis of massive parallel recordings of neuronal responses in cat and monkey visual cortex suggests that the cerebral cortex exploits the high dimensional dynamic space offered by recurrent networks for the encoding, classification and storage of information. Evidence is presented that the recurrent connections among cortical neurons are susceptible to activity dependent modifications of their synaptic gain, which allows the network to store priors about the statistical contingencies of the outer world. Matching of sensory evidence with stored priors is associated with fast transitions towards substates of reduced dimensionality that are well classifiable by linear classifiers. In addition the network dynamics allow for the superposition and fast read out of information about sequentially presented stimuli, facilitating the encoding and storage of information about sequences. It is proposed that computations in high dimensional state space can account for the ultra-fast integration of sensory evidence with stored priors and the subsequent classification of the results of this matching operation.

ELPIDA TZAFESTAS

*Department of Philosophy and History of Science, University of Athens*

## **Oh, that evil artificial intelligence**

There is much discussion going on these days on the perils, threats and evils of artificial intelligence, more than in any other domain of scientific and/or technological endeavour. We are briefly reviewing these views and their arguments as they appear mainly in popular press

and media, as well as in general or popular science fora. We also review the admittedly fewer voices of defense from the experts point of view. Next, we attempt an evaluation of these views along three axes, the historical, the social and the political. Historically, artificial intelligence is by far not the first scientific or technological endeavour or artifact that is accused of presenting such dangers. We bring forward the psychological roots of such behaviors as well as the specificities of the current historical context that nourish them. We also discuss how the cybernetic origins and the actual objectives of artificial intelligence provide additional arguments against itself. At the social level, we review the current concerns and we show that they are in general not too different from earlier concerns about other fast-expanding human activities. We especially insist on the modern times fear of “takeover” of humans by machines. From a political point of view, we unravel the relationship and the interactions between some current political debates or views and the role of artificial intelligence as a discipline. We also discuss how the politics of science influence and are connected to all of the above. A further non-negligible consequence is the impact of the big audience image of artificial intelligence on the discipline itself and on the shaping of its objectives and methods. We claim that this impact is overall negative.

## ROUND TABLE

Organizer: IRINI SKALIORA

### Discussants:

WOLF SINGER

*Max Planck Institute for Brain Research, Frankfurt*

PHILIP KARGOPOULOS

*School of Psychology, Aristotle University of Thessaloniki*

KONSTANTINOS MOUTOUSIS

*Department of Philosophy & History of Science, University of Athens*

NIKOLAOS SMYRNIS

*Psychiatry Department, University of Athens*

### **Can we ever hope to find a naturalistic explanation for consciousness?**

Consciousness is a complex mental phenomenon that has hitherto defied a naturalistic explanation. This is, at least partly, due to the so-called “hard problem of consciousness” a term coined by David Chalmers to refer to the issue of subjective experience: why (and how) we have ‘qualia’; or how (and why) sensations are transformed (?) into experiential qualities (e.g. the quality of deep blue, the sensation of a sweet fruit). According to some, there is “no good explanation of why and how such qualia arise. Why should physical processing give rise to a rich inner life at all? It seems objectively unreasonable that it should, and yet it does (Chalmers, 1995)”. At the same time, others (Dennet, Dehaene, Novella) dispute the very existence of problem.

Are we presently any closer to a naturalistic explanation of consciousness? Do the (neuro) scientific attempts to explain simpler aspects of conscious experience, such as visual awareness, have any bearing on the ‘hard problem’? Is the view that “the so-called hard problem will be solved in the process of answering the “easy” ones” - as argued by Dennet? Do we need new laws of physics in order to tackle the issue? And to what extent are we limited by our language in this search?

This discussion will bring together experts from Neuroscience and Philosophy to debate these matters. Professors Singer and Kargopoulos will make brief introductory statements, followed by a discussion with the other members of the panel and with the audience.

## SYMPOSIUM

Organizer: STAVROS IOANNIDIS

### Participants:

STAVROS IOANNIDIS<sup>1</sup>

MICHAEL VINOS<sup>1,2</sup>

AMALIA TSAKIRI VINOS<sup>1</sup>

### Commentators:

IRINI SKALIORA<sup>2</sup>

KONSTANTINOS ARMAOS<sup>3</sup>

*<sup>1</sup>Department of Philosophy and History of Science, National and Kapodistrian University of Athens, Athens, Greece*

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*<sup>3</sup> CREED Lab, Tinbergen Institute, University of Amsterdam*

## **New Mechanism and the System Approach to Biological Complex Systems**

What methodological strategies should we adopt for the investigation of complex systems such as organisms and brains? The aim of this symposium is to critically examine some common views within philosophy of biology, cognitive science and neuroscience regarding this question, by comparing prominent philosophical views with examples from scientific practice.

The focal point of the symposium will be the recent so-called new mechanistic philosophy (or 'New Mechanism') within philosophy of science (cf. Craver & Tabery 2016). According to New Mechanism, the search for mechanisms and mechanical explanations is a (perhaps the) main aim in sciences such as biology and cognitive science. There exists a widespread consensus among philosophers of science that an adequate philosophical account of the practice of many sciences must be structured around this basic notion (cf. Glennan & Illari 2018, Part 4).

New mechanists take 'mechanisms' to be entities (complex systems) in their own right which are characterised by a certain ontological structure. The following represents a broad consensus about what a mechanism is: "a mechanism for a phenomenon consists of entities and

activities organised in such a way that they are responsible for the phenomenon” (Illari & Williamson, 2012, 120). Mechanistic explanations, then, explain complex systems by identifying the mechanisms that produce the systems’ behaviour.

It is not clear, however, whether many explanations offered by science in fields such as systems biology or systems neuroscience conform to the model of a mechanistic explanation as commonly understood. In particular, it is not clear whether systems that exhibit systemic or emergent properties and complex dynamics can indeed be characterised as ‘mechanisms’ and analysed mechanistically. Let us call the ‘system approach’ the various methodologies employed in science to analyse such complex systems. There are three options regarding the relation between the system approach and the mechanistic approach: first, the system approach is a subcategory of the mechanistic approach; second, the approaches are distinct, and only the former is appropriate for understanding certain kinds of systems; third, the approaches are distinct but complementary—both should be used, as each of them is useful for understanding different aspects of the system under study. There is currently no consensus among philosophers about which of those three options is correct.

In the symposium we are going to illuminate the contrast between the mechanistic and the system approach and attempt to answer the following questions by focusing on examples of explanations from current neuroscience and cognitive science: How should the mechanistic approach be characterised in general terms? In particular, is it a reductionist strategy or not? Should mechanism be seen as an ontological or merely as a methodological stance? What is the role of decomposition in the examinations of complex systems? What are the relations between different kinds of decompositions and decomposable systems, on the one hand, and the contrast between the mechanistic and the system approach, on the other?

**Keywords:** mechanism, mechanistic explanation, system approach, complex systems, decomposition

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**FIRST TALK**

MICHAEL VINOS, IRINI SKALIORA

**Self-Organized Criticality and the Brain**

As any complex system, the functioning brain, probably the most complex of the biological ones, can be studied under two complementary groups of approaches: these that utilize the bottom-up direction, according to which the hypotheses for the macroscopic level are based on the observations of the microscopic dynamics (e.g. neurons, small local networks) or the top-down approaches, which hold that conjectures for the microscopic level are based on more global observations, regarding even the whole brain. Self-Organized Criticality (SOC) (Bak, Tang, & Wiesenfeld, 1987, 1988) is a viewpoint from which the two levels of activity can be realized as connected. Criticality is a kind of behavior which can be observed during a second order (i.e. continuous) phase transition of a system. Such a system can remain sustained between the two phases and this is the state of criticality, a status really “on the edge of chaos” (Hesse & Gross, 2014; Langton, 1990). The *hypothesis of criticality* for the brain posits that this organ has evolved in such a way for specifically allowing this type of function to emerge because the latter endows the system with certain fitness benefits (Hesse & Gross, 2014). The balancing at criticality or near it optimizes the brain regarding the dynamic range of its responses, information transmission and information capacity (Shew & Plenz, 2013).

The SOC approach for brain dynamics is, in essence, an attempt for providing insights for the fundamental problem in the field of neurosciences, the one that is usually been kept hidden “under the rug”: how this “very large conglomerate of interconnected neurons produce a repertoire of given behaviors in a flexible and self organized way” (Chialvo, 2010). Regarding the same question (D. Plenz & Niebur, 2014) maintain that the standard view that the brain networks are analogous to stable, permanently connected, electronic circuits is giving its place to a different one under which the circuitry elements continuously alter their interrelations, “leading to the emergence of complex spatio-temporal patterns”. It seems that the assumption which triggered the current main bulk of work regarding SOC and neural systems was that of *neuronal avalanches* in the cortical networks (Beggs & Plenz, 2003, 2004). The term denotes a phenomenon which encompasses the observed critically balanced transmission of information across the brain cortex and which exhibits multiple features of complex organization in different scales as also in different dimensions. A rather astounding fact is the similarity of neuronal avalanches to other well-established expressions of SOC in very different physical

systems, with the most prominent being the analogies with tectonic earthquakes (Plenz, 2014), such as the specific relation between the organization of avalanches in time and their organization as magnitudes in space that results in “cascades of cascades”, in repeating and nested sequences of events of neuronal activity. Either under the scope of avalanches or regarding a possibly broader interpretation of SOC in the brain, it must be noted that the most significant element regarding this phenomenon is the proper identification of the SOC “phenotype” (Watkins, Pruessner, Chapman, Crosby, & Jensen, 2016):

1. Scale invariance or lack of a characteristic scale
2. Spatio-temporal correlations in the form of power-laws
3. Self-tuning to the critical point (of an underlying second order phase transition)

Relevant experimental work will be outlined as examples for this type of investigation of cortical networks dynamics.

