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# Final Program

## International Neuropsychological Society

### 2014 Mid-Year Meeting

July 9–11, 2014  
Jerusalem, Israel

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#### WEDNESDAY, JULY 9, 2014

8:15–9:45 AM

**Pre-Meeting CE Workshop A: Evidence-Based Practice and the Use of Reliable Change Methods**  
**Presenter: Gordon J. Chelune**  
*Zion Hall A*

1. CHELUNE, GJ

Evidence-Based Practice and the Use of Reliable Change Methods

8:15–9:45 AM

**Pre-Meeting CE Workshop B: Hypoxia-Ischaemia, Hippocampal Damage and Memory Impairment: A Causal Hypothesis?**  
**Presenter: Faraneh Vargha-Khadem**  
*Zion Hall B*

1. VARGHA-KHADEM, F

Hypoxia-Ischaemia, Hippocampal Damage and Memory Impairment: A Causal Hypothesis?

9:45–10:00 AM

**15-Minute Break**  
*On Own*

10:00–11:30 AM

**Symposium 1: Developmental Differences in Skill Learning: From Basic Science to the Clinic**  
**Chair: Esther Adi-Japha**  
*Zion Hall C*

1. ADI-JAPHA, E

Developmental differences in skill learning: From basic science to the clinic

2. ADI-JAPHA, E

Developmental differences in the acquisition of a simple grapho-motor task

3. KARNI, A

The consolidation of a motor skill in children and adults: a developmental matter of critical time

4. FERMAN, S

Children are inferior to adults in acquiring an artificial morphological rule even when afforded supporting learning conditions

5. KISHON-RABIN, L

Learning to hear better: When is age an advantage?

10:00–11:30 AM

**Paper Session 1: Assessment**  
**Moderator: Miriam Levav**  
*Zion Hall A*

1. GONCALVES, MA

A Systematic Review on WAIS-III: A Special Focus on Acquired Brain Injury

2. HENDRIKS, M

Adaptation of the Wechsler Adult Intelligence Scale - 4th edition (WAIS-IV) for Indonesia

3. KRAUSZ, G

Opening Doors - A BCI-based Tool for Detection of Awareness and for Communication with Non-Responsive Patients

4. TAL SABAN, M

Adolescent and Adults Coordination Questionnaire- AAC-Q: Development and Psychometric Properties

5. OVADIA, D

Neuropsychology as a Tool for a More Ethical Approach to Cognitive Rehabilitation

**10:00–11:30 AM****Paper Session 2: Attention**  
**Moderator: Nachum Soroker**  
**Zion Hall B**

1. MAZOR-KARSENTY, T Comparing the Executive Attention of Adult Females with ADHD to that of Females with Sensory Modulation Disorder (SMD) under Aversive and Non-Aversive Auditory Conditions
2. YAAKOBY-ROTEM, S Asymmetric Attention Networks: The Case Of Children
3. BLOCH, A Context Effects in Adults with ADHD: Behavioral and Eye Movement Measures
4. SZCZEPANOWSKI, R Attentional Selection Mediates Affective Processing in the Perceptual Crowding Task
5. ASHKENAZI, S Domain-specific and domain-general effects on strategy selection in complex arithmetic: evidences from Attention-Deficit Hyperactivity Disorder (ADHD) and normally developed college students

**10:00–11:30 AM****Poster Session 1: Aging, Behavioral Neurology, Cancer, Dementia, and Stroke/Aneurysm**  
**Zion Hall D and West & North Foyers****Aging**

1. FISHER, T Aging ADHD: A New Concept
2. HATTA, T Developmental Trajectories of Verbal and Visuospatial Abilities in Healthy Older Adults
3. SHIN, M A Normative Study of the Korean Version of Memory Diagnostic System (MDS) for Elderly
4. HANDLE, E Diagnostic and Evaluative Considerations in Dementia Assessment with an Ethnically Diverse Sample
5. ZIMERMAN, S Implicit Motivation Makes the Brain Grow Younger: Improving Executive Functions of Older Adults
6. ORTIZ, X Effects of Age on the Components of Attention in Elderly People
7. IWAHARA, A Better control of blood pressure in midlife was associated with cognitive function in old age: The Minabe Study in Japan
8. CONTADOR, I Effect of Education and Literacy on Cognitive Performance in a Community-Based Sample of non-Demented Spanish Elders
9. OBLER, LK Measuring Lexical Retrieval in Older Adults' Discourse
10. ASGHAR, M Potential role of grape powder in improving age-related decline in brain and kidney functions

**Behavioral Neurology**

11. ODAGIRI, M Investigation of the Underpinning Mechanisms of Sequential Object Use Disorder Using Eye-tracking
12. OLIVEIRA, MA Comparison of cognitive outcome in patients after cerebellar stroke and cerebellar stroke patients undergone decompressive surgery
13. MAN, L Brief social isolation in early adolescence affects cognitive learning and BDNF mRNA in different age rats

**Cancer**

14. MARGELISCH, K Cognitive deficits in children with cancer before and after treatment
15. SELA, G Impact of oncological surgery on neurocognition
16. MESKAL, I Cognitive functioning in meningioma patients in preoperative and postoperative stage
17. LAI, Y A Case of Recurrent Malignant Parotid Tumor Manifesting Progressive Aphasia as Initial Neuropsychological Symptoms
18. VAN ZANDVOORT, M Neuropsychological functioning and survival after awake craniotomy under intra-operative stimulation in malignant appearing primary brain tumors
19. OLIVEIRA, MA Cognitive assessment of a patient with isular glioma: case report
20. OLIVEIRA, MA Olfactory meningioma: a case of behavioral alterations

**Dementia (Alzheimer's)**

21. KALBI, M Transcranial Doppler Ultrasonography: A Method of Evaluating Cognitively Impaired and Non-cognitively Impaired Elderly
22. KIRK, A What predicts cognitive decline over one year in rural and remote persons with Alzheimer's disease?
23. ENNOK, M WAIS-III Qualitative Errors in Patients with Alzheimer's Disease
24. MANFREDI, V Non-Pharmacological Approach to Cognitive Decline
25. VIEIRA, VL Methodological procedures in clinical rehabilitation of Alzheimer's disease patients

**Dementia (Subcortical, Specific Disorders, MCI, etc.)**

26. CHI, C Post-surgical Cognitive Changes in Idiopathic Normal Pressure Hydrocephalus: the Recovery Pattern
27. ZILBRKWIT, D Bilingualism and Personality as A Form of Cognitive Reserve: The Influence of The Big Five Personality Traits and Command of Multiple Languages on Neuropsychological Performance in Type-2 Diabetic Elderly
28. BISIACCHI, P Assessing Inter- And Intra-Individual Cognitive Variability In Patients At Risk For Cognitive Impairment
29. BEZDICEK, O The Contribution of the Mattis Dementia Rating Scale to the Diagnosis of Parkinson Disease Mild Cognitive Impairment
30. JOHANIDESOVÁ, S Neuropsychiatric and Cognitive Aspects of Creutzfeldt-Jakob Disease

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|-----|-------------|---|
| 31. | CAVACO, S   | Verbal Fluency and Motor Symptoms In Parkinson s Disease: Parallel Paths?                               |
| 32. | ANDRADE, PA | Speech therapy in progressive nonfluent aphasia: A pilot study  |
| 33. | NIKOLAI, T  | Performance in four verbal fluency tests and effect of time on item generation in-non demented elderly  |
| 34. | PARENTE, A  | UNUSUAL COGNITIVE FINDINGS IN TEMPORAL LOBE DEGENERATION  |
| 35. | EK, A       | Does Ethnicity and Mother Tongue Affect Results on Neuropsychological Tests in MCI?                     |
| 36. | MARKOVA, H  | Specific Questions May Differentiate Between Mild Cognitive Impairment And Subjective Memory Complaints |

**Stroke/Aneurysm**

- |     |                      |   |
|-----|----------------------|---|
| 37. | TOBA, M              | Apathy more than depression seems to interfere with early motor recovery after stroke |
| 38. | TOBA, M              | Motor symptoms of post-stroke depression  |
| 39. | ARANGO LASPRILLA, JC | Longitudinal Study of Neuropsychological Changes During the First Year After Stroke   |
| 40. | CAMERON, K           | Investigating Appraisal of Disability Post-Stroke: Patient vs. Clinician              |

**11:30 AM–12:00 PM**

**Coffee Break**

*Zion Hall D*

**12:00–1:00 PM**

**Keynote: Neurocognitive Mechanisms of Number Processing and Developmental Dyscalculia**

**Presenter: Avishai Henik (Introduction: Eli Vakil)**

*Zion Ballroom*

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|----|----------|--|
| 1. | HENIK, A | Neurocognitive Mechanisms of Number Processing and Developmental Dyscalculia |
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**1:00–2:00 PM**

**Lunch Break**

*On Own*

**2:00–3:30 PM**

**Symposium 2: The Processing of Threat from a Cognitive and Social Perspective**

**Chair: Delphine Grynberg**

*Zion Hall C*

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|----|--------------|---|
| 1. | GRYNBERG, D  | The processing of threat from a cognitive and social perspective  |
| 2. | GRYNBERG, D  | Attentional and automatic processing of facial expressions of pain                                      |
| 3. | PEGNA, AJ    | Unconscious processing of facial expressions : is it the threat or the relevance that counts ?          |
| 4. | MERMILLOD, M | The Importance of Low Spatial Frequency Information for Detection of Visual Threats                     |
| 5. | VERMEULEN, N | Desperately Seeking Friends: How Expectation of Punishment Modulates Attention to Angry and Happy Faces |

**2:00–3:30 PM**

**Paper Session 3: TBI (A)**

**Moderator: Dan Hoofien**

*Zion Hall A*

- |    |             |   |
|----|-------------|---|
| 1. | PONSFORD, J | Outcome 2, 5 and 10 years following traumatic brain injury: A prospective study   |
| 2. | GAINES, KD  | Executive Functioning of Combat Veterans Diagnosed with Mild Traumatic Brain Injury   |
| 3. | HOOFIEN, D  | Examination of the Long-Term Efficacy of Three Out-Patient Neuropsychological Rehabilitation Programs for Patients with Acquired Brain Injuries |
| 4. | AZOUVI, P   | The Dysexecutive Syndrome of Severe Traumatic Brain Injury. The GREFEX Study  |
| 5. | JAMES, A    | Neurobehavioural Predictors of Verbal Aggression, Physical Aggression and Inappropriate Sexual Behaviour After Acquired Brain Injury            |

**2:00–3:30 PM**

**Paper Session 4: Dementia and Aging**

**Moderator: Richard F. Kaplan**

*Zion Hall B*

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|----|-------------|--|
| 1. | PEREIRA, R  | Impact of Alzheimer's Disease Related Anosognosia in Caregivers' Quality of Life   |
| 2. | KESSELS, RP | Transfer Effects of Online Working-Memory Training in Healthy Older Adults and Mild Cognitive Impairment                                       |
| 3. | JANSSEN, M  | Utility of the Montreal Cognitive Assessment and HIV Dementia Scale as Screening Instruments for Cognitive Deficits in HIV-1 Infected Patients |
| 4. | BRANDT, J   | Is Risk-Taking Affected by Deep Brain Stimulation in Parkinson's Disease?  |
| 5. | KAPLAN, RF  | Depression and Hypertension Predict MRI White Matter Hyperintensities in the Normal Elderly  |

**2:00–3:30 PM**

**Poster Session 2: Attention, Autism, Emotion, Epilepsy, Genetics, Laterality, Infectious Disease, Imaging, Learning Disabilities, and Visuospatial Functions**  
*Zion Hall D and West & North Foyers*

**ADHD/Attentional Functions**

1. VAKIL, E Adults with ADHD Eye Movement Performance on the Stroop Task
2. SUAREZ, IC Deciphering Interference Control in Adults with ADHD
3. KIMURA, T Flexibility of attention in real 3D space
4. KONSTANTOPOULOS, K Sensitivity of the Children Color Trails Test (CCTT) in the Greek-Cypriot children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD)
5. ZIVAN, M An eye-opener: A study of MPH intervention in ADHD using pupillary responses in young adults
6. SHOHAM, R Relation between risk taking and ADHD symptoms may be mediated by erroneous decision making and higher benefit perception
7. ISENBERG-BECHAR, D Effects of  $\omega$ -3 Long-Chain Polyunsaturated Fatty Acids (LCPUFA) supplementation on emotion and cognitive processing of ADHD children medicated with Methylphenidate - an ongoing study
8. SCHNEIDER, B Relationships between neuropsychological performance and physician and self-report ratings of ADHD symptoms

**Autism Spectrum Disorders**

9. SHAUL, R Asperger Disorder, Theory of Mind, and 2D:4D Digit Ratio as Proxy for Fetal Testosterone Exposure
10. KENETT, YN The Hyper-Modular Associative Mind: A Computational Analysis of Associative Responses of Persons with Asperger Syndrome
11. SCHWAIGER, E The Interpersonal Style of Adults with Autism Spectrum Disorder
12. EILON, I Theory of Mind Impairment and Linguistic Abilities in Autism
13. KLOPPER, F A Cluster Analysis Exploration of the Characteristics of High-functioning Subgroups Within the Autism Spectrum in Children Aged 5-14 Years

**Emotional Processes**

14. BALCONI, M The Empathic Effect on Attentional Mechanisms (Eye-Movements), Cortical Correlates (N200 ERPs) and Autonomic Behavior (EMG) in Emotional Face Processing
15. HILTON, D Facial and Vocal Affect Recognition in Veterans Assessed for TBI with Polytrauma
16. NAOR, N When more is less: exaggerated empathy impairs accurate emotion recognition

**Epilepsy/Seizures**

17. MORENO DE IBARRA, M Pseudo-Crisis or Convulsive Syndrome? Transdisciplinary Neuropsychologic Assessment Contribution to Differential Diagnosis. From the Lab to Cognitive Intervention
18. GIOVAGNOLI, A Different cognitive trends after temporal lobe epilepsy surgery
19. TZUR, M Neuropsychological Profile and Quality of Life Among Children with Epilepsy

**Genetics/Genetic Disorders**

20. EGGER, JI A large de novo distal 16p11.2 deletion in a patient with normal intelligence: Evidence for a neuropsychological phenotype

**Hemispheric Asymmetry/Laterality/Callosal Studies**

21. LESHEM, R Lateralized effects of sad prosody on word processing
22. VINGERHOETS, G The Effect of Handedness Consistency on Bimanual Coordination: A Behavioural and Electrophysiological Investigation

**HIV/AIDS/Infectious Disease**

23. WOODS, SP HIV-Associated Neurocognitive Disorders Affect Resources Allocated to Prospective Memory Versus Ongoing Task Performance
24. LAI, Y Neuropsychological Manifestations of a 5-Month Follow-Up Case with HIV-Associated PML
25. SCHONFELD, D The Effects of Bilingualism on Verbal Fluency and Executive Functioning in HIV infected Hispanic Adults

**Imaging (Functional)**

26. JUNG, J Research about Patient's Response to Olfactory Stimulations, Brain Response and Pathophysiology in Anosmia Patients Using Olfactometer and 3.0T functional MRI
27. LALONDE, FM Default Mode Network Differences Between Kallmann Syndrome Patients and Healthy Controls: An fMRI Resting State Study

**Imaging (Structural)**

28. MÜRNER-LAVANCHY, I Delay of Cortical Thinning in Very Preterm Born Children

**Learning Disabilities/Academic Skills**

- 29. LORBER, R Does Methylphenidate (Ritalin) Help Dyslexias with Attentional Bases?
- 30. GABAY, Y Impaired Probabilistic Learning Mechanisms in Developmental Dyslexia
- 31. KAHTA, S Modality Effects on Sequential Learning of Individuals with Developmental Dyslexia (DD): Evidence from Artificial Grammar Learning (AGL) task
- 32. KHENTOV-KRAUS, L Vowel Letter Dyslexia
- 33. YACHINI, M Vowel Letter Dysgraphia

**Visuospatial Functions/Neglect/Agnosia**

- 34. TOBA, M Neuroanatomy of visuo-spatial neglect: a game-theoretical analysis approach
- 35. SOBANSKA, M Arithmetical operations and numerical surface form: differential effects on multiplication and subtraction
- 36. HIROMITSU, K Tactile extinction depends on the attention to somatosensory input

**3:30–5:00 PM**

**Symposium 3: Latest Developments in the Assessment and Management of People With Disorders of Consciousness**

**Chair: Barbara A. Wilson**

*Zion Hall C*

- 1. WILSON, BA Latest Developments in the Assessment and Management of People With Disorders of Consciousness
- 2. MURPHY, L Holistic Assessment of People with Disorders of Consciousness: Capturing the Person - Implications for Rehabilitation Therapies and Family Adjustment
- 3. SHIEL, A The WHIM-II: Initial development and piloting
- 4. MORRISSEY, AM Complimentary Use of Neurobehavioural Assessment Scales with Prolonged Disorders of Consciousness
- 5. WILSON, BA Improving the Behavioural Responses of Vegetative and Minimally Conscious Patients Through Changes in Position

**3:30–5:00 PM**

**Paper Session 5: Language**

**Moderator: Guy Vingerhoets**

*Zion Hall A*

- 1. SCHARFF, C Addiction, Neuroscience and Psychology: Transdisciplinary Approaches Creating Breakthroughs in Addiction Recovery
- 2. ANDELMAN, F THE ROLE OF INFERIOR TEMPORAL GYRUS IN VISUAL LANGUAGE PROCESSING: A DIRECT CORTICAL STIMULATION STUDY
- 3. DOTAN, D Breaking Down Number Syntax: Dissociation Between Naming and Comprehension of Two-Digit Numbers
- 4. GVION, A To Bee or Not to Bea : Two Subtypes of Surface Dysgraphia
- 5. CIVIER, O Reduced Fractional Anisotropy in the Anterior Corpus Callosum Predicts Reduced Speech Fluency in Persistent Developmental Stuttering

**3:30–5:00 PM**

**Paper Session 6: Development and Genetics**

**Moderator: Sarah Raz**

*Zion Hall B*

- 1. GEVA, R The neonatal biological origins of social difficulties: insights from prematurity
- 2. PETERS, BN Head Growth in the Neonatal Intensive Care Unit and Preschool Neuropsychological Performance
- 3. ROELOFS, R A Comparison of Affective Information Processing in Noonan and Turner Syndromes: Evidence of Alexithymia
- 4. ANAKI, D Factors Underlying Face and Emotion Recognition in Women with Turner Syndrome
- 5. ASBE, MA Temporal Discounting and Strategy Use in School-Aged Children

**5:00–5:30 PM**

**Coffee Break**

*Zion Hall D*

**5:30–6:30 PM**

**Presidential Address: Neuropsychology, Networks and Connectivity**

**INS President: Erin D. Bigler (Introduction: Eli Vakil)**

*Zion Ballroom*

- 1. BIGLER, ED Neuropsychology, Networks and Connectivity

6:30–7:30 PM

**Welcome Reception**  
*Zion West & North Foyers*

7:00–8:30 PM

**INS-SLC Student Networking Social, Presented by the INS Student Liaison Committee**  
**Hosts: Irene Meier, Moran Gofer Levi**  
*Laromny Balcony (Overlooking the Hotel Pool)*

## THURSDAY, JULY 10, 2014

9:00–10:00 AM

**Keynote: Free Neuronal Associations in the Human Brain**  
**Presenter: Rafi Malach (Introduction: Erin D. Bigler)**  
*Zion Ballroom*

1. MALACH, R

Free Neuronal Associations in the Human Brain

9:00–10:30 AM

**Neuropsychology Research Training Around the World: Student Professional Development Panel, Presented by the INS Student Liaison Committee**  
**Presenters: Gina Geffen, Michela Balconi, Juan C. Arango Lasprilla, Jennifer J. Manly**  
*Galil Room*

10:00–10:30 AM

**Coffee Break**  
*Zion Hall D*

10:30 AM–12:00 PM

**Symposium 4: Have Video Demonstrations of Classic Neurobehavioral Syndromes Advanced Our Understanding of the Neural Substrates of Complex Behavior? (PLEASE SEE ADDENDUM)**  
**Chair: Kathleen Haaland**  
*Zion Hall C*

1. HAALAND, KY
2. BOWERS, D
3. VINGERHOETS, G
4. KNIGHT, RT
5. HAALAND, K

Aphasia and limb apraxia after left hemisphere stroke  
 Hemispatial Neglect and Emotion Perception Disorders After Right Hemisphere Lesions  
 Typical and atypical lateralization of cognitive functions  
 Gazzaniga's Evaluation of Hemispheric asymmetry after Commissurotomy  
 Video demonstrations of classic neurobehavioral syndromes. Have they advanced our understanding of the neural substrates of complex behavior?

10:30 AM–12:00 PM

**Paper Session 7: TBI (B)**  
**Moderator: Philippe Azouvi**  
*Zion Hall A*

1. GAINES, KD
2. AZOUVI, P
3. LIVNY-EZER, A
4. STUDER, M
5. ASARNOW, R

Comparison of Effort Measures, Cognitive Complaints, and Self-reported Neuropsychiatric Symptoms in Blast-Induced Mild TBI  
 Ecological Validity of the Dysexecutive Questionnaire: Results from the Paris-TBI study  
 Cognitive Deficits Post Traumatic Brain Injury and their Association with Local Functional Connectivity Density in Resting-State  
 Serum marker S100B is associated with ongoing cognitive symptoms in children after mild traumatic brain injury and ongoing somatic symptoms in children after orthopedic injuries  
 Effects of White Matter Disruption and Restitution in Children on Cognitive impairments and Recovery During the First Year Following Moderate/Severe Traumatic Brain Injury

10:30 AM–12:00 PM

**Paper Session 8: Language**  
**Moderator: David Anaki**  
*Zion Hall B*

1. PINA RODRIGUES, A
2. REBOLA, J
3. BIRAN, M

Text Reading and Noise Exclusion in Dyslexia  
 Word Reading and Noise Exclusion in Dyslexia: Eye Movements and Performance  
 The Relations between Treatment Outcome, the Underlying Deficit and the Representation in the Lexical Process: Evidence from Homophones Naming Treatment

4. MESHULAM, M The Cortical Dynamics of Thought: a Data-Driven Analysis of Intracranial Recordings During a Deliberative Task
5. DOTAN, D Phonological Pathways of Speech Production: Lexical Information in Post-Lexical Stages

10:30 AM–12:00 PM

**Poster Session 3: Cognitive Intervention/Rehabilitation, Executive Functions/Frontal Lobes, Memory Functions, and TBI**  
*Zion Hall D and West & North Foyers*

**Cognitive Intervention/Rehabilitation**

1. SIMON, SS Cognitive Psychotherapy in elders with depression and cognitive deficits: a review
2. MARGELISCH, K Impacts of a word-picture training on reading and spelling in Swiss elementary school children
3. WINGBERMÜHLE, E Treatment of Impaired Affective Information Processing and Social Cognition in Neuropsychiatric Patients: A Systematic Review
4. FRIEDMAN, R Telerehabilitation of Anomia in Primary Progressive Aphasia
5. TURON, M Early Neurocognitive Rehabilitation in Intensive Care Unit: Proof of Concept
6. PYASIK, M Description of neuropsychological syndrome of stuttering as a basis for successful neurorehabilitation
7. PYASIK, M Rehabilitation of impaired interactions of brain structures in stuttering

**Executive Functions/Frontal Lobes**

8. DEV, N Exploring Executive Functioning in Patients with Frontal and Temporal Lobe Epilepsy Using a Novel Ecologically-Valid Virtual Reality Task: The Jansari Assessment of Executive Functions (JEF©)
9. BIELIAUSKAS, L Cognitive Reserve and Executive Dysfunction: Impact on Judgment of Health and Safety in an Inpatient Veteran Population
10. HALLER, M High Gamma Duration in Human Prefrontal Cortex Predicts Decision Time
11. LINKOVSKI, O A call for control: The Relations between Inhibition and Doubt
12. FASOTTI, L Sensitivity of the Everyday Description Task, an ‘Open-Ended’ Script Generation Task, to Anterior Executive Dysfunction
13. JÓDAR, M Cognitive flexibility as a predictor of decision making performance in the Ballon Analogue Risk Task (B.A.R.T)
14. WITKOWSKA, MA What’s So Special About Professional Gamers?

**Memory Functions**

15. HAMPSON, E Working Memory Impairment During Pregnancy: Association With Antepartum Depression?
16. KATZOFF, A Best Conditions for Declarative Memory: Multiplication Facts as a Model
17. PYASIK, M Selective Involvement of Lingual Gyrus in Working Memory and Perception of Different Types of Visual Stimuli
18. BLACHSTEIN, H Verbal Learning Across the Lifespan: An Analysis of the Components of the Learning Curve
19. ZANNONI, I Impaired Temporal Consciousness and preserved Knowing Consciousness in confabulation and amnesia
20. MARANGONI, S Varieties of confabulations
21. BARBERA, C Confabulation and awareness of memory impairment
22. BRAZZAROLA, M A longitudinal study of confabulation
23. SELA, G The impact of colloid cysts and their treatment on neurocognition
24. PARK, P Impaired recognition of faces encoded by emotional and semantic processes in patients with Parkinson disease
25. SALVADOR, J Some developmental aspects of semantic memory in children: Lessons from a sample of Mexican middle school children
26. LEVY, DA Parietal Lesion Effects on Cued Recall Following Pair Associate Learning
27. BEN-ZVI, S The Brain and the Scale: Lesion Effects on Measures and Indices of the Wechsler Memory Scale
28. BLOCH, A Eye Activated Sequence Learning in Older Populations

**TBI (Adult)**

29. GOULD, KR A Longitudinal Examination of Positive Changes in Quality of Life After Traumatic Brain Injury
30. ROSENBERG, H Facial Emotion Recognition Deficits following Traumatic Brain Injury: Re-Examining the Valence Effect and the Role of Emotion Intensity
31. ROSENBERG, H Facial Emotion Recognition after Moderate-Severe Traumatic Brain Injury: The Role of Task Difficulty, Injury Severity, and Neuropsychological Functioning
32. GOODEN, JR Self-Awareness of On-Road Driving after Traumatic Brain Injury
33. DYMOWSKI, A Attention and Executive Functioning Following Traumatic Brain Injury
34. GRIMA, NA Characterising Sleep Dysfunction after Traumatic Brain Injury: A Systematic Review of Objective and Self-Report Measures
35. RADO, T Community Neurorehabilitation: The Challenge of Working With Apathy: A Single Case Study Design Combining Holistic Neuropsychological Rehabilitation and Methylphenidate to Treat a 55 Year Old Man More Than 3 Years Post Traumatic Brain Injury
36. BALDIVIA, B Brain Injury Family Intervention applicability in a Brazilian sample of relatives of Traumatic Brain Injury victims diagnosed with Diffuse Axonal Injury

37. CHAMMAS, F  
38. BOGDANOVA, Y  
39. STARGATT, R  
40. TURON VIÑAS, M  
41. AL-DIWAN, JK
- Contributions of personality assessment in understanding cognitive and affective disorders after TBI  
Neuropsychiatric and Functional Status in Veterans with Blast TBI  
**TBI (Child)**  
Can Reading Delay In Complicated Mild And Moderate Traumatic Brain Injury (TBI) Be Distinguished From Developmental Reading Delay On Neuropsychological Tests?  
Assossation between age and Executive Functions and IQ in a TBI pediatric sample  
Mental Health Consequences Of Wars And Terrorism In Iraq: A Preliminary Report
- 12:00–12:15 PM** **15-Minute Break**  
*On Own*
- 12:15–1:15 PM** **Keynote, presented by the INS-Satz Award Winner: Confessions of a Serial Mentor and Mentee: Reflections on Collegiality in Research, Teaching and Clinical Practice**  
**Presenter: Gina Geffen (Introduction: Jennie Ponsford)**  
*Zion Ballroom*
1. GEFFEN, G  
Confessions of a Serial Mentor and Mentee: Reflections on Collegiality in Research, Teaching and Clinical Practice
- 1:15–2:15 PM** **Lunch Break**  
*On Own*
- 2:15–3:15 PM** **The Herbert Birch Memorial Lecture: Adolescent Brain Development**  
**Presenter: Eveline Crone (Introduction: Jason Brandt)**  
*Zion Ballroom*
1. CRONE, E  
Adolescent Brain Development
- 2:30–4:00 PM** **Publishing and Reviewing in Neuropsychology: Student Workshop, Presented by the INS Student Liaison Committee**  
**Presenters: Kathleen Haaland, Guy Vingerhoets**  
*Galil Room*
- 3:15–3:45 PM** **Coffee Break**  
*Zion Hall D*
- 3:45–5:15 PM** **Symposium 5: New Views on Hippocampal Function: Memory and Beyond**  
**Chair: Asaf Gilboa**  
**Discussant: Mieke Verfaellie**  
*Zion Hall C*
1. GILBOA, A  
2. RYAN, JD  
3. VERFAELLIE, M  
4. GILBOA, A  
5. LEE, AC  
6. ROSENBAUM, R
- New Views on Hippocampal Function: Memory and Beyond  
The Contributions of Hippocampal Relational Binding to Ongoing Processing  
Cognitive Impairments in MTL Amnesia: Beyond Episodic Memory  
The Hippocampus And High Order Conditioning: Implications To Decision-Making And Choice Behaviour  
Relating Perceptual Processing To Mnemonic Function In The Medial Temporal Lobe  
Dissociations in future thinking following episodic memory loss
- 3:45–5:15 PM** **Paper Session 9: Interventions**  
**Moderator: Ronny Geva**  
*Zion Hall A*
1. BERTENS, D  
2. KIVILIS-MEIRI, N  
3. DAVIDOVITCH, S
- Effects of Combining Errorless Learning and Goal Management Training on Daily Executive Functioning after Acquired Brain Injury  
Associations Between Family Burden, Daily Functioning and Psychological Reactions Among Patients With Brain Injury, Before and After Out-patient Neuropsychological Rehabilitation  
Brooding Regarding Negative Experiences: From an Actor to an Observer Perspective



4. IBARRETXE-BILBAO, N Improving Functional Disability, Depression and Cognition in Parkinson Disease with REHACOP Program
5. SHANY-UR, T Predictors of community integration in acquired brain injury patients undergoing neuropsychological rehabilitation: the role of cognitive abilities and self-reported life satisfaction and mood

**3:45–5:15 PM****Paper Session 10: Cognitive Neuroscience (A)****Moderator: Simone Shamay-Tsoory****Zion Hall B**

1. BOTTINI, G Grasping: from lab to rehab
2. TARAGIN, D Mental Rotation: The Effects of Processing Strategy and Gender on Children's Performance and Eye Movements' Pattern
3. ZADKA, H Patients with Parkinson's Disease Are Able to Learn in a Probabilistic Feedback-Based Learning Environment When Level of Uncertainty Is Reduced
4. AHONNISKA-ASSA, J Growing up with Acquired Visual Disorientation and Body Schema Disorder: 10 Years of Clinical Observation and Neuropsychological Follow-up
5. FRENKEL-TOLEDO, S Dysfunction of the Human Mirror Neuron System in Parietal Ideomotor Apraxia: Evidence from Mu Suppression

**3:45–5:15 PM****Poster Session 4: Cognitive Neuroscience, Language and Speech Functions, and Medical/Neurological Disorders/Other****Zion Hall D and West & North Foyers****Cognitive Neuroscience**

1. RANNIKKO, I Changes in verbal learning and memory in schizophrenia and non-psychotic controls in midlife: A nine-year follow-up in the Northern Finland Birth Cohort 1966 study
2. RANNIKKO, I Longitudinal change of verbal and visual learning and memory in midlife in general population sample. A nine-year follow-up in the Northern Finland Birth Cohort 1966 study
3. BALCONI, M Reward Sensitivity, Cognition and Metacognition in Gambling Behavior
4. VANUTELLI, ME Arousal Modulation In Disturb Of Consciousness: How about the Semantic Meaning Process?
5. SEMYONOV, O What You See Is What You Get? Mechanisms of Impaired Emotion Recognition in Developmental Visual Agnosia
6. NAPARSTEK, S A Case Study of Acalculia
7. WAPP, M Cognitive Improvement in Patients with Carotid Artery Disease is Independent of Treatment Type
8. ITOL, C Cognitive traits predict sleepiness during awake surgery
9. IBARRETXE-BILBAO, N The Relationship Between the Uncinate Tract and Verbal and Visual Memory is Mediated by Processing Speed in Parkinson Disease
10. IBARRETXE-BILBAO, N Structural Brain Alterations and Cognitive Disturbances in Parkinson's Disease Patients with Impaired Processing Speed
11. RIVOLTA, D Multi-voxel pattern analysis (MVPA) of fMRI data reveals aberrant face-discriminant ability in people with congenital prosopagnosia
12. SALNER, N Spatial Attention Affects Letter Position Errors in Reading in Short Exposure
13. AREND, I Dissociating Emotion and Attention Functions in the Pulvinar Nucleus of the Thalamus

**Language and Speech Functions/Aphasia**

14. NEUMANN-WERTH, Y An Electrophysiological Investigation of the Lateral Anterior Positivity: Clinical Implications
15. FRIEDMANN, N Anomia in the phonological output lexicon: another source for Surface dyslexia
16. CHERNEY, LR Transcranial Direct Current Stimulation: A Pilot Study of Anodal, Cathodal and Sham Stimulation in Aphasia
17. CHERNEY, LR Computer-Directed Sentence-Level Writing Treatment for Persons with Chronic Aphasia
18. KISELEV, S Investigation of brain holistic mechanism in Russian-speaking children with weakness in grammar understanding
19. VÁZQUEZ DE SEBASTIÁN, J Efficacy of the Spanish Version of the Constraint-Induced Aphasia Therapy in Post-Stroke Aphasia
20. LEIVA MADUEÑO, I Beyond Language: Melodic Intonation Therapy Improves Communication, Behaviour and Quality of Life in Subacute and Early Chronic Post-Stroke Aphasia
21. TRINCZER, IL Who Moved the Middle? Effect of Reading Direction and Morphology on Visual Perception of Written Words
22. GAWRON, N Narrative Discourse in Individuals with Subcortical Ischaemic Vascular Dementia (SIVD)
23. GUGGENHEIM, R Previously Undescribed Type of Developmental Phonological Dyslexia
24. BALABAN, N Brain Damage, Theory of Mind and Language
25. BEN-DAVID, BM A New Tool for Assessing Impairments of Identification of Emotions in Spoken Language Following Traumatic Brain Injury - the Test of Rating of Emotions in Speech (T-RES)
26. YACHINI, M Dyslexia & SLI: A Double Dissociation

**Medical/Neurological Disorders/Other (Adult)**

27. HARCIAREK, M Defective performance on Trail Making Test in adequately hemodialyzed patients: A general slowing or an executive phenomenon?
28. ZURAWEL, M The Effect of Surgery, Surgery Type and Cognitive Reserve on Neuropsychological Outcome after STN DBS Surgery in Parkinson Disease Patients
29. RUIS, C Awake craniotomy and coaching
30. TAL SABAN, M Participation Profile of Young Adults with Developmental Coordination Disorder (DCD)
31. CAVACO, S Cognitive Functioning in Acquired Hepatocerebral Degeneration
32. NORDLUND, A Frequent Mild Cognitive Deficits in Several Functional Domains in Elderly Patients with Heart Failure without Known Cognitive Disorders

**Medical/Neurological Disorders/Other (Child)**

33. MARYNIAK, A Pure alexia in a teenage girl after the removal of a large astrocytoma in the third ventricle and the left lateral ventricle
34. MARYNIAK, A Are children with pilocytic astrocytoma in the cerebellum especially intelligent?
35. YANG, C Improvement of Verbal Ability Correlated With Increased Left Temporal Perfusion Following Encephaloduroarteriosynangiosis in Pediatric Patients with Moyamoya Disease
36. HAIN, L Relationship between Neonatal Hypoxia-Periventricular Leukomalacia and Neuropsychological Sequelae
37. PIERCY, J Neuropsychological Functioning and Linear Growth in Very Preterm-Born Preschoolers
38. CHISHOLM, AK Intellectual, Academic and Psychosocial Functioning in School-Aged Children with Oesophageal Atresia
39. HAKKARAINEN, E Arithmetic Fluency in Youth with Cerebral Palsy
40. SUDIKOFF, EL Electrophysiological Evidence of Attentional Network Disruptions in Children with Neurofibromatosis Type 1

**5:15–6:15 PM**

**INS Awards Ceremony & Business Meeting**  
**Awards Ceremony Chair: Robert K. Heaton**  
**Business Meeting Chair: Erin D. Bigler**  
*Zion Ballroom*

**7:00–8:30 PM**

**Optional Meeting Dinner**  
*Inbal Hotel Restaurant*

**FRIDAY, JULY 11, 2014****9:00–10:00 AM**

**Keynote: Insights Into Cognition from Intracranial Recordings**  
**Presenter: Robert T. Knight (Introduction: Leon Deouell)**  
*Zion Ballroom*

1. KNIGHT, RT

Insights Into Cognition from Intracranial Recordings

**10:00–10:30 AM**

**Coffee Break**  
*Zion Hall D*

**10:30 AM–12:00 PM**

**Symposium 6: Life-Span Development of Episodic Memory: Neural Correlates and Modifiers (PLEASE SEE ADDENDUM)**  
**Chair: Naftali Raz**  
**Discussant: Ulman Lindenberger**  
*Zion Hall C*

1. RAZ, N  
 2. OFEN, N  
 3. RAZ, N  
 4. LINDENBERGER, U  
 5. DUZEL, E  
 6. BÄCKMAN, L

Life-Span Development of Episodic Memory: Neural Correlates and Modifiers  
 Development of Episodic Memory in Children and Young Adults  
 Linking age-related changes in brain “hardware” and memory: why is it so hard?  
 Discussant’s statement  
 Motivational regulation of episodic memory consolidation in older adults  
 Dopamine and Episodic Memory

**10:30 AM–12:00 PM****Paper Session 11: Executive Functions****Moderator: Yehuda Pollak***Zion Hall A*

1. JANSARI, A C'est Ma Fête! Can A French Adaptation Of A Virtual Reality Assessment Of Children's Executive Functions (JEF-C<sup>®</sup>) Work And Be Used With Paediatric Patients With Acquired Brain Injury?
2. MOTA, N Action Decision in Moral Dilemma Vary With Deliberated Self-Control Among Healthy Female University Students: A Preliminary Study
3. HELED, E Executive Functions among Current and Recovered Anorexia Nervosa Patients: Quantitative and Qualitative Analyses
4. LAZER, SC Differentiation Between "Cold" and "Hot" Executive Functions in Eating Disorders: Implications for Intervention

**10:30 AM–12:00 PM****Paper Session 12: Cognitive Neuroscience (B)****Moderator: Roy P. Kessels***Zion Hall B*

1. MAYSELESS, N Modulating creativity by altering the balance between right and left inferior frontal gyrus with tDCS
2. SHABI, A The Effects of Chronic Sleep Loss on Information Processing Speed and Subsequent Effects on Other Cognitive Abilities in Adolescents
3. HILLARY, FG Hyperconnectivity in brain networks as a marker of recovery following traumatic brain injury
4. RAJTMAJER, S Modeling plasticity in brain networks after neurological disruption: a critique of connectivity modeling approaches
5. RAZ, N Beyond the Eye - Behavioral and Cortical Assessment in Posterior Cortical Atrophy (PCA)

**10:30 AM–12:00 PM****Poster Session 5: Assessment/Psychometrics/Methods, Cross Cultural, Drug/Toxin-Related Disorders, Electrophysiology, Forensic Neuropsychology, Demyelinating Disorders, and Psychopathology/ Neuropsychiatry***Zion Hall D and West & North Foyers***Assessment/Psychometrics/Methods (Adult)**

1. AXELROD, BN Using Finger Tapping as a Measure of Performance Validity
2. BOUMAN, Z Validation of the Dutch version of the Wechsler Memory Scale – Fourth Edition in patients with Temporal Lobe Epilepsy
3. IBARRETXE-BILBAO, N Validation and Normalized Data for the M-WCST (NORMACOG Project) in Spanish Population
4. IBARRETXE-BILBAO, N Comparison of the Verbal Fluency Performance with letter P and Letter L in a Spanish Sample
5. BOLCEKOVA, E The Bicycle Drawing Test: A Useful Method for Assessing Visuospatial and Executive Functions
6. LOJEK, E The Value of the Activity in Coping and Positive Attitude Scale in the Assessment of Depression in Healthy Persons, Brain Damaged Individuals and Patients with Major Depression
7. RIOS-LAGO, M Construct Validity Of The Stroop Colour-Word Test: Influence Of Speed Of Information Processing, Verbal Fluency, Perceptual Interference, Motor Inhibition, Cognitive Flexibility, And Working Memory
8. BOYCHEVA, EL Clinical Validity of The Spanish Version of Mattis Dementia Rating Scale in Patients with Mild Alzheimer's Disease and Mild Cognitive Impairment
9. ASANO, K Word Retrieval Process Analyzed by Clustering and Switching Components in Phonemic Verbal Fluency Test by Japanese with Parkinson's Disease
10. CALDERÓN CHAGUALÁ, JA Neuropsychological Profile of tolimenses Athlete
11. MICHALEC, J Validity of the Tower of London Task for Detection of Planning Impairment in Patients with Parkinson Disease Mild Cognitive Impairment

**Assessment/Psychometrics/Methods (Child)**

12. KONSTANTOPOULOS, K Sensitivity of the Children Color Trails Test (CCTT) in bilingual Cypriot children
13. MORENO DE IBARRA, M Neuropsychological Functioning of Children with Attention Deficit Hyperactivity Disorder, with High Functioning Autism and Without Diagnosis. From Research to Intervention
14. GUEDES, DZ Neuropsychological screening and assessment in Brazilian infants under risk conditions
15. OLIVEIRA, RM Normative data for Brazilian children on the RAVLT, Verbal Fluency and Stroop paradigms
16. OLIVEIRA, RM Evidence of reliability on the RAVLT, Verbal Fluency and Stroop Paradigms applied to Brazilian children

**Cross Cultural**

17. KOTIK-FRIEDGUT, B Cultural Neuropsychology: Roots and New Branches
18. CARACUEL, A Prevalence of Perceived Ethical Misconduct: A National Survey of Neuropsychology Professionals in Spain
19. RIVERA, D Prevalence of Perceived Ethical Misconduct: An International Survey of Neuropsychology Professionals across Latin America

20. ARANGO LASPRILLA, JC A National Survey of the Neuropsychology Professionals in Latin America  
 21. PERRIN, PB A National Survey of the Neuropsychology Professionals in Spain
- Drug/Toxin-Related Disorders (Including Alcoholism)**
22. AMBROZIAK, AR Subjective Well-Being in Drug Addicted Patients: Indications for Neuropsychologists  
 23. SANTA MARIA, MP Cognitive Intra-Individual Variability Predicts Historical Lead Exposure but Academic Intra-Individual Variability Does Not
- Electrophysiology/EEG/ERP**
24. ERLBECK, H Effects of Attentional Modulation on the Mismatch Negativity (MMN) in a Single vs. Multifeature Oddball  
 25. SOLLFRANK, T Effects of 3D Visualisation Modalities on Motor Related Potentials  
 26. SHEVTSOVA, T Dual-Tasks as an Approach to Estimation of Functional Capacity under Information Loads in Patients with Traumatic Brain Injury and Healthy Persons  
 27. ANDERSSON, S Sensory Evoked Potential Modulation – an Index of LTP-like Stimulus-Specific Neocortical Plasticity?  
 28. JANG, S The effect of hypersonic wave sound for EEG
- Epilepsy/Seizures**
29. KRAMSKA, L Cognitive performance in patients with psychogenic non-epileptic seizures
- Stroke/Aneurysm**
30. KRAMSKA, L Assessment of cognitive decline in patients treated for cerebral aneurysm using Czech Reading Test
- Forensic Neuropsychology**
31. WILLSON, P The Utility of MMSE as a Predictor of Real-Life Testamentary Capacity  
 32. STARZA-SMITH, A Neuropsychological Risk Factors for Offending in Children/Adolescents Post Acquired Brain Injury (ABI): Two Case Studies - Pyromania and Sexual Disinhibition  
 33. DAMRY, T A Novel Symptom Validity Test (SVT) Based on the Delis Kaplan Executive Function System (D-KEFS) Card Sorting Test
- Multiple Sclerosis/ALS/Demyelinating Disorders**
34. IBARRETXE-BILBAO, N Cognitive Impairment and Brain Structural Alterations in Multiple Sclerosis Patients
- Psychopathology/Neuropsychiatry (Other)**
35. HELED, E Extreme “Fragmented Perception” in the ROCFT - A Neuropsychological Case Study of Patient with Anorexia Nervosa  
 36. LICHTENSTEIN-VIDNE, L Distracting Stimuli and Affective Disorders: The Interactive Relationship between Task- Relevance, Anxiety and Depression  
 37. GERTNER, L When personality meets memory
- Psychopathology/Neuropsychiatry (Schizophrenia)**
38. TOBA, M Deductive reasoning in schizophrenia  
 39. TOBA, M Theory of mind kind of humor understanding seems to be specifically altered in schizophrenia  
 40. FERNANDEZ-GONZALO, S A New Social and Non-Social Cognitive Rehabilitation Computerized Program for Schizophrenia/ Schizoaffective Disorders in Early Stages: Preliminary Efficacy Results and Maintenance at 3months Follow-up

**12:00–1:30 PM****Symposium 7: Creating Accessible Measures for Children with Motor and Communication Impairments (PLEASE SEE ADDENDUM)**

**Chair: Tamar Silberg**  
*Zion Hall C*

1. SILBERG, T Creating Accessible Measures for Children with Motor and Communication Impairments  
 2. WARSCHAUSKY, S Studying the psychometric properties of alternative and modified accessible cognitive assessment instruments  
 3. KAUFMAN, J Accessible assessment of auditory and visual working memory in children with cerebral palsy  
 4. AHONNISKA-ASSA, J Using Eye-tracking Technology in Assessing Cognitive Functioning among Girls with Severe Motor and Communication Limitations  
 5. GOFER-LEVI, M What can implicit measures tell us about learning abilities among children with Cerebral Palsy (CP)?

**12:00–1:30 PM****Paper Session 13: Memory**

**Moderator: Daniel A. Levy**  
*Zion Hall A*

1. PERTZOV, Y Remembering What Was Where, From Cognitive Mechanisms to the Clinic

2. BLOCH, A Motor and Non Motor Sequence Learning in People with Spinal Cord Injury
3. ALTGASSEN, M Executive Control Load Affects Prospective Memory Performance in Individuals with Korsakoff Syndrome
4. STANILOIU, A Chronic Functional Amnesia after Anesthesia
5. BREZIS, RS Neural Correlates of Self-related Memory in Youth with Autism Spectrum Conditions

**12:00–1:30 PM**

**Paper Session 14: Cognitive and Behavioral Neurology**

**Moderator: Fofi Constantinidou**

***Zion Hall B***

1. GEFFEN, G Maladaptive Neuroplasticity Reversal By Multidisciplinary Intervention: A Case Study Of Complex Regional Pain Syndrome (CRPS)
2. CONSTANTINIDOU, F Benign Rolandic Epilepsy and memory performance in elementary school-age children: Not so “benign” after all?
3. EVANS, J Understanding and Assessing Dual-tasking Deficits in People with Multiple Sclerosis (PWMS)
4. HUENGES WAJER, I Relationship between CT-perfusion on admission and cognitive functioning 3 months after aneurysmal subarachnoid hemorrhage
5. MENESES, RF Quality of life in epilepsy across time: Does it change? Why (not)?

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# Abstracts Presented at the International Neuropsychological Society 2014 Mid-Year Meeting

July 9–11, 2014  
Jerusalem, Israel

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WEDNESDAY MORNING, JULY 9, 2014

## Symposium 1: Developmental Differences in Skill Learning: From Basic Science to the Clinic

Chair: Esther Adi-Japha

10:00–11:30 a.m.

**E. ADI-JAPHA, S. FERMAN, L. KISHON-RABIN, E. ADI-JAPHA & A. KARNI. Developmental differences in skill learning: From basic science to the clinic.**

**Symposium Description:** The notion that children's brains are more susceptible to shaping by experience has been invoked in explaining an apparent superiority of children in the acquisition of skills and implicit, procedural, knowledge. There is, however, good laboratory evidence for very effective skill learning in adults. Furthermore, several studies have shown an adult advantage in the rate of skill acquisition. These include studies of auditory perceptual learning, locomotion, serial reaction time (SRT) and learning artificial morphological rule. Only a few studies reported advantageous learning in children. These studies used variants of the SRT task. Other studies reported similar learning in children and in adults. The measures were saccadic latencies, drawing movements and the SRT task. One question to be discussed is whether the neural processes underlying skill learning are age-invariant, and the observed age-dependent difference is related to other maturational effects or rather that qualitative differences in skill learning mechanisms develop with age. Sara Ferman will open the discussion by presenting findings that indicate age-dependent maturation in the establishment of procedural memory in learning a complex language task. Liat Kishon-Rabin will present findings from auditory perceptual learning tasks supporting the notion that skill acquisition may reflect the interaction of two factors: the maturation of procedural memory mechanisms and of specific, task relevant cognitive and sensory processing abilities. In contrast, Esti Adi-Japha will present findings from a simple grapho-motor learning task suggesting that the neural processes underlying skill learning are age-invariant with a possible advantage for children over adults. From a complimentary perspective, Avi Karni will report a childhood advantage in the expression of long-term procedural memory (consolidation phase) following the acquisition of a new finger movement sequence. Clinical implications will be discussed.

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**E. ADI-JAPHA. Developmental differences in the acquisition of a simple grapho-motor task.**

Procedural memory plays a major role during childhood, when many new skills are acquired. Previous studies of age-related differences in skill acquisition mainly focused on skill learning within a single practice session. It was suggested that age-related differences in practice gains depend on the amount of practice: in extended training, adults may reach asymptotic performance while children continuously improve. This limits the study of age-related differences in the evolution of memory consolidation and retention over longer periods. The problem is more pronounced in younger children whose training capacity is restricted. Here, I will present a simple grapho-motor ("invented letter") task (ILT). Kindergarten children and adults show a similar rate of improvement by the end of the first training day on the ILT. Therefore, the ILT was used for testing age-related differences in skill acquisition. The task is typical of kindergarteners' activities, and tests the same type of kindergarteners' proficiencies that predict later academic achievements, as indicated by recent analyses of several large-scale longitudinal studies. The Performance of 20 kindergarteners, 20 second graders and 20 adults on the task indicated larger training gains among kindergarteners and second graders than among adults. Furthermore, children and adults showed consolidation gains 24 hours post-training that were retained two weeks later.

Next, the task was used to predict academic achievements in the year following an assessment of 36 kindergarteners and 20 second graders. Our results indicate that long-term consolidated performance had predicative validity for academic achievements that is larger than that of measures of short term memory that are often studied in relation to learning disabilities. The performance of the task was further studied in kindergarteners with and without language impairments (LI). Forgetting in the absence of consolidation in children with LI will be discussed. Correspondence: *Esther Adi-Japha, School of Education, Bar-Ilan University, Ramat Gan, Israel, Ramat-Gan 52900002, Israel. E-mail: Esther.Japha@gmail.com*

**A. KARNI. The consolidation of a motor skill in children and adults: a developmental matter of critical time.**

A tacit and almost universally accepted notion is that children are better than adults in the acquisition of skills ("how to", procedural knowledge) and importantly that this advantage reflects a higher potential for plasticity in children's brains. Nevertheless, in many laboratory tasks, in which training can lead to skill and procedural memory, adults not only outperform children, but also seem to benefit from the training experience in a manner as robust as (if not superior to) children before puberty. Adults and children show not only significant within-session (on-line) gains in performance, but also significant delayed (off-line)

gains. The latter are expressed, in adults, hours after training (in some cases only if sleep is afforded) and presumably reflect structural synaptic plasticity. However, in adults, the gains acquired in training are susceptible to interference (the blocking of memory consolidation processes) by subsequent inconsistent experience during a time window of a few hours after the initial training experience. Thereafter, the completion of procedural memory consolidation processes result in “stabilization”. My colleagues and I have recently shown that delayed gains are expressed by children much earlier after training than in adults. Importantly, children are susceptible to interference in a much shorter time-window compared to adults, with stabilization occurring within minutes rather than hours after training. Thus, both aspects of skill consolidation - the expression of delayed performance gains and mnemonic stabilization, require more time in adults compared to children. This suggests a new view of sensitive periods in skill acquisition: rather than a decrease in the potential for plasticity per se, puberty extends the memory consolidation phase, thus lengthening the time-window in which new knowledge is tested for consistency before it is allowed to consolidate into long-term memory. Correspondence: *Avi Karni, The Sagol Department of Neurobiology, Human Biology, Haifa 3498838, Israel. E-mail: avik@construct.haifa.ac.il*

**S. FERMAN. Children are inferior to adults in acquiring an artificial morphological rule even when afforded supporting learning conditions.**

A leading notion posits that language-learning skills decline between childhood and adulthood. This notion has been associated with the critical period hypothesis and with children’s superiority in procedural learning. Eight-year-olds, 12-year-olds, and young adults underwent an equivalent multi-session training experience in the application of an artificial morphological rule (AMR) to repeated (specific) and novel (generalization) items, using judgment and speech production tasks, without explicit instruction regarding the nature of the rule. The AMR consisted of phonological transformations of verbs expressing a semantic distinction: whether the preceding noun was animate or inanimate. The results showed the 8-year-olds to be the poorest learners while the adults to be the best learners in all task parameters including those that were clearly implicit. The 8-year-olds, unlike most of the adults and 12-year-olds, failed to uncover the semantic aspect of the AMR explicitly and subsequently to generalize it accurately to novel items. In three additional experiments, three other groups of 8-year-olds were afforded the same training experience, with a change in only one aspect of the training condition in each experiment: 1) using variable training items; 2) supplying an explicit explanation of the nature of the rule; 3) both. Every one of these conditions resulted in a significant improvement in the ability to generalize the AMR accurately to new items albeit, at the expense of performance speed under all conditions and accurate performance of repeated items under the first condition. However, even under these supporting conditions, the 8-year-olds’ performance was inferior to that of the older participants. Our findings support the notion of age-dependent maturation in the establishment not only of declarative but also of procedural system in learning a complex language task, and do not support the simple notion of children’s advantage in language-learning skills.

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**L. KISHON-RABIN. Learning to hear better: When is age an advantage?**

Contrary to the notion of sensitive periods of increased brain plasticity early in life, recent studies suggest that the prolonged development of auditory and cognitive systems during childhood may lead to inferior auditory learning abilities in children. In this presentation, we report on two studies that compared learning induced gains in the auditory modality between children and adults using two different auditory skills:

frequency discrimination (FD) and grammar learning (GL) of a rule from a sequence of non-linguistic auditory stimuli. In the 1st study, 20 children (7-9 years old) and 24 young adults (YA) underwent 10 training sessions of FD at 1 kHz. In the 2nd study, 18 12-year old children and 10 YA underwent 5 training sessions, and 8 of the children continued to train in 5 more sessions. In each session, participants listened to sequences of 4 sounds (tones and noise) presented according to an invented rule and then were asked to judge the correctness of the sequences and to complete the last sound the sequence (J&C). For both tasks and groups, learning was observed. However the children and adults differed in the final performance and in the pattern of improvement over time. In the FD, all adults and 60% of the children showed similar final thresholds which could be explained in the latter group by initial DF threshold and non-verbal cognitive abilities. In the GL task, 5 of the YA learned the rule in the J&C tasks but only one YA could describe the rule. In contrast, only 22.2% of the children learned the rule on both tasks but it took them twice as long as the YA, and none knew to describe the rule. Another 22% showed learning only on the completion task and the remainder showed no evidence of learning at all. These findings support the notion of late maturation in auditory learning abilities which may be influenced by maturation of memory mechanisms and the maturation of specific, task relevant cognitive and sensory processing abilities.

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**Paper Session 1:  
Assessment**

**Moderator: Miriam Levav**

**10:00–11:30 a.m.**

**M.A. GONCALVES, M.R. SIMOES & A. CASTRO-CALDAS. A Systematic Review on WAIS-III: A Special Focus on Acquired Brain Injury.**

**Objective:** We undertook a systematic review to explore (1) the main target of the publications, (2) the main conclusions of the clinical/neurological studies which used the whole WAIS-III battery and (3) the criteria used to select subjects for clinical/neurological studies.

**Participants and Methods:** EBSCO Host database was searched three times (2011-06-08; 2013-01-29 and 2014-01-14) using the term “WAIS-III” and the only limiters applied were “full text” and “Scholarly (peer reviewed) journals”. A total of 226 articles were identified from the literature search.

**Results:** We classified 28 as theoretical articles, 23 articles as no WAIS-III focus nor data, 28 as articles focused on other tests but with WAIS-III data, 13 as articles focused on short-forms, 46 as articles with the technical manual samples, and 88 as articles with various kinds of samples. We subcategorized all 88 articles with samples and analyzed in detail, looking for a specific profile, those articles that had clinical (neurological/psychiatric) samples, and that used the whole battery. Then we went back to the 226 articles, we identified 20 that had mixed neurologic or neuropsychiatric samples and we analyzed all inclusion criteria described at the article’s methods sections.

**Conclusions:** At the end, we came to the conclusions that (1) most of the published articles on this systematic review have neuropsychologists as the main target, (2) there is no profile specific to brain injury only, and (3a) apart from two articles, there is no selection of brain injury samples according to injury localization and (3b) the so called “mixed neurologic/neuropsychiatric samples” are really a mixed and disorganized accumulation of various etiologies of brain diseases.

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**C. SUWARTONO, M. HENDRIKS, M. HALIM & R. KESSELS. Adaptation of the Wechsler Adult Intelligence Scale - 4th edition (WAIS-IV) for Indonesia.**

**Objective:** Aim of this study was to translate and validate the WAIS-IV for the Indonesian population. Here we present the results of the first pilot study examining its psychometric properties.

**Participants and Methods:** The pilot study consists of 473 participants from Java island to determine items and item sequences. Representative participants were selected on the basis of the demographical distribution of the Indonesian Statistical Bureau; 59% were female, ages were between 16 - 69 (M=33.0, SD=13.7). Educational background was junior high school (7.2%), senior high school (36.8%), academy (7.6%), undergraduate (36.4%), master (11%), and doctoral (1%). Index difficulty analyses were performed. Reliability coefficients were obtained (Cronbach's alpha and the intraclass correlations, two way mixed model with absolute agreement). Exploratory factor analysis (EFA) was performed with principal components analysis for extraction method (varimax with Kaiser normalization).

**Results:** For most subtests the items' index difficulties were not distributed from easy to difficult. 50% or more changes in item sequences were necessary for CO, IN, FW, VC, VP, PCm, SI, and MR, and the item orders of those subtests were rearranged. Cronbach's alpha of the WAIS-IV subtests ranged from .62-.84. Interrater agreements ranged between .91-.97. The EFA produced two factors with eigenvalues >1. The variance that explained by the first (general) factor (47.9% out of 56.2%) in the initial solution.

**Conclusions:** Based on this relatively big pilot study a first version of the WAIS-IV was developed for Indonesia. The item sequence in most of the translated Indonesian WAIS-IV subtests had to undergo major changes with respect to item difficulty compared to the US version. The reliabilities of the subtests are generally good, and have high interater agreement. Overall, the results of this first pilot study provide a psychometrically promising good starting point basis for the standardization of the Indonesian version of WAIS-IV.

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**G. KRAUSZ, R. ORTNER, C. GUGER, J. RODRIGUEZ, A. ESPINOSA, S. LAUREYS & Z.R. LUGO. Opening Doors - A BCI-based Tool for Detection of Awareness and for Communication with Non-Responsive Patients.**

**Objective:** Over 40% of patients diagnosed as vegetative are reclassified as (at least) minimally conscious when assessed by experts. We introduce an approach using BCI (Brain-Computer Interface) technology for assessment of patients suffering a disorder of consciousness, and even providing basic communication with some of them. The EEG signals are automatically analyzed and classified on a computer. The system combines three different BCI approaches within one tool: auditory P300, tactile P300, and motor imagery. An auditory or tactile oddball P300 paradigm is used for an initial assessment of the patient. As long as patients have enough cognitive functions to understand spoken messages, they can be trained to use different mental strategies to provide simple YES/NO answers to questions.