**Keywords:** Self-Organized Criticality, Neuronal Avalanches, brain dynamics, cortical networks

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## SECOND TALK

AMALIA TSAKIRI VINOS

### To decompose or not to decompose... phenomena in Cognitive Science

The aim of this presentation is to illuminate the distinction between two seemingly contrasting explanatory strategies in Cognitive Science (CogSci), namely *dynamical systems approach* and *mechanistic approach*. The main contrast concerns the notion of decomposition which will be the central theme of my inquiry. Decomposition is a concept which can be applied both to a system and to a phenomenon. When applied to a system it typically refers to a hierarchy of components which are subsystems themselves and they can also have subsystems as components and so on. The crucial point is that the interactions between the components in every subsystem are very strong while there are no interactions between components of different subsystems. This results to a modular organization. A phenomenon which is being observed on the top level of such a system can be reducibly explained and predicted by decomposing and localizing it in functions and components. From a philosophical point of view decomposition is considered compatible with mechanistic approach.

When philosophers try to understand how life sciences researchers investigate phenomena they apprehend that they discover, identify, and describe mechanisms. A minimal definition of the term *mechanism* is the following: "a mechanism for a phenomenon consists of entities (or parts) whose activities and interactions are organized so as to be responsible for the phenomenon" (Glennan, 2017, p. 17) This captures a decomposing strategy which is the main methodological trend in cognitive science as well. Specifically, a cognitive phenomenon is



modeled as a complex hierarchical system which instantiates it. On the top –psychological– level lies the behavior which is analyzed in sub functions which are further analyzed in processes which are localized in brain areas, neural circuits, and activation patterns and so on. The strategy of full decomposition and localization is principally reductive and a sufficient understanding of the interactions of the bottom parts presumably explains the phenomenon.

At the other end someone can find the dynamical systems approach. Generally, with this approach, in the CogSci point of view, we refer to the *dynamical hypothesis (DH)* and related ideas, initially proposed by Tim van Gelder (1998) which states that cognitive agents are dynamical systems. In the DH a cognitive phenomenon is studied without decomposing it in smaller processes and without localizing it in interacting parts which would explain the behavior of the system. On the contrary, the focus of research methodologies is system properties and mathematical analytical tools are used for investigating them. This can be done in various scales, ranging from the dynamics in neural assemblies to the emergent properties that arise in coupled agent-environment systems.

Simon and Ando (1961) in their seminal paper “Aggregation of variables in dynamic systems” and later Simon (1962) in “The architecture of complexity” argued that there is a special kind of complex hierarchical systems that are not fully decomposable. This means that there exist interactions between the subcomponents of the system that instantiates a given phenomenon, which are weak but cannot be neglected. These interactions give rise to properties in an aggregate way. I propose that mind, which is an information processing system, can be studied as a so-called near-decomposable system and thus, a unified explanatory strategy which combines elements from both mechanistic and dynamical approaches is feasible.

**Keywords:** complexity, dynamical systems, near-decomposability, mechanistic explanation

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**THIRD TALK**

STAVROS IOANNIDIS

**Defending Methodological Mechanism**

The main aim of the talk is to defend a position that I will call Methodological Mechanism (MM) against the ontological turn within recent mechanistic philosophy ('New Mechanism') in philosophy of science (cf. Glennan 2017). New Mechanism is commonly understood to include two broad theses, an ontological and a methodological. According to the former, the world consists of mechanisms; according to the latter, the main objective of science is to find mechanisms and construct mechanistic explanations of the phenomena. A central issue among new mechanists is how exactly the concept of mechanism as used in science should be characterised in general terms. I will argue that almost all well-known general characterisations found in the literature lend themselves easily to an ontological interpretation and so provide the necessary content for the ontological thesis of New Mechanism. However, this is a move that should be resisted, as it cannot be properly grounded in scientific practice.

I will argue that 'mechanism' as used in scientific practice is actually a very thin concept: a theoretically described causal pathway that produces the phenomena (cf. Ioannidis & Psillos 2017). As such, it cannot lead to some substantive 'mechanistic' ontological picture, contra the claims of several new mechanists. Mechanism, then, as a general view, should best be viewed as primarily a methodological rather than an ontological stance. I will use some of the early work on decompositional explanations of complex systems (e.g. Kauffman 1970, Wimsatt 1972) to further support MM and to argue against the recent ontological turn in mechanistic philosophy.

I will suggest that MM has the following consequences:

- First, that we have to distinguish between the thin concept of 'mechanism' in scientific practice, and methodological strategies/modelling techniques of complex systems that can be described as 'mechanistic'.

- Second, that this distinction leads to two different senses of what a ‘mechanistic explanation’ is: an explanation can be mechanistic either because it identifies a mechanism qua causal pathway, or because it involves a ‘mechanistic model’.
- Third, that top-down approaches to complex systems are compatible with a general mechanistic outlook, i.e. that to explain the behaviour of a system one should search for the underlying mechanisms.

**Keywords:** mechanistic explanation, causal pathway, methodological mechanism, mechanistic model, decomposition, complex systems

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ANGELIKI ANDRIKOPOULOU<sup>1</sup>, ATHANASSIOS PROTOPAPAS<sup>1,2</sup>, & AMALIA ARVANITI<sup>3</sup>

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<sup>2</sup>*University of Oslo, Norway*

<sup>3</sup>*Department of English Language and Linguistics, University of Kent, UK*

## **Lexical stress is not underspecified: evidence for the representation of stress from eye-tracking**

Is stress inseparably connected to the lexical representations in the lexicon or is it underspecified and assigned upon words through metrical frames? In the current study we investigated the representation of stress in Greek with two visual-world experiments. We aimed to: (a) replicate previous findings in Italian and German, (b) add details on the nature of stress representation in the lexicon based on the theories of underspecification and metrical patterns, and (c) investigate the influence of the stress mark in the process of word processing in silent reading. 72 adults, native speakers of Greek, participated in Experiment 1. To test theories of stress representation, 30 critical pairs of three-syllable words were selected. Each pair was matched segmentally on their first two syllables and the first phoneme of their third syllable but differed in stress. The 30 pairs were divided into three groups of alternative stress patterns. In particular, 10 pairs had stress on their first and second syllable, 10 pairs had stress on their second and third syllable, and 10 pairs had stress on their first and third syllable. During the experimental procedure, participants listened to semantically neutral sentences ending with the target word and had to mouse-click on the target, selecting in every trial among four alternative lexical candidates presented on a computer screen. If stress is underspecified, we expected asymmetrical competition effects among competitive pairs. More specifically, when the target words were stressed with less frequent stress patterns (i.e. antepenultimate or final, presumably marked), and their competitors were stressed with the dominant stress pattern (i.e., penultimate, presumably unmarked), then we expected higher levels of competition, reflected in smaller differences between fixations in the two words. In contrast, when target words had the dominant, unspecified stress pattern and their competitors had one of the two fully specified stress patterns (i.e., antepenultimate or final), then we expected smaller competition effects, reflected by greater difference in fixations to the two words. Experiment 2 was a replication of Experiment 1, in which all stress diacritics were eliminated from the displayed words. Forty-two native speakers of Greek took part in this experiment. The results of Experiment 1 replicated previous findings supporting

the view that lexical stress affects word recognition at early stages, with significantly more fixations recorded for targets before segmental disambiguation. The results of Experiment 2 replicated to some extent those of Experiment 1, suggesting that the stress diacritic in written words may have some impact on word recognition processes. Crucially, there was no evidence in favor of underspecification in either experiment, as the predicted asymmetries in the competition between targets and competitors with alternative stress patterns were not confirmed.

ΣΟΦΙΑ ΛΟΥΗ<sup>1</sup> & ΑΘΑΝΑΣΙΟΣ ΠΡΩΤΟΠΑΠΑΣ<sup>2</sup>

*<sup>1</sup>Τμήμα Ιστορίας και Φιλοσοφίας της Επιστήμης, Πανεπιστήμιο Αθηνών*

*<sup>2</sup>University of Oslo, Norway*

### **Πρώμη Μορφολογική κατάτμηση κατά την οπτική λεξική αναγνώριση: αλήθεια ή μύθος;**

Κεντρικά ερωτήματα πολλών μελετών στον τομέα της λεξικής επεξεργασίας είναι α) πώς επεξεργαζόμαστε τις σύνθετες μορφολογικά λέξεις (π.χ. player, playing): ως ενιαίες λέξεις (player, playing) ή με βάση τα συστατικά τους μορφήματα (play-er, play-ing) και β) πότε εξασφαλίζεται πρόσβαση στην μορφολογική πληροφορία κατά την οπτική λεξική αναγνώριση. Κι ενώ οι ενδείξεις συγκλίνουν υπέρ της επεξεργασίας των λέξεων βάσει των συστατικών τους μορφημάτων, υπάρχει έντονη ασυμφωνία σχετικά με το χρονικό πλαίσιο κατάτμησης της λέξης σε μορφήματα: λαμβάνει χώρα πρώιμα κατά την λεξική αναγνώριση βασιζόμενη αποκλειστικά στην ανάλυση της ορθογραφίας των λέξεων ή λαμβάνει χώρα αργότερα κατά την αναγνώριση και καθορίζεται από τα σημασιολογικά χαρακτηριστικά της λέξης; Η παρούσα μελέτη διερευνά τον ιδιαίτερο ρόλο της ορθογραφίας και της σημασίας στη λεξική αναγνώριση της ελληνικής γλώσσας σε έργα οπτικής λεξικής απόφασης με συγκαλυμμένη (Πείραμα 1) και καθυστερημένη (Πείραμα 2) προέγερση, όπου αντανακλώνται πρώιμα ή ύστερα στάδια της λεξικής αναγνώρισης αντίστοιχα. Πιο συγκεκριμένα, μελετάται η επίδραση της ορθογραφικής (π.χ. ορμόνη-ορμές) και σημασιολογικής (π.χ. εντάσεις-ορμές) προέγερσης σε σύνθετες μορφολογικά λέξεις, που συνιστούν το σύνολο των λέξεων της ελληνικής γλώσσας, κι εν συνεχεία συγκρίνονται με την επίδραση της μορφολογικής προέγερσης στις ίδιες σύνθετες μορφολογικά λέξεις (π.χ. ορμής-ορμές), όπου η κοινή ορθογραφία και σημασία συνυπάρχουν. Τα αποτελέσματα των παραπάνω πειραμάτων συμφωνούν ότι στην λεξική αναγνώριση των ελληνικών λέξεων, ο