**Participants and Methods:** Six chronic locked-in patients (P300 approach) and 20 healthy subjects (motor imagery approach) participated in an initial validation study. Mann Whitney U-tests are used to indicate the level of significance of intra-subject differences between target and non-target P300 responses. A linear discriminant analysis (LDA) is used to classify the signals trial-by-trial and to generate accuracy plots

indicating the required number of repetitions to reach a certain level of accuracy. For the motor imagery approach common spatial patterns (CSP) are computed and used to train a LDA. The single trial classification uses the LDA output every 0.5 seconds and a majority voting assigns the final output of each trial.

**Results:** The results from the P300 group show that 4 out of 6 locked-in patients were able to reach accuracy clearly above chance level after 7 to 20 repetitions. In the motor-imagery group an average accuracy of 80.7% was achieved. 6 participants reached accuracy between 90 and 100% and only one could not exceed 60%.

**Conclusions:** The approach can provide both, simple assessment of consciousness and cognitive functions in non-responsive patients, as well as simple communication in terms of YES/NO answers.

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**M. TAL SABAN, A. ORNOY & S. PARUSH. Adolescent and Adults Coordination Questionnaire- AAC-Q: Development and Psychometric Properties.**

**Objective:** The purpose of this paper is to describe the development of a brief, ecologically valid, self-report questionnaire, the AAC-Q, used to identify developmental coordination disorder (DCD) in adolescents and adults. In recent years we have learned that DCD can continue into adulthood, influencing participation in daily life, learning and quality of life. Despite this increasing awareness of the implications of DCD, only a few tests include older age ranges.

**Participants and Methods:** Participants and Method: The development of the AAC-Q included three phases; development of the questionnaire, establishment of psychometric properties and determining cut-off scores. We began with a pool of functional tasks and activities that can cause difficulties for adolescents and adults with DCD, in accordance with DSM-5. This pool of items was narrowed down to 18 potential questions which then underwent content validity, ecological validity and qualitative evaluation. At the completion of the first phase the AAC-Q included 12 questions. Psychometric properties were then established based on 28 adolescents and adults with suspected DCD, ages 16-35 yrs (M=21.18), and 28 matched peers without DCD (M=26.64) who completed the questionnaire.

**Results:** Reliability of the AAC-Q was determined using Cronbach  $\alpha$  ( $\alpha=.88$ ) and test-retest reliability ( $r=.94$ ;  $p < .001$ ). An independent sample t-test to assess construct validity revealed significant differences between groups ( $t_{27}=9.37$ ;  $p<.001$ ). Cut-off scores were established using data from a random sample of 2379 adolescents and young adults aged 19-25 (1081 males [45.4%]; mean age=20.68 SD=3.42).

**Conclusions:** Conclusion: The overall purpose of this study was to establish a questionnaire for identifying DCD in adolescents and adults. The AAC-Q was found to be a standardized, reliable, valid, brief, ecological and user friendly measure to screen DCD.

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**D. OVADIA, S. ANNA & G. BOTTINI. Neuropsychology as a Tool for a More Ethical Approach to Cognitive Rehabilitation.**

**Objective:** Neuropsychology can help clinicians in doing an ethical triage for rehabilitation not only on the basis of cognitive impairments but also on the residual cognitive reservoir. Since the early development of rehabilitation medicine, ethical issues have been discussed, such as level of informed consent, allocation of scarce resources and the selection of patients with the better prognosis (Caplan A et al, 1987). Cognitive rehabilitation aggravated rather than simplified the ethical dilemmas (Sarno MT, 2007), as it also involves issues with neurologically impaired persons such as: respect of the autonomy related to



impaired communication, understanding the level of competence in decision-making (Sim J, 1998).

**Participants and Methods:** We will use as an example MAPS (Mental Acute Performance in Stroke), a test developed by our lab to identify subtle deficits and residual cognitive potentialities in acute stroke with two aims: a better triage of patients with good prognostic indexes and selection of the best rehabilitation program (Sedda A et al, submitted). We administered MAPS to 107 acute stroke patients, (left brain and right brain damage) and mapped the brain lesion volume.

**Results:** We found that, except for subtests exploring apraxia, all the other subtests of MAPS are able to highlight spared abilities in stroke patients. MAPS is able to fill the actual gap between the need to assess patients in the acute phase of stroke and the absence of reliable instruments and allows to detect not only impairments but also spared functions.

**Conclusions:** The common lack of resources in our health systems, especially in the area of cognitive rehabilitation, asks neuropsychology to change its theoretical perspective from the measurement of the deficits to the evaluation of what has been spared by the disease.

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## Paper Session 2: Attention

Moderator: Nachum Soroker

10:00–11:30 a.m.

**T. MAZOR-KARSENTY, S. PARUSH & L. SHALEV. Comparing the Executive Attention of Adult Females with ADHD to that of Females with Sensory Modulation Disorder (SMD) under Aversive and Non-Aversive Auditory Conditions.**

**Objective:** Behavioral expressions of SMD are often similar to those of ADHD in pediatric and adult populations. There is also a high comorbidity rate between these two diagnoses and lack of research regarding the neuropsychological differentiation between them. This study aimed to analyze the performance of adults with SMD on executive attention under non-aversive conditions and their performance on the same measure under aversive auditory conditions, and compare it to that of adults with ADHD.

**Participants and Methods:** Participants were 66 adult females: 20 with SMD, 20 with ADHD and SMD, six with ADHD alone, and 20 controls. The experimental measures were the Battery of Aversiveness to Sounds (BAS), a standardized measure of aversive sounds, and the Stroop-like Location – Direction Task (SLDT) to assess executive attention. The BAS was administered during the initial stage of the experimental procedure, from which the three most aversive sounds specific for each participant were chosen. Afterward, participants' performance on the SLDT was measured under two conditions: with aversive sounds and without sounds.

**Results:** A 2 x 2 factorial design with repeated measures was performed. Results under the non-aversive condition indicated a specific core deficit in executive attention for ADHD but not for SMD. Results under aversive auditory conditions indicated that the presence of the SMD factor contributed to significantly worse performance on the most demanding sub-task of executive attention, the Direction sub-task.

**Conclusions:** We provide an important, groundbreaking discovery, of SMD impairment in a unique combination of a cognitively demanding task with aversive sounds, providing preliminary objective evidence differentiating SMD from ADHD.

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**S. YAAKOBY-ROTEM & R. GEVA. Asymmetric Attention Networks: The Case Of Children.**

**Objective:** Visuospatial attention networks are represented in both hemispheres, with right-hemisphere dominance. Little is known about the lateralization of the attention networks in children. The objective of the current study was to generate an adaptation of the Attention Network Test for Children (ANT-C) (Rueda et al., 2004) and the Lateralized Attention Network Test (LANT) (Greene et al., 2008) to create a children's version of the latter (LANT-C).

The first aim was to compare performance on the ANT-C with results of the LANT-C. The second aim was to study the added value of the LANT-C by studying expressions of each of the three attention-networks as functions of a lateralized stimulus presentation, and lateralized execution. The goal was to understand how the different combinations of stimulus presentation field and executing hand influence the functioning of the three networks in children.

**Participants and Methods:** Participants were 82 children, aged 5-6y. They were examined with the ANT-C, LANT-C, and intelligence and attention questionnaires. To assess the lateralization of attentional-networks performance on the LANT-C was compared with performance on the ANT-C.

**Results:** MANOVA showed a main effect for network, with high efficiency for orienting and lower executive efficiency (accuracy;  $p < 0.001$ ,  $\eta^2 = .282$ ). An effect for procedure elucidated higher efficiency in the ANT-C relative to LANT-C (accuracy;  $p < 0.01$ ,  $\eta^2 = .097$ ). A procedure x network interaction was also found; procedure difference was present in alerting and executive networks ( $p < 0.05$ ,  $\eta^2 = .096$ ). A LANT-C analysis showed left visual-field alerting advantage, while right hand benefitted executive performance.

**Conclusions:** Results extend previous findings manifesting a right-hemisphere advantage in children's alerting-attention, pointing to the importance of lateralization of brain function in understanding the integrity of attention networks in children.

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**A. BLOCH, L. BRICK, M. REFAEL, K. ARIAV & E. VAKIL. Context Effects in Adults with ADHD: Behavioral and Eye Movement Measures.**

**Objective:** The purpose of this study was to compare context effects (CEs), in a face recognition task, of adults with ADHD with those of a control group. Behavioral and eye movement measures were recorded and analyzed.

**Participants and Methods:** 15 individuals diagnosed with ADHD (ages 18-31) and 15 control individuals participated in this study. Three types of memory were tested: direct memory of target, direct memory of context and indirect memory of context (i.e., CE). Eye movements were recorded during the learning and the recognition phases of the task. Participants were presented with 48 pairs of faces and were asked to memorize one of them that was marked with a red square (i.e., target). The other face was viewed as context. Recognition of the target face was tested under four different context conditions: repeat, re-pair, new and no context. In addition, direct memory of context was tested. We hypothesized that both groups will show CE but overall the control group will recognize more faces. With regard to eye movements we hypothesized that the group with ADHD would spend less time on target and more context faces compared to controls.

**Results:** As predicted, both groups showed CE and the controls recognized more target faces than the group with ADHD. Additionally, eye movements during learning indicated that significantly more time was spent on targets than on the contexts. The most pronounced differences between the groups were the time spent and number of fixations on the targets rather than on the context stimuli. All participants made more transitions when shown with the same original context condition as in learning (i.e., repeat) compared to the other context conditions.

**Conclusions:** ADHD leads to impaired recognition but does not affect the CE. Thus, individuals with ADHD use contextual information as

recognition cues. The deficient eye movements observed in the participants with ADHD is associated with their poorer recognition of target faces.

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**R. SZCZEPANOWSKI, P. STYRKOWIEC, T. KOMENDZINSKI & L.O. HARVEY JR.. Attentional Selection Mediates Affective Processing in the Perceptual Crowding Task.**

**Objective:** Perceptual crowding studies show that spatial closeness of peripherally located objects impairs visual awareness. In fact, a recent crowding study shows that unaware emotional faces can effectively bias subsequent judgments indicating that crowded items are suppressed at the letter stage of visual processing. Here, we advanced this study by showing that attentional selection is mainly involved in resolving competition among crowded faces, and the interaction between awareness and attentional selection is mediated by thresholds.

**Participants and Methods:** Twenty-nine volunteers participated in the study, and performed a crowding task in which facial targets exhibiting anger had to be distinguished from scrambled faces. Attentional selection was manipulated by varying peripheral locations of the crowded objects. Given that the underlying processing was viewed as all-or-none, the confidence-rating data were fitted with the variable-criteria Krantz's threshold model. To get the best-model fits to the experimental data we employed a maximum-likelihood estimation method based on the method of scoring, implemented in RscorePlus software.

**Results:** The Krantz's threshold model accounted successfully for the variance in the confidence-rating data as the chi-square statistics gave non-significant values for both peripheral conditions ( $p > .05$ ). We then examined the interaction between awareness and attentional selection by analyzing the signal parameters from the model with repeated-measures ANOVA. The analysis revealed that more conscious responses for emotional targets were produced when crowded objects were located nearer to the fovea.

**Conclusions:** Our crowding study demonstrated that attentional selection may be predisposed in determining which neural representation of multiple stimuli can reach visual awareness (the highest levels of processing). Moreover, it is also plausible that emotional percepts are mediated between conscious and unconscious states via thresholds when attentional selection occurs.

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**S. ASHKENAZI. Domain-specific and domain-general effects on strategy selection in complex arithmetic: evidences from Attention-Deficit Hyperactivity Disorder (ADHD) and normally developed college students.**

**Objective:** The solution of multi-digit addition problems involves numerous strategies such as, memory based retrieval or adding the decade first followed by the units. Here, we investigated the role of domain specific factors related to math ability, versus domain general factors such as executive functions on strategy selection and accuracy in complex addition problems.

**Participants and Methods:** In order to examine the role of domain general processing, typically developed college students were compared to Attention-Deficit Hyperactivity Disorder (ADHD) students due to the ADHD deficits in executive function and sustained attention.

**Results:** Contrary to the findings usually found in studies with adults, we discovered that both domain specific factors and domain general factors play a significant role in the strategy selection process and accuracy in solving complex addition problems. Importantly, domain specific and domain general abilities uniquely impact the complex arithmetical condition (carry over; e.g., 59+63) but not the simple arithmetical condition (non-carry; e.g., 52+63).

**Conclusions:** Hence, the present finding suggests that superior executive function or superior sustains attention abilities can serve as a compensatory mechanism to low approximate number system acuity. Therefore, it is important to assess both domain general and domain specific factors when diagnosing math disabilities.

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**Poster Session 1:  
Aging, Behavioral Neurology, Cancer, Dementia,  
and Stroke/Aneurysm**

**10:00–11:30 a.m.**

**Aging**

**T. FISHER, N. ADLER, G. COHAVI-PERETZ, Y. TAVOR, R. BEN-HAYUN & J. AHARON-PERETZ. Aging ADHD: A New Concept.**

**Objective:** During aging subjective reports of cognitive problems become common. Conditions such as age associated cognitive impairment; MCI and dementia increase in prevalence and are the prominent diagnoses. The contribution of prior undiagnosed ADHD is seldom taken into consideration. The aim of the current study was to examine whether childhood or adult ADHD should be considered relevant in the differential diagnosis of cognitive complaints in aging.

**Participants and Methods:** Thirty six individuals, age 50-70, diagnosed with probable ADHD (pADHD), and 29 controls participated. The pADHD group included 12 individuals self referred due to complaints of cognitive decline or memory impairment, previously undiagnosed with ADHD (ADHD-A) but with lifelong symptomatology of ADHD and fulfilling ADHD criteria, and 24 individuals, parents of diagnosed ADHD individuals and reporting ADHD symptoms (ADHD-B) but without complaints regarding recent cognitive decline. Neuropsychological evaluation consisted of the Conners' Adult ADHD Rating Scale, BDI, logical memory subscale, California Verbal Learning Test (short), CANTAB (PAL, IED) and the T.O.V.A. The study was conducted at the Cognitive Neurology Clinic - Rambam Health Care Center and granted the approval of the local IRB committee.

**Results:** ADHD-A were impaired on attention parameters while memory and executive functions were intact. ADHD-B did not present measurable attention or other neuropsychological deficits as compared to controls. Neither group fulfilled criteria for MCI or dementia.

**Conclusions:** We propose that ADHD should be considered as an additional entity in the DD of subjective cognitive complaints in the elderly. Recognition of the specific profiles of ADHD should contribute to the ability to reach optimal differentiation from predementia conditions, and thus enable tailoring of appropriate therapies. The pathophysiology and future trajectory of the emerging ADHD symptomatology in elderly patients fulfilling lifelong ADHD symptomatology has still to be elucidated.

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**T. HATTA, A. IWAHARA, T. HATTA, E. ITO, C. HOTTA, K. FUJIWARA & N. NAGAHARA. Developmental Trajectories of Verbal and Visuospatial Abilities in Healthy Older Adults.**

**Objective:** Two models of cognitive aging, the hemisphere asymmetry reduction in older adults (HAROLD) model and the right hemi-aging model, were compared based upon the verbal memory and visuospatial task performance of 338 elderly participants.

**Participants and Methods:** A total of 338 healthy rural community dwellers over 50 years of age participated in this research study; 206 were women and 132 were men. All participants were enrolled in the

Yakumo Study in Japan. They showed no sign of physical disorders, internal disease, or dementia at the initial phase of the study.

To examine developmental changes by using a cross-sectional design, participants were assigned into five groups based on their age decade of 50's (n = 62; 17 men, 45 women), 60's (n = 128; 52 men, 76 women), 70's (n = 95; 39 men, 56 women) and 80's (n = 53; 24 men, 29 women). Logical memory function was evaluated using the Japanese version of the Wechsler Memory Scale-Revised (WMS-R) and the Money Road-Map Test can be regarded as reflecting right hemisphere visuospatial ability. We compared whether the developmental changes on both tasks show different declining trajectories.

**Results:** The analyses showed a sex difference in the process of performance decline with increasing age. However, there was no evidence for a superiority of spatial ability over verbal ability; instead both abilities declined gradually as age increased. These findings suggest that both right and left hemisphere functions decline as age increases.

**Conclusions:** The findings support the view of the HAROLD model rather than the right hemi-aging model of cognitive aging.

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#### **M. SHIN, J. KWON & M. KIM. A Normative Study of the Korean Version of Memory Diagnostic System (MDS) for Elderly.**

**Objective:** This study aims to calculate the norms for normal aging elderly on newly developed computerized Korean version of neuropsychological test (Memory Diagnostic System, MDS, Shin & Kwon, 2013, forthcoming).

**Participants and Methods:** Four hundred healthy elderly (200 male, 200 female) aged 60-74 years (mean age = 66.95 years) were recruited for the study. Subjects who have illiteracy, dementia, sensory deficit, neurological disorder were excluded. The subjects' age was coded as 60-62, 63-65, 66-68, 69-71, and 72-74 years group. The MDS measure various cognitive functions, such as attention, verbal and visuo-spatial memory, verbal and visuo-spatial working memory, and executive function. We analyzed normative data on verbal and visuo-spatial memory and attention tests by different age groups.

**Results:** There were linear declining trends of memory and attention by aging. The older age was associated with poorer verbal and visuo-spatial memory and attention scores.

**Conclusions:** This study demonstrated the gradual decline of verbal and visuo-spatial memory, and attention abilities in normal elderly with age. This normative data could be helpful to discriminate between people with normal aging memory decline and those with dementia or mild cognitive impairment (MCI).

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#### **J.B. ALLEN, K. DAVIDSON, C. KOCIUBA & E. HANDLE. Diagnostic and Evaluative Considerations in Dementia Assessment with an Ethnically Diverse Sample.**

**Objective:** This study addresses the relationship between premorbid cognitive estimation methods and current intellectual and functional status in an ethnically diverse sample of older individuals. In particular, it focuses on the impact of ethnocultural differences in most optimally establishing reliable estimates of premorbid functioning. Historically, various predictive methods related to both demographic factors (years of educ., vocational status, etc.) and measures of literacy (NART, WTAR, etc.) have been used to establish premorbid estimates of intellectual functioning to which current cognitive and adaptive functioning performance can be compared in individuals with potential cognitive decline; however, previous studies have not addressed the effects of ethnocultural differences on reliability of premorbid cognitive estimation.

**Participants and Methods:** The researchers recruited 100 participants, including 55 African American individuals. The participants in the study had an overall mean age of approximately 72 and possessed on average 13 years of education. After conducting screening and informed consent procedures, researchers interviewed and assessed each participant in the domains of cognitive, adaptive, and reading status.

**Results:** Estimates of education quality at both the elementary education level ( $r = .34$ ,  $p < .001$ ) and secondary education level ( $r = .41$ ,  $p < .001$ ) were significant predictors of current cognitive performance for the African American participants but not for the Caucasian participants. Additionally, alternative measures of reading recognition (PIAT;  $r = .77$ ,  $p < .001$ ) produced more accurate IQ predictions than more established performance measures.

**Conclusions:** Findings suggest that determining quality of education in addition to identifying years of formal education may contribute to more reliable pre-morbid IQ estimates, particularly when working with ethnically diverse individuals. Also, the study results clarified the relationship between pre-morbid cognitive estimates and current adaptive functioning.

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#### **S. ZIMERMAN & R.R. HASSIN. Implicit Motivation Makes the Brain Grow Younger: Improving Executive Functions of Older Adults.**

**Objective:** The dominant view in the cognitive sciences holds that while controlled processes (e.g., working memory) decline with age, implicit, automatic processes do not. Here we challenge this view by arguing that high-level automatic processes (more specifically, implicit motivation) decline with age, and that this decline plays an important and as yet unappreciated role in cognitive aging. We hypothesized that since high-level automatic processes are less likely to be spontaneously activated in old age, their external activation should have stronger effects on older (vs. younger) adults.

**Participants and Methods:** In two experiments we used different methods to boost implicit motivation, and measured executive functions of healthy younger (18-25 years of age) and older adults (60-75 years of age) using the Wisconsin Card Sorting Task (WCST).

In Experiment 1 (n=69) we used goal priming to recruit achievement motivation: participants were exposed to either achievement related words or control words before tested on the WCST.

In Experiment 2 (n=120) motivation was manipulated by subtly increasing engagement in the task: we created a modified version of the WCST that uses cards with pleasant faces instead of geometric shapes. Other than replacing shapes with faces the tests were identical. The design of both Experiments was a 2 (Implicit motivation: high [goal priming/faces] vs. low [Control/shapes]) x 2 (Population: Younger vs. Older adults) between subjects design.

**Results:** In line with our reasoning above, in both experiments analysis of variance revealed that implicitly induced changes in motivation significantly improved older adults' performance in the WCST, while their effects on younger adults were milder.

**Conclusions:** These results cast doubt on current explanations of age-related decline in executive functions, and open up new directions in research on cognitive aging.

Importantly, they have consequential implications for neuropsychological assessment and interventions that are designed to help the elderly.

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#### **X. ORTIZ, J. BORRANI & P. VALDEZ. Effects of Age on the Components of Attention in Elderly People.**

**Objective:** Cognitive processes such as attention are diminished in elderly people, compared to younger adults. In this study, attention was

analyzed during normal aging using a neuropsychological model with four components: tonic alertness, phasic alertness, selective attention and sustained attention. The aim of this study was to analyze changes on the components of attention during aging.

**Participants and Methods:** Participants were 43 elderly people aged between 60 and 81 years old (21 females, 22 males; age:  $72.00 \pm 5.83$  years), with no history of sensory or neurological disorder that performed all their daily living activities themselves. A continuous performance task was used to assess the components of attention.

**Results:** Age correlated with all components of attention. As age increased, correct responses decreased (tonic alertness:  $r = -0.43$ ,  $p < 0.01$ ; phasic alertness:  $r = -0.45$ ,  $p < 0.01$ ; selective attention:  $r = -0.45$ ,  $p < 0.01$ ) and reaction time increased (tonic alertness  $r = 0.32$ ,  $p < 0.05$ ; phasic alertness:  $r = 0.40$ ,  $p < 0.01$ ; selective attention:  $r = 0.40$ ,  $p < 0.01$ ). Regarding sustained attention, as age increased, the general stability of performance decreased (standard deviation of correct responses:  $r = 0.43$ ,  $p < 0.01$ ; standard deviation of reaction time:  $r = 0.52$ ,  $p < 0.001$ ).

**Conclusions:** All components of attention decrease in elderly people while they are aging. The attention difficulties found in this study may affect the daily activities of elderly people, since they suggest a lower ability to respond to stimuli in general (tonic alertness), benefit from warning signals (phasic alertness), give specific responses to specific stimuli (selective attention) and keep responding efficiently over time (sustained attention). These difficulties could make elderly people commit more errors and therefore hinder their capacity to live independently. Correspondence: *Jorge Borrani, Laboratory of Psychophysiology, Universidad Autonoma de Nuevo Leon, Mutualismo 110, Col. Mitras Centro, Monterrey 64460, Mexico. E-mail: jorgeborrani@yahoo.com.mx*

#### **A. IWAHARA & T. HATTA. Better control of blood pressure in midlife was associated with cognitive function in old age: The Minabe Study in Japan.**

**Objective:** Several studies show that hypertension in midlife is also related to cognitive impairment in old age. However, the associations between blood pressure and cognitive functions have been inconclusive. In this study, we examined this association in the sexagenarian and the septuagenarian separately to test our hypothesis that different risk factors were related to cognitive decline in each generation respectively.

**Participants and Methods:** Participants were 1338 community-dwelling persons without dementia (678 men and 660 women). Resting systolic and diastolic blood pressures were measured in the seated position using an automated sphygmomanometer (HEM-907; Omron). The cognitive functions were measured by means of logical memory test, D-CAT (digit cancellation test) and verbal fluency test. We asked participants about their use of antihypertensive drug and collected their data about blood pressure measured at a health examination conducted ten years ago. We constructed a series of multiple linear regression models to examine the association of blood pressure with each cognitive function. Separate analyses were conducted for each combination of predictor (SBP, DBP, past SBP, past DBP, and use of antihypertensive drug) and dependent value (logical memory test, D-CAT, and verbal fluency test). Regression models included the following covariates: age, education, gender, and body mass index.

**Results:** Results indicated the following two points: (1) Higher levels of past DBP was associated with decline in logical memory test and higher level of past SBP was associated with decline in verbal fluency test in the sexagenarian, (2) The use of antihypertensive drug was associated with decline in D-CAT and verbal fluency test in the septuagenarian.

**Conclusions:** Our findings suggest that high blood pressure in the past decade is risk factor for cognitive decline in the sexagenarian but is not risk factor in the septuagenarian. The treatment of high blood pressure in midlife is important for the maintenance of cognitive functions.

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#### **I. CONTADOR, A. SERNA, E. BOYCHEVA, V. PUERTAS-MARTÍN, J. BENITO-LEÓN & F. BERMEJO-PAREJA. Effect of Education and Literacy on Cognitive Performance in a Community-Based Sample of non-Demented Spanish Elders.**

**Objective:** Education has traditionally been used for normalization and interpretation of cognitive test. However, scientific evidences show that literacy may be a better predictor of cognitive performance than years of schooling in some populations. We examined whether literacy is an independent predictor of cognitive test scores over and above age, sex and years of education among non-demented elders.

**Participants and Methods:** A sample of 1,510 participants was selected from the NEDICES, a community-based epidemiological study of dementia and other neurological conditions in Central Spain. All individuals completed a screening phase for dementia (MMSE-37 & Pfeffer's scale) plus a standardized brief neuropsychological battery (attention, language, memory and executive functions). Those individuals with history of Parkinson's disease, tremor, ictus or dementia were excluded of the sample. Multiple Linear Regression analyses, entering demographic variables as a first step (age, sex and years of education) and Word Accentuation Test (WAT) as measure of literacy in the final step, were carried out to test the relative influence of education and literacy on cognitive performance.

**Results:** Forty-five percent of the sample did not obtain the primary school certificate ( $\leq 5$  years; 3% were illiterates). The Pearson's correlation between years of schooling and literacy was 0.49. Literacy has a significant independent effect on cognitive test performance beyond that predicted by demographic variables such as age, sex and education. This effect appears to be stronger on recall (story and words) and verbal fluency, but was also significant on naming and visual-motor sequencing task.

**Conclusions:** These findings provide further evidence that literacy better predicts cognitive performance than years of education. Future investigations should clarify the strengths of these contributors regarding the demographic and socioeconomic characteristics of the sample. Correspondence: *Israel Contador, Departamento de Psicología Básica, Psicobiología y Metodología de las Ciencias del Comportamiento, Universidad de Salamanca, Avenida de la Merced 109-131, Salamanca 37005, Spain. E-mail: icontador@usal.es*

#### **L.K. OBLER, J. HYUN, A. PAPLIKAR, E. HIGBY, M. GORAL & D. CAHANA-AMITAY. Measuring Lexical Retrieval in Older Adults' Discourse.**

**Objective:** While confrontation naming tasks are commonly used to measure language abilities in aging, scores on standard tests do not necessarily reflect age-related word-finding problems in natural speech. Fewer correct object labels have been reported in a video-description task for older vs. younger adults (Heller & Dobbs, 1993), as have more irrelevant content words (Arbuckle, et al., 2000). We asked whether performance on standard naming tasks predicts lexical retrieval in discourse (cf. Kavé et al. 2009).

**Participants and Methods:** To elicit specific words we gave 135 adults aged 55-84 a picture-book, *Frog, Where Are You?* (Mayer, 2003), with 31 objects and 15 actions circled, asking them to tell the story mentioning the circled items. Appropriateness of participants' responses was rated on a Likert scale by 30 age- and education-matched raters. Participants were also given two standard lexical retrieval tasks—Boston Naming Test for nouns (BNT) and Action Naming Test for verbs (ANT). **Results:** After age, education and gender were adjusted for, BNT and ANT accuracy predicted acceptability of lexical responses in discourse (nouns:  $p < .001$ ; verbs:  $p = .003$ ). Since the discourse nouns and verbs were of higher frequency than the BNT and ANT ones, we selected a subset of each with comparable frequencies. For these, Age predicted noun but not verb retrieval (BNT:  $p = .005$ ; nouns-in-discourse:  $p = .009$ ; ANT:  $p = .071$ ; verbs-in-discourse:  $p = .300$ ). We found a significant main effect for both task ( $F = 253.54$ ,  $p < .001$ ) and word class ( $F = 99.27$ ,  $p < .001$ ) and an interaction between the two ( $F = 99.27$ ,  $p < .001$ ). Lexical retrieval was poorer in discourse than in confrontation

naming, with verbs showing lower accuracy than nouns only in discourse ( $p < .001$ ).

**Conclusions:** Word-finding in confrontation naming, thus, predicts lexical retrieval in discourse. Discourse, however, permits much greater variability in responses, especially for verbs, which may lead to retrieval of less ideal word choices.

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### **M. ASGHAR, S. SALIM, G. PATKI & J. WILLIAMS. Potential role of grape powder in improving age-related decline in brain and kidney functions.**

**Objective:** Using rat model of aging, we recently reported that aging is associated with impairments in kidney and brain function. And, age-associated oxidative stress seems to be a contributing factor for these abnormalities in aged rats. Present study was undertaken to examine whether grape powder (rich in polyphenols) treatment is beneficial in improving age-related decline in kidney and brain functions.

**Participants and Methods:** Adult (2-month) and aged (21-month) Fischer 344 rats, an aging model of rats, were subjected to grape powder/placebo treatment (15g/L in drinking water ad libitum) for 4 weeks followed by determination of brain and kidney functions. Brain function was evaluated using learning and memory tests (radial arm water maze). Kidney function was determined as the ability of dopamine (a natriuretic hormone) to produce sodium excretion and by measuring proteinuria. Bladder urine and blood plasma were obtained for biochemical studies.

**Results:** We found that learning and memory function was decreased in control aged than in adult rats, which increased with grape powder in aged rats. Also, natriuretic response (sodium excretion) to dopamine was reduced in control aged compared to adult rats, which increased in grape powder treated aged rats. Furthermore, there was greater magnitude of urinary protein levels in aged than in adults, which decreased with grape powder in aged rats. Interestingly age-associated oxidative stress markers (protein carbonyls and malondialdehyde) in urine and plasma decreased with grape powder treatment in aged rats.

**Conclusions:** Our results suggest that oxidative stress could be a risk factor for age-related decline in brain cognitive and kidney functions. And, grape powder through its antioxidant activity seems to restore aging brain and kidney functions. Since kidney function contributes to cardiovascular outcome grape powder may have potential to reduce age-associated cardiovascular disorders as well.

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## **Behavioral Neurology**

### **M. ODAGIRI, K. UEDA, T. MURAI, Y. OHICASHI & S. FUNAHASHI. Investigation of the Underpinning Mechanisms of Sequential Object Use Disorder Using Eye-tracking.**

**Objective:** To elucidate mechanisms of sequential object use disorder through the analysis of a patient's visual search strategy and eye-hand coordination.

**Participants and Methods:** The patient was a 68-year-old, right-handed man with multiple system atrophy. While showing mild ataxia of the extremities, he could perform pointing, smooth pursuit, saccade, and single object use. He completed standard neuropsychological and praxis tests. During sequential object use, look-ahead (LAF), next-target, and immediate fixations, which would help future, next, and immediate actions, respectively, were extracted. The number of action units, which were subdivided into the smallest component characterized by a spatial or qualitative change of object, was also calculated, in addition to the performance time, the eye movement distance, and the number of action errors.

**Results:** The number of LAFs was associated with the proportion of action units with spatial transformation only in the control group. The total number of the patient's LAFs was significantly lower than that of the control group, and was associated not only with correct actions but also with incorrect ones. Next-target fixations were significantly decreased only in the trials where the goal was not achieved. The number of the patient's action errors was correlated with the eye movement distance per action unit.

**Conclusions:** LAFs might have an important role related to a spatial sketchpad system for future action. The patient's visual search during tasks depended not on LAFs but exclusively on next-target and immediate fixations. However, when the visual search distance was long, next-target fixations and sequential object use also became vulnerable and impaired. Fundamental dysfunction observed in LAFs and next-target detection might reflect the dysfunction of sequence processing in the cerebellum.

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### **M.A. OLIVEIRA, F.C. MAIA, R.O. AMORIM, A.F. ANDRADE, G.C. BENUTE, M.J. TEIXEIRA & M.C. LUCIA. Comparison of cognitive outcome in patients after cerebellar stroke and cerebellar stroke patients undergone decompressive surgery.**

**Objective:** The cerebellar strokes involving compression are rare and the worsening of prognosis may result in the patient's death in few minutes or days. Patients with cerebellar stroke can also develop a hypertensive and present hydrocephalus symptoms or brainstem compression, the surgical intervention can determine the evolution and prognosis of these cases; however the best time for such intervention remains controversial. The aim of this study was to compare two patients groups of ischemic cerebellar stroke outpatients; the first group underwent the decompressive procedure, the second group was not operated. We performed neuropsychological evaluation and humor and anxiety scales in both groups.

**Participants and Methods:** The sample was seven outpatients referred by the neurosurgery team of Hospital das Clínicas of São Paulo separated in operated or non-operate. The neuropsychological assessment took place in one session using the following instruments: MoCa; BAI; BDI; RAVLT, EXIT-25 and the vocabulary of WAIS III. For the statistical test was used the Mann-Whitney for small samples.

**Results:** No significant differences were found in groups .MoCa ( $p=0.72$ ); BAI ( $p=0.28$ ); BDI ( $p=0.85$ ); RAVLT ( $p=0.47$ ); EXIT (0.85); Vocabulary ( $p=0.28$ ); inferring that the cognitive sequelae can follow similar course in both groups. The patients' performance within the same group showed a large discrepancy which may have caused the data variation, we assume that these data can reflect a pre morbid pattern and not due to injury.

**Conclusions:** Although surgery is more invasive, there were no significant differences in cognitive performance compared to non-operated patients, showing that regardless of the treatment cognitive prognosis seems to be similar in both groups.

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### **L. MAN & S. FENG. Brief social isolation in early adolescence affects cognitive learning and BDNF mRNA in different age rats.**

**Objective:** Studies showed that isolation rearing can disrupt behaviors and brain development of rats. Traditionally, isolation was conducted from weaning to adulthood. Our study was to examine the effects of early adolescent isolation (PND21–34) on cognitive learning and BDNF mRNA in the medial prefrontal cortex (mPFC), nucleus accumbens (NAc) and hippocampus of adolescent and adult rats

**Participants and Methods:** On PND21, male Sprague Dawley rats were randomly assigned to either socially-reared or isolation-reared conditions and kept for two weeks (PND21–34). Next, the isolation-reared

rats were randomly returned to group-rearing for a three week re-socialization period (PND35–55), and socially reared rats were randomly reassigned to a new group. On PND35 and PND56, rats from each group were chosen for Morris water maze testing and PCR assays.

**Results:** At PND35, for spatial and reversal learning, there were no significant difference between the socially-reared and isolation-reared rats. For BDNF mRNA, adolescent social isolation resulted in an increased level in the mPFC but decreased levels in the hippocampus and NAc.

At PND56, for spatial learning there was no significant difference between social and isolated rats. However, for reversal learning, the escape latency of isolation-reared rats was increased significantly at the first and third day. And the distance traveled of the isolated rats was also increased at the third day. For BDNF mRNA, isolated rats showed decreased levels in the hippocampus and NAc.

**Conclusions:** Early adolescent social isolation makes different influence on cognitive function and BDNF mRNA levels of adolescent and adult rats. It only impaired the reversal learning of adult rats, however the decreased BDNF mRNA in hippocampus and NAc was lasted from adolescence to adulthood. The current findings support the use of adolescent isolation rearing as an useful model to probe the neurodevelopmental mechanisms of some neuropsychiatric disorders, such as schizophrenia. Correspondence: *Li Man, psychology, Peking University, Rm 2064#48, Yanyuan Peking University, Haidian District, Beijing, China, 100871, Beijing 100871, China. E-mail: liman32401@163.com*

## Cancer

**K. MARGELISCH, M. STUDER, M. STEINLIN, K. LEIBUNDGUT & T. HEINKS. Cognitive deficits in children with cancer before and after treatment.**

**Objective:** Children with brain tumors (BT) often feature cognitive problems after medical treatment such as surgery, radiation, and/or chemotherapy. Results of a few empirical studies indicate that a variety of functional deficits can already be present before the start of treatment. Children with cancer not involving the central nervous system are not expected to show disease-related cognitive problems. Since they are usually exposed to a comparable level of emotional and physical distress, they serve as a well-balanced control group (CG) in the analysis of cognitive performance of children with BT. Thereby the impact of the disease itself on cognitive functions can be distinguished from the effects of the following treatment.

**Participants and Methods:** We analyzed an array of cognitive functions in 20 children with BT and 27 control patients. In both groups, tests were administered at diagnosis (T0), (i.e. before any therapeutic intervention such as surgery, chemotherapy or irradiation), and after the termination of the intensive medical treatment phase (T1).

**Results:** At T0, performance of children with BT was comparable to that of CG patients in the areas of intelligence, perceptual reasoning, verbal comprehension, and processing speed. However, BT patients performed significantly worse in working memory, verbal learning and attention measures. At T1 BT patients still showed these deficits. This time 33% of the children with BT showed a performance of one standard deviation below the normative mean in at least four different cognitive compared to 20% at T0.

**Conclusions:** Verbal learning, memory and attention seem to be the most vulnerable functions affected by BT. Children with BT who already perform in an impaired range at T0 seem to be those most vulnerable to further cognitive sequelae caused by therapeutic interventions. Thus, there is a need for cognitive assessment and intervention in children with BT as early as possible in the treatment process to minimize long-term cognitive deficits.

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**G. SELA, F. ANDELMAN, O. BARZILAI, T. GONEN, S. RAZI, R. GROSMAN & Z. RAM. Impact of oncological surgery on neurocognition.**

**Objective:** Cancerous brain tumors are known for their influence on neuro-cognition alongside other functions like motor functions and daily activities. Surgical treatment of these tumors reduces intra cranial pressure and increase the life span of these patients. In the current study, we performed pre surgical and post surgical neurocognitive evaluation of patients with primary brain tumors.

**Participants and Methods:** 100 patients with an MRI based diagnosis of brain tumor underwent neurocognitive evaluation. This included an estimate of IQ, language, verbal and spatial memory, attention and working memory (verbal and spatial) and spatial organization. Of the 100 patients, 40 had a post operative diagnosis of high grade (grade III+IV), 60 patients were diagnosed as low grade.

**Results:** The low grade patients had a better pre operative function on measures of language, spatial memory and spatial organization compared to patients with high grade tumors, despite the larger tumor size. After surgery, all patients groups improved on measures of language, spatial memory, verbal attention and working memory and spatial organization but not on verbal memory, spatial attention and working memory.

**Conclusions:** There are baseline differences in neurocognitive function of neuro-oncology patients' possibly as a function of tumor type and speed of tumor gross. Moreover, after surgery, all patients groups shows a trend of improvement in there neurocognitive function.

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**I. MESKAL, K. GEHRING, S.D. VAN DER LINDEN, G.M. RUTTEN & M.M. SITSKOORN. Cognitive functioning in meningioma patients in preoperative and postoperative stage.**

**Objective:** Cognitive dysfunction is common in patients with primary brain tumors and may have a major impact on quality of life and the ability to perform activities of daily living. Previous studies have mainly focused on glioma patients. This prospective follow-up study examined cognitive functioning in meningioma patients before and after surgery.

**Participants and Methods:** Sixty-eight meningioma patients were neuropsychologically assessed in the St. Elisabeth Hospital, Tilburg, The Netherlands, one day before intracranial surgery. Sixty-two patients were followed up three months after surgery. To identify the impaired domains of cognitive function, all patients were assessed with a computerized battery of neuropsychological tests (i.e., CNS Vital Signs) including memory, psychomotor speed, reaction time, complex attention, cognitive flexibility, processing speed, and executive functioning.

**Results:** Meningioma patients showed significantly lower scores on all cognitive domains preoperatively and postoperatively, in comparison with healthy controls ( $p < 0.05$ ). Preoperatively, 47 out of 68 patients (69%) scored low or very low on one or more cognitive domains. Post-operatively 27 out of 62 patients (44%) scored within this range. Test performances of meningioma patients improved three months after surgery, with the exception of psychomotor speed and reaction time.

**Conclusions:** Based on these results, we conclude that meningioma patients are faced with cognitive dysfunction in several cognitive domains both pre- and postoperatively. Diagnosis and treatment of these cognitive deficits should help improve treatment outcomes and quality of life in meningioma patients.

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**Y. LAI, C. LIN, C. YANG & M. HUA. A Case of Recurrent Malignant Parotid Tumor Manifesting Progressive Aphasia as Initial Neuropsychological Symptoms.**

**Objective:** Malignant parotid tumor is rare with high recurrence rate and its initial symptom is also hard to detect due to slow progression. Progressive cognitive changes are showed due to brain tissue compressed by the tumor's growth and invasion into skull base and intracranial region. This report presents a case with recurrent parotid tumor manifesting progressive linguistic deficits as initial symptoms.

**Participants and Methods:** A 63-year-old, right-handed male with a left-sided malignant parotid tumor diagnosed in 2007 and received parotidectomy and chemotherapy with regular follow-ups. He has suffered from an insidious onset of naming difficulty with slow progression since Sep., 2012, followed by poor memory and slowed response from early 2013. Aforementioned symptoms with rapid deterioration plus comprehension and reading difficulties have been noted since Oct., 2013, so he visited our Neurology Clinic where primary progressive aphasia (PPA) was initially suspected. A comprehensive neuropsychological assessment (NPA) and brain MRI were arranged for differential diagnosis.

**Results:** NPA revealed global impairments of core linguistic functions, deteriorated intellectual function, and impairments of orientation, memory, and executive function. PPA was ruled out at first for his atypical linguistic impaired patterns. Brain MRI suggested the recurrent tumor invaded intracranial region, compressed the left perisylvian and temporal lobe, and induced a mass effect contributing to his linguistic deficits, memory and processing speed deterioration, and recent subacute general cognitive decline which interfered with ADLs. Major Neurocognitive Disorder, probably due to another medical condition (tumor related), was impressed based on DSM-5.

**Conclusions:** This report suggests that intracranial tumor invasion might also cause progressive cognitive decline. Clinicians should consider tumor recurrence when a patient with tumor history showed progressive cognitive decline.

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**M. VAN ZANDVOORT, M.L. BROEKMAN, T. SEUTE, T. SNIJDERS, M. RADOS, C. RUIS, W. SPLIET, I. HUENGES WAJER, R. HOFF & P. ROBE. Neuropsychological functioning and survival after awake craniotomy under intra-operative stimulation in malignant appearing primary brain tumors.**

**Objective:** Diffuse high grade gliomas (HGG) are progressive primary brain tumors that are almost always fatal. Neurosurgical intervention in order to (partial) resect the brain tumor under intraoperative stimulation monitoring (ISM) in awake patients is increasingly becoming available for low grade gliomas to preserve neurocognitive functioning. In this study we evaluate cognitive outcome in HGG patients operated under ISM.

**Participants and Methods:** Patients were tested with a concise neuropsychological test battery 1 week prior to awake surgery under ISM. Patients stable in the first week post surgery were included after 6 months. Test performances were standardized on highly comparable controls and differences in pre versus post treatment were analyzed with paired t-tests corrected for multiple testing, effect-sizes were calculated.

**Results:** 20 of the 27 patients that were included for pre-surgical examination could be included for post-surgical evaluation of whom 13 patients were seen. 7 patients were lost due to: (2) logistical reasons, (5) decrease in condition due to tumor progression. Survival rate of these patients was favorable. No differences in neuropsychological functioning were found and increase in number of impairments was only found on verbal fluency.

**Conclusions:** We conclude that awake craniotomy under ISM in HGG does enhance favorable outcome in terms of survival and this does not increase focal cognitive impairments at six months after surgery. Nevertheless, cognitive integrity represented in mental processing speed and dynamic language function appeared vulnerable in this population.

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**M.A. OLIVEIRA, G.G. BENUTE, C. CORREIA, M.C. LUCIA & M.J. TEIXEIRA. Cognitive assessment of a patient with insular glioma: case report.**

**Objective:** The cognitive functioning of the insular cortex is controversial in various aspects, there are some issues regarding the role of the insular cortex in human cognition. Therefore, this study aims to assess the cognitive function of a patient diagnosed with a high grade glioma affecting the insular region, encroaching the frontal and temporal lobes.

**Participants and Methods:** The instruments utilized were: Montreal Cognitive Assessment (MoCa); Rey Auditory Verbal Learning Test (RAVLT); Beck Depression Inventory (BDI), Functional Assessment of Cancer Therapy Brain questionnaire (FACT-Br), Frontal Assessment Battery (FAB), International Affective Picture System (IAPS); Katz index for daily life activities, Trail making test (TMT), estimated IQ (intelligence quotient) calculated using the Matricial Reasonable and the Vocabulary subtests of Wechsler Intelligence Scale for adults (WAIS III), Controlled Word Association Test (COWAT) and Rey Complex Figure Copy Test (RCFT). The patient was a female, 62 years old, married, and completed the high school grade.

**Results:** The neuropsychological assessment showed: impaired performance in screening test (MoCa), no depressive symptoms (BDI), low processing speed (TMT), preserved fluency (COWAT), preserved intellectual functioning (WAISIII), no data for visual constructive skill (the patient refused to finish the task – RCFT), preserved daily life activities (Katz index). On IAPS categorization of the pictures, the patient showed impaired ability attributing feelings even for neutral pictures.

**Conclusions:** In the analyses of this case was evident the emotional commitment of the patient, who had clearly difficulties in recognizing neutral stimuli, associations between emotional state and behavioral interference and emotions hindering the accomplishment of specific tasks.

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**M.A. OLIVEIRA, K.G. SAKIHAMA, G.G. BENUTE & M.C. LUCIA. Olfactory meningioma: a case of behavioral alterations.**

**Objective:** The olfactory meningioma is part of a group of primary tumors and represents a significant percentage of the population causing extensive compression at the brainstem, usually diagnosed when already have a large size. The aim of this study is to present a neuropsychological assessment of a olfactory meningioma with prominent behavioral alterations especially in executive functioning.

**Participants and Methods:** The participant was a male, 41 years, complete high school, after bilateral resection of a olfactory meningioma at 2013 year. The instruments used at neuropsychological assessment: Rey Auditory-verbal Learning Test (RAVLT), Montreal Cognitive Assessment (MOCA), Controlled Word Association Test (COWAT), Wechsler Intelligence Scale (WAIS III), Behavioral Assessment of dysexecutive Syndrome (BADS), Quality of life (FACT), Trail Making Test (TMT), The Executive Interview (EXIT 25).

**Results:** The main results found were in Executive functioning: planning, impulsivity, prolixity in speech, emotional lability, organization, self regulation, showed in EXIT and BADS instruments. Impaired Long-term Episodic memory, showed by RAVLT and, constructive visual ability.

**Conclusions:** Comparing the case with the classical patient Phineas Gage, we could observe the same behavioral alterations especially reported by the familiar and changes in his personality. He used to be more aggressive, engaging in risky behaviors, unfaithful, arrogant and full of ambitions for the future. After the surgery, the patient seems to be more loving with his family and wife, unable to engage in risky

activities, unable to make decisions about his future. Even though he shows permanent personality changes his executive functioning in problem solving is impaired as well.

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### Dementia (Alzheimer's)

#### M. KALBI, J. CATINDIG, S. MARASIGAN & J. NAVARRO. Transcranial Doppler Ultrasonography: A Method of Evaluating Cognitively Impaired and Non-cognitively Impaired Elderly.

**Objective:** The purpose of this study was to investigate and compare the cerebral hemodynamic status (blood flow velocity and pulsatility index) of cognitively impaired and non-cognitively impaired elderly using Transcranial Doppler.

**Participants and Methods:** This is a cross sectional study conducted in Jose R. Reyes Memorial Medical Center (JRRMMC) from January to August 2013. Forty patients were selected using convenience sampling and were screened using the Montreal Cognitive Assessment-Philippines (MoCA-P). Scores more than or equal to 21 were grouped under non-cognitively impaired elderly while scores lower than 21 were under cognitively impaired elderly. Transcranial ultrasound basal examination were performed using a 2-MHz power motion probe (M-mode) to study the middle cerebral artery (MCA), the anterior circulation artery (ACA) and posterior cerebral artery (PCA).

**Results:** Our findings showed that patients with cognitive impairment have lower mean flow velocity ( $p$  value=0.0001) and higher pulsatility index ( $p$  value=0.0001) when compared to non-cognitively impaired elderly.

**Conclusions:** Our findings are congruent with previous observations that abnormalities in cerebral hemodynamic status are present in cognitively impaired elderly and may be related to microvessel damage secondary to vascular risk factors.

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#### A. KIRK, D. HAGER, C. KARUNANAYAKE, D.G. MORGAN & M. O'CONNELL. What predicts cognitive decline over one year in rural and remote persons with Alzheimer's disease?

**Objective:** To investigate predictors of cognitive decline, we examined the association between cognitive change over one year and socio-demographic, clinical, and functional data at diagnosis in a rural and remote Saskatchewan population with Alzheimer's disease.

**Participants and Methods:** Participants were consecutively diagnosed in our Rural and Remote Memory Clinic with probable Alzheimer's disease by NINCDS-ADRDA criteria. Our sample included 72 (66.7% female) patients with AD. Independent variables included socio-demographic, clinical, and functional information collected through questionnaires and assessments administered at diagnosis. The dependent variable was the difference between MMSE score at one year follow-up visit and MMSE score at initial visit. Variables underwent bivariate linear regression analysis. All associated variables then underwent multiple regression analysis to determine predictors of cognitive decline.

**Results:** Mean age at diagnosis was 75.3 (SD=7.44). We found that female gender, poor Bristol Activities of Daily Living score, and history of hypertension were significantly associated with a greater decline in MMSE score at one year.

**Conclusions:** Female gender, decreased ability to carry out activities of daily living, and history of hypertension predicted greater cognitive decline at one year. Many previously suggested predictors of cognitive decline were not found to be predictors in this study suggesting that predictors may vary between populations. Additional research is

required in this field to identify clinically useful predictors of decline and interactions between them.

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#### M. ENNOK, K. BURK, K. ANNI & ÜLLA. LINNAMÄGI. WAIS-III Qualitative Errors in Patients with Alzheimer's Disease.

**Objective:** Wechsler's Adult Intelligence Scale is one of the most commonly used test for quantitative comparisons of various intellectual abilities. Qualitative performance of its subtests has received fewer attention. The aim of this on-going study is to analyse qualitative aspects of errors made in WAIS-III and compare results between patients with Alzheimer's disease (AD) and healthy control subjects.

**Participants and Methods:** Current sample is 12 patients with AD (mean age: 73.2, mean MMSE: 21.7) and 12 healthy controls (mean age: 73.8, mean MMSE: 29.0). All participants were administered Estonian version of WAIS-III. All 0-point answers in Picture Completion (PC) and Similarities (S) subtests were divided into in set or out of set error types.

**Results:** Raw scores and number of 0-point answers differed significantly between groups. In PC subtest both groups made more in set errors than out of set errors. Of all errors in AD group, 37% were in set and 14% were out of set errors. Control group had 27% in set and 15% out of set errors. When looking at the error subtypes AD patients gave more "description errors" (part of out-of-set errors) than control group ( $p=.033$ ). In S subtest AD group made more out of set errors (46% of all errors) than control group (36%); in set errors were more frequent in control group (32% of all errors) than in AD group responses (18%). Additionally AD group gave more "not alike" answers (20% of all errors, compared to 7% on control group errors).

**Conclusions:** Results proved that there are some qualitative differences of errors. Qualitative analysis can lead to better understanding of patients' cognitive impairments and can help more accurately diagnose different neuropsychological disorders.

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#### V. MANFREDI, A. PARENTE, L. SCHIFANO, S. OLIVERI & A.R. GIOVAGNOLI. Non-Pharmacological Approach to Cognitive Decline.

**Objective:** Non-pharmacological treatment may help limit the impact of cortical damage on psycho-behavioral aspects in Alzheimer's disease (AD). Psycho-education and mental-physical activities may enhance mood and interpersonal communication. This study explored the effects of psycho-education and music therapy, added to standard drug therapies, on the psycho-behavioral pattern of patients with AD.

**Participants and Methods:** Forty patients with moderate AD treated with standard pharmacological therapy were selected. Psycho-behavioral aspects were evaluated with the Neuropsychiatric Inventory (NPI) (Cummings et al., 1994). Patients were randomly assigned to the experimental group (pharmacological plus non-pharmacological therapy) or control group (pharmacological therapy). The experimental treatment consisted in social and psycho-education activities and music therapy group sessions using rhythmical and melodic instruments. Each treatment lasted three months. The psycho-behavioral functions were evaluated before and at the end of the treatment.

**Results:** After treatment, patients of the experimental group showed a significant decrement of the NPI Depression score, while no change was observed in the control group.

**Conclusions:** The combination of pharmacological and non-pharmacological treatment contributes in ameliorating the psycho-behavioral pattern of patients with AD. Non-pharmacological treatment increasing patients' information and enhancing interpersonal relationships may particularly improve mood and support coping.



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**V.L. VIEIRA, S. BRUCKI, A. MARTINS, M. OLIVEIRA, L. VASCONCELOS, F. CANALI, L. LEITE, B. BITTENCURT, L. VAZ, P. BERTOLUCCI & O. BUENO. Methodological procedures in clinical rehabilitation of Alzheimer's disease patients.**

**Objective:** Present a clinical rehabilitation program focusing on family guidance and introducing compensatory strategies, thus enabling maintenance of functionality, diminished psychiatric symptoms, and enhanced quality of life for patients and caregivers.

**Participants and Methods:** 12 patients (6 female), average age 75.42 (06.22), and 9:58 (5.6) years of schooling. Fulfilled NINCDS / ADRDA criteria and were taking maximum anticholinesterase dose. Cognitive profile was evaluated using MMSE, ADAS-Cog, Wechsler Memory (Information and Orientation), Personal Data and Temporal Orientation. Caregivers responded to the NPI and Functional Activities Questionnaire (FAQ). After Initial testing (T1), retesting after 8 months of rehabilitation program (T2). Comprised two sessions per week and Family Guidance every fortnight. Techniques used: Reduced clues, spaced learning, reminiscence therapy, and reality orientation, guided by errorless learning. Patients filled out Personal Data (PD) and Temporal Orientation (TO) every day

**Results:** MMSE (T1: 23.25 (1.82)/ T2: 23.42(2.81); ADAS-Cog (T1: 17.11 (6.73)/ T2: 2.21 (8.59), WMS Information (T1: 4.33(1.89)/ T2: 4.58(1.73); WMS Orientation (T1: 3.75(1.29)/T2: 3.67(0.89); DP-StreetT1: 3.00(0.00)/T2: 2.92 (0.29); District T1: 3.00(0.00)/ T2: 3.00(0.00);TelephoneT1: 2.75(0.62)/T2: 2.75 (0.62), NPI-(T1: 23.42(23.38)/T2: 19.83(17.73); FAQ-(T1: 10.67(7.24)/ T2: 13.92(6.92)

**Conclusions:** These results show that external supports adapted to patients conditions may help maintain functionality for longer periods when introduced in the initial phase of the disease.

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**Dementia (Subcortical, Specific Disorders, MCI, etc.)**

**C. CHI, C. CHEN, G. PENG, H. MA & S. CHIANG. Post-surgical Cognitive Changes in Idiopathic Normal Pressure Hydrocephalus: the Recovery Pattern.**

**Objective:** Improvement in cognitive function after ventriculoperitoneal(VP) shunt placement with idiopathic normal pressure hydrocephalus(iNPH) patient still remains controversial. The long-term changes on the neuropsychological performance after VP shunt insertion of patients with iNPH were followed and examined.

**Participants and Methods:** We identified 19 participants meeting the criteria for iNPH. All patients underwent neurological, radiological, and neuropsychological examinations before and after lumbar drainage. All patients showed improvement in at least 1 clinical symptom with lumbar drainage. They were treated by VP shunt and in follow-up a series of neuropsychological tests were administered in 1, 4 and 12 months with pre-lumbar drainage as baseline. For some reasons, there were 5 patients at the 1 month, 7 patients at the 4 month and 6 patients at the 12 month follow-up respectively. The same tests were used each time to measure global cognitive function, visual construction, memory and verbal fluency. These tests were the Wechsler Adult Intelligence Scale—Third Edition (WAIS—III), the word lists subtest of the Wechsler Memory Scale—Third Edition (WMS—III), Rey Complex Figure Test (RCFT), and the Semantic Association of Verbal Fluency test.

**Results:** The Wilcoxon signed-rank test for repeated measurement on a single sample was used to compare the cognitive results at pre- and post-surgery. A significant( $p<0.05$ ) difference was shown in global cognitive function and memory at the 1 month follow-up. There were improvements in memory and verbal fluency at the 4 month follow-up. At the 12 month follow-up, global cognitive function and memory showed a significant( $p<0.05$ ) difference.

**Conclusions:** This long-term study demonstrates patients with iNPH treated by VP shunt showed the recovery pattern in general intelligence, consolidation and retrieval in memory, and verbal fluency. These findings implicate global cognitive abilities and frontal lobe related functions will be improved after the shunt treatment.

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**D. ZILBRKWIT, M. ESHKAR, Y. RASSOVSKY, M. BEERI & R. RAVONA. Bilingualism and Personality as A Form of Cognitive Reserve: The Influence of The Big Five Personality Traits and Command of Multiple Languages on Neuropsychological Performance in Type-2 Diabetic Elderly.**

**Objective:** Numerous studies have demonstrated a link between type-2 diabetes, increased risk of cognitive decline, mild cognitive impairment, and dementia. However, the mechanism through which diabetes affects brain and cognitive functions is not fully understood. In the present study, we examined two factors that could potentially mediate the impact of diabetes severity on cognition. Specifically, we examined the impact of bilingualism and personality features on the relationship between diabetes severity and cognitive outcome. Bilingualism, or command of different languages, requires frequently choosing and alternating between distinct languages on a daily basis, and taps diverse cognitive functions, such as working memory, switching or cognitive flexibility, and inhibitory control. Several studies have demonstrated that bilingualism was related to delay in onset of dementia and higher integrity of white matter. Studies that examined personality factors in this context demonstrated differential patterns of relationship with decline. For example, studies have shown a positive association between high neuroticism and cognitive decline, whereas high conscientiousness and high openness was associated with a better cognitive outcome

**Participants and Methods:** In the present study we collected data using the The Big Five Inventory and a revision of the Language Experience and Proficiency Questionnaire on 70 participants diagnosed with type-2 diabetes, as part of a longitudinal project of the Israel Diabetes and Cognitive Decline (IDCD)

**Results:** We found that Extraversion, Neuroticism, and Openness to Experience, as well as measures of bilingualism, affected the association between illness severity and cognitive decline.

**Conclusions:** These findings suggest bilingualism and several personality characteristics may be part of cognitive reserve, by serving as protective factors that moderate the detrimental effects of diabetes on cognitive decline.

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**P. BISIACCHI, G. CONA, V. TARANTINO & G. CAPIZZI. Assessing Inter- And Intra-Individual Cognitive Variability In Patients At Risk For Cognitive Impairment.**

**Objective:** Recent evidence reveals that inter- and intra-individual variability significantly affect cognitive performance in a number of neuropsychological pathologies. We applied a flexible family of statistical models to elucidate the contribution of inter- and intra-individual variables on cognitive functioning in healthy volunteers and patients at risk for hepatic encephalopathy (HE).

**Participants and Methods:** Sixty-five volunteers (32 patients with cirrhosis and 33 healthy volunteers) were assessed by means of the Inhibitory Control Task (ICT).

Generalized Additive Model for Location, Scale and Shape (GAMLSS) was fitted for jointly modeling the mean and the intra-variability of Reaction Times (RTs) as a function of socio-demographic and task related covariates. Furthermore a Generalized Linear Mixed Model (GLMM) was fitted for modeling accuracy.

**Results:** When controlling for the covariates, patients without minimal hepatic encephalopathy (MHE) did not differ from patients with MHE in the low-demanding condition, both in terms of RTs and accuracy. Moreover, they showed a significant decline in accuracy compared to the control group. Compared to patients with MHE, patients without MHE showed faster RTs and higher accuracy only in the high-demanding condition.

**Conclusions:** The results revealed that the application of GAMLSS and GLMM models are able to capture subtle cognitive alterations, previously not detected, in patients subclinical pathologies.