ρόλος της μορφολογίας είναι σημαντικός κι ανεξάρτητος από το ρόλο της ορθογραφίας και της σημασίας, καθώς απουσία μορφολογικής σχέσης, η επίδραση της ορθογραφικής ομοιότητας δεν ήταν σημαντική στο έργο με συγκαλυμμένη προέγερση, ούτε η επίδραση της σημασιολογικής ομοιότητας στο έργο καθυστερημένης προέγερσης. Τα αποτελέσματα θα συζητηθούν με άξονα τις θεωρίες λεξικής αναγνώρισης.

PETROS A. M. GELEPITHIS

*Faculty of Medicine, University of Crete*

### **Affect in Humans, Nonhuman Animals, and Robots**

I will use the term ‘affect’ as an umbrella term to include the notions of ‘emotion’, ‘feeling’, ‘mood’, etc as used in studies both across species and about emotional-to-become robots. This paper focuses on emotions.

Emotions are ancestral in their origin and they are present in probably most animal taxa. It has been argued that all mammalian species have emotions (Ranksepp 1998) and many subsequent studies (e.g., Ranksepp & Lahvis 2011; Reimerta et al.2013) support this view. Although this sweeping statement may not be correct (e.g., Edgar et al. 2012), there is evidence of emotions in birds (e.g., Bekoff 2007; Orlaith & Bugnyar 2010), fish (Rey et al., 2015) and insects (e.g., Bateson et al. 2011). In addition, there are studies pointing out the existence of higher order emotions in dogs (e.g., Albourquerque et al. 2016).

In addition, human emotions are ubiquitous across human cultures and play pivotal role in all human activities and decisions (consciously or unconsciously). Their impact range from everyday behaviour to scientific research, from love, sex, and compassion, to blind acts of terror. Is there possibility for this enormous and centrally significant space of human emotions to be further enriched?

Recently, advances in both psychology and artificial intelligence allow machines to recognise and express emotions, enabling new technologies spanning a wide range of fields and sectors from education to commerce and from therapy to security (e.g., Picard 2000; Anderson & Kaliouby 2009; Breazeal 2009; Arkin & Moshkina 2015; Cowalczuk & Czubenko 2016; Jung 2017; Pessoa 2017). Such developments have in turn raised several ethical and social issues concerning the full range of ‘noémon’ systems including humanoid or not robots with designed or, possibly, own emotions (see, for instance, Anderson & Anderson 2011; Bringsjord et al 2012).

This paper is in two parts. In the first, I propose six clusters of issues that any aspiring theory of emotions, and of course of mind, should ideally be able to address satisfactorily. I subsequently suggest that any theory of emotion should be judged in terms of its efficacy to address these six clusters.

In the second part, I introduce the perspective of the *theory of noémon systems* on the nature and mechanisms of emotion of an e-entity<sup>1</sup>.

<sup>1</sup>An umbrella term to refer to either a human and a non-human animal capable of emotions, or a robot capable of recognising and exhibiting emotions.

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## **Intentional binding in multisensory event sequences: The role of intentionality, causality, and temporal predictability**

The temporal illusion of subjectively experiencing a shorter interval duration between a voluntary action and its produced sensory effect is known as intentional binding (i.e., IB) [Haggard et al., 2002]. The research on IB has mainly focused on the use of abstract events, that lack an inherent causal link between actions and their effects, and, thus, they require the use of adaptation strategies. We proposed the adoption of a more naturalistic approach by using multisensory events that are familiar and learned and, thus, they have inherent causal associations. We hypothesized that this established causal link between the event sequences would lead to an increased IB magnitude without the need for adaptation strategies. We conducted five experiments, where we manipulated the action-effect causal relations, while participants performed a simultaneity judgment task [Cravo et al., 2011]. That is, we presented an audiovisual impact action effect, which could be causally related or not, with a preceding voluntary action and an initial cue. Moreover, we tested for the impact of intentionality by the presence or absence of a voluntary action, while the temporal intervals between the action and effect were fixed or random (i.e., manipulation of temporal predictability). Participant data showed no IB induction for audiovisual abstract (Experiment 1) or naturalistic action effects (Experiment 2). However, an enhanced action-effect causal link from the initial cue up to the effect pair (Experiment 3) for temporally predictable intervals, displayed a robust IB effect. In conflict situations, where the event sequences were either mismatched (unrelated initial cue to action and effect; Experiment 4) or had a mismatched response mapping (different type of voluntary action; Experiment 5), no IB effect was obtained. These findings suggest that IB is bound to an integrated sense of causality, which can be obtained only for causally-linked and temporally predictable sequences of multisensory events. Any disruption in this causal sequence, or absence of voluntary action and temporal action-effect predictability, led to the attenuation of the IB effect.

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## **Intentional binding in naturalistic multisensory events: The role of semantic relatedness**

Previous research have demonstrated that voluntary actions and their sensory effects are perceived closer in time; a phenomenon known as intentional binding (IB). Most up-to-date studies have examined IB employing one-modality action effects, mostly abstract (e.g., Buehner & Humphreys, 2009), yet everyday life actions usually produce multisensory, informationally rich effects. Previous experiments have highlighted the importance of predictable action effects for the occurrence of IB (e.g., Desantis, Hughes, & Wazsak, 2012), however the issue of the outcome's particular characteristics and their effect on the phenomenon has not been decidedly addressed. Recently, Thanopoulos, Psarou, and Vatakis (submitted) used naturalistic multisensory stimuli as action outcomes and showed that IB occurs when voluntary actions and their effects hold an inherent causal link from everyday experience, sparing the use of adaptation strategies. However, given the use of a multisensory effect, the induction of IB may be affected by potential crossmodal binding rivalries (Kostaki & Vatakis, 2016). In particular, the unity assumption (i.e., an observer's belief that some stimuli "go together"; Welch & Warren, 1980) might cause temporal stimulus shifts in order to reinforce a unified percept, which can interact with the temporal shift towards the action, as predicted by IB. Thus, in the present study, we attempted to investigate whether strongly unified multisensory action effects can diminish the IB phenomenon. We presented naturalistic multisensory stimuli as action outcomes on an IB paradigm and chose to vary the temporal parameters and semantic content of the presentations (Vatakis & Spence, 2007). Specifically, we used an simultaneity judgment task, with the auditory and visual stimuli serving as effects of a voluntary action and manipulated the semantic congruency between the streams of each modality. We predicted that congruent stimuli would be strongly unified, often acting against their temporal misplacement towards the action, while this would not be the case for incongruent stimuli. Our results will help shed light, for the first time, on the effect of action outcome characteristics on the IB phenomenon.

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## **Aging effects on the multisensory perception of the body**

Currently there are contrasting evidence on how the character of embodiment and multisensory integration alters with age with only a few studies examining the role of age in multisensory body schema modulations. We, thus, investigated whether the mechanisms that adjust our body schema percept to various incoming sensory information are modulated by age. This was done through the use of two upper limb illusions: the Marble Hand and the Rubber Hand illusion (MHI and RHI, respectively). For MHI, we presented synchronous audio-tactile stimulation to 83 participants that were divided in 3 age groups: minors (0-17), young adults (18-45), and older adults (46-60 years old). The MHI was assessed through a questionnaire developed by Senna et al. (2014). The analysis revealed a limited experience of the MHI irrespective of age. In terms of age, our results showed increased illusory percepts for the minors and young adults as compared to the older adults. No differences between minors and young adults were noted. These results indicate that the audio-tactile update of body material perception is altered through the age span with illusory perception decreasing as we grow older. For the RHI (Botvinick & Cohen, 1998), 210 participants were tested and divided into the same age groups as those in MHI. The data analysis showed that 81% of the participants did experience the illusion but with no significant age-related differences. Utilising Botvinick & Cohen (1998)’s questionnaire, we introduced a qualitative criterion, namely the ratio of the average score of the 3 illusion indicative questions to the average

score of the remaining 6 neutral questions, which resulted in a weak positive correlation between age and ratio and between age group and ratio. Additionally, the participants experienced the illusion differently as a function of age with an increase in score ratio from the 0-17 to the 18-45 age group. These results are consistent with the hypothesis that older adults have a lower experience of embodiment as compared to younger adults and tend to favor visual processing (Costello & Bloesch, 2017). Even though the outcomes of the MHI and RHI aging data may seem contradictory, we suggest that the importance of visual monitoring in the RHI and the absence of it in audio-tactile MHI is the differentiation factor. Overall, there is an influence of age in the multisensory mechanisms of body schema, however more research with larger sample sizes is necessary.

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## **A behavioural evaluation of inverse effectiveness as a function of stimuli quality and synchrony**

One of the most fundamental principles of multisensory integration is that of inverse effectiveness (IE) supporting that maximization of multisensory gain is attained when the unisensory components of an event evoke weak neuronal responses. Previous behavioural investigations of IE have yielded conflicting findings regarding the levels of noise that lead to the maximization of multisensory gain. Furthermore, studies in this field are often limited to the use of speech stimuli and the artificial degradation of the auditory stream. Here, we examined whether IE would be demonstrated behaviorally by implementing naturalistic degradation in both sensory streams of an audiovisual speech event. Specifically, participants were asked to identify three syllables (/ba/, /fa/, /tha/) presented visually, aurally, or audiovisually at different levels of noise and noise combinations. We expected that participants' performance would deteriorate as the noise levels increased for unisensory

conditions, while for audiovisual conditions we expected that multisensory gain would increase as ambiguity in both channels increased as per the predictions of IE. The analysis showed that according to the: a) Contrast index, the gain was minimized when the auditory stream was of the highest noise independent of visual noise for the syllable /ba/, while no differences were noted for /fa/ and /tha/; b) Absolute Difference (in %) index, the combinations of high auditory and low visual noise levels led to a maximum gain for /ba/ and /fa/, while for /tha/, maximum gain was obtained when both streams were of low noise; and c) Multisensory Integration and Absolute Difference indices, the gain was minimized when the auditory stream was of the highest noise for /ba/, but not for /fa/ and /tha/. Therefore, IE was only validated for specific indices and stimuli, and, thus, our findings along with previous studies place the behavioral validation IE in question. Utilizing the high and low gain multisensory combinations of Experiment 1, we examined -for the first time- the interaction of IE with the temporal rule of multisensory integration (i.e., signals presented synchronously or close in time are more likely to be integrated). Specifically, in Exp. 2, the audiovisual speech stimuli from Exp. 1 were presented at different stimulus onset asynchronies and participants had to complete temporal order judgments. The analysis revealed a higher asynchrony tolerance when high gain stimuli were presented as compared to audiovisual pairs of low gain. Taken together, these findings suggest that the magnitude of multisensory gain and the width of the temporal window of integration interact as a function of the effectiveness levels of the auditory and visual streams of the speech event.

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## **The role of change in interval duration judgements**

Temporal judgments belong to a different category of perception due to the fact that there isn't any dedicated sensory system for timing. Thus, the estimation of interval duration requires temporal cues that emerge from transformations of other, non-temporal, perceptual dimensions. Three theories that could account for and predict the role of change in interval duration judgments have been proposed: The change-based account that postulates that the physical or the absolute number of perceived changes that occur within an interval are the cues for its perceived duration (Poynter, 1989). The saliency account emphasizes the apparent aspects of change and considers subjective time dilation as a function of change's perceptual vividness (Herbst, Javadi, van der Meer, & Busch, 2013). Lastly, the neural energy account supports a linear relationship between the neural energy processing requirements of

the stimuli in an interval and its perceived duration (Eagleman & Pariyadath, 2009). Previous research supports that the most crucial temporal cue is the perceived change rather than the physical change, however, it is not clear what is the most important aspect of change perception that affects perceived duration (Herbst et al., 2013). Additionally, it has not been clarified to-date whether higher visual processing demands lead to decreased duration estimates (Brown, 1995; Sgouramani & Vatakis, 2013) or greater selective attention to a stimulus increases its judged duration, irrespectively of the distribution of attentional resources between temporal and non-temporal processing (Mattes & Ulrich, 1998; Tse, Intriligator, Rivest, & Cavanagh, 2004). Hence, we examined which account provides the most appropriate theoretical approach to explain duration judgments of visual stimuli. Change's awareness was considered of special interest to clarify whether duration estimates of intervals in the supra-second range derive from an unconscious metric representation or they are subject to aspects of phenomenal consciousness (Lewis & Miall, 2003; Montemayor, 2017). Our experimental method included a dual task in a flickering paradigm with a change detection task and a temporal reproduction task. We used simple visual geometrical stimuli continuously undergoing one transformation, throughout a trial's duration, which was masked due to the flickering presentation. During stimulus presentation, the timing of perceived change was recorded to examine how attentional distribution affects duration estimates. Subsequently, perceptual change's awareness was assessed using a 4 alternative forced choice task to examine whether unconscious change perception can modulate perceived duration. Moreover, we varied stimulus complexity based on the different predictions offered by the three theoretical accounts. If perceived change is the sole temporal cue, the detection of change will dilate subjective duration, irrespectively of stimulus complexity, while if phenomenal change weights differentially, change detection in the less complex stimulus, as appearing more saliently, would dilate more the interval duration than the perceived change of the more complex stimulus. In contrast, based on the neural energy account we would expect that the perceived duration would be a function of stimulus complexity. Our experimental results will elucidate how stimulus changes and the allocation of attention to non-temporal processing demands affect perceived duration.

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## **Learning to read with a simulation of artificial vision: Experienced-related Changes in Performance on a reading task**

In the context of developing a visual prosthesis to restore sight to the blind, it can be useful to examine performance with simulations of artificial vision in order to guide device design. Accordingly, various psychophysical tasks have been administered for measuring performance of normal, sighted subjects and examining the trajectory of improvement over time. Learning effects have been found with eccentric reading for human subjects and with letter recognition tasks for both humans and in non-human primates when there is frequent engagement with the task involved. However, practice with using phosphene vision to perform a more complex task such as reading meaningful sentences, has yet to be evaluated in humans. With the current study, part of a larger project of developing a thalamic visual prosthesis, we sought to examine the beneficial effect of longitudinal learning to read with a simulation of artificial sight. Specifically, we investigated how six normal, sighted subjects adapted to phosphene vision by examining their performance in reading simple, novel sentences out loud in 20-minute sessions on a daily or a near-daily basis, over a period of at least eight weeks. English sentences conforming to the MNREAD criteria, were presented on a LCD monitor through a virtual-reality simulation of artificial vision. The simulation included a real-time gaze contingent architecture that reveals more detail at the point of regard, mimicking a thalamic visual prosthesis. We used five font sizes (logMAR 1.0-1.4) and three

center-weighted phosphene patterns (2000, 1000, 500 phosphenes) to display the text, and included a non-phosphenized view (*i.e.*, normally displayed text) as a control condition. We found that subjects improved their reading accuracy (fraction of words read correctly) in all conditions and training lead to an increase of reading speed (number of correctly read words per minute) that was equivalent to doubling of available phosphenes for each pattern. Most interestingly, the hardest condition (smallest font size through 500 phosphenes), proved highly usable after training while the same pattern did not provide functional reading at the beginning. Consistent with experience-driven neuroplastic changes, we also found that gaps in training tended to lead to temporary decreases in reading speed, but, surprisingly, not reading accuracy. Taken together, our findings suggest that a pattern with 500 phosphenes (130 in central vision) can provide functional reading, an essential activity of daily living. Our results are important for the clinical design of a thalamic prosthesis and as well as post-implant rehabilitation strategies.

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## **Investigating the Relationship between Face Recognition Ability and False Memories from Misinformation in the Context of Individual Differences**

The main purpose of the present, ongoing, study is the investigation of the relationship between Face Recognition Ability (FRA) and False Memories from Misinformation (FMfM), by also emphasizing on the possible effect of individual differences on the above-mentioned variables. More specifically, we investigate how FRA can possibly predict an individual's vulnerability to misinformation and thus, result to the emergence of False Memories, by adopting the 'Classic Misinformation Paradigm'. Our secondary goal is to further investigate and understand how individual differences (*i.e.* gender, age, educational level) and the exposure time to complex visual stimuli could possibly influence the individuals' identification and further, result to FMfM. Based on findings of previous, similar, studies we hypothesized that individuals with lower FRA will be more prone to experience FMfM. For the investigation of the above hypothesis, up to this point, a sample of 100 participants have been recruited and randomly allocated to one of two experimental groups (control [N=50] and experimental [N=50]). Furthermore, a cognitive battery constructed by the researchers was



used to measure FRA and the amount of False Memories experienced by the participants during the experimental procedure, which consisted of four different stages: In the first stage, participants were requested to pay attention and watch to a brief presentation of pictures/frames depicting a short scene from a movie. In the second stage, participants were asked to recognize the faces presented to them in the first stage of the experimental procedure, in a Face Recognition Cognitive Test. Next, in the third stage of the experiment participants were asked to listen to a series of brief pre-recorded narrations, either depicting the exact events that were presented to them in the first stage of the experiment, or providing them with misinformation cues, depending on the group that they were allocated to (experimental group=misinformation, control group=no misinformation). Finally, in the fourth stage of the experiment, participants were asked to respond to two different types of questionnaires in order to investigate the degree and the source (i.e. pictures, narrations, both) of False Memories that the individuals experienced during the experimental procedure, respectively. Furthermore, up to this point, our results have not indicated a significant relationship between FRA and FMfM. Our second statistical analysis indicated a statistically significant relationship between FRA and a variable we defined as Resistance to Misinformation (RtM), which might indicate that higher FRA and the Recognition of Misinformation (RoM) can be related. Additionally, there was a significant relationship found between the demographic variables such as educational level and: a) FRA, b) overall memory score and c) FMfM. Our results also have not indicated a statistically significant relationship between gender and: a) FRA and b) FMfM. However, our results might have been influenced by several limitations of the present, ongoing study, such as, the small number of participants with a higher educational level and/or the presence of familiar faces in the Face Recognition task, and/or the small number of participants in the experimental group, as well. It was also found that women showed higher overall memory scores than men. Finally, it should be noted that due to the limited age-range of the participants in the present study, the variable of age was not included in the statistical analysis at this time.