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**O. BEZDICEK, J. MICHALEC, T. NIKOLAI, P. HAVRÁNKOVÁ, R. JECH, J. ROTH & E. RUZICKA. The Contribution of the Mattis Dementia Rating Scale to the Diagnosis of Parkinson Disease Mild Cognitive Impairment.**

**Objective:** Mattis Dementia Rating Scale (MDRS) has been suggested as a standard diagnostic tool for the assessment of Parkinson disease mild cognitive impairment (PD-MCI) at Level I (screening instruments for assessing global cognitive abilities, Litvan et al.; 2012). The main objective of our study was to identify the discriminative properties of the MDRS to identify PD-MCI. PD-MCI diagnosis was determined on the basis of comprehensive neuropsychological battery (Level II; performing  $-1.5$  SD below the mean).

**Participants and Methods:** We compared the cognitive performance in the MDRS in two groups matched according to age and education levels: 60 PD-MCI patients (mean age:  $59.6 \pm 7.4$ , education:  $13.9 \pm 2.9$ ) and 77 controls (NC; mean age:  $57.7 \pm 9.3$ ; education:  $14.6 \pm 2.6$ ).

**Results:** The cognitive performance between PD-MCI and NC was different in following MDRS scores: Total score  $p < .001$ ; moreover, in subscales Attention  $p = .005$ ; Initiation  $p < .001$  and Memory  $p < .001$ . ROC curve had following characteristics: AUC =  $.803$  (95% CI =  $.720-.886$ ;  $p < .001$ ), with the screening cutoff score determined at  $<139$  points, the MDRS showed the highest combined sensitivity of 64% and specificity of 91% in the detection of cognitive deficit in PD-MCI.

**Conclusions:** MDRS seems to have a fair discriminative validity as a diagnostic tool for the diagnosis of PD-MCI at Level I as derived from a comprehensive battery at Level II. MDRS can be recommended as an appropriate screening tool at Level I according to the standard PD-MCI criteria.

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**S. JOHANIDESOVÁ, E. BOLCEKOVÁ, R. MATĚJ & R. RUSINA. Neuropsychiatric and Cognitive Aspects of Creutzfeldt-Jakob Disease.**

**Objective:** The most frequent form of prion diseases is the Creutzfeldt-Jakob disease (CJD). Its diagnosis is based on the combination of fast progressing dementia with other neurological symptoms. Biomarkers include assessment of cerebrospinal fluid (protein 14-3-3), MRI and EEG. The aim of this study is to analyze cognitive-behavioral symptoms in patients with post-mortem confirmed CJD.

**Participants and Methods:** 15 patients with post-mortem confirmed diagnosis of CJD were included in this study. Average age was 63.7 years

(52-76 years), men and women were represented evenly. 14 patients had sporadic form and one patient had genetic CJD with R208H PRNP mutation. Clinical data and results of neuropsychological assessments were analysed retrospectively.

**Results:** Average duration of sporadic CJD form was 4.4 months (range 2-9 months). All patients suffered from cognitive deficits with frontal traits and alteration of executive and language functions (dysarthria, global aphasia). Other cognitive domains were also affected (mnestic and visuospatial functions including constructional apraxia). Bradypsychia, perseveration, grasping, utilization and echopraxia were frequently found among the patients. The most frequent neuropsychiatric symptoms were depression, apathy, irritability, anxiety, aggression, visual hallucinations and insomnia.

**Conclusions:** Early detection of prion disease is very important for the patient and his/her family. As there is no causal therapy, it is important to protect the patient from undergoing further useless and often uncomfortable examinations and to begin with palliative care as soon as possible.

In the wider context the gained data could help to assist in developing new neuropsychological testing methods.

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**A. GONÇALVES, A. MENDES, N. VILA-CHÃ, I. MOREIRA, A. BASTOS LIMA & S. CAVACO. Verbal Fluency and Motor Symptoms In Parkinson s Disease: Parallel Paths?**

**Objective:** Verbal fluency tests are commonly used to assess cognitive functioning in Parkinson s Disease (PD) patients. The association between this measure of executive functions and motor symptoms in PD is still poorly understood. The study goal was to explore the association between semantic fluency and motor symptoms in PD.

**Participants and Methods:** One hundred and eighty-six consecutive patients with idiopathic PD (50% men; mean age=68.57, sd=11.24; mean education=5.9y, sd=4; mean disease duration=8.1y, sd=5.4; mean levodopa equivalent dose (LED)=835 mg, sd=548) were included. Unified Parkinson s Disease Rating Scale-III (UPDRS-III; mean=32.4, sd=10.8) was measured after 12 hours without antiparkinsonian medication. Semantic fluency measures (animals and supermarket) were applied under the effect of the usual medication of the patient. Pearson's correlation, t-test for independent samples, and multiple linear regression (backward selection) were used for data analyses.

**Results:** Animals score was negatively correlated with age ( $r = -.453$ ,  $p < .001$ ), LED ( $r = -.178$ ,  $p = .015$ ), disease duration ( $r = -.191$ ,  $p = .009$ ) and UPDRS-III ( $r = -.367$ ,  $p < .001$ ), and positively correlated with education ( $r = .533$ ,  $p < .001$ ). Similar correlations were found between supermarket score and variables age ( $r = -.330$ ,  $p < .001$ ), LED ( $r = -.263$ ,  $p < .001$ ), disease duration ( $r = -.193$ ,  $p = .008$ ), UPDRS-III ( $r = -.444$ ,  $p < .001$ ), and education ( $r = .364$ ,  $p < .001$ ). No significant sex differences were found ( $p > .05$ ). Multiple linear regression analysis was conducted with semantic fluency scores as the dependent variable and the following as independent variables: age, education, disease duration, LED, and UPDRS-III. Age, education, and UPDRS-III remained statistically associated with semantic fluency animals ( $R^2 = .38$ ) and supermarket ( $R^2 = .31$ ).

**Conclusions:** A strong linear association between semantic fluency and motor manifestations of PD was demonstrated. These results suggest a shared progression and a common underlying pathophysiology.

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**P.A. ANDRADE, J. SALVADOR CRUZ & A.L. SOSA ORTIZ. Speech therapy in progressive nonfluent aphasia: A pilot study.**

**Objective:** Investigate the changes in language processing, neuropsychiatric symptoms (NP), quality of life (QoL), and activities of daily living (ADLs) in four patients with progressive nonfluent aphasia (PNFA) after receiving speech therapy. We have hypothesized that cognitive and socioemotional processes would improve.

**Participants and Methods:** A longitudinal study with a pre - post and follow up evaluation was designed to compare patients with PNFA submitted to speech therapy 1 hour per week for 3 months (stimulating naming, repetition, phonological and syntactic processing); working simultaneously in a daily homework.

Assessments (neuropsychological, NP, QoL and ADLs; and primary caregiver's emotional state, QoL and burden evaluation scales) were applied before and after therapy; a follow up evaluation was conducted three months after therapy was completed, applying the same instruments to patients and primary caregivers.

**Results:** Patients showed improvement in language prosody, fluency, and content of spontaneous speech and a significant improvement in repetition, reading aloud, and oral-phonatory praxis. Aspects of cognitive functioning (orientation, verbal naming, praxis, and memory) remained stable; ADLs and QoL improved. Related to primary caregiver, neuropsychiatric symptoms remain absent, good quality of life and decreased burden.

**Conclusions:** Speech therapy can improve language processing and also positively impact other cognitive and socio-emotional processes in PNFA. This three-month therapeutic stimulation slowed cognitive decline; maintenance and improvements in NP and ADLs were observed, indicators that relate to improvement in quality of life of patients; a success in PNFA treatment, considering the rapid progression of this disease.

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**T. NIKOLAI, M. VYHNÁLEK, O. BEZDÍČEK, H. ŠTĚPÁNKOVÁ, M. KOPEČEK & J. HORT. Performance in four verbal fluency tests and effect of time on item generation in non demented elderly.**

**Objective:** Verbal fluency tests are commonly used to assess language, executive functions and semantic memory in the elderly. The purpose of the study was to evaluate the discriminative potential of both phonemic and semantic fluency in normal ageing (NA), subjective memory complaints (SMC) and amnesic mild cognitive impairment (aMCI).

**Participants and Methods:** Phonemic fluency (2 letters K, P) and semantic fluency (animals, vegetables) were administered as a part of neuropsychological battery to 112 NA subjects, 63 subjects with SMC and 50 aMCI. These three groups did not differ in age and education and level of depression symptoms based on the Geriatric Depression Scale. We measured performance of word generation in 30 seconds intervals and the total score in all verbal fluency tasks.

**Results:** The NA group and SMC outperformed aMCI group in all measures of verbal fluency (total score of phonemic fluency and semantic fluency and all secondary scores,  $p < .05$ ). Only semantic fluency "vegetables" discriminated between control group and SMC in number of words generated in 30-60 seconds interval ( $p < .001$ ).

**Conclusions:** Phonemic and semantic verbal fluency measures differentiate between subjective and objective memory impairment in all measures.

Semantic fluency "vegetables" in the interval 30-60 seconds seems to be the only measure to discriminate between NA and SMC subjects. In conclusion, verbal fluency is a useful tool for identifying cognitive impairment in elderly.

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**A. PARENTE, V. MANFREDI & A. GIOVAGNOLI. UNUSUAL COGNITIVE FINDINGS IN TEMPORAL LOBE DEGENERATION.**

**Objective:** Different patterns of temporal lobe atrophy may characterize frontotemporal dementia (FTD), causing heterogeneous clinical phenotypes involving memory, language and social cognition. The focus of the present study is to describe two cases of temporal lobe degeneration associated with selective cognitive patterns, highlighting the importance of single-case studies in the neuropsychology of FTD.

**Participants and Methods:** Two patients with temporal lobe degeneration underwent detailed neuropsychological assessment investigating: language, attention, executive functions, praxis, perception, memory and emotion recognition.

**Results:** The first case showed a dissociation between the semantics of emotion and non-emotion stimuli, in bilateral temporal lobe atrophy. The second case was characterized by non-fluent primary progressive aphasia (PPA) and preserved praxis and visual-spatial abilities associated with right temporal lobe atrophy.

**Conclusions:** Results suggest a multimodal model of semantic memory in the first case, and a double hemisphere crossing in the second case. The description of the two single cases here reported may contribute to show unusual cognitive patterns in temporal lobe degeneration. Detailed single case examinations are important to the understanding of the architecture of human cognition.

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**A. EK, A. WALLIN & A. NORDLUND. Does Ethnicity and Mother Tongue Affect Results on Neuropsychological Tests in MCI?**

**Objective:** An increasing proportion of elderly people with mild cognitive impairment were born in another country than the present country of residence in countries with a high proportion of labour immigrants, such as Sweden. The study aimed to investigate if patients with MCI who have another ethnicity and mother tongue than Swedish perform differently on a neuropsychological battery than native Swedish MCI subjects. Are the Swedish neuropsychological norms applicable for non native Swedes?

**Participants and Methods:** Forty non native Swedish MCI subjects who spoke fluent Swedish (mean age 66) were compared to 40 age and education matched native Swedish MCI subjects, and 60 healthy controls included in the Gothenburg MCI study. The neuropsychological battery consisted of 20 tests assessing speed/attention, memory, visuo-spatial, language and executive functions.

**Results:** The healthy controls performed significantly better than both MCI groups on 20 out of 24 test variables. The non native Swedes tended to perform slightly worse than the native Swedes on most tests, but there were no significant differences between the MCI groups even on the language tests. There was only one borderline significant difference between the MCI groups on an executive test, Wisconsin Card Sorting Test.

**Conclusions:** The results suggest that the norms (largely from native Swedish populations) used in the Gothenburg MCI study are applicable also for non native Swedes with MCI. Thus ethnicity and mother tongue seems to affect performance on neuropsychological tests less than expected.

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**H. MARKOVA, T. NIKOLAI, K. SHEARDOVA, E. RUBINOVA, J. LACZO & M. VYHNALEK. Specific Questions May Differentiate Between Mild Cognitive Impairment And Subjective Memory Complaints.**

**Objective:** Memory complaints (MC) are a common symptom reported by two distinct groups of patients: those with amnesic mild cognitive impairment (aMCI), whose memory complaints reflect objective cognitive decline of 1.5 SD comparing to norms; and those with subjective memory complaints (SMC), who score normally on neuropsychological tests. The aim of this study was to find whether aMCI patients differ from SMC participants in the global amount of MC and to find specific questions that could differentiate between these groups.

**Participants and Methods:** A sample of 55 non-demented subjects referred to the Memory Disorders Clinic for MC underwent a complex neuropsychological assessment and were further classified into aMCI (n=25) or SMC (n=30) group. Thirty-nine-item McNair's Cognitive Difficulties Scale (CDS) and 10-item Questionnaire de la plainte mnésique (QPM) together with depression and anxiety scales were administered to all patients.

**Results:** aMCI and SMC did not differ in the amount of MC in neither of the scales (difference in QPM approached statistical significance,  $p=0.051$ ). Two complaints distinguished aMCI from SMC: forgetting about meetings and having difficulties with recalling words ( $p = 0.008$  and  $0.013$ , respectively). Participants with aMCI and SMC did not differ in the amount of depressive or anxiety symptoms.

**Conclusions:** In our cohort, frequency of MC does not predict objective impairment in aMCI and cannot distinguish aMCI from SMC subjects. Clinical significance of specific questions must be further analyzed.

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### Stroke/Aneurysm

**A. DUMBRAVA, C. BALUT & M. TOBA. Apathy more than depression seems to interfere with early motor recovery after stroke.**

**Objective:** Several studies proved the negative impact of depression on recovery from stroke; less (if anything) is known concerning the influence of apathy on the same process. The present study is aimed to look at this neglected aspect.

**Participants and Methods:** During hospitalization, the evolution of the neurological recovery after mildly to moderately severe ischemic stroke (assessed with NIHSS) has been compared in equivalent (in respect to usual demographic and clinical parameters) groups of patients corresponding to each combination of depression (major or minor, according to DSM-IV criteria) and apathy (estimated with "The Apathy Evaluation Scale" of Marin, Biedrzycki and Firinciogullari, 1991): with depression but no apathy (n= 25), with apathy but no depression (n= 19), with depression and apathy (n= 23), without any of the two (n= 27).

**Results:** At discharge, the improvement in NIHSS score was similar in patients with depression and without depression or apathy but was significantly lower in the presence as compared with the absence of apathy (either alone or associated with depression). So, it seems that during the early period after stroke, spontaneous recovery is more negatively influenced by apathy rather than by depression.

**Conclusions:** The impact of apathy versus depression in the long run evolution and rehabilitation of stroke patients waits further examination. Correspondence: *Monica Toba, ICM, 47, Bd. de l'Hopital, Paris 75013, France. E-mail: monica.n.toba@gmail.com*

**A. DUMBRAVA, C. BALUT & M. TOBA. Motor symptoms of post-stroke depression.**

**Objective:** Motor dysfunction has been viewed as central to the symptomatology of depression since Kraepelin. However, despite being an overt and relatively objective component of depression, it remains usually assessed just by the impression of the clinician and not by more rigorously psychometric procedure. The aim of present study is to overcome this aspect.

**Participants and Methods:** Motor symptoms has been recorded (distinctly for each component) using "The Motor Agitation and Retardation Scale" (Sobin, Mayer, Endicott, 1998), during the first and the last week of hospitalization for first ever ischemic stroke, in two groups of patients with (n= 53) and without (n= 57) depression (major or minor, according to DSM-IV criteria), equivalent to each other in respect to age, sex ratio, length of education and level of neurological symptoms (mild to moderate, based on NIHSS).

**Results:** At the first moment of investigation, the two groups were significantly indistinguishable on each of the motor symptoms explored; however, before discharge from the hospital, the depressed patients showed a significantly higher degree of motor retardation compared with the non-depressed.

**Conclusions:** The significance of the present data is discussed in the context of the current debate over psychological versus neurological views of post-stroke depression.

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**J.C. ARANGO LASPRILLA, J.A. CALDERÓN CHAGUALÁ, H. CHACÓN PERALTA, G. VERGARA TORRES, L. OLABARRIETA, H.L. ROGERS & P.B. PERRIN. Longitudinal Study of Neuropsychological Changes During the First Year After Stroke.**

**Objective:** To examine cognitive changes in neuropsychological functioning during the first year post-stroke.

**Participants and Methods:** 40 individuals diagnosed with stroke and 40 age- and gender-matched healthy controls from Ibagué, Colombia were administered a comprehensive neuropsychological evaluation at three, six, and twelve months post-injury. The battery included the Trail Making Test (TMT) Parts A and B (abstract visual reasoning), Stroop Test (attention), Digit Symbol Test (speed of information processing), Phonological Fluency Letter "F" Test (executive functioning), Semantic Fluency Category "Animal" Test (semantic memory), Verbal Memory Test (verbal memory), Wisconsin Card Sorting Test (executive functioning), Rey Figure Test (visual-spatial skills), and Boston Naming Test (Vocabulary).

**Results:** The 2 x 3 between and within groups repeated-measures ANOVAs showed (1) main effects for group, with individuals with stroke performing better than controls and (2) main effects for time with improved performance across all three time points on: the TMT A and B, Stroop Color, Stoop Color and Word Digit Symbol modalities, Phonological and Semantic Verbal Fluency, Verbal Memory, Wisconsin number of categories, and Rey Figure recall ( $p's < 0.01$ ). Group x time interactions were found on the Stroop Word, Rey Figure Copy, and Boston Naming Test such that individuals with stroke scored lower than controls but improved their performance over time, while the controls remained high over time ( $p's < 0.05$ ).

**Conclusions:** Even though cognitive functioning improves over time in stroke patients, patients still perform significantly worse than healthy controls even one year after the event. Since these Colombian patients did not receive neuropsychological rehabilitation, these findings suggest that comprehensive cognitive rehabilitation may be warranted within the first year after stroke to accelerate improvement and impact on performance of everyday activities.

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**K. CAMERON, R. STOLWYK & J. PONSFORD. Investigating Appraisal of Disability Post-Stroke: Patient vs. Clinician.**

**Objective:** Investigation of unawareness of deficits post-stroke has traditionally focused on assessment of impairments (e.g., hemiplegia). However, consistent with the WHO-ICF model of disability, there is a need to comprehend how patients perceive their post-stroke abilities at the level of activity limitation and participation restriction. Study objectives were: 1) to characterise the difference between self and clinician ratings of functional ability - referred to as "appraisal discrepancy" 2) to explore any differences in appraisal discrepancy between current functioning and predicted post-discharge functioning; and 3) to explore the association between appraisal discrepancy and various biopsychosocial correlates.

**Participants and Methods:** The results represent the first 19 sub-acute stroke patients recruited. Both the patient and clinician rated the patient's current functioning and predicted functioning three months' post-discharge using the Patient Competency Rating Scale (PCRS). Appraisal discrepancy was calculated by subtracting clinician ratings from patient ratings.

**Results:** As a group, Wilcoxin signed rank tests revealed that patients consistently rated themselves as more competent and independent in their functioning for both current functioning,  $z = -3.82$ ,  $p < .01$ ,  $r = .62$ , and predicted functioning,  $z = -3.82$ ,  $p < .01$ ,  $r = .62$ . However, there was no significant difference in appraisal discrepancy between current and predicted functioning. Correlations indicated that appraisal discrepancies were associated with cognitive impairment, depression and reduced rehabilitation engagement.

**Conclusions:** When compared to clinicians, stroke patients tend to overestimate their functional abilities. However, the nature and degree of this discrepancy remains stable with regard to predicted levels of functioning post-discharge. Findings can guide rehabilitation programs, inform goal-setting practices and identify those patients who are most likely to exhibit appraisal discrepancies.

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## WEDNESDAY AFTERNOON, JULY 9, 2014

### Symposium 2: The Processing of Threat from a Cognitive and Social Perspective

Chair: Delphine Grynberg

2:00–3:30 p.m.

**D. GRYNBERG, D. GRYNBERG, A. PEGNA, M. MERMILLOD, N. VERMEULEN & D. GRYNBERG. The processing of threat from a cognitive and social perspective.**

**Symposium Description:** In our daily life, we are sometimes confronted with threat-related stimuli. These may consist in facial expressions (e.g., fear or anger), frightening animals (e.g., barking dog) or in complex situation (e.g., violent argument). Various studies showed that these stimuli are processed rapidly. In this symposium we will examine in more detail the nature of this processing and how it is modulated by contextual and perceptual factors in healthy and clinical populations.

One aim of this symposium will be to examine the visual awareness of threatening stimuli through Electrophysiological and BOLD responses among healthy and brain damaged populations (Alan Pegna). Another aim will be to investigate the role of spatial frequency channels on the detection of threatening pictures in healthy and clinical populations (i.e., Tourette's syndrome and Parkinson's disease; Martial Mermillod). The influence of a threatening context (i.e., potential unpleasant sensory stimulation after inaccurate responses) on the processing of angry and happy facial expressions will be examined by Nicolas Vermeulen. Finally, Delphine Grynberg will show that specific expressions of threat (i.e., painful faces) require more attentional resources than non-threatening expressions to be processed and are automatically associated with affective empathy.

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**D. GRYNBERG, P. MAURAGE, O. LUMINET & N. VERMEULEN. Attentional and automatic processing of facial expressions of pain.**

**Objectives:** The aims of these studies are to investigate the temporal dynamic of attentional processing of painful expressions and how these expressions are automatically associated with affective empathy.

**Methods:** In the first study, we used the attentional blink (AB) paradigm in order to study the attentional resources that are allocated to painful

expressions. This paradigm allows to investigate how the processing of painful expressions influences (interferes) the detection of subsequent stimuli presented within short time intervals. In the second study, we used a priming paradigm in which ambiguous facial expressions of pain were subliminally primed by words related to empathic concern, distress, or by negative and neutral words. It was hypothesized that empathic concern or distress-related words might facilitate the detection of pain in ambiguous facial expressions of pain as compared to negative and neutral ones.

**Results:** In the attentional blink paradigm, we showed that relative to neutral expressions processing, painful expressions processing produces an AB (i.e., interference with the processing of subsequent neutral stimuli presented after 124 and 335 msec). In the affective priming paradigm, we showed that the detection of pain in ambiguous facial expressions of pain was higher and faster when preceded by distress primes relative to neutral or negative primes.

**Conclusion:** These studies suggest that painful facial expressions modulate the attentional processing at short time intervals and that their processing is automatically associated with personal distress. These studies also suggest that the threat-value of painful expressions may account for these effects.

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**A.J. PEGNA. Unconscious processing of facial expressions : is it the threat or the relevance that counts ?**

**Objectives:** In the last decades, evidence has emerged suggesting that emotional expressions can be processed without awareness through a rapid subcortical visual pathway that runs in parallel with the habitual geniculo-striate route. Evidence from patients with damage to primary visual areas appears to confirm these suggestions. However, this alternate route may not be restricted to threatening or emotional stimuli but may apply more generally to any stimulus providing it is behaviourally relevant to the viewer.

**Methods:** Here we describe a series of studies carried out in patients with damage to their primary visual cortex and who present blindness to the all or part of their visual field, yet who retain the ability of guessing certain features of the stimuli presented to them, a capacity termed blindsight. Electrophysiological and BOLD responses were measured in response to unseen facial expression of emotions as well as other

types of meaningful stimuli such as neutral faces and naked bodies in these patients.

**Results:** fMRI confirms the presence of an amygdala response for emotional faces even in the absence of awareness. Electrophysiological findings mirror these observations, further demonstrating early modulations in both surface and depth recordings of these patients' brains. In particular, similar effects were observed for behaviourally meaningful, non-facial stimuli such as bodies.

**Conclusion:** These findings demonstrate that unconscious processing occurs for threatening stimuli through visual pathways that bypass the established geniculostriate route. More importantly, the data suggest that this mode of processing is used more generally by stimuli that present a certain degree of behavioural significance to the subject.

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### M. MERMILOD. The Importance of Low Spatial Frequency Information for Detection of Visual Threats.

**Objectives:** Research in visual cognition has proposed that low spatial frequency (LSF) information would provide a rapid emotional cue for basic but ultra-rapid behavioral response to a potential visual threat in the environment (Vuilleumier, Armony, Driver, & Dolan, 2003; Pourtois, Dan, Grandjean, Sander, & Vuilleumier, 2005). This effect could be driven by fronto-parietal cortical areas (Bullier, 2001; Bar, 2004), temporal cortex (Livingstone & Hubel, 1988) but also by subcortical tecto-pulvinar regions (Ledoux, 1996; Schiller, Malpeli, & Schein, 1979). **Methods:** We report a series of behavioral and neuropsychological studies that investigated the differential role of spatial frequency channels in response to visual danger and emotional facial expressions for control participants compared to two pathological populations involving dysregulation of the basal ganglia: (i) Tourette's syndrome (TS) and (ii) Parkinson's disease (PD) patients under deep brain stimulation and dopamine replacement therapies active or not.

**Results:** Results show a better recognition of visual danger for LSF compared to HSF band-pass stimuli. However, the recognition of HSF emotional faces seems to be particularly reduced for TS patients. Moreover, if PD patients without therapy produced a lower recognition of LSF stimuli, they also produced lower recognition of HSF stimuli under deep-brain stimulation and dopamine replacement therapy.

**Conclusions:** This suggests a specific role of LSF information for fast recognition of a potential danger in the visual environment. However, the problems of TS and PD patients to recognize HSF emotional expressions suggest an important effect of their pathologies (and therapies!) not only at the level of the basal ganglia, but also at the level of occipito-temporal cortical areas.

**Keywords:** Visual perception – Emotions – Spatial Frequencies – Tourette's syndrome – Parkinson's disease

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### N. VERMEULEN. Desperately Seeking Friends: How Expectation of Punishment Modulates Attention to Angry and Happy Faces.

**Objectives:** The processing advantage for angry faces (i.e., the "anger superiority effect") is a well-known phenomenon showing intrinsic links between attention and emotion. It has been suggested that this effect is driven by a module specialized in the processing of threatening information (i.e., the "fear-system").

**Methods:** We sought to provide direct empirical support for this hypothesis by designing an experiment where detection trials of face stimuli were preceded or not by the presentation of a threat cue, i.e. a visual cue signaling a potential aversive stimulation (i.e., a 90dB white noise). We predicted that the concurrent presentation of this cue would tune the fear-system away from the relatively more secondary threat displayed by the angry faces, thereby reducing the anger superiority effect.

**Results:** First, the potential aversive stimulation (i.e., a 90dB white noise) disrupts the well-known processing advantage for angry faces. Second, it facilitates the detection of happy (smiling) faces.

**Conclusions:** These results suggest that selective attention serves at least two basic purposes: (1) To efficiently detect threatening signals and (2) to detect potential coping resources in the environment. This original finding supports the model of Öhman and Mineka (2001) and is consistent with the notion that human attention is strongly constrained by systems involved in the detection of threat.

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## Paper Session 3: TBI (A)

Moderator: Dan Hoofien

2:00–3:30 p.m.

### J. PONSFORD, M. DOWNING, G. SPITZ & J. OLVER. Outcome 2, 5 and 10 years following traumatic brain injury: A prospective study.

**Objective:** Traumatic brain injury (TBI) may impair capacity to return to many aspects of premorbid life. However, there has been limited longitudinal research examining outcome beyond five years post-injury. The aim of this study was to examine various aspects of functioning over a span of 10 years following TBI.

**Participants and Methods:** One hundred and forty one individuals with TBI were assessed at two, five, and 10 years post-injury. Participants comprised 61% males with a mean age at injury of 34.91 years (SD=16.07), and mean education 11.29 years (SD = 2.43), median GCS of 5 (range = 3-15) and mean PTA duration of 35.75 days (SD = 38.68; range = 0-182). They completed a Structured Outcome Questionnaire, documenting mobility, ADL independence, employment and relationship status and symptoms experienced at 2, 5 and 10 years post-injury.

**Results:** Fatigue and balance problems were the most common neurological symptoms, with reported rates decreasing only slightly over the 10-year period. Mobility outcomes were good in over 75%, with few participants requiring aids for mobility. Changes in cognitive, communication, behavioral and emotional functions were reported by approximately 60% of the sample at all time-points. Levels of independence in activities of daily living were high over the 10-year period, and up to 70% return to driving. Nevertheless, approximately 40% required more support than before injury. Only half the sample returned to previous leisure activities and less than half were employed at each assessment time post-injury. Whilst marital status remained surprisingly stable over time, approximately 30% reported difficulties in personal relationships. Older age at injury did not substantially alter the pattern of changes over time, except in employment.

**Conclusions:** Overall, problems that were evident at 2 years post-injury persisted until 10 years post-injury. The importance of these findings is discussed with reference to rehabilitation programs.

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### K.D. GAINES. Executive Functioning of Combat Veterans Diagnosed with Mild Traumatic Brain Injury.

**Objective:** The purpose of this study was to investigate whether U.S. veterans deployed in Iraq or Afghanistan with mild Traumatic Brain Injury (mTBI) show neuropsychological deficits.

**Participants and Methods:** Veterans discharged between 2007 and 2012, ages of 18 and 50 were recruited from Veterans Affairs clinics. Independent groups, mTBI (57) and no-TBI (57) were screened to exclude history of neurological conditions, learning disabilities, Attention Deficit Hyper Activity Disorder, and substance abuse. Demographic

data included age, ethnicity, marital status, medications, and education. Groups were administered psychodiagnostic measures: Beck Depression Inventory-II, Combat Exposure Scale, Word Memory Test, and the Self-Awareness of Deficits Interview. Neuropsychological instruments included the Rey-Osterrieth Complex Figure (copy, copy time, copy qualitative, immediate recall, and orientation), Letter and Category Fluency, Trails A and B, Christiansen H-abbreviated, Soper Neuropsychological Screen, Wechsler Memory Scale subtests Logical Memory I and II, and the Street Completion Test.

**Results:** The mTBI group performed significantly worse on all of the executive and non-executive measurements with the exception of Category Fluency ( $p = .08$ ), after controlling for age, depression, effort, and combat exposure. Post hoc analyses rendered the Rey Immediate and Rey Copy Time non-significant. The mTBI group was more depressed ( $t(56) = 3.19, p < .01$ ), reported more combat exposure ( $t(56) = 4.37, p < .001$ ), and had good awareness of cognitive deficits. The mTBI group scored poorer on effort (sign test,  $p < .02$ ), but only subtest Multiple Choice was significant ( $t(56) = 5.84, p < .001$ ).

**Conclusions:** Combat veterans diagnosed with mTBI performed significantly poorer than no-TBI veterans on executive and non-executive measures. They also reported higher levels of depression and combat exposure, displayed poorer effort, and showed good insight to their cognitive deficits.

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#### **D. HOOFIEN, T. SALOMON-SHUSHAN, D. WEISMAN, N. BAR-LEV, L. SHARONI & S. BEN MOSHE. Examination of the Long-Term Efficacy of Three Out-Patient Neuropsychological Rehabilitation Programs for Patients with Acquired Brain Injuries.**

**Objective:** Previous studies have repeatedly demonstrated the positive effects of comprehensive neuropsychological rehabilitation programs at the immediate post-treatment phase. The present study aimed at examining whether such effects sustain long after patients' graduation from the program.

**Participants and Methods:** One hundred and thirteen patients with acquired brain injuries (24% females) participated in three neuropsychological rehabilitation programs: Comprehensive Day Center ( $n = 25$ ); Pre-vocational Rehabilitation Workshops ( $n = 45$ ) and Standard Neuropsychological Treatment ( $n = 43$ ). Mean years of age of the participants was 33.6, SD 11.2; Mean time since brain injury = 4.7 y SD 6.9. Rates of employment, stability at work, community integration, mood and quality of life were evaluated at the beginning (T1) and at the end (T2) of the treatment and one and two years post treatment (T3 and T4 respectively). Study Research design: Double-blind, within-patients, longitudinal follow-up study.

**Results:** A clear long-term improvement in rates of employment was evident. Of the 86 patients who were unemployed at T1, 35 (41%) were employed at T2, 40 (48%) were employed at T3 and 48 (56%) at T4. Graduates of the Comprehensive Day Center reached the highest rate of employment at T4 (70%). GLM Repeated measures analyses revealed significant main effects of the treatment programs across the four testing times, with no interaction effects. In all measures the patients improved between testing times. Immediate post-treatment improvements not only sustained at T3 and T4 but in some measures continued to improve.

**Conclusions:** Out-patient neuropsychological rehabilitation programs are effective not only at the immediate post-treatment term but also at the long-run, at least one and two years after graduation. The positive impact of the treatments sustains over time, and in some aspects improvement even continues to occur without further therapeutic interventions.

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#### **P. AZOUVI, C. VALLAT-AZOUVI, P. JOSEPH, T. MEULEMANS, C. BERTOLA, D. LE GALL, A. BELLMANN, M. ROUSSEL, F. COYETTE, M. KRIER, C. FRANCONIE, C. BINDSCHAEDLER & O. GODEFROY. The Dysexecutive Syndrome of Severe Traumatic Brain Injury. The GREFEX Study.**

**Objective:** To assess the sensitivity of usual neuropsychological tests and their relationships with behavioral changes after severe TBI.

**Participants and Methods:** 112 patients with chronic severe TBI from a previously described database (Godefroy et al. 2010,) were compared to the full set of 780 controls.

The GREFEX battery included 7 tests of executive functions and the Behavioral Dysexecutive Syndrome Inventory (proxy rating). Performance analysis was based on a validated diagnostic criteria (Godefroy et al., 2010) and recently described methodology (Godefroy et al., in press) controlling for age, education and gender. Summary scores were computed and performance dichotomized (normal, impaired) based on 5th percentile from controls' z scores. Two stepwise logistic regression analyses were conducted (with cognitive and behavioral measures), to assess which combination of scores could best discriminate patients from controls.

**Results:** The frequency of dysexecutive cognitive impairment was 54%, lower than that of behavioral changes (81.5%), and with smaller effect-sizes. Double dissociations were observed between cognitive and behavioral assessments. Logistic regression showed that 3 cognitive z-scores (verbal fluency, time of completion of Stroop reading and of TMT-B) and 3 behavior z-scores (hypoactivity, anticipation, and hyperactivity) best discriminated patients from controls (area under the ROC curve respectively = 0.86 and 0.89).

**Conclusions:** Behavioral changes were more frequent and severe than cognitive deficits. The most pronounced deficits were found for measures of initiation, information generation and speed of processing. A shortened battery including three cognitive tests and three items from the behavioral inventory may provide a rapid screening method with reasonable sensitivity to detect deficits of executive functions in patients with severe TBI.

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#### **A. JAMES & A. YOUNG. Neurobehavioural Predictors of Verbal Aggression, Physical Aggression and Inappropriate Sexual Behaviour After Acquired Brain Injury.**

**Objective:** To identify neurobehavioural predictors of verbal aggression (VA), physical aggression (PA) and inappropriate sexual behaviour (ISB) in a multi-centre sample of individuals participating in brain injury rehabilitation.

**Participants and Methods:** Three hundred and one participants with severe acquired brain injury of heterogeneous aetiology were recruited from prospective admissions to seven post-acute residential rehabilitation services. Clinician-rated Mayo-Portland Adaptability Inventory (MPAI-IV) subscales were used as independent variables in two-part regression models (to account for excess zeroes) of observed VA, PA and ISB. Behaviours were recorded with the BIRT Aggression Rating Scale (BARS) and the St Andrew's Sexual Behaviour Assessment (SASBA).

**Results:** VA presence was associated with male sex, having sustained a traumatic brain injury, being admitted six months or more post-injury and higher scores (reflecting poorer function) on MPAI-4 subscales of Adjustment and Participation. When present, higher levels of VA was associated with poorer educational attainment, having sustained a TBI and higher scores on the Adjustment subscale.

PA presence was associated with male sex, having been admitted six months or more post-injury and MPAI-4 Adjustment. Greater PA when present was strongly associated with higher scores on the Participation subscale of the MPAI-4.

ISB presence was associated with male sex, a premorbid history of substance abuse, having sustained brain injury at a younger age and higher

MPAI-4 Adjustment scores. When present, higher levels of ISB was associated with higher MPAI-4 Adjustment scores only.

**Conclusions:** This was the first study to successfully model aggressive behaviour and ISB in a sample of participants with severe ABI. Previous work (James & Young, 2013) has indicated that these problematic behaviours should be considered separately following ABI. Consideration is given to models of aggression and ISB as well as the latent structure of the MPAI-IV.

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## Paper Session 4: Dementia and Aging

Moderator: Richard F. Kaplan

2:00–3:30 p.m.

### R. PEREIRA & W. DE SOUZA. Impact of Alzheimer's Disease Related Anosognosia in Caregivers' Quality of Life.

**Objective:** The present study evaluated the impact of anosognosia related to AD in quality of life (QoL) of caregivers, using the detection of anosognosia method of evaluating the discrepancy between assessments of patients and caregivers.

**Participants and Methods:** 50 patient - caregiver pairs were evaluated through the Addenbrooke's Cognitive Examination, Dementia Questionnaire - expanded and scale of quality of life in AD (caregiver version).

**Results:** It was observed that caregivers of patients with signs of anosognosia had lower scores on the QoL assessment ( $p < 0.01$ ) and these patients had a worse cognitive potential ( $p < 0.05$ ). Anosognosia and QoL scores were negatively correlated ( $-0.349, p < 0.01$ ), while QoL and cognitive functioning presented correlation of  $0.613$  ( $p < .01$ ). Trying to control the cognitive functioning we observed that anosognosia has greater impact on QoL in individuals with more severe cognitive impairments but this impact appears in all groups.

**Conclusions:** Interventions aimed at reducing the impact of anosognosia could influence the quality of life of caregivers, regardless of cognitive functioning of the patient.

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### R.P. KESSELS, A. VERMEIJ & J.A. CLAASSEN. Transfer Effects of Online Working-Memory Training in Healthy Older Adults and Mild Cognitive Impairment.

**Objective:** Working memory (WM) functioning declines with aging. Since WM has a large impact on several higher-order cognitive functions, it would be highly relevant to improve WM functioning at older age. Our aim was to investigate the transfer effects of core WM training on the WM domain and other cognitive domains in both healthy elderly and Mild Cognitive Impairment (MCI) patients.

**Participants and Methods:** Participants were 19 healthy older adults (70.2±5.4 years, MMSE=29.4±0.9) and 13 amnesic MCI patients (67.1±6.5 years, MMSE=27.5±2.2). The online adaptive WM training Cogmed QM (commercially available software) consisted of twelve verbal and spatial exercises. Participants completed 25 training sessions of 45 minutes. Performance on a battery of neuropsychological tests was assessed before and after training, and after a 3-month follow-up period.

**Results:** Preliminary results showed that after training, healthy older adults showed improved scores on Digit Span Forward, Spatial Span Backward, and Rey Auditory Verbal Learning Test (RAVLT) recall ( $p < 0.05$ ). They also improved on spatial fluency ( $p < 0.001$ ), but the number of errors increased as well. At follow-up these gains were maintained, except for RAVLT recall, and performance was improved on Digit Span

Backward and total score of RAVLT. MCI patients showed improved performance on Digit Span Backward and Spatial Span Backward after training ( $p < 0.05$ ). These results were maintained at follow-up.

**Conclusions:** We observed improved performance on WM tasks as well as transfer effects to other cognitive domains in the healthy older adults. Ours is the first study to have examined WM training in MCI, showing gains on trained and untrained tasks within the WM domain, which are maintained after 3 months. The lack of transfer effects in MCI may be due to progression of underlying neurodegenerative processes. In this ongoing research project we will establish the neural correlates of WM training by means of functional Near-Infrared Spectroscopy.

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### M. JANSSEN, M. BOSCH, P. KOOPMANS & R. KESSELS. Utility of the Montreal Cognitive Assessment and HIV Dementia Scale as Screening Instruments for Cognitive Deficits in HIV-1 Infected Patients.

**Objective:** Administration of an extensive neuropsychological assessment is the gold standard for adequately evaluating cognitive impairment. However, such an extensive examination is not feasible in all individuals with cognitive complaints due to restrictions with respect to cost and time. Several brief cognitive screening tools have therefore been developed over the years. Our aim was to investigate the validity of the Montreal Cognitive Assessment (MoCA) and the HIV Dementia Scale (HDS) as screening tools to detect cognitive deficits in HIV-1 infected patients compared to extensive neuropsychological testing.

**Participants and Methods:** 98 HIV-1-infected patients on cART for at least one year and HIVRNA  $< 50$  copies/ml were included. The MoCA, HDS and an extensive neuropsychological assessment measuring 8 cognitive domains, including symptom validity testing, were administered. ROC analyses were applied to calculate sensitivity and specificity of the MoCA and the HDS in comparison to the performance on the neuropsychological assessment (cognitively impaired vs. unimpaired).

**Results:** After controlling for symptom validity, neuropsychological assessment showed cognitive impairment in 41 patients (43%). ROC analyses showed a sensitivity of 76% and specificity of 51% for the MoCA with a cutoff score of 27. For the HDS a sensitivity of 66% and specificity of 60% were found using 14 as cutoff score. The Areas under the Curve for the MoCA (0.70) and the HDS (0.66) did not significantly differ ( $p=0.623$ ).

**Conclusions:** Both the MoCA and HDS show moderate sensitivity yet poor specificity in detecting cognitive deficits. As a result, these screening instruments are not recommended for use in the diagnostic process. Nevertheless, given their short and easy administration, these tools may serve as a first screen to identify patients who require extensive neuropsychological assessment.

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### J. BRANDT, H. AL-JOUDI, B. SHPRITZ, N. ALJEHANI, C. UMEH & Z. MARI. Is Risk-Taking Affected by Deep Brain Stimulation in Parkinson's Disease?

**Objective:** Concerns persist that deep brain stimulation (DBS) of the subthalamic nucleus increases impulsivity and/or induces excessive reward-seeking. We report here on decision-making in "risky" and "ambiguous" situations in PD patients tested on and off stimulation.

**Participants and Methods:** Patients receiving DBS had 2 testing sessions; medications were unchanged in the DBS-on and DBS-off conditions. Medically-controlled PD patients and neurologically normal persons served as control groups. The 3 groups were well matched.

In the Game of Dice Task (GDT) subjects won or lost money by rolling a single die. On each trial, they chose how many sides of the die to bet on. If they bet on a single side and it came up, they won \$10; if it didn't



come up, they lost \$10. Choosing 2 sides was associated with a \$5 win or loss; 3 sides, a \$2 win or loss; and 4 sides, a \$1 win or loss. This task assesses risk-taking when the odds of winning and the consequences are knowable.

“Deal or No-Deal” (DND) assesses preference for risk (holding on to one’s briefcase) over a “sure thing” (the banker’s offer). Subjects chose to deal or not to deal on a maximum of 10 rounds. Unlike in the GDT, here subjects are uncertain how much they can win, as the amount in their briefcases and the payoff matrix are unknown.

**Results:** On the GDT, PD patients with or without DBS made risky bets more often ( $p=.007$ ) and ended the task with less money ( $p=.001$ ) than normal controls (Kruskall-Wallis test). There was a trend for DBS stimulation to ameliorate this effect. On DND, the PD groups won less money than normals ( $p=.05$ ); they were more conservative, dealing earlier and accepting smaller offers. Patients won less money in the DBS-on than DBS-off condition ( $p=.036$ , Wilcoxin test).

**Conclusions:** We confirm previous reports of impaired “risky” decision-making in PD, but found no excess risk-taking with stimulation. However, in an “ambiguous” risk situation, PD patients were more risk-averse than normal, and this tendency was greatest with stimulation.

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**R.F. KAPLAN, W.B. WHITE, N. MOSCUFO, D. WAKEFIELD & L. WOLFSON. Depression and Hypertension Predict MRI White Matter Hyperintensities in the Normal Elderly.**

**Objective:** The progression of white matter hyperintensities (WMH) over a two-year period has been linked to average daily blood pressures above 135 mm Hg. Depression has also been shown to be a related to increased WMH in depressed geriatric patients. We investigated the influence of both blood pressure and depression in the progression of WMH over a 2-year period.

**Participants and Methods:** Seventy-three adults, ages 77 to 91 ( $M = 83.8$ ,  $SD = 3.9$ ) were enrolled in a 4-year study comparing changes in WMHs to changes in mobility and cognition. Quantitative MRI was used to measure WMH volume and 24-hour ambulatory monitoring was used to determine average daily blood pressure. Depression was assessed using Center for Epidemiologic Studies Depression Scale (CES-D).

**Results:** Hierarchical regression analyses showed age did not predict WMH progression; however, when hypertension (blood pressure over 135mm Hg) was added the resulting model yielded a multiple R value of .29 accounting for 8.4% of the variance ( $p < .05$ ). The addition of CES-D scores resulted in a multiple R of .37 which accounted for 14% of the variance in WMH progression.

**Conclusions:** WMH is known to be associated with functional decline and decreased mobility in the elderly. These data suggest that hypertension and depression are independent predictors of WMH progression. To what extent depression adds to the risk of WMH progression or is a consequence remains to be determined.

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**Poster Session 2:  
Attention, Autism, Emotion, Epilepsy, Genetics,  
Laterality, Infectious Disease, Imaging, Learning  
Disabilities, and Visuospatial Functions**

**2:00–3:30 p.m.**

**ADHD/Attentional Functions**

**E. VAKIL, M. MASS & R. SCHIFF. Adults with ADHD Eye Movement Performance on the Stroop Task.**

**Objective:** The purpose of this study was to compare eye movement patterns of adults with ADHD with those of a control group as they performed the Stroop task.

**Participants and Methods:** Thirty individuals diagnosed with ADHD (ages 18-31) and thirty matched control individuals participated in this study. The Stroop task involves naming the color of the ink displayed and suppressing the automatic response to the incongruent word that names a color. The two dimensions of the stimuli - the ink color and the word - were displayed separately on the computer screen in order to measure the participants’ eye movements while they performed the task. The main hypothesis was that in the incongruent condition, the group with ADHD would spend more time on the distractor (i.e., the word) than the controls.

**Results:** The behavioral findings were consistent with previous findings reported in literature, namely that participants with ADHD showed a more pronounced Stroop effect than the controls (i.e., significantly larger differences in terms of speed and accuracy between the congruent and incongruent conditions, as compared with controls). Analyses of the recorded eye movements indicated that overall, more time was spent on the target (ink color) than on the distractor (word). Contrary to our prediction, the most pronounced differences between the groups were the time spent on the target as well as the number of fixations on the target rather than on the distractor.

**Conclusions:** Thus, the stronger Stroop effect observed in the ADHD group stems from the additional time spent on the target stimuli. Furthermore, the group with ADHD made more transitions between target and distractor stimuli than the controls. These results were interpreted to indicate that the inhibition difficulties shown in the group with ADHD are more central than peripheral. This is because the interference of the distractor was more pronounced due to the increased time allocated to the target rather than the presence of the distractor itself.

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**I.C. SUAREZ, B. BURLE, F. LOPERA & L. CASINI. Deciphering Interference Control in Adults with ADHD.**

**Objective:** A deficit in “interference control” is a common characteristic of adults with Attention Deficit Hyperactivity Disorder (ADHD) (Barkley, 1997). This has mainly been interpreted as the result of an inability to inhibit inappropriate stimulus-driven response. However, controlling interference involves additional processes other than simply the ability to inhibit. Consequently, we used sophisticated analysis to decipher interference control in these patients.

Behavioral analyses of correct responses were extended with EMG activity recording. This allowed us to better quantify the control of interference and more specifically the part which remains hidden when only observing correct response activity without distinguishing “pure correct” from “partial errors” trials. Partial errors correspond to subthreshold EMG bursts associated with incorrect responses activations preceding the correct one. Therefore partial errors are interpreted as activations that has been detected and corrected before to become a full error.

**Participants and Methods:** We compared interference control between 14 adults with ADHD, and 15 healthy adults when performing a Simon

RT task. Electromyography activity (EMG) was recorded from the flexor pollicis brevis of each thumb.

**Results:** The main findings were that adults with ADHD were slower and showed larger interference effect in comparison to healthy controls. However, our overall analyses revealed that the larger interference effect was neither due to a higher impulse expression, nor to a deficit in inhibition. But, interestingly, larger interference effects found in the Simon task correlated with sustained attention impairments found in the neuropsychological continuous performance test.

**Conclusions:** We proposed and discussed the hypothesis that the deficit of interference control in adults with ADHD would not be due to a higher impulse expression, nor to a deficit in inhibition, but would rather be secondary to sustained attention impairments leading to a slowing down of information processing.

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#### **T. KIMURA, T. FUKUNAGA & S. DOI. Flexibility of attention in real 3D space.**

**Objective:** Investigating attention in real 3D space is important issue for understanding the cognitive and neuropsychological mechanisms of human behavior in daily life. Specifically, human cognition under dynamic conditions remains unclear. In this study, distributions of attention were compared between static (Kimura et al., 2013, ESCOP) and dynamic conditions.

**Participants and Methods:** Five male volunteers participated. They observed the stimuli with binocular vision. The Eriksen flanker task was used to clarify how well attention distribution can be controlled in real 3D space when the observer was moving forward. A 3D attention measurement system was designed and built that was around 12 m long with the fixation point located 120 cm from the observer. The observer was provided with a seat on a movable platform. The speed of the platform was 0.44 m/s when moving. During each trial, a target was presented at the fixation point, and a flanker stimulus was presented randomly 30, 81, 120, 158, or 230 cm from the observer. Compatible and incompatible conditions of target and flanker shapes were used in order to clarify the distribution of attention in real 3D space. Furthermore, the participants were required to identify the target shape while ignoring the flanker stimulus.

**Results:** The results of the flanker compatibility effect (FOE) calculation for both static and dynamic conditions indicate that there were no interference effects even though flankers were presented along the observer's central line of sight. As this is inconsistent with previous findings investigated in 2D space, there is a possibility that the distribution of attention operates in a different fashion between 2D and 3D space.

**Conclusions:** Findings in this study indicate that the internal representation used by human attention systems can be flexibly controlled in real 3D space when the observer is in both static and dynamic situations. This flexibility would contribute to our appropriate behavior in 3D space.

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#### **K. PAMPOULOU, N. CONSTANTINOULOU, R. PAPAGEORGIOU, A. KYRIAKOU & K. KONSTANTOPOULOS. Sensitivity of the Children Color Trails Test (CCTT) in the Greek-Cypriot children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD).**

**Objective:** The Children Color Trails Test (CCTT) is a neuropsychological test that measures perceptual tracking, sustained and divided attention and was created as a culture-free alternate to Trail Making

Test. Recently, its use has been increased in clinical populations such as seizures and learning and/or language disabilities. The aim of the present study was to assess the sensitivity of CCTT in Greek children (Cypriot dialect) diagnosed with Attention Deficit Hyperactivity Disorder (ADHD).

**Participants and Methods:** A total of 34 native Cypriot children diagnosed with ADHD (DSM-IV criteria) and 34 pair-matched in age and gender healthy children took part in the study. Exclusion criteria involved the existence of other neurological and psychiatric diseases, mother history of alcoholism and drug abuse during pregnancy, birth prematurity, hearing loss and visual problems.

**Results:** The mean age of the ADHD group was 126.64 months (SD=28.94) and the mean age of the control group was 126.97 months (SD=28.57). The mean value for CCTT1 in the ADHD group was 44.63 seconds (SD=21.22) and the mean value for the control group was 36.13 seconds (SD=11.38). The mean value for CCTT2 in the ADHD group was 84.38 seconds (SD=52.35) and the mean value for the control group was 58.10 seconds (SD=22.11). There was no significant difference between the ADHD group as compared to control group in CCTT1 ( $U=693.000$ ,  $N=68$ ,  $p=0.098$ ). There was a significant difference between the ADHD group as compared to control group in CCTT2 ( $U=757.000$ ,  $N=68$ ,  $p=0.014$ ).

**Conclusions:** CCTT is a promising tool for the measurement of attention in the Greek speaking Cypriot children. Further research is needed to use this test in other Greek clinical groups.

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#### **M. ZIVAN, R. GEVA, D. OLCHIK & J. SCHREIBER. An eye-opener: A study of MPH intervention in ADHD using pupillary responses in young adults.**

**Objective:** Attention capacities, alerting, orienting, and executive monitoring, involve salient autonomic correlates as evidenced by changes in pupil dilation (PD). Remote high-resolution recording may allow the discernment of temporo-spatial attributes of autonomic responses that characterize pharmacological effects on attention networks during free viewing, irrespective of voluntary performance. People with Attention Deficit Hyperactivity Disorder (ADHD), who experience attention difficulties, are commonly treated with Methylphenidate (MPH, Ritalin®), a norepinephrine reuptake inhibitor.

The aim of the current study was to explore PD responses in an alerting and executive monitoring task in order to estimate concurrent locus coeruleus (LC) noradrenergic input trajectories.

**Participants and Methods:** Young adults with ADHD ( $N=26$ ) and controls ( $N=27$ ) performed the Attention Network Task twice (participants with ADHD were tested with and without MPH).

**Results:** Analysis showed that the alerting PD response is characterized by an early alerting component (Pa), while executive control, is evidenced by a prominent effort-dependent late component (Pe). In untreated participants with ADHD neither component is sensitive to changing task demands. A repeated-measures analysis showed a construct specific pattern of pupil responses as a function of Ritalin intervention, which normalized the alerting response in ADHD patients. Comparisons of performance with MPH showed an increased alerting effect ( $F=7.343$ ,  $p<0.013$ ), that was more evident on Pa ( $F=5.351$ ,  $p<0.030$ ).

**Conclusions:** Results point to the notion that ADHD affects autonomic alerting reactivity to stimulation; and that MPH, which involves an augmented noradrenergic activation of the autonomic system, normalizes this activation mechanism. These results may deepen our understanding of the ADHD deficit and the mechanism involved in MPH efficacy.

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**R. SHOHAM & Y. POLLAK. Relation between risk taking and ADHD symptoms may be mediated by erroneous decision making and higher benefit perception.**

**Objective:** People with attention deficit hyperactivity disorder (ADHD) tend to take risks such as dangerous driving, substance abuse and gambling. These tendencies are often interpreted as reflecting risk seeking, i.e., lower sensitivity to risk. Variance in risk taking was conceptualized as resulting from two underlying processes: 1. Risk/Return perception: The magnitude of riskiness/benefit an individual correctly or erroneously ascribes to an alternative. 2. Perceived risk attitude: how much a decision maker is attracted or repelled by alternatives that she perceives as more risky. This study aimed to examine which of the processes underlies risk taking associated with ADHD.

**Participants and Methods:** In study 1, 60 adolescents with and without ADHD performed a gambling task, in which they had to choose between safer and riskier options. Importantly, risky choices were associated with higher expected value.

In study 2, 139 adults completed two questionnaires: the Adult ADHD Self Report Scale (ASRS-v1.1) for measuring ADHD symptoms, and the Domain-specific Risk-Taking (DOSPERT) questionnaire for measuring risk taking, risk perception and benefit perception.

**Results:** Adolescents with ADHD showed more cautious and less advantageous decision making.

Adults with higher level of ADHD symptoms reported higher risk taking and higher benefit perception. Benefit perception mediated the relation between level of ADHD symptoms and risk taking.

**Conclusions:** These findings suggest that ADHD symptoms relate to risk taking, and that this relation is mediated by erroneous decision making and differences in benefit perception, rather than different risk attitude.

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**D. ISENBERG-BECHAR, R. GEVA & E. GRANOT. Effects of  $\omega$ -3 Long-Chain Polyunsaturated Fatty Acids (LCPUFA) supplementation on emotion and cognitive processing of ADHD children medicated with Methylphenidate - an ongoing study.**

**Objective:** The current study aimed to investigate the effects of combined treatment of MPH and two  $\omega$ -3 LCPUFA, EPA and DHA on cognitive and emotion processing of ADHD diagnosed and long term medicated children.

**Participants and Methods:** 45 ADHD diagnosed and medicated children were given capsules containing 500/100 mg/d EPA/DHA ratio each, or placebo for 12 weeks, on a double-blind, placebo controlled design. The performance measures were assessed using a touch-screen computerized battery (IntegNeuro™). For emotion recognition, participants selected the verbal label corresponding to each facial expression. The cognitive measure was the rate of improvement across four recall trials of an immediate verbal memory task.

**Results:** Following LCPUFA supplementation, verbal memory learning rates, emotion processing of positive and neutral facial expression and EPA /DHA values improved after 12 weeks treatment. Increasing EPA concentrations in phospholipids were related to clinical improvement. A significant time X treatment interaction was found for happy expression recognition with significant difference over time in the treatment group for happy and for neutral expression recognition. The cognitive variables results were essentially negative, with an exception of immediate verbal memory learning rate, which improved following  $\omega$ -3 supplementation. In the treatment group, a significant increase was found in EPA and DHA values over time. A classification of the omega and placebo groups were performed using spatial representation of their EPA, DHA and happy facial expression recognition values. LDA analysis revealed that the misclassification error rate was 8%.

**Conclusions:** Data support the potential role of  $\omega$ -3 LCPUFA and especially EPA, in the regulation of affect and the influence of emotion regulation on cognitive processing. Larger samples are needed to determine the beneficial effect of  $\omega$ -3 LCPUFA and different EPA/DHA

combinations as a complementary treatment on the emotional and social deficits in ADHD MPH medicated children.

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**B. SCHNEIDER, T. THOERING & S. MORITZ. Relationships between neuropsychological performance and physician and self-report ratings of ADHD symptoms.**

**Objective:** To examine the correlations between ratings of Attention Deficit Hyperactivity Disorder (ADHD) symptoms obtained from physicians and self-report measures, and how they are related to neuropsychological performance.

**Participants and Methods:** The sample included 79 adults ages 18 – 69 who were referred for neuropsychological testing. Referring physicians provided a rating of the likelihood of an ADHD diagnosis for each patient. Patients completed measures of attention, executive functioning, and memory, as well as two self-report measures of ADHD symptoms: the ADHD Self-Report Scale (ADHD-SR) and the Wender Utah Rating Scale-Short Form (WURS-SF).

**Results:** Scores on the ADHD-SR and WURS-SF were significantly and positively correlated. According to a chi-square analysis, ADHD classification was in agreement for 72% of the cases. Neither the WURS-SF nor the ADHD-SB was significantly associated with physician ratings. Among 18 neuropsychological measures administered, correlations revealed that poorer performances only on measures of delayed verbal memory (AVLT Long Delay Free Recall; WMS Logical Memory Delayed Recall) were significantly related with a greater likelihood of ADHD diagnosis according to physician ratings. Poorer performances on measures of executive functioning (TMT-B), attention (TMT-A) and verbal memory (AVLT Delay Short Delay Free Recall) were significantly related to the WURS-SF. Likewise, poorer scores on measures of verbal memory (AVLT Short Delayed Free Recall) and auditory attention (TAP divided auditory attention) were significantly related to the ADHD-SB.

**Conclusions:** Poor convergent validity between self-report and physician ratings of ADHD symptoms was found. Self-report measures were associated with a slightly broader range of neuropsychological domains than physician ratings. However, intradomain correlations between neuropsychological and self-report measures were inconsistent suggesting that self-report measures alone are insufficient for diagnosis of ADHD.

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## Autism Spectrum Disorders

**R. SHAUL & A.H. ZOHAR. Asperger Disorder, Theory of Mind, and 2D:4D Digit Ratio as Proxy for Fetal Testosterone Exposure.**

**Objective:** The second-to-fourth digit ratio (2D:4D) is sexually dimorphic and is fixed early in development. There is indirect evidence that 2D:4D is related to fetal testosterone (fT) levels and that it has organizational effects on the developing human brain. Inter-individual variation in fT levels correlate with adult sex-typed behavior. 2D:4D has been shown to be lower in people diagnosed with autism-spectrum disorder compared to healthy controls. Recent research indicates a possible role of fT in the etiology of autism-spectrum disorders. The current study tested the relationship between a measure of the socio cognitive ability- Theory of Mind (ToM), and 2D:4D, in individuals with Asperger disorder, vs. healthy controls (HC).

**Participants and Methods:** We used Vernier calipers to measure the 2D:4D in 60 adult men (28 diagnosed with Asperger disorder, 32 gender- and age- matched HC) who were also tested on the 'Reading the Mind in the Eyes' task as a measure of ToM.