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## **Gaze and head contingency in visual prosthetic systems: A proposed artificial vision study**

Despite being considered automatic, perceiving the visual world is a highly complex process that depends on intact visual and oculomotor function. Visual scanning is necessary to efficiently integrate individual glances into more coherent perceptions (Chen, Hallum, Suaning, & Lovell, 2007). To date, however, most prosthetic devices do not deliver stimulation based on full gaze position (head direction plus eye position within the head). They, therefore, provide suboptimal visual information to the user and require substantial training to hold the eyes fixed forward while scanning with the head (Gilchrist, Brown, & Findlay, 1997). Here, we report attempts of current visual prosthetic devices to overcome the hurdle of gaze contingency and address the effects of head versus eye movements on processing visual information in a simulated prosthetic vision paradigm (Chen et al., 2007). To date, studies of visual performance with normal, sighted subjects have employed a simulation of artificial vision and have updated the artificial percept based on the participants' head (Chen et al., 2007) and/or eye movements (Vurro et al., 2014; Rassia & Pezaris, in preparation). We now propose to perform a new study that includes a similar head-contingent mode so as to examine the potential improvements of adding full gaze contingency to existing visual prosthesis designs. Assessing the contribution of full gaze contingency to visual perception in a simulated reading task will provide a novel and rigorous examination of the three viewing modes (i.e., eye-only, head-only, and full-gaze contingent modes) and allow us to further optimize prosthetic utility for everyday activities. Finally, the proposed study also holds the premise of answering questions regarding the level of training in holding the eyes still that is required for optimal head-only use. Answering these questions could help overcome the limitations of current prosthetic devices and would contribute significantly to the post-implantation rehabilitation strategies that could assist patients make use of artificial visual signals that they provide.

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## **Thinking and feeling inside the cockpit. Approaching the construct of emotion and cognition interaction in civil aviation accidents**

Descartian dualism had a detrimental effect in the study of the nature of emotion and cognition in philosophy and science, something that led to their treatment as largely separate entities. Today it is common ground that such a view is erroneous. With the advances in neuropsychology we have vast evidence for the common neurobiological background and clinical manifestations of emotion and cognition. Ultimately, in many cases the clear distinction between the two is blurry. Complex human behavior can only be perceived under this prism. Such a behavior is the human risk factor in aviation. Up until now human factor theories have not been informed adequately from the advances in neuroscience, treating cognitive and emotional variables as rather distinct entities. Moreover they are based on theoretical constructions with no obvious relation to data driven approaches. In the majority of cases human error is considered as a human factor synonym which has been thoroughly described but not adequately defined.

The 100 most fatal civil aviation accidents were subjected to data driven content analysis in order to extract the psychological/emotional and cognitive variables attributed to the cockpit crew at the time of the accident. Two clinical neuropsychologists reviewed official accident reports searching for commonly recurring psychological/emotional and cognitive themes. A third independent researcher calculated Cohen's interrater reliability for cognitive and psychological variables. Apart from accident reports as the official coding unit, researchers reviewed –where available– all possible sources of information for each accident (e.g., cockpit voice recordings, judicial reports, textbooks on aviation accidents, etc.).

25 emotional/psychological and 17 cognitive variables were recognized. A possible interaction between emotional and cognitive variables was found in the majority of accidents accounting for as much as 53% of total cases and 77% of human factor cases. The interaction construct was predefined as a spatiotemporal presence of at least one cognitive and one psychological variable attributed to the cockpit crew. Under this prism human error cannot be considered as the cause of an accident but as a symptom of a complex human behavior that can be studied and assessed. A discussion following the previous results is two-fold: 1) Neurobiological and clinical data of emotion and cognition interaction, and 2) civil aviation accident paradigms. A comprehensive approach for the assessment and study of the human risk factor in aviation is proposed based on clinical neuropsychology: Aerospace Neuropsychology is the integration of neuropsychological methodology, theory and practice in aerospace settings, in order to study and assess individuals in every aspect of the human machine interaction with an aim to fly.

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### **The effects of early life seizures in combination with peripubertal stress on cognition and brain structure during adulthood**

Epilepsy is a common neurological disorder that affects a significant proportion of the population. Epileptic seizures are its main symptom and occur more often in young children due to the protracted maturation of the inhibitory circuitry. Meanwhile, puberty is a critical period due to the activation of the hypothalamus-pituitary-gonadal axis and the gonadal hormones. The puberty period is accompanied by changes, in both the structure and the function of the brain, as maturation of neuronal circuits continues.

The purpose of this study was to investigate the combined effects of early life seizures and peripubertal stress on behaviour and brain structure during adulthood, using the two-hit model, which hypothesizes that the exposure to a second hit during a critical period (here, the peripubertal stress), increases the organism's vulnerability to the effects of a first hit (here, the early life seizure, ELS). For this reason an epileptic seizure was induced with pentylenetetrazol (PTZ) in 16 male C57/bl6 mice on the 24th postnatal day (P24). Later, during puberty (P33-50) the animals underwent a chronic unpredictable stress protocol for 10 days (including elevated platform, tilted cage, forced swimming, social stress, food and water deprivation, wet bedding and restraint stress). When the animals reached adulthood, a battery of behavioral tests

(nesting, marble burying, openfield, elevated plus maze, sociability and social novelty, rotarod and novel object recognition task) was employed in order to evaluate aspects of their cognition and behavior.

To study the potential effects of ELS on brain structure, we used mouse brains that had undergone the same manipulation protocol except that they had experienced 4 epileptic seizures instead of one. These brains were processed for immunohistochemistry and the expression of parvalbumin (PV) and perineuronal networks (PNN) was quantified. Our results showed no combined effects of ELSs and peripubertal stress, either on cognitive abilities, or brain structure. Consequently, we can not confirm that stress, as a second hit, leads to an increase of the organism's vulnerability to the effects of the first hit. Nevertheless, individual main effects of both early life seizures and the stress were found, indicating that our protocols were effective. Future studies will be needed, using potentially a different epileptic substance or a more intense stress protocol, in order to further study the main effects and the two hit model under the same conditions.

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## Η επίδραση της ημικρανίας-έντασης στη χωρική προσοχή σύμφωνα με την κοινωνική συναισθηματική προσαρμοστικότητα

Ο σκοπός της παρούσας μελέτης είναι να διερευνήσει την επίδραση του πόνου, σε ασθενείς που υποφέρουν μόνο από ημικρανίες. Περίπου το 45% του παγκόσμιου πληθυσμού υποφέρει από ημικρανίες (Lezak 2012). Η ημικρανία είναι μια χρόνια διαταραχή που χαρακτηρίζεται από επαναλαμβανόμενες, μέτριες έως έντονες κεφαλαλγίες (Adderson et al, 1994). Η ένταση του πόνου δημιουργεί διάσπαση προσοχής, διαταραχές στην μνήμη και στο αυτόνομο νευρικό σύστημα (ΑΝΣ) με αποτέλεσμα να υπάρχει διαταραχή στις υψηλής λειτουργικότητας γνωστικές διαδικασίες.

Για το σκοπό της παρούσας μελέτης χρησιμοποιήθηκαν το Clock Drawing Test (Kirby M et al, 2001) το Symbol Digit Modality test (Smith 1973) και η σκάλα κοινωνικό-συναισθηματικής αξιολόγησης (PCRS; Prigatono 1986) σε 60 ασθενείς (30 γυναίκες και 30 άντρες) με χρόνιες ημικρανίες. Τα αποτελέσματα στην παρούσα μελέτη έδειξαν αρνητικό στατιστικά σημαντικό συσχετισμό μεταξύ της έντασης του πόνου και τις οπτικοχωρικής προσοχής, και αντίληψης  $r=-0.786$ ,  $p<0.05$  καθώς και τις κοινωνικοσυναισθηματικής προσαρμογής ( $r=-0.654$ ,  $p<0.05$ ).

Επιπροσθέτως παρατηρήθηκε ότι το 85% της χαμηλής οπτικοχωρικής ικανότητας προβλέπεται από την ένταση του πόνου και την χαμηλή κοινωνικό-συναισθηματική προσαρμογή του ατόμου. Βάσει των παραπάνω, η εκπαίδευση ενός ατόμου με χρόνιες ημικρανίες σε προγράμματα, βασισμένο στην διαχείριση του πόνου (Gate Theory) μπορεί να βελτιώσει τις γνωστικές του δεξιότητες.

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### **The importance of a reliable and fast cognitive assessment in Multiple Sclerosis and the Montreal Cognitive Assessment as an effective tool.**

**Aim:** Multiple Sclerosis (MS) is an autoimmune and neurodegeneration illness that, even in mild type (RRMS), 40% to 70% of patients deal with cognitive deficits. Up to nowadays, neuropsychological evaluation of MS patients remains a time-consuming procedure that, due to patients' fatigue, its outcome can be biased. Hence, the purpose of this study is to examine the effectiveness of the Montreal Cognitive Assessment (MoCA) as a reliable tool for assessing cognitive dysfunction of MS patients.

**Methodology:** Thirty RRMS patients were recruited by Evangelismos Hospital and 30 age-matched HCl by City Unity College. MoCA was used in order to measure cognitive impairments and it was compared to SDMT and VFT outcomes.