**Results:** Adults with Asperger disorder showed significantly lower scores on the 'Reading the Mind in the Eyes' task compared to the HC

( $F(1,56)=13.287, P=0.001$ ). 2D:4D of adults with Asperger disorder, was not lower than population norms ( $F(1,56)=0.356, N.S$ ). There was a significant positive correlation between the 'Reading the Mind in the Eyes' score and 2D:4D, only in the Asperger group ( $r=0.329, P<0.05$ ).

**Conclusions:** These findings link FT to autism spectrum disorders' social difficulties. They are relevant to the 'Extreme Male Brain Theory of Autism' (Baron-Cohen, 2002) and the new diagnosis of autism spectrum disorders in DSM-V.

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**Y.N. KENETT, R. GOLD & M. FAUST. The Hyper-Modular Associative Mind: A Computational Analysis of Associative Responses of Persons with Asperger Syndrome.**

**Objective:** A main characteristic of persons with Asperger syndrome (AS) is deficits in flexibility, i.e., rigidity of thought. This rigidity can explain the poor comprehension of unusual semantic relations that require flexibility in processing. The aim of the present study was to explore the semantic organization in the mental lexicon in AS.

**Participants and Methods:** A group of 19 AS persons and 50 matched controls generated free semantic associations to a set of 96 words. Network science tools were used to investigate the organization of the target words in the semantic memory of AS persons compared to controls. This was done by analyzing association correlations – the overlap of associative responses to two target words ("associative clouds"). This method allowed us to compare the difference in semantic organization between AS persons and controls and is the first computational analysis of semantic organization of AS persons.

**Results:** Our analysis revealed that AS persons exhibit a hyper-modular semantic organization, in the sense that their mental lexicon is more compartmentalized compared to controls. We validated our results through statistical bootstrapping techniques, by simulating a distribution of sample-matched control data to control for any possible sample size contamination. Comparing the AS network measures to their bootstrapped sample-matched control distributions revealed that only the modularity measure significantly differed, falling to the right of the bootstrapped distribution. Finally, we analyzed the amount of unique associations generated to the target words. This revealed that AS persons generate a significant lower amount of associations for most of the words, providing further evidence for the rigidity of the AS mental lexicon.

**Conclusions:** We argue that this hyper modularity may be related to the rigidity of thought expressed by AS persons and discuss its relation to deficits in semantic language processes that they experience.

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**E. SCHWAIGER, B. OTT, N. NARVEKAR, B. WONG, G. ROSE & M. O'CONNOR. The Interpersonal Style of Adults with Autism Spectrum Disorder.**

**Objective:** A hallmark feature of autism spectrum disorders (ASD) is a deficit in interpersonal interaction (American Psychiatric Association, 2013; Asperger, 1991/1944; Wing, 1981). While the personality characteristics of adults with ASD have been examined, measures which permit location on the interpersonal circumplex (IPC) have not been utilized. The PAI contains two interpersonal scales, WRM and DOM, which were created to correspond to the orthogonal Warmth and Dominance dimensions of the IPC (Morey, 1992). The aim of this study was to determine the personality profile and IPC coordinates of adults with ASD using the PAI.

**Participants and Methods:** The PAI was used to determine the personality profile and IPC coordinates of a group of 40 adults with a diagnosis of ASD and 36 matched non-ASD clinical controls. All participants had been assessed in a hospital-based cognitive neurology clinic and

all underwent a comprehensive evaluation consisting of measures of neuropsychological and personality functioning.

**Results:** All PAI scale scores were subjected to a two-way analysis of variance with diagnostic group (ASD, non-ASD) and age (high, low) as fixed factors. Individuals diagnosed with ASD had significantly elevated scores on SCZ ( $F(1, 75) = 5.58, p = .021$ ) and NON ( $F(1, 75) = 8.26, p < .01$ ). The ASD group also endorsed significantly reduced scores on WRM ( $F(1, 75) = 24.92, p < .01$ ) and DOM ( $F(1, 75) = 8.00, p < .01$ ). While both the ASD and non-ASD group fell within the avoidant quadrant of the IPC, the ASD group was more distally located.

**Conclusions:** These results suggest that adults with ASD endorse higher levels of symptoms often related to schizophrenia spectrum conditions and reductions in perception of social support. Both the ASD and non-ASD group endorsed low WRM and DOM scores, placing them within the avoidant octant; however, the ASD group's position indicates a more extreme expression of this interpersonal style. Future directions and treatment recommendations are discussed.

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**I. EILON, N. BALABAN & N. FRIEDMANN. Theory of Mind Impairment and Linguistic Abilities in Autism.**

**Objective:** The aim of this research was twofold; to describe the Theory of Mind (TOM) impairment in a group of Autistic Spectrum Disordered (ASD) children and to examine the implications of TOM impairment on linguistic abilities that require considering the hearer's viewpoint, and on purely syntactic abilities that are independent of TOM.

**Participants and Methods:** The participants were 19 ASD children (aged 8;3-11;2) and 20 typically developing children (aged 8;1-10;3). TOM ability was evaluated using the aTOMic battery (10 TOM tasks). The results showed a significant difference within the ASD group: 12 participants with ASD performed significantly below the control group (i.e., aTOMic ASD) whereas 7 ASD participants showed preserved TOM. Next, we presented to all the participants 12 language tests in two linguistic fields: reference terms and prepositions. Seven tasks required consideration of the hearer's viewpoint and 5 were purely syntactic tasks.

**Results:** The results showed that the aTOMic ASD group had difficulty in all linguistic tasks that demanded consideration of hearers' viewpoint. For example, they started stories with a pronoun without introducing the characters first; used fewer null subjects when these were appropriate, and had difficulty in creating differentiating description according to hearers' knowledge. Their use of prepositions to describe spatial perspectives was also impaired. In comparison, the ASD with good TOM had difficulty only in 3 of 7 linguistic tasks of this kind.

Ten of the ASD children had no syntactic difficulties. No correlation was found between the TOM and the syntactic results.

**Conclusions:** These findings show that TOM impairment causes impairment in specific linguistic skills that rely on the ability to consider the viewpoint of others. Importantly, these linguistic difficulties are not accompanied with a general linguistic impairment. We conclude that clinicians should consider these difficulties while providing children with ASD linguistic treatment.

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**F. KLOPPER, R. TESTA, C. PANTELIS & S. SKAFIDAS. A Cluster Analysis Exploration of the Characteristics of High-functioning Subgroups Within the Autism Spectrum in Children Aged 5-14 Years.**

**Objective:** Individuals with autism spectrum disorder (ASD) exhibit a range of different behaviours and levels of neurocognitive functioning. Often developmental trajectories differ, with some children experiencing delayed language and motor milestones and regression, whilst others reportedly have normal or precocious skill development in some areas.

Traditionally individuals have been classified into three to four groups: Autistic Disorder, High-functioning Autism, Asperger's Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified. With introduction of DSM-V this division is arbitrary; argued by some groups to be erroneous as it overlooks great heterogeneity reported between and within groups. Nevertheless, it must be acknowledged that the above-mentioned distinctions were also often found to be lacking and the four-group classification was inadequate, such that debate remains regarding the possibility of categorically distinct subtypes. This study explored whether an Australian sample of high-functioning children with ASD could be differentiated into clinically meaningful subgroups based on development and behaviour.

**Participants and Methods:** Autism Diagnostic Observation Schedule and Autism Diagnosis Interview-Revised ratings for 62 children aged 5-14 with ASD without cognitive impairment were subjected to cluster analysis. Cognitive (WISC-IV, WRAML), language (CELF-4), pragmatic communication (CCC-2) and behavioural (BASC-2) data were used to further explore clusters.

**Results:** As hypothesised, analysis revealed two subgroups differentiated by the pattern of communication and social interaction skills, restricted interests and repetitive behaviours. The newly defined clusters displayed different patterns of language and pragmatic communication.

**Conclusions:** This study revealed robust ASD behavioural phenotypes, affording future exploration of genetic factors that may contribute to cluster profiles and assisting in understanding potential variability in aetiological mechanisms and developmental trajectories.

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## Emotional Processes

### M. BALCONI & Y. CANAVESIO. The Empathic Effect on Attentional Mechanisms (Eye-Movements), Cortical Correlates (N200 ERPs) and Autonomic Behavior (EMG) in Emotional Face Processing.

**Objective:** The present research aims to explore the empathic effect on emotional face processing. Indeed, in addition to specific attentional mechanisms, previous evidences suggest a close relationship between the ability to recognize facial emotions and the emotional empathy. A multi-measure approach was adopted.

**Participants and Methods:** We considered the effect of high vs. low empathic trait (Balanced Emotional Empathy Scale, BEES) on subjects' performance (response times, RTs), attentional mechanisms (eye-movements, fixation count and duration), cortical correlates (ERP N200 effect), autonomic responsiveness (facial feedback, zygomatic and corrugators activity). Four emotional types (anger, fear, happiness, sadness) and neutral pattern were submitted for an emotional detection task.

**Results:** Empathic trait was observed to be relevant for face detection performance (reduced RTs), the attentional processes (higher eye scanning in specific Areas of Interest, AOIs), ERP "salience effect" (increased N200 amplitude), and autonomic activity (higher facial mimicry). Moreover, a second crucial effect was the direct and strength correlation between these multiple measures. Third, the emotional content of faces, in terms of valence and arousal, showed to affect the subjects' responsiveness on these multiple measures.

**Conclusions:** We suggested that empathy may function as a facilitator of the processes underlying the comprehension of emotions in face, and a general "mimicry effect" was supposed to explain these results, since we supposed that high empathy is able to influence the cognitive and the autonomic responsiveness, making the subject more skilful in emotional face processing.

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### D. HILTON, T. TORRES & J.H. POOLE. Facial and Vocal Affect Recognition in Veterans Assessed for TBI with Polytrauma.

**Objective:** (1) Test perception of both facial and vocal affective cues. (2) Analyze the pattern of errors in affect perception.

**Participants and Methods:** Participants were 23 outpatient veterans who screened positive for mild to severe Traumatic Brain Injury (TBI) on a standard VA screen. Most participants had symptoms consistent with neurocognitive deficits, comorbid PTSD, and mood disturbance. Patients completed Ekman's Facial Affect Recognition (FAR) and the Vocal Affect Recognition (VAR) task from the Florida Affect Battery, as part of a standard neuropsychological battery. Analysis of frequency and pattern of errors was conducted.

**Results:** FAR and VAR were not significantly correlated with each other. Impaired performance ( $Z < -1.5$ ) was evident in 25% of subjects on FAR and 39% on VAR. Analyses of errors revealed that fearful stimuli were the most frequently missed items on both tasks, followed by other negative emotions. The most frequent intrusions on FAR were erroneous perception of angry, surprised, and neutral facial expressions. The most frequent intrusions on VAR were erroneous perception of neutral and happy vocal tones. Comparison to control variables indicated that affect recognition is relatively independent of non-emotional cognitive ability.

**Conclusions:** (1) In this veteran population, recognition of negative emotions from facial and auditory stimuli was differentially impaired. (2) This error pattern is the same as previously reported in bilateral amygdala damage. (3) Tests of affect recognition capture a unique area of function not measured by other tests. These findings suggest: TBI and chronic emotional distress impair the ability to recognize facial and vocal affect. Misperception of facial and vocal signals may interfere with interpersonal relationships and other social interactions. Perception of both facial and vocal emotion should be assessed to capture potential problems and plan rehabilitative treatments in this important domain. Correspondence: *Diandra Hilton, MA, Psychology, VA Medical Center Palo Alto, 3801 Miranda Ave. (117), Palo Alto, CA 94304. E-mail: dhilton@paloalto.ucla.edu*

### N. NAOR, S.G. SHAMAY-TSOORY & H. OKON-SINGER. When more is less: exaggerated empathy impairs accurate emotion recognition.

**Objective:** Empathy, our ability to understand, share and act upon the feelings and thoughts of others, has received a considerable amount of attention in the work of neuroscientists and psychologists in the past two decades. To date neuropsychological research on empathy has focused on diminished levels of empathy as a marker for neurological and psychiatric populations. Here we suggest that exaggerated levels of empathy may also be dysfunctional.

**Participants and Methods:** To examine our assumption that exaggerated empathy to pain might hinder the ability to accurately recognize others emotions and to judge its intensity, participants were exposed to pictures depicting real life painful/non-painful scenarios. Immediately following picture presentation, participants were asked to judge the emotion intensity of painful, happy or sad facial expressions. Both sets of pictures used were devised and validated by us in previous experiments.

**Results:** A 2x3 repeated measures ANOVA with a within participants factor of Emotion (Happy, Pain & Sad) and between participants factor of Scenario (Pain, Neutral) found a significant main effect of Emotion [ $F(2,48)=14.30, p<.001, \eta_p^2=.373$ ], significant main effect of Scenario [ $F(1,48)=4.73, p<.05, \eta_p^2=.165$ ], and a significant Emotion x Scenario interaction [ $F(2,48)=6.08, p<.005, \eta_p^2=.201$ ]. Bonferroni post hoc analysis indicated a significant mean difference between Pain and Happy emotions ( $p>.001$ ), Pain and Sad emotions ( $p=.011$ ), but not for Happy and Sad emotion ( $p=.162$ ).

**Conclusions:** Preliminary results support our assumption that exposure to painful scenarios specifically resulted in an exaggeration of judgments of painful expression, whereas no such distortion was found for neither happy nor sad expressions. These results are, to the best of our knowledge, the first empirical evidence for empathy's cognitive cost. Future

work is planned to examine the impact of individual differences in empathic abilities on these effects, as well as their possible involvement in clinical conditions.

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## Epilepsy/Seizures

**K. GONCALVES, J. GONZÁLEZ, I. MAITÍN, N. PINTO, C. JAYARO, M. MORENO DE IBARRA & A. PIÑA. Pseudo-Crisis or Convulsive Syndrome? Transdisciplinary Neuropsychologic Assessment Contribution to Differential Diagnosis. From the Lab to Cognitive Intervention.**

**Objective:** Perform a Transdisciplinary Neuropsychologic Assessment to rule out pseudoseizures and do cognitive intervention.

**Participants and Methods:** 43 years old woman who complaints of quitting her job due to cognitive impairment during the last 4 years with poor adhesion to pharmacological treatment due to drowsiness. Personal history: 1997 severe head injury TBI after falling down stairs and 2009 car accident related closed TBI. Transdisciplinary Neuropsychological Assessment: WAIS-III, Rorschach Test, Neuropsi-Attention & Memory, WSTC, 5DT & Luria-UCV's subtests: Reading, Writing, Arithmetic & Motor Function; Medical, psychiatric & educational examination.

**Results:** Heterogeneous neuropsychological functioning profile; borderline intellectual level with deficit in memory processes, attention and executive functions. During Rorschach, presented an episode characterized by: loss of consciousness, rhythmic blinking (right eye), tremor in right hand, automatic movements, guttural sounds & no response painful stimulation of temporo-maxillary joint. No lost postural tone, remained seated. She presented retrograde amnesia for the event, drowsiness & disorientation in time & space. EEG in situ: Isolated spike-wave on frontal-parietal-occipital regions, initially presented clonic movements in right lower extremity, then more widespread automatic movements in all extremities. Personality Assessment: No factitious and/or simulation features, although she showed anxious and affective symptoms.

**Conclusions:** ID: convulsive syndrome secondarily generalized partial seizures with secondary impairment of higher functions, especially memory. Recommendations: Pharmacological treatment, MRI, regular psychiatric & neurological control visits. Neurocognitive Intervention Program: Was reoriented considering the aforementioned results. The transdisciplinary neuropsychological assessment allowed to exclude pseudo-crisis and reorient pharmacological treatment, behavioral intervention & neurocognitive rehabilitation.

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**A. GIOVAGNOLI, A. PARENTE, V. MANFREDI, A. TARALLO, G. DIDATO, F. DELEO, C. PATERLINI, G. TRINGALI, F. VILLANI & R. SPREAFICO. Different cognitive trends after temporal lobe epilepsy surgery.**

**Objective:** Temporal lobe epilepsy (TLE) is the most common form of intractable epilepsy. TLE surgery alleviate seizures but it also bears the risk of losing cognitive abilities. This study evaluated learning, initiative, and theory of mind (ToM) before and after surgery with the goal of characterizing different facets of the cognitive outcome.

**Participants and Methods:** Forty patients with drug-resistant TLE and MTLs were evaluated before and a year after surgery. Anterior temporal lobe resection was carried out depending on the extension of the epileptic zone and functionally eloquent areas, involving the anterior lateral and medial temporal lobe (uncus, amygdala, and part of the hippocampus). Forty healthy subjects were controls. The faux pas task

(FPT), selective reminding procedure (SRP) and word fluency test on phonemic cues (WFT) assessed ToM, learning, and initiative.

**Results:** Before surgery, left and right TLE patients were impaired in ToM, learning, and initiative compared with controls. At the one-year postoperative follow-up, both patients groups showed significant improvement in learning and initiative, whereas ToM was unchanged.

**Conclusions:** Distinct cognitive abilities have different trends after TLE surgery. ToM does not show any relevant changes, although other functions improve. MTLs may impair advanced cognitive abilities as a consequence of a secondary damage to the medial and orbital prefrontal regions, with chronic deleterious effects.

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**M. TZUR, M. LEVAV, A. BORD, Y. FELDMANN & B. BEN ZEEV. Neuropsychological Profile and Quality of Life Among Children with Epilepsy.**

**Objective:** Quality of life (QOL) concerns are of utmost importance in chronic disorders that are associated with problems beyond the apparent symptoms of the disease. Epilepsy, the most prevalent neurological condition in childhood, is the paradigm of such a disorder. Multiple factors determine the QOL experienced by children with epilepsy. Previous research has demonstrated several physical, psychological, cognitive and environmental factors which affect QOL among children with epilepsy. The aim of this study was to examine the relationship between child's QOL, as reported by the parents, and the neuropsychological and behavioral profile of their children.

**Participants and Methods:** 114 children diagnosed with epilepsy (mean age 8.3; 50% girls) were administered a short neuropsychological battery assessing: attention, verbal and visual-motor skills. In addition, parents/caregivers completed the Child Behavior Checklist (CBCL) and the QOL of children with epilepsy questionnaire.

**Results:** The preliminary results reveal a positive correlation between the time elapsed since epilepsy diagnosis and child's QOL score as reported by the parent. A positive correlation was found between parental reports on child's QOL and child's visual-motor index and attention index scores. Yet no significant correlation was found between child scores on the verbal index and parental reported QOL. A positive correlation was found between the two parental reported questionnaires (i.e., QOL and CBCL). No significant differences in QOL scores were found according to child's gender and type of epilepsy (partial Vs generalized epilepsy).

**Conclusions:** QOL among children with epilepsy is related to the duration of the chronic condition, with longer duration since onset associated with poorer QOL outcome. The current results emphasize the importance of addressing neuropsychological and behavioral aspects of child's psychological state, when evaluating issues related to child's QOL.

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## Genetics/Genetic Disorders

**J.I. EGGER, W.M. VERHOEVEN, W. VERBEECK & N. DE LEEUW. A large de novo distal 16p11.2 deletion in a patient with normal intelligence: Evidence for a neuropsychological phenotype.**

**Objective:** The 16p11.2 microdeletion syndrome is characterized by a wide range of phenotypic expressions and is often associated with developmental delay, symptoms from the autism spectrum, epilepsy, congenital anomalies and obesity. Usually, these phenotypes are related to a proximal 16p11.2 deletion of ~600 kb (BP4-BP5) that includes the SH2B1 gene which is reported to be causative for morbid obesity. This more centromeric deletion, however, is functionally different from the more distal 16p12.2p11.2 region which includes the so-called atypical 16p11.2 BP2-BP3 deletion presenting with developmental delay,

behavioural problems and mild facial dysmorphisms. The current study aims at the cognitive phenotyping of this novel distal deletion.

**Participants and Methods:** An adult male with a long history of maladaptive behaviours was referred for diagnostic assessment of his a-motivational features. Assessment comprised Kaufman Adult Intelligence Test (KAIT), Cambridge Neuropsychological Test Automated Battery (CANTAB), Autism Diagnostic Observation Schedule (ADOS), and Minnesota Multiphasic Personality Inventory (MMPI-2-RF).

**Results:** Extensive neuropsychological examination demonstrated rigid thinking, anxious beliefs and ideas of reference in the presence of normal intelligence. Microarray analysis demonstrated a de novo 970 kb 16p11.2 BP1-BP4 microdeletion that can be regarded as explanatory for his behavioural profile.

**Conclusions:** The distal 16p11.2 deletion phenotype is not exclusively related to developmental delay nor to autism spectrum disorders. Rather, it has a highly variable presentation that may include, as demonstrated in the present neuropsychological profile of the present patient, high average intelligence and social cognitive dysfunctions referring to Asperger's syndrome. It is concluded that genetic testing may be of putative relevance for the understanding of neuropsychiatric and neuropsychological phenomena.

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### Hemispheric Asymmetry/Laterality/ Callosal Studies

**R. LESHEM, Y. ARZOUAN & R. ARMONY-SIVAN. Lateralized effects of sad prosody on word processing.**

**Objective:** This study examined the effect of sad prosody on hemispheric functioning during word processing. We hypothesized an overall REA/LH dominance for word processing, especially for words spoken in neutral rather than sad prosody. In addition, differential recruitment of the two hemispheres was expected during the processing of words spoken in neutral versus sad prosody. Specifically, words spoken in neutral prosody were expected to produce greater activation over the left than the right hemisphere, reflecting early, automatic stages of perceptual processing. Meanwhile, words spoken in sad prosody were expected to produce bilateral activation, reflecting the contribution of both hemispheres to later, higher order cognitive components of word processing.

**Participants and Methods:** Twenty-two right-handed, native English speakers, undergraduate students at the University of California, Los Angeles, participated in the study. A dichotic listening task, combining focused attention and signal-detection methods, was conducted to evaluate the detection of a word spoken in neutral or sad prosody. Behavioral measures along with ERPs recordings were analyzed.

**Results:** An overall right ear advantage was found for word detection regardless of prosody, as well as increased activity in the left hemisphere concurrently with bilateral activity. Detection of a word in neutral prosody revealed greater ERP amplitudes at left side over parietal area and bilateral activity over frontal areas in early time window (150-170 ms). However, detection of a word in sad prosody revealed bilateral activity over frontal area in later time window (240-260 ms).

**Conclusions:** These findings suggest differential hemispheric recruitment during the processing of words in neutral and sad prosodies. We posit that lateralized effects of sad prosody on word detection primarily reflected cognitive rather than perceptual processes.

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**D. KOURTIS, L. DE SAEDELEER & G. VINGERHOETS. The Effect of Handedness Consistency on Bimanual Coordination: A Behavioural and Electrophysiological Investigation.**

**Objective:** Previous research has shown that handedness consistency might be a more important factor than direction of hand dominance in the performance of various cognitive and motor tasks. We investigated the effect of handedness consistency in bimanual coordination.

**Participants and Methods:** We employed a task where participants (N=26) had to respond to visual cues and perform symmetrical or asymmetrical bimanual movements towards cue-designated targets. Response and movement times were recorded in parallel with high-density electroencephalography (EEG).

**Results:** Behavioural analyses showed that participants with inconsistent hand preference (n=13) were equally fast at initiating symmetrical and asymmetrical bimanual movements, whereas participants with consistent hand preference (n=13) were slower in initiating (the more demanding) asymmetrical movements. Moreover, the amplitudes of the Movement Related Potential and the suppression of the 10 Hz - mu rhythm were larger in participants with inconsistent hand preference over premotor and primary sensorimotor areas.

**Conclusions:** Our findings suggest that individuals with inconsistent hand preference have an advantage in the planning and organization of bimanual movements, which may not be related to the direction of their hand dominance.

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### HIV/AIDS/Infectious Disease

**S.P. WOODS, K. DOYLE, E. MORGAN & S. LOFT. HIV-Associated Neurocognitive Disorders Affect Resources Allocated to Prospective Memory Versus Ongoing Task Performance.**

**Objective:** Deficits in the strategic aspects of event-based prospective memory (PM) are evident among persons with HIV-associated neurocognitive disorders (HAND) and can affect real-world functions, such as medication non-adherence. The current study examined the role of task importance in HIV-associated PM deficits.

**Participants and Methods:** Participants included 31 seronegative individuals and 50 persons living with HIV infection, 15 of whom were diagnosed with HAND according to Frascati criteria. All participants completed three conditions of an ongoing lexical decision task: 1) baseline without PM task requirements; 2) with event-based PM task requirements that emphasized the importance of the ongoing task; and 3) with event-based PM task requirements that emphasized the importance of the PM task.

**Results:** All study groups showed the expected step-wise increase in response time to the ongoing task, increasing their allocation of attentional resources to the PM task when it was important ( $p > .01$ ). With regard to PM performance, an interaction was observed whereby HIV+ subjects with HAND were significantly less accurate than the neurocognitively normal HIV+ participants in the PM condition emphasizing the importance of the ongoing task ( $p < .05$ ), but not when the importance of the PM task was emphasized ( $p > .10$ ).

**Conclusions:** Findings suggest that adults with HAND require increased cognitive resources allocated to support event-based PM performance, which may have implications for designing cognitive interventions to improve health behaviors affected by PM.

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**Y. LAI & T. CHENG. Neuropsychological Manifestations of a 5-Month Follow-Up Case with HIV-Associated PML.**

**Objective:** Progressively multifocal leukoencephalopathy (PML), a rare viral infectious disease, exclusively occurs in people with severe immune insufficiency such as HIV. PML is characterized by demyelinated subcortical white matter at multiple locations of brain. Despite no known cure, improved immune function might slow or stop the disease progression, and those affected cognitive functions might also improve. This report describes an HIV positive case who suffered from a subacute cognitive decline diagnosed as PML and the outcome after antiretroviral therapy.

**Participants and Methods:** A 43-year-old, right-handed male whose response has slowed down since Nov. 2012 was sent to our hospital for subacute cognitive decline in Feb. 2013. HIV positive was detected. Brain MRI showed multifocal white matter lesions in cerebrum and cerebellum, and HIV-associated PML was impressed. He was then referred to take a comprehensive neuropsychological assessment (NPA) in Mar. 2013. After antiretroviral treatment, his immune function improved, brain MRI showed partial resolution, and he received a follow-up NPA in Aug. 2013.

**Results:** Pre-treatment NPA revealed impairments of memory, comprehension, calculation, executive function, spatial perceptual function, and constructional praxis. The WAIS-III didn't administrate due to the patient's fatigue and slowness. Remarkable negative behaviors (spontaneity, disorganization, and inattention) were also observed. Five months later, improvements of all above mentioned cognitive domains, with the exception of an extremely low of the Processing Speed (PSI = 69), were noted. It suggested that the subcortical lesions were still evident.

**Conclusions:** (1) This case manifested cognitive features resulting from demyelination such as psychomotor slowness and dysexecutive function. (2) NPA is an effective tool for monitoring the treatment outcome. (3) The slowness has remained even after drug therapy; a further cognitive rehabilitation may be needed.

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**D. SCHONFELD, N. THALER, A. ARENTOFT, A.D. THAMES, S.A. CASTELLON & C.H. HINKIN. The Effects of Bilingualism on Verbal Fluency and Executive Functioning in HIV infected Hispanic Adults.**

**Objective:** Bilingualism is often associated with disadvantages on verbal fluency tasks and more subtle advantages on some measures of cognitive control (Mindt et al., 2008). HIV infection is associated with mild world generation deficits on verbal fluency tasks as well as robust deficits in executive functioning (Iudicello et al., 2007; Levy et al., 2013). We sought to compare verbal fluency and executive functioning performance between purely English-only and Spanish-English speaking HIV infected Hispanic-American adults. We hypothesized that Hispanic HIV infected bilinguals would perform significantly worse on verbal fluency tasks but significantly better on cognitive control tasks when compared to Hispanic HIV infected monolinguals.

**Participants and Methods:** 19 bilingual and 14 monolingual Hispanic HIV infected adults were examined with the FAS task as the measure of verbal fluency and the Stroop Interference task as the measure of executive functioning. Groups did not differ in age, education, gender, annual income, CD4 count, reading level or global neurocognition.

**Results:** A MANOVA demonstrated that HIV infected Hispanic bilinguals (FAS:  $M=40.11, SD=15.02$ ) performed significantly worse ( $p<0.05$ ) than HIV infected Hispanic monolinguals (FAS:  $M=50.86, SD=9.61$ ) on the verbal fluency task. However, bilinguals (Stroop-I:  $M=46.26, SD=9.81$ ) did not significantly differ on executive functioning performance when compared to monolinguals (Stroop-I:  $M=45.00, SD=6.26$ ).

**Conclusions:** As hypothesized, HIV positive Hispanic bilinguals exhibited significantly poorer verbal fluency performance when compared to HIV positive Hispanic monolinguals. Contrary to expectation, the groups did not differ on the executive functioning task. It is possible

that the robust adverse effects of HIV infection on executive functioning may have obscured the subtle advantageous effects of bilingualism on cognitive control tasks. Further studies using a larger sample and HIV negative controls are needed to provide a more definitive answer to this research question.

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## Imaging (Functional)

**J. JUNG, I. KANG, Y. SON & S. KIM. Research about Patient's Response to Olfactory Stimulations, Brain Response and Pathophysiology in Anosmia Patients Using Olfactometer and 3.0T functional MRI.**

**Objective:** Until today, almost olfactory function tests are subjective tests using patient's response with odors. There are credibility problems and there is no other objective tests to diagnose anosmia, especially anosmia after head trauma. Also, about patient's response to olfactory stimulations and changing in brain response and pathophysiology in anosmia have not been identified. In this study we tried to identify the correlation between patient's olfactory sensation and fine changing in brain response to diagnose lesion location and functional disorder of anosmia objectively by stimulating olfactory system with odors during taking 3.0T functional MRI.

**Participants and Methods:** Total participants were 30 people. Fifteen people were normal person and 15 were anosmia patients. There were 4 groups according to etiology in anosmia patients- sinusitis, head trauma, upper respiratory infection (URI) and idiopathic group. All of them were stimulated with lavender odor with olfactometer exploited in our research lab and detect brain response with 3.0T functional MRI. We analysed activated brain area after odor stimulation.

**Results:** In normal group, primary olfactory cortex, medial prefrontal area, insula and substantia nigra were activated ( $p<0.001$ ). In sinusitis group, brain response was decreased in primary olfactory and insula, bilaterally. In head trauma group, no brain activation was observed in all area. In URI group, brain response was decreased in medial prefrontal area. In idiopathic group, various brain response was observed ( $p<0.001$ ).