**Results:** MoCA is a valid neuropsychological battery which assesses MS patients ( $\alpha = 0.72$ ) and provides proper outcomes to doctors and neuropsychologists. More to this, there were statistically significant differences in MoCA scores between HCl and MS patients ( $t(59) = 1.716$ ,  $p < 0.05$ ). Finally, statistically significant strong positive correlations were observed between MoCA with SDMT ( $r = 0.681$ ,  $p < 0.05$ ) and VFT ( $r = 0.673$ ,  $p < 0.05$ ).

**Conclusion:** The findings of this study support previous studies on the efficacy of MoCA as a useful and reliable neurosurgical functionality test in MS patients, making neuroscience as a brief process whose effects are unaffected by the cognitive fatigue of the patient.

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## **The interplay of dynamic gaze and emotion on time estimation**

Recent studies have shown that timing can be dramatically affected by gaze behavior (e.g., Thones et al., 2016) and emotional facial expressions (e.g., Droit-Volet, et al., 2004). However, the manner in which timing is modulated has not been consistent with results being mixed and interpretations attributed to both attentional and arousal mechanisms (e.g., Gil et al., 2011). Additionally, studies to-date have mainly utilized static images and a small sample of facial expressions, while gaze and emotion are highly complex, variable, and dynamic. In the present study, therefore, we investigated the effects of gaze direction and emotion on the perceived duration of dynamic facial stimuli by using video clips of a male and female actor (Amsterdam Dynamic Facial Expression Set; Van der Schalk et al., 2011). Specifically, we presented angry, happy, fearful, and neutral faces by keeping constant the timing of emotional exposure and varying the gaze (direct or indirect) duration (from 960 to 1680 ms). Twenty-four participants performed a temporal bisection task whose analysis showed a general underestimation of angry, fearful, and neutral faces as compared to happy faces, a result that was independent of gaze direction. This finding is in line with previous studies supporting that the allocation of attention to processing emotion leads to temporal underestimation (e.g., Lui et al., 2011) according to the Attentional Gate Model (AGM; e.g., Zakay & Block, 1995). Conversely, the bisection point for happy faces resulted in an interval overestimation only for the cases that the gaze was direct, a result that could be interpreted as a product of approach-withdrawal attentional mechanisms (Angrilli et al., 1997; Corr, 2013). Additionally, a higher weber ratio for happy faces with direct as opposed to averted gaze was noted, thus indicating a lower temporal sensitivity for directly gazing happy faces. This result seems to support the aforementioned finding on temporal overestimated of happy directly gazing faces, as it could be attributed to the cognitive bias promoted by affiliation behaviors, where the anticipation of a positive event and the preparation to act is linked to dopamine activity (i.e., readiness to move) and the subsequent prolonged experience of the event (Droit-Volet et al., 2009). Together, our results support that apart from the attentional accounts on time modulation in the presence of gaze and emotional signals, the social significance of the stimulus also plays a crucial role in dynamically forming perceived temporal information.

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## **Metricality and rhythm complexity interactively modulate visual rhythm perceptual learning**

Rhythm perception is considered as having a special affinity with the auditory system (Barakat et al., 2015; Grahn, 2012). Yet, recent evidence suggests visual moving stimuli can effectively



mediate rhythmic information (Grahn, 2012), while discrimination performance of two-integer-ratio visual rhythms consisting of static visual stimuli can also be enhanced following training with multisensory and visual-only moving stimuli (Paraskevoudi & Vatakis, in preparation). However, it remains unknown whether these improvements would be observed in rhythms of different interval durations that have been found to increase the memory load (Teki & Griffiths, 2014). Here, we aimed to extend previous findings by assessing whether the metricality (metric simple vs. metric complex rhythms) and rhythm complexity (i.e., number of integer ratios) interactively affect post-training performance in a task consisting of static visual rhythms. We, thus, investigated whether multisensory training with moving stimuli (i.e., a moving bar accompanied by filled auditory tones) benefits discrimination of metric simple and complex visual rhythms (i.e., sequences of static circles of changing colors) that consisted of four (Exp.1), three, and two (Exp. 2) interval durations. Experiment 1 showed significant post-training enhancements for metric complex four-integer-ratio visual rhythms only, a finding that was also evident in three- and two-integer-ratio rhythms (Exp. 2). These results are in line with recent evidence suggesting that training on more difficult judgments may improve temporal acuity (De Nier, Koo, & Wallace, 2016). Experiment 2 further demonstrated that the post-training enhancements are limited to three-integer-ratio rhythms and metric-complex rhythms only. Interestingly, contrary to our previous work no significant post-training improvements were observed for two-integer-ratio rhythms. We speculate that this difference results from the use of filled auditory intervals during multisensory training in Exp. 2 as compared to the empty auditory intervals employed in previous studies (Paraskevoudi & Vatakis, in preparation). Taken together, these findings suggest that metricality and rhythm complexity together affect perceptual learning of rhythms. Future studies need to elucidate the differential effects of filled and empty auditory intervals on multisensory rhythm perceptual learning.

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## **Causality and probability in causal maps**

The aim of this research is to bring together philosophy of science and experimental psychology on representing causal knowledge and learning. In the literature cited causal knowledge and causal learning underlie any scientific or naive theory formation. It could be argued that the formation and alteration of any abstract and coherent set of concepts and beliefs could be based on or constrained by a causal learning process (Bonawitz et al. 2006, 2012). We will discuss the theory of causal maps and the critique it has received: is the notion of probability needed for an analysis of the concept of causation in forming a theory of knowledge and learning within the field of cognitive psychology?

In the field of philosophy and psychology during the 20th century the concept of causality moved towards a probabilistic analysis. The last ten years, psychological research in the field of causal models has shown that the developing cognitive system of early childhood seems to be organized with such representations and cognitive mechanisms that can be characterized as causal models of the world and enable children to develop an accurate "causal map" (Gopnik, et al., 2004). These causal models are based on the theory of probability and are computationally implemented in Causal Bayes Networks.

Alison Gopnik and her colleagues (Gopnik et al., 2001, 2004, Gopnik and Schulz, 2007) support that starting out in infancy and early childhood and throughout our adult life, human learning is explained better in terms of theory building and changing. According to Gopnik theory formation and causal representation go hand in hand (Gopnik, 2012). The notion of causality is important, because it helps us to put our experience in order, to predict events, to imagine new possibilities, even ones that will never occur in reality, and to manipulate our environment.

In the past it was supported that children learn by making and testing hypotheses. Contrary to that, Gopnik and her colleagues propose that children behave as probabilistic learners (Gopnik, et al. 2004), that is by making hypotheses and gradually change the probability of each hypothesis to occur under new data, new experiences. They are equipped with a causal learning system, which makes them able to construe hypotheses about how the experience of events captures the causal structure of their relations. Causal maps represent

causal relations and are non egocentric, accurate, and can be learned. Experimental data support that children use such representations, which are implemented in Causal Bayes Nets. Children use information about the probability of parameters in a causal network to form a causal map.

Johnson-Laird and his colleagues (Goldvarg, E. & Johnson-Laird, 2000, Frosh, C. and Johnson-Laird, P.N. 2011) are skeptical as of the need of a probabilistic analysis of causality in causal reasoning and modeling (Khemlani, S., Lotstein, M. and Johnson-Laird, P.N., 2014).

It seems that philosophers and cognitive researchers can both benefit from this debate. It also seems promising that a probabilistic approach of the concept of causality has been so fruitful in the field of cognitive development and theory change. In conclusion, it seems possible that the missing link between rational models of inference and theory based conceptual development is a probabilistic notion of causality.

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### **Self-deception and illusion of fairness in bargaining games**

In this presentation, we review the literature in regards to deception and self-deception in bargaining games. Bargaining games such as the Ultimatum (UG) and the Dictator's Game (DG) have been a topic of heated debate in regards to social cognition and behaviour for the last 20 years. In UG (1), player A ("proposer") is given an amount of money and asked to choose what percentage to give to player B ("responder"). Then, the other player either accepts the offer or rejects it. If the responder accepts, the amounts are shared as agreed. If the offer is declined, players receive nothing. According to Game Theory, the responder should never decline an offer, no matter how low it might be, because "something is better than nothing" and, therefore, a subgame perfect strategy would be the "no-declining" strategy. Accordingly, since the proposer is aware of the "no-declining" strategy of the responder, offers should be minimal, in order to maximize the proposer's gain. However, when actual individuals are tested in UG, their behaviour is quite different from the one expected by Game Theory. Responders usually decline offers that are less than 30% and proposers tend to make fair offers ranging an average of 40-50%. This phenomenon was initially explained as an adaptive tendency of people for fairness and the rejecting behaviour of the responders was interpreted as altruistic punishment towards an unfair player (2). In evolutionary terms, an overly egoistic individual might be dangerous for the group's survival and prosperity. Thus, group members are justified to punish the culprit, even at their own (minimal) expense.

It was suggested that the proposers' behaviour in UG might actually be an elaborate maximizing strategy taking into account all the possible mental mechanisms of the responder that could lead to a rejection. In order to investigate this hypothesis, a new, simplified version of UG, was created (3). In DG, player A ("allocator") chooses the amount to offer but player B ("recipient") has no choice but to accept it. This way, rational allocators can just keep all the

money for themselves without fearing a rejection by player B. Even so, it has been shown that players tend to offer an average of 20-30% to their counterpart. This was initially thought to be evidence of an inherent fairness principle. However, a multitude of experiments and different manipulations (social distance, imbalanced information, context, monitoring, role assignment method etc.) of both UG and DG have shown that it is easy for players to change their strategy and become more or (more often) less fair, once the conditions allow it (2, 4). It is therefore possible that people want to be perceived as fair and will act like it as long as their behaviour is directly and obviously linked to the outcome of the game. This means that people are likely deceiving others and themselves in order to protect their self-perception as fair while at the same time protecting their self-interest.

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### **Aspects of Performance Spectatorship: “embodied simulation” and “embodied language”**

Nowadays, the new field of Neuroaesthetics –introduced by Semir Zeki– along with the discovery of the Mirror Neuron System (MNs) in the brain –by Giacomo Rizzolatti– have enhanced the relations between Art and Neuroscience (Zeki 1999, Rizzolatti 2004). Their findings shed light on issues concerning aesthetic perception by investigating the brain-body physiological correlates of aesthetic experience and action-understanding, both of which are fundamental in theatre perception.

In the late twentieth century, a number of important theatre theorists (H. Blau, J. Feral, Br. McConachie etc) drew attention to the significance of the *sensory element* in the spectator's

perception of performance. In their publications they introduced concepts of spectatorship which moved away from *interpretation* towards *sensory* perception and *empathy*. The fact is that theorists of theatre had intuitively stressed the central role that *sensation* plays in spectatorship, at least one decade before neuroscientists begun to investigate aesthetics thoroughly; not to mention Antonin Artaud (1958) who envisioned it more than half a century ago.

Neuroscientist Vittorio Gallese coined the term “embodied simulation” in order to describe the neural activation taking place during the aesthetic response to paintings and sculptures (Gallese 2017). In addition, available neuroimaging evidence seems to suggest that even certain classes of *words* can activate specific sensorimotor areas in the individual’s brain in order to ascribe meaning. Thus, a similar term, such as “embodied language” (Buccino 2016), is employed in order to describe the neural substrates activated during language understanding. In many ways, the above-mentioned findings (visual and auditory stimuli) demonstrate that the performance spectator’s primal perception occurs on a *sensory* level, thus vindicating the assertions of contemporary theatre theorists on spectatorship.

The proposed announcement reviews the above-mentioned neuroimaging data and discusses them in connection to performance spectatorship. The author strongly believes that the time is right for theatre theorists, artists and neuroscientists to form an interdisciplinary research platform on an issue of their common interest: spectatorship. The announcement will also discuss the outcome of a few cases of such a collaboration.

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## **Modeling the cognitive-cultural parameters that affect the integration of heterogeneous populations in a social system**

The presentation involves the effect of various cognitive and cultural factors in the integration of new populations in a society during a number of generations. This research will involve the use of agent-based modeling in a simplified virtual environment. The primary question to be answered is whether the cultural differences are attenuated in a common environment that makes a harmonious co-existence possible without the complete assimilation or the segregation of cultural minorities.

In the last five years there has been a marked increase in the migration flows in the countries of the western world. This increase has led, in many cases, in the empowerment of xenophobic and nativist political forces, and an active conversation regarding the compatibility, integration, and conflict of different civilizations. Migration and adaptation in new environment is not new – human populations have been relocating since our species first emerged. The methods we use to study these phenomena need not be confined in the classical social sciences; with the emergence of computational social and behavioral sciences, we can study these processes in a dynamic and multidisciplinary fashion, using concepts and tools from other scientific domains, such as anthropology or cognitive science.

This study focuses mainly on the way an agent perceives itself as part of a larger whole (irrespectively of the subgroup it happens to belong to), and the way individual cognitive processes, combined with social effects such as social influence and homophily lead to behaviors of imitation, xenophobia, aggression or even in the need of physical relocation to restore the feeling of safety in an environment of similar agents.

Using a version of Schelling's computational segregation model, we studied the effects of various cognitive and cultural parameters in the integration processes in the span of generations. We use common language and common everyday life that natives and second-generation immigrants share as purely cultural parameters, and imitation, individual tolerance and the feeling of individual satisfaction as purely cognitive parameters. These parameters are, of course, interacting and to a degree are products of social and more general environmental processes and effects, as well as parts of feedback loops that effect the individual as well as the group.

In this research we will also investigate the well-known finding from the field of classical sociology, according to which the attitudes of second generation immigrants is correlated with the degree of integration of their parents; the general rule is that the immigrants whose parents are not well integrated will be more conservative and less welcoming of new immigrant arrivals. In practical terms, this will be seen in the local concentrations and the degree of heterogeneity of the population.

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### **Improving reading comprehension through the enhancing of strategies for the production of communicative texts**

Written speech is an effective tool of thought and communication, as well as a flexible tool of achievement of various goals in one's life. Reading comprehension and production of written speech are deliberate, dynamic and laborious problem-solving procedures whose close relation and interaction have been studied for years. Many studies have investigated the effect of reading comprehension on the production of written speech, although only few investigations have focused on the effect of production of written speech on reading comprehension. The aim of the study is to design, implement and evaluate an intervention program providing visual, verbal and social-procedural facilities to students, either having writing disabilities or not, in order to determine whether the development of metacognitive knowledge and skills concerning writing have any impact on students' reading comprehension, as well as to investigate the interaction between production and comprehension of written speech. Three 3<sup>rd</sup> grade groups took part in the study. Two of the groups were members of the experimental group and the third was the control group. The teaching approach utilized was "acquiring knowledge through apprenticeship" and mentoring in the context of instructional scaffolding. Experimental-group students who were taught metacognitive strategies concerning writing through the genre-based-procedural approach appear to develop the metacognitive knowledge and skills relevant to reading comprehension. Study findings also indicated a positive interaction between the production and comprehension of communicative texts.



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## **Adaptation to the Greek population of the Metacognitive Awareness of Reading Strategies Inventory (MARSI) version 1.0**

Metacognitive strategies in reading are self-monitoring and self-regulating activities, focusing on both the process and the product of reading. They are designed to increase readers' knowledge of awareness, to improve their reading comprehension, and to evaluate the whole attempt. The present study is examining the psychometric properties of the Greek version of Mokhtari and Reichard's (2002) Metacognitive Awareness of Reading Strategies Inventory (MARSI) version 1.0, which consists of Likert 5 rating scale of 30 statements about what students do when they read school-related materials. First, MARSI scale is designed as a tool for enabling students increase metacognitive awareness and strategy use while reading. Second, teachers can be provided with a reliable means of assessing, monitoring, and documenting the reading strategies used by students. Third, MARSI scale can serve as a helpful instrument for teachers and researchers in investigating the impact of teaching strategic reading on students' reading comprehension. On the one hand teachers can use the data obtained from the tool as a means of monitoring students' reading progress. On the other hand by using the individual and group average scores researchers can derive a profile designating students along the three subscales of the inventory.

When adapting and weighting the scale to the Greek population, the standards for ensuring psychometric integrity, conceptual validity and the adaptation of foreign language / psychometric tools are strictly adhered to. The sample consists of 1264 students of 12-24 yrs. The inventory was field-tested with a representative sample of students in Gymnasium (aged 12-15) and Lyceum (aged 15-24) drawn from urban, suburban, and rural school districts in Greece. Participation in the study was voluntary and the students were informed that all results were confidential. The scale was distributed and completed by the students on the computer in Google Forms.

The Reliability Analysis of the MARSI scale has shown a Cronbach's alpha index of 0.92 which is proving a high reliability index. Afterwards Exploratory Factor Analysis was conducted in order to explore the linear combination of the variables. A choice was made of the five most significant factors explaining the 48% of the total variance. Depending on the weight of the variables on the results some of them were excluded and Exploratory Factor Analysis was again

conducted on the remaining variables. We observed that the factors are grouped differently in the Greek version of the scale. This fact, however, can be interpreted by taking into account the differences between the American and the Greek educational system and also the learning habits of the Greek students. Depending on the loading of the variables in the results, some were excluded and the factorial analysis was again performed on the remaining 16 variables. The Reliability Analysis of the 16 statements scale gave Cronbach's alpha index of 0.84.

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### **Examining explanatory co-existence through dual process theories by eye tracking methodology**

Recent findings in Cognitive Science have shown that after systematic teaching, intuitive beliefs are not rejected but suppressed, remaining active even during adulthood. Scholars in Cognitive Science suggested dual process theories (DPT) as a possible theoretical vehicle to interpret the “explanatory co-existence” of both scientific and intuitive beliefs in the same mind. According to the DPT, a purely intuitive process is associated with the rapid reaction (Type 1 processing) and is competing with a more demanding analytical processing associated with the slow response (Type 2 processing). Defining features of Type 1 processing are an autonomous process and the independence of cognitive ability. Features of Type 2 processing are cognitive decoupling, mental simulation and its relation to cognitive ability. Dual process theorists have defined the belief bias as individuals’ tendency to assess conclusions by empirical truth (Type 1 processing) and not by logical necessity or validity of syllogism (Type 2 processing). For example, asking people to evaluate the conclusion of a valid syllogism (e.g., "All mammals walk. Whales are mammals. Therefore, whales walk"), they incorrectly respond that the conclusion does not follow logically from the premises, or they spend more time to respond correctly. We suggest that “explanatory co-existence” could be examined by adapted on dual process methodology tasks. We assume that the “whole number bias” and the “intuitive belief bias” could be detected by the phenomenon of belief bias, as children and university students assess the validity of deductive syllogisms which are compatible and incompatible with intuitive beliefs. In addition, individual differences that explain the belief bias are examined regarding age and gender. In the current paper, however, we will present the evidence from a group of adults. The participants were examined on a series of valid syllogisms half of which the result was incompatible with the everyday experience. The accuracy of the responses and the reaction time were recorded. The analysis showed that participants are less accurate or spent more time

to validate a syllogism when, (based on evidence coming from previous studies on conceptual change studies), it is incompatible than with those that they are compatible with their initial beliefs adults might had. Moreover, it is assumed that eye movements during the validation of the syllogisms could elucidate the process the individuals follow, and particularly the information they use to validate the different types of syllogisms. Hence, the eye-movements during to the process of validation of the syllogisms were recorded by the Tobii Eye Tracker. Indeed, the visualization of the eye movements showed different elements of information that the individuals use when they decide about the validity of the different syllogistic reasoning problems in the compatible and incompatible condition.

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### **Executive Functions of Children with Autistic Spectrum Disorder (ASD): A pilot study of conceptual parameters and therapeutic intervention**

Executive functions (EF) are by definition deficient in people in the Autism Spectrum. Deficits in EF are associated with difficulties in skills such as adaptive behavior, school performance, and social interaction. It is likely that there may be differences among children with ASD regarding EF, such as working memory, inhibitory control and cognitive flexibility. The purpose of this study is to assess and teach skills of executive functions, specifically working memory, inhibitory control, and cognitive flexibility, as well as to investigate whether there are overlaps in the three areas mentioned above. This probability will be studied by examining whether an intervention in one executive skill affects another. The participants in this study are a 7 year-old girl and a 6.6 year-old boy diagnosed with ASD, who are pupils who attend first grade in regular education without receiving any form of support in school. The effectiveness of the intervention - based in the science of Behavioral Analysis and the use of techniques such as positive reinforcement, shaping and modeling - will be evaluated by direct observation and the use of a multiple baseline across response categories experimental design. It is expected that there will be an overlap among the EFs under study but an increase in all target responses for both participants following the introduction of intervention. This outcome will lead to the conclusion that we can treat EFs as operant behavior.

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## **The meaning of force in High-functioning Autism Spectrum Disorder adolescents**

### Theoretical background

Alternative conceptions of force have been studied previously and there have been theoretical proposals for their emergence (Eshach 2010; Watts & Zylbersztajn 1981). Moreover an ongoing debate in the conceptual change literature discusses whether these informal ideas constitute a coherent model with internal structure and hierarchy (Driver 1989; Ioannides & Vosniadou 2002; Vosniadou & Skopeliti 2014) or they consist of an unstructured collection of small and discrete knowledge elements which can be used occasionally by each student (Clark et al. 2014; diSessa et al. 2004; diSessa 1993).

However neither the relevant alternative conceptions nor their coherence have been studied before for adolescents in the high-functioning autism spectrum (HFASD).

Empathizing - Systemizing theory (E-S theory) is a prominent theory that aims to explain autism. It states that students with high-functioning autism spectrum disorders (HFASD) have superior systemizing ability which makes them capable of understanding a system in a completely unique and coherent way (Baron-Cohen 2009; Krajmer et al. 2010). Since we expected systematizing ability to be strongly correlated with the quality of observation of phenomena pertaining to the presence of forces we also expected correlations between systemizing ability and conceptions of force and their coherence for both populations.

### Research design and methodology

The current study tries to answer the following three research questions

1. What are the alternative conceptions of force of HFASD adolescents compared to those of normal development students?
2. How does the coherency of HFSAD adolescents' use of conceptions of force compare with the coherency of normal development students?
3. How does the systemizing ability of HFSAD and normal development students correlate with their use of force conceptions and their coherence across different contexts?

For this purpose an experimental investigation was conducted with 19 adolescents with HFASD (age range: 12 to 16 yrs) and 55 typically developing adolescents (age range: 12 to 16 yrs) matched on sex and non verbal mental age. Two structured computerized tools were constructed for data collection. The first tool (EDEIA), explored the alternative conceptions of force for HFASD and general adolescent population while the second instrument (EMIS) measured systemizing ability in these two populations.

#### Research findings and discussion

We found that the alternative conceptions used in previous research in order to describe the general adolescent population's understanding of force (Ioannides & Vosniadou, 2002) could also describe HFASD adolescents' answers in EDEIA. Moreover, in both groups the 'acquired force' model was counted as the best-match model; that is the model that adolescents counted for the most question sets across EDEIA tasks

However, HFASD adolescents use their alternative conceptions of force with different frequency than adolescents of typical development. Furthermore a statistically significant difference in favor of adolescents with HFASD was found in the consistency of usage of this model {Asymp. Sig (2-tailed) = 0,011}.

Finally the correlations between systematizing ability and the use and coherence of alternative force conceptions varied in a statistically significant manner between the two populations.

We will argue that the different patterns of answers in the two populations not only indicate that the mechanisms that lead to the formation of these conceptions in the two populations are different but also that, according to the presuppositions of the framework theory of HFASD adolescents, force is a property of a train of events in which the object is participating rather than an internal or an acquired property of the object itself.

We consider that our results are highly relevant to the teaching of force to HFASD adolescents.

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**BIRGINIA ΠΑΠΑΤΡΕΧΑ, ΙΩΑΝΝΗΣ ΣΠΑΝΤΙΔΑΚΗΣ, ΕΛΕΝΗ ΒΑΣΙΛΑΚΗ**

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### **Θεραπευτικές ιδιότητες του γραπτού λόγου και μεταγνώση των μαθητών κατά την παραγωγή αφηγηματικών κειμένων**

Η μεθοδολογία της δημιουργικής θεραπευτικής γραφής κινητοποιεί ένα υψηλό δυναμικό αυτοσυνειδησίας και δίνει ερεθίσματα για περισυλλογή ώστε ο μαθητής να ανακαλύπτει τη σχέση του με τον εαυτό του και να αποσαφηνίζει την ταυτότητά του ως συγγραφέα (Bolton, 2013). Χαρακτηριστικό γνώρισμα της θεραπευτικής γραφής είναι ότι δίνεται έμφαση στην ίδια τη διαδικασία της σύνθεσης νοήματος και όχι στο τελικό προϊόν. Ως διαδικασία η γραφή λειτουργεί ως «αφηγηματικός τρόπος γνώσης». Ο Bruner (1991) αναφέρει την «αφηγηματική κατασκευή της πραγματικότητας» μέσω της μεσολάβησης «πολιτιστικών προϊόντων», όπως η γλώσσα. Επομένως, ένα αφήγημα είναι το ίδιο ένα «πολιτιστικό προϊόν». Ο Herman (2007) διερευνά τους τρόπους με τους οποίους η αφήγηση λειτουργεί ως «γνωσιακό τέχνημα» (cognitive artifact), με σκοπό την υποστήριξη της γνώσης. Ένας ακόμη ουσιαστικός παράγοντας στην «αποκάλυψη» των γνώσεων που έχει ο μαθητής κατά την εξάσκησή του στη θεραπευτική γραφή είναι η μεταγνώση. Εκτελεί τις λειτουργίες της σκόπιμης και εμπρόθετης

παρακολούθησης μέσω της μεταγνωστικής γνώσης και του ελέγχου του γνωστικού συστήματος μέσω των μεταγνωστικών δεξιοτήτων (Σπαντιδάκης, 2010). Πολλοί ερευνητές στο χώρο της εκπαίδευσης υποστηρίζουν ότι τις μεταγνωστικές δεξιότητες τις βοηθά η ίδια η πράξη της γραφής (Carr, 2002). Παρόλο που τα ερευνητικά δεδομένα καταδεικνύουν τη σπουδαιότητα της διδασκαλίας των στρατηγικών, την ίδια στιγμή επισημαίνουν την απουσία διδασκαλίας τους στην τάξη.

Στόχος της παρούσας έρευνας είναι ο σχεδιασμός, η εφαρμογή και η αξιολόγηση εκπαιδευτικού προγράμματος παρέμβασης που συνδυάζει τη διδασκαλία στρατηγικών παραγωγής γραπτού λόγου με τις τεχνικές θεραπευτικής γραφής σε μαθητές με ή χωρίς μαθησιακές δυσκολίες, προκειμένου να διαπιστωθεί η αλληλεπίδραση μεταξύ ποιότητας του γραπτού λόγου και μεταγνώσης των μαθητών. Στην έρευνα πήραν μέρος τέσσερα τμήματα Α τάξης Γυμνασίου εκ των οποίων τα τρία αποτέλεσαν τις πειραματικές ομάδες και το τέταρτο την ομάδα ελέγχου. Τα προγράμματα παρέμβασης που υλοποιήθηκαν στηρίχθηκαν στα κοινωνιογνωστικά μοντέλα παραγωγής γραπτού λόγου και στις τεχνικές θεραπευτικής γραφής. Η μεταγνωστική γνώση αξιολογήθηκε με αδόμητη συνέντευξη ενώ για τις μεταγνωστικές στρατηγικές χρησιμοποιήθηκε ειδικά διαμορφωμένη κλίδα παρατήρησης. Τα αποτελέσματα έδειξαν πως οι μαθητές της κοινωνιογνωστικής ομάδας και οι μαθητές της συνδυαστικής ομάδας ανέπτυξαν σημαντικά το επίπεδο της μεταγνωστικής γνώσης που διέθεταν. Αντίθετα οι μαθητές της ομάδας των τεχνικών της θεραπευτικής γραφής ανέπτυξαν σε μικρότερο βαθμό το επίπεδο μεταγνώσης τους κυρίως σε ότι αφορά έκφραση και λεξιλόγιο. Ακόμη, παρατηρήθηκε ότι οι μαθητές της ομάδας ελέγχου (παραδοσιακής διδασκαλίας) έδωσαν έμφαση μόνο στην εικόνα του γραπτού και όχι στη δομή και την οργάνωση των ιδεών. Τέλος, ως προς τις μεταγνωστικές στρατηγικές αναπτύχθηκαν περισσότερο στους μαθητές της συνδυαστικής ομάδας, γεγονός που επιβεβαιώνει τη σπουδαιότητα διδασκαλίας στρατηγικών μέσω των τεχνικών θεραπευτικής γραφής.