**Conclusions:** This research showed the possibility of 3.0T functional MRI as objective olfactory test, especially in head trauma patients.

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**F.M. LALONDE, A. DELANEY, K.M. MCCARTHY, J.D. BLUMENTHAL, J.N. GIEDD, W.F. CROWLEY & R. BALASUBRAMANIAN. Default Mode Network Differences Between Kallmann Syndrome Patients and Healthy Controls: An fMRI Resting State Study.**

**Objective:** We previously reported that exposure to sex hormones during puberty effects cognitive and brain development. Idiopathic hypogonadotropic hypogonadism (IHH) patients performed significantly lower on tests of spatial working memory, cognitive flexibility, processing speed, verbal memory, and verbal fluency. As part of an ongoing study of the cognitive, structural and functional brain characteristics of IHH, we investigated resting state functional connectivity, the default mode network (DMN) in particular, in a sample of IHH patients and a group of age and sex-matched healthy volunteers (HV). We explored whether delayed exposure to sex hormones at the normal age of puberty would effect resting state functional connectivity.

**Participants and Methods:** Resting state fMRI scans (10-minute duration; eyes open looking at a white fixation cross on a black background) were collected from 9 IHH (3 women, 4 men) and 7 HV (5 women, 4



men) with an average age of 29.98 and 27.94 years, respectively. The two groups were matched for handedness and socioeconomic status. MRI volumes were collected every two seconds using a GE 3 Tesla magnet and a 32-channel head coil. Heart rate and respiration were recorded and used in the analysis to remove physiological noise from the timeseries. We measured functional connectivity within the DMN by extracting the mean timeseries of a predefined seed region in the posterior cingulate cortex (PCC) and correlating it with all other voxels.

**Results:** The mean PCC timeseries was significantly correlated with regions in the ventral medial prefrontal cortex and inferior parietal lobules in both groups. The magnitude of the correlation was greater in the left parietal regions for the IHH patients.

**Conclusions:** IHH patients show the typical DMN during resting state fMRI. Correlations between the mean PCC timeseries and left parietal areas were greater among IHH patients when compared to HV. Subtle spatial impairments observed in IHH may therefore be related to altered functional connectivity when at rest.

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## Imaging (Structural)

**I. MÜRNER-LAVANCHY, M. STEINLIN, C. RUMMEL, W. PERRIC & R. EVERTS. Delay of Cortical Thinning in Very Preterm Born Children.**

**Objective:** Cortical gray matter thinning takes place during childhood due to pruning of inefficient synaptic connections and an increase in myelination. Alterations in brain structure occur in very preterm born children with prolonged maturation of the frontal lobes and smaller cortical and white matter volume. These findings give rise to the question if age affects cortical thinning differently in very preterm born children compared to controls. The aim of the present study was to investigate the relationship between age and cortical thickness in very preterm born children when compared to controls.

**Participants and Methods:** Forty-one very preterm born children (<32 weeks gestational age and/or < 1500 gram birth weight) and 30 term born controls were included in the study (7-12 years). The automated surface reconstruction software FreeSurfer was applied to obtain measurements of cortical thickness based on T1-weighted MRI images.

**Results:** Cortical thickness was lower in bilateral frontal and left parietal regions and higher in left temporal gyri in very preterm born children compared to controls. However, these differences depended on age. In very preterm born children, age correlated negatively with cortical thickness in right frontal, parietal and inferior temporal regions. Accordingly, cortical thickness was higher in young compared to old very preterm born children in bilateral frontal, parietal and temporal regions. In controls, age was not associated with cortical thickness.

**Conclusions:** In very preterm born children, cortical thinning still occurs between the age of 7 and 12 years, mainly in frontal and parietal areas. In controls, however, a substantial part of cortical thinning appears to be completed in these regions before they reach the age of 7 years. These data indicate a delay in cortical thinning in very preterm born children.

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## Learning Disabilities/Academic Skills

**R. LORBER. Does Methylphenidate (Ritalin) Help Dyslexias with Attentional Bases?**

**Objective:** Dyslexia and ADHD are multidimensional disorders that have distinct subtypes. Various types of developmental dyslexia exist,

each originating from a different deficit in the word reading process. Several types of dyslexia seem to have an orthographic-attentional basis: letter position dyslexia (LPD) and attentional dyslexia. We assessed whether methylphenidate (MPH), the most commonly used drug treatment for ADHD, helps to reduced reading errors in these dyslexias.

**Participants and Methods:** We tested the reading of 20 Hebrew-speaking participants with attentional-based dyslexia and ADHD, once with and once without methylphenidate.

**Results:** Methylphenidate did not improve the reading accuracy of the dyslexic participants. Their rate of migrations between words and within words was not affected by MPH, even though MPH positively affected their performance in at least one of three attentional function (sustained, selective, executive attention).

**Conclusions:** This suggests that the reading and attention systems are separate, and that the deficit the underlies LPD and attentional dyslexia is orthographic-specific rather than resulting from a general attentional deficit.

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**Y. GABAY, R. SCHIFF, E. VAKIL & L. HOLT. Impaired Probabilistic Learning Mechanisms in Developmental Dyslexia.**

**Objective:** Developmental dyslexia (DD) is presumed to arise from specific phonological impairments. However, an emerging theoretical framework suggests that phonological impairments may be seen as symptoms stemming from an underlying dysfunction of procedural learning mechanisms.

**Participants and Methods:** Here we tested procedural learning mechanisms in adults with DD (n=15) and matched-controls (n=15) using two versions of the Weather Prediction Task: Feedback (FB) vs. Paired-associate (PA). In the FB task, participants learned which cue is associated with what value via guessing (initially) and subsequently receiving feedback, whereas in the PA version, the participants viewed both the cue and its value simultaneously. In both versions, participants were trained during 3 blocks of 150 trials and then were tested on a subsequent block in which no corrective feedback/outcome was provided to participants.

**Results:** We observed impaired learning in the group with DD compared with the control group across tasks. In the FB task participants with DD were impaired in learning rate across blocks compared to controls. Additionally, impaired performance of the DD group at the test phase was observed in both the FB and PA tasks.

**Conclusions:** The results suggest, therefore, that probabilistic learning mechanisms which have been shown to be important for language and reading are significantly deficient in those with DD.

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**S. KAHTA & R. SCHIFF. Modality Effects on Sequential Learning of Individuals with Developmental Dyslexia (DD): Evidence from Artificial Grammar Learning (AGL) task.**

**Objective:** It has been claimed that individuals with DD are deficient in sequential learning. Most studies explored this deficit using visual stimuli based on the assumption that implicit learning processes a-modal in nature, and yielded inconsistent results. Recently, it has been shown that modality constrained implicit learning processes both qualitatively and quantitatively. The aim of the current study was to investigate these modality constraints among adults with DD using AGL task.

**Participants and Methods:** Sixty three adults participated in two experiments, 31 were diagnosed with DD since early childhood, and 32 were typically developed (TD) readers. The first experiment explored sequential learning using visual letter strings presented spatially, and the second employed tone strings presented temporally. Endorsement rates and accuracy were calculated for each group.

**Results:** Results of the TD group supported the a-modal nature of implicit learning processes, while results of the DD group revealed a superiority of visual implicit learning.

**Conclusions:** These results support the sequential learning deficit assumption among individuals with DD, and show that this deficit is more pronounced when processing auditory sequential stimuli. Theoretical and clinical implications are discussed.

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#### L. KHENTOV-KRAUS & N. FRIEDMANN. Vowel Letter Dyslexia.

**Objective:** This study describes a new type of dyslexia, vowel letter dyslexia, characterized by impaired reading of vowel letters. We assessed the characteristics of this dyslexia, identified the locus of the deficit in the reading model, and ruled out alternative explanations for the source of vowel errors.

**Participants and Methods:** We report on 25 Hebrew readers with vowel letter dyslexia: Each of whom made significantly more vowel errors than the age-matched control group, and significantly more errors in vowels than in consonants. We used an extensive line of 24 tests in order to thoroughly explore this phenomenon.

**Results:** The participants make migrations, substitutions, omissions, and additions of vowel letters in reading, almost without errors in consonants. Based on tests that examined various components, we ruled out deficits in the early visual stages of reading and in the phonological output stages, as well as visual, morphological, and auditory deficits, and concluded that vowel letter dyslexia results from a selective deficit in vowel processing in the sublexical route. Accordingly, vowel errors occurred predominantly when the participants read via the sublexical route. More vowel errors occur when the erroneous response creates an existing word, yet, a considerable rate of errors made created nonwords, indicating that the participants were using the sub-lexical route. They made even more vowel errors when they read English words, probably because they read English less frequently and hence had fewer items in the lexicon and relied more on the sublexical route in reading.

**Conclusions:** This study reports a new type of dyslexia and provides evidence for the different status of vowels and consonants in reading. Locating the source of vowel dyslexia in a selective deficit in the sub-lexical route sheds light on the reading model, establishing that the sublexical route handles vowels and consonants separately.

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#### M. YACHINI, L. KHENTOV-KRAUS, A. GVION, R. GUGGENHEIM, R. KEIDAR & N. FRIEDMANN. Vowel Letter Dysgraphia.

**Objective:** We describe, for the first time, a developmental dysgraphia characterized by a selective deficit in vowel writing, which we term vowel dysgraphia.

Writing is a cognitive process that can be described using a dual route neuropsychological model (Rapp, 2002). This model includes various stages and components, each of which with a different role in the writing process, and each can be selectively impaired.

**Participants and Methods:** Ten participants with a selective deficit in vowel writing were identified using the TILTAN writing screening test (Friedmann, Gvion, & Yachini, 2007). These participants participated in a further line of tests designed to assess the characteristics of this dysgraphia and its locus in the spelling model. These tests included input and output modalities – writing to dictation, written naming, oral spelling, typing, and spontaneous writing, words and nonwords, and words with various characteristics with respect to vowels and consonants.

**Results:** The error types that the participants produced involved transpositions, omissions, and substitutions of vowels. They made these errors only or almost only in vowels, and not in consonants. Errors occurred in both real words and nonwords, and in all input and output modalities. All the participants had length effect.

**Conclusions:** Based on the error patterns and the existence of length effect we conclude that vowel dysgraphia result from a selective vowel impairment to the graphemic output buffer.

These findings help us gain better understanding of the graphemic buffer, as they suggest that vowels and consonants are processed separately in this buffer. The results can also help therapists develop more targeted treatment programs.

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### Visuospatial Functions/Neglect/Agnosia

#### M. TOBA, M. ZAVAGLIA, F. RASTELLI, C. HILGETAG & A. VALERO-CABRE. Neuroanatomy of visuo-spatial neglect: a game-theoretical analysis approach.

**Objective:** Right brain-damaged patients with visuo-spatial neglect usually fail to respond to left-sided objects and deviate rightwards when bisecting horizontal lines. Here, we explored the anatomical correlates for the performance of neglect patients in a line bisection test, using a novel game-theoretical analysis. We aimed at deriving contributions of several right-hemispheric cortical regions-of-interest (ROI) to attentional orienting.

**Participants and Methods:** Performance in the line bisection task together with the corresponding lesion patterns were explored through a Multi-perturbation Shapley value Analysis (MSA) (Keinan et al. 2004) in 24 neglect patients (> 2 months post-stroke). MSA is a rigorous game-theory-based method to infer causal regional contributions from behavioural performance after multiple lesions, treating brain regions as players in a coalition game. Four right-hemisphere ROIs important in visuo-spatial attention were used in the analysis: frontal eye field (FEF), intraparietal sulcus (IPS), inferior frontal gyrus (IFG), temporo-parietal junction (TPJ) and one region representing the 'rest of the brain'. Overlap (in %) between infarct lesions and each ROI was calculated for each patient.

**Results:** The analysis of this patients sample revealed that contributions computed with MSA were significantly different from zero for all the ROIs considered. Highest contributions were observed for the IPS and TPJ. Functional interactions derived from MSA also revealed synergisms between IFG and all the other regions (IPS, FEF and especially TPJ) and the 'rest of the brain'.

**Conclusions:** The contribution of the IPS to attentional orienting was repeatedly emphasized. By using a game-theory-based method, we could infer the pivotal role of functional interactions between TPJ and IFG for the attentional orienting. The understanding of causal contributions of brain regions to mental functions implies important consequences for the rehabilitation of brain-damaged patients.

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#### M. SOBANSKA, E. LOJEK, N. GAWRON & A. PLUTA. Arithmetical operations and numerical surface form: differential effects on multiplication and subtraction.

**Objective:** There are two contradictory approaches to the processing of arithmetical operations and symbolical numeral formats. According to the first approach, there is one processing pathway for all types of arithmetical operations and all symbolic numerical formats. According to the second approach there are separate and specific processing pathways. The aim of the present study was to analyze the effect of numerical surface form (Arabic digits vs spoken word numerals) on multiplication and subtraction response time.

**Participants and Methods:** Forty-seven right-handed men and women aged from 20 to 76 ( $M = 55.74$ ,  $SD = 12.81$ ) participated. The experimental assignment had three parts: Numbers, Multiplication and Subtraction. The Number part consisted of 69 numbers (within the

1 to 85). Subjects were asked to transcode one number format into another. There were 81 Multiplication (from  $1 \times 1$  to  $9 \times 9$ ) and 36 Subtraction problems (from  $2 - 1$  to  $9 - 8$ ). Examples were presented visually (Arabic digits) or auditory (spoken number words in Polish). Participants responded either orally or by means of a numerical keyboard. There were 4 experimental conditions which differed in format of stimuli presentation and format of response.

**Results:** The effect of numerical surface form on speed of arithmetical problem solving was different for multiplication and subtraction ( $F(3, 138)=36.401, p<0.001, \eta^2=0.442$ ). Multiplication is quickest when both the problem and the response are in the word numerical format. Subtraction is quickest when both the operands and the response are in the Arabic digit format.

**Conclusions:** These observations are consistent with the hypothesis that multiplication involves direct retrieval of arithmetical facts stored by means of verbal representation whereas subtraction involves semantic representation which can be accessed more easily by means of Arabic input. The present results confirm the separate processing pathways hypothesis.

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**K. HIROMITSU, C. ITOI, S. SAITO, R. YAMADA, N. SHINOURA & A. MIDORIKAWA. Tactile extinction depends on the attention to somatosensory input.**

**Objective:** It has been considered that tactile extinction occurs as a consequence of the deficit in spatial attention or engaging attention to the ipsilesional side. However, there is little theoretical consensus on the nature of the mechanism. In this study, we examined a patient with tactile extinction in order to determine whether tactile extinction was based on space-based attention or not.

**Participants and Methods:** The patient was 69-year-old, right-handed male suffering from hemorrhage caused by a brain tumor which was located in the right parietal lobe, and showed the contralesional tactile extinction. As an experiment, the patient was presented the tactile stimuli on his tip of index finger unilaterally or bilaterally with the hands apart (parallel condition) or crossed (crossed condition) to distinguish whether the disorder was based on spatial attention or somatosensory-based attention, and asked to detect the stimuli. In addition, there were two presented patterns of bilateral tactile stimuli (i.e. simultaneously or successively), in which the successive stimuli were presented in two presented patterns (i.e. contralesional side at first or not) with the interval of 500 msec.

**Results:** In both parallel and crossed conditions, the simultaneous stimuli elicited the contralesional extinction. Furthermore, only when the ipsilesional index finger was stimulated earlier than the contralesional one, the contralesional extinction was occurred, on the contrary, when the contralesional one was stimulated earlier than the ipsilesional one, the patient accurately detected the both index fingers.

**Conclusions:** Tactile extinction is based on the attention to position sense of one's own body, not on spatial attention. In addition, only when the ipsilesional stimulus precedes the contralesional stimulus, the input from contralesional stimulus can scarcely reach awareness.

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**Symposium 3:  
Latest Developments in the Assessment and  
Management of People With Disorders of  
Consciousness**

**Chair: Barbara A. Wilson**

**3:30–5:00 p.m.**

**B.A. WILSON, A. SHIEL, A. MORRISSEY, L. MURPHY, B.A. WILSON & B.A. WILSON. Latest Developments in the Assessment and Management of People With Disorders of Consciousness.**

**Symposium Description:** This symposium is concerned with people who are in the Vegetative State (VS) and the minimally conscious state (MCS). Accurate assessment of these patients continues to challenge clinicians and misdiagnoses are common. Better assessment can improve medical care, diagnosis and prognosis. Following a brief review of the size and extent of the problem we include four presentations addressing this issue. The first describes the revision and redevelopment of a widely used test to measure the behavioural repertoire of patients with disorders of consciousness, the Wessex Head Injury Matrix (WHIM). The second paper considers how two tests, the WHIM and the SMART (Sensory Modality Assessment and Rehabilitation Technique) can be used together to improve detection of behavioural awareness. The third paper looks at holistic assessment of people with disorders of consciousness and the implications for rehabilitation therapies and family adjustment. The final paper is concerned with improving behavioural awareness through changes in position. Patients are usually assessed when lying down but responses can be improved if they are assessed when upright on a tilt table or standing frame. We conclude the symposium with a discussion of the implications of our findings for the future assessment and management of people in the VS and the MCS.

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**L. MURPHY. Holistic Assessment of People with Disorders of Consciousness: Capturing the Person - Implications for Rehabilitation Therapies and Family Adjustment.**

A framework for the psychological assessment of people with Disorders of Consciousness is currently in development. A starting point for this framework consists of a brief cognitive assessment, designed to investigate memory, orientation, new learning, and verbal and visual comprehension. Once an individual's capacity to process information at a basic level has been established, meaningful rehabilitation strategies can be formulated. It is important to extend such an assessment to include a basic evaluation of mood and insight in order to 'capture the person' behind the brain injury. Three unusual clinical examples are given, to illustrate the importance of a person centred approach in the ongoing treatment and management of such individuals.

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**A. SHIEL, S. LEAHY, A. MORRISSEY, R. LEONARD & B.A. WILSON. The WHIM-II: Initial development and piloting.**

Provision of accurate assessment of people with Disorders of Consciousness (DoC) continues to challenge clinicians. Functional neuroimaging studies confirm that misdiagnosis (Andrews (1996), Childs et al (1993) Schnakers et al (2009)) continues. However for the majority of clinicians working with people with DoC, neurobehavioural assessment is the approach of choice. One such assessment The Wessex Head Injury Matrix (WHIM) (Shiel et al, 2000) is a scale to assess people recovering from severe head injury. It comprises 62 hierarchically organised behaviours, both spontaneous and elicited, which may be observed in patients with severe brain injury. While the original scale was developed from data

collected with people with acute traumatic brain injury, it has proven to be useful in assessment of people with DoC regardless of aetiology. The WHIM is one of the scales recommended recently for assessment of people with DoC (RCP, 2013) and was reported to be the most commonly used tool to assess this group in the UK (Delargy et al, 2013). However, it has not undergone revision or further development since publication and it has become clear that major revision of the scale is required. Amongst the limitations are: the hierarchy could be more robust, some additional behaviours are needed, some redundant behaviours need to be removed and some operational definitions should be rewritten. Redevelopment of the scale using both retrospective and prospective data has commenced. Retrospective data on a cohort of forty seven people with DoC from three centres comprising over 700 individual WHIM assessments were collated. Following analysis a reordered scale was proposed and piloted with two single cases. Analysis suggests the revised scale has a more robust order and that inclusion of other behaviours is required. Revision of operational definitions and instructions for administration are recommended as the currently potentially purposeful but inconsistent behaviours are missed.

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**A.M. MORRISSEY, A. PUNDOLE, R. LEONARD, H. GILL-THWAITES, L. MCLELLAN, B. WILSON & A. SHIEL. Complimentary Use of Neurobehavioural Assessment Scales with Prolonged Disorders of Consciousness.**

The prevalence of disorders of consciousness in all care settings is increasing owing to medical and technological improvements. Monitoring behavioural responses of people with disorders of consciousness should occur at all levels of care to ensure diagnostic accuracy. Behavioural assessment of consciousness remains the most accessible in the clinical setting for rehabilitative professionals. While a number of scales exist to guide this form of assessment, none are without reservation (Seel et al., 2010). There exists no international standard guidelines for assessment and choice of behavioural assessment is based predominantly on clinical preference. It need not be a monopoly however as this study will identify the advantages of employing more than one neurobehavioural scale.

Recent national guidelines (Royal College of Physicians, 2013) and legal rulings (W v M, 2011) have recommended the use of the Wessex Head Injury Matrix (Shiel et al., 2000) and the Sensory Modality Assessment and Rehabilitation Technique (Gill-Thwaites & Munday, 2004) for behavioural assessment for this patient population. Both these tools have specific aims and measurements but this study proposes that when used together in clinical practice they may offer an improved opportunity to detect behavioural awareness. The merits of extended behavioural assessment (Godbolt et al., 2012) and the use of varying types of sensory stimulation have been noted. When employed together both scales could offer further opportunity for the person to demonstrate awareness in any care setting.

For this unique but growing population novel methods of assessment need to be considered to address the high rates of misdiagnosis (Schnakers, 2009). The potential for a symbiotic relationship between these two scales is very promising. This study will use detailed case examples to illustrate this point. These case studies will highlight the role both can play when used simultaneously in acute, sub acute and long term care.

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**B.A. WILSON, A. ROSE, S. DHARMAPURKAR & G. FLORSCHUTZ. Improving the Behavioural Responses of Vegetative and Minimally Conscious Patients Through Changes in Position.**

Elliott et al. (2005) and Wilson et al (2013) showed that vegetative and minimally conscious patients were more responsive when assessed in an upright position. Wilson et al (2013) also showed that some patients

were more responsive when assessed while seated in a wheelchair. This paper provides further evidence for the claim that position can affect the responsiveness of patients with disorders of consciousness. We assessed twenty patients of whom nine were in the vegetative state (VS) and eleven in the minimally conscious state (MCS). All patients were assessed with the Wessex Head Injury Matrix (WHIM) in three positions, lying down, seated in a wheelchair and when upright on a tilt table or standing frame. Several assessments were conducted in each position and the best score in each position was recorded. Of the nine VS patients, three had sustained a traumatic brain injury (TBI) and six had other diagnoses, mostly anoxic brain damage. Of the MCS patients, six had sustained a TBI and five were impaired through other causes. There was a statistically significant difference between the three positions. Most patients showed more behaviours when in the upright position and fewest when lying down. This was particularly true for patients in the MCS. This confirms earlier findings suggesting that positional changes can have an effect on the level of arousal and awareness among patients in the VS and MCS.

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**Paper Session 5:  
Language**

**Moderator: Guy Vingerhoets**

**3:30–5:00 p.m.**

**C. SCHARFF. Addiction, Neuroscience and Psychology: Transdisciplinary Approaches Creating Breakthroughs in Addiction Recovery.**

**Objective:** Addiction has one of the poorest recovery rates of any mental health issue. It is estimated that one year post treatment, only one in ten addicts remains sober. Recovery rates in 12-step programs are suggested to be around the same level. Meanwhile, death rates caused by accidental drug overdoses are skyrocketing in the United States and prescription drug abuse is being called an “epidemic.” This presentation will show how neuropsychology is being successfully applied to improve outcomes in an addiction treatment center.

**Participants and Methods:** This presentation will provide a detailed look at the neuropsychological principles and complementary therapies that have allowed the Cliffside Malibu treatment model to have seven times the success rate as “standard” treatment, as well as give researchers and therapists insight into the application of these principles and the ways in which we are able to use neuroscience and psychology to create a progressive recovery model. We have eight years of patient recovery data to support these claims.

**Results:** At Cliffside Malibu, our neuropsychological based treatment protocol is providing a recovery rate of near 70% one year post treatment, seven times the expected results.

**Conclusions:** Applied neuropsychology is perhaps one of the greatest breakthroughs in addiction treatment. Moving beyond genetic concepts of disease, which have provided little therapeutic value, researchers have discovered that addiction is at its core a neuropsychological event. Behavior changes brain function and brain function further modifies behavior – both toward and away from addiction. Research and clinical results have shown that entrenched behaviors are completely modifiable. Even the most hopeless addicts can in essence have their brains “rewired” through the development of new neural pathways, creating a complete and comfortable recovery.

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**F. ANDELMAN, S. KIPERWASSER, M.Y. NEUFELD & I. FRIED. THE ROLE OF INFERIOR TEMPORAL GYRUS IN VISUAL LANGUAGE PROCESSING: A DIRECT CORTICAL STIMULATION STUDY.**

**Objective:** The inferior temporal gyrus (ITG) is considered to be a high-order visual area, the final stage of the ventral stream responsible for visual perception. It has been hypothesized that ITG plays a crucial role in perception of written words (Cohen et al 2002). Here, we used the intracranial cortical stimulation of ITG to investigate the effects of disruption on performance on a reading task in a patient with implanted electrodes.

**Participants and Methods:** the patient suffering from medically intractable epilepsy was a candidate for surgical removal of her epileptic focus. As part of her comprehensive medical and neuropsychological assessment, she had undergone an invasive video-EEG monitoring procedure with implanted subdural strips on ITG and functional mapping. The language tasks included naming and reading words and sentences.

**Results:** speech arrest during a naming task was observed upon electrical stimulation of the mid-posterior temporal strip. Disruption on a reading task was observed upon stimulation of the temporo-occipital strip, during which the patient reported distortions of letters rendering the word impossible to read. The patient underwent surgery under awake conditions with additional functional mapping performed throughout the resection. Postoperatively, she was seizure-free, with no deficits in oral language, or in perception of visual gestalts but with a mild deficit in reading, for which she was referred to cognitive rehabilitation.

**Conclusions:** the results of pre-operative and intra-operative electrical functional mapping as well as the patient's post-operative reading difficulties suggest that visual word form recognition depends not only on the visual features of letter strings but are also influenced by language dependent parameters represented in the dominant ITG. These results are suggestive of language-specific tuning of visual cortex of the dominant ITG.

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**D. DOTAN, S. DEHAENE & N. FRIEDMANN. Breaking Down Number Syntax: Dissociation Between Naming and Comprehension of Two-Digit Numbers.**

**Objective:** What is the scope of the syntactic processes that handle multi-digit numbers? Can the meaning of two-digit Arabic numbers be accessed even if a syntactic deficit prevents accessing their verbal-phonological representations?

**Participants and Methods:** We explored the number processing of ZN, an aphasic patient with a syntactic deficit in digit-to-verbal transcoding.

**Results:** ZN could hardly read aloud two-digit numbers, but could read them as single digits ("four, two"). Neuropsychological examination showed that his deficit was neither in digit input nor in phonological output processes, as he could copy and repeat two-digit numbers. His deficit lied in a central process that converts digits to abstract number words and sends this information to phonological retrieval processes.

Crucially, in spite of this deficit in number transcoding, ZN's two-digit comprehension was spared in several ways: (1) he could calculate two-digit additions; (2) he showed good performance in a two-digit comparison task, and a continuous distance effect; and (3) his performance in a task of mapping numbers to positions on an unmarked number line showed a logarithmic (nonlinear) factor, indicating that he represented two-digit Arabic numbers as holistic two-digit quantities.

The number-to-position task further showed that whereas ZN's logarithmic representation was normal, his linear quantity encoding was delayed and more decomposed into digits than in the control group.

**Conclusions:** Two-digit number comprehension – arithmetic and quantity encoding – does not require converting the digits to verbal representation. Namely, saying and comprehending multi-digit Arabic numbers is handled by separate syntactic processes.

ZN's performance in number-to-position task suggests two separate quantity encoding mechanisms: a logarithmic-holistic mechanism,

which is intact for ZN, and a linear-decomposed mechanism, which is impaired. The latter might be related to the verbal encoding of numbers. Correspondence: *Dror Dotan, Language and Brain Lab, School of Education, Tel Aviv University, PO box 39040, Ramat Aviv, Tel Aviv 69978, Israel. E-mail: dror.dotan@gmail.com*

**A. GVION & N. FRIEDMANN. To Bee or Not to Bea : Two Subtypes of Surface Dysgraphia.**

**Objective:** Surface dysgraphia (SD) is traditionally conceived as a writing deficit that stems from impairment at the orthographic lexicon resulting in writing via phoneme-to-grapheme conversion route. This may lead to lexical or non-lexical erroneous spellings (writing bee or bea instead of be). A look at the writing process suggests, however, that a deficit in the lexical route can also result from a disconnection between the semantic system and the orthographic lexicon. In this case, orthographic lexicon itself is intact, so writing can proceed via the phonological lexicon to the orthographic lexicon. Writing via this route is expected to result in writing predominantly existing words (writing be instead of bee).

**Participants and Methods:** To examine this prediction we assessed the writing patterns of 11 Hebrew-speaking individuals with developmental SD in various written tasks. We also tested their reading in order to examine whether the orthographic input lexicon can be intact when the output lexicon is impaired and vice versa.

**Results:** We identified two subtypes of SD. Nine of the SD participants had both lexical and nonlexical phonologically-plausible errors and no frequency effect, indicating a deficit to the orthographic output lexicon, whereas two other SD individuals showed indications of intact lexicon, making predominantly errors that created existing words (writing be and not bee instead of bea), with frequency effect and significantly fewer errors on irregular nonhomophonic words. As to reading, the results suggest that surface dyslexia and dysgraphia are dissociable with respect to the orthographic lexicon. Three individuals had spared orthographic lexicon for reading but not for writing.

**Conclusions:** The results support the existence of two types of surface dysgraphia resulting from two different deficits in the spelling process. Correspondence: *Aviah Gvion, Ono academic college Reuth medical center, 41st Bney Binyamin st., Even Yehuda 40500, Israel. E-mail: aviah.g@ono.ac.il*

**O. CIVIER, V. KRONFELD-DUENIAS, O. AMIR, R. EZRATI & M. BEN-SHACHAR. Reduced Fractional Anisotropy in the Anterior Corpus Callosum Predicts Reduced Speech Fluency in Persistent Developmental Stuttering.**

**Objective:** Developmental stuttering is a prevalent disorder, characterized by frequent speech disfluencies. White matter anomalies are reported in stuttering individuals, but their functional significance is unclear. We sought to examine this question by analyzing the relation between white matter properties and level of speech fluency in adults who stutter.

**Participants and Methods:** We used diffusion tensor imaging with tract-based spatial statistics, and assessed speech fluency and diffusion properties of white matter in 14 adults who stutter and 14 matched controls.

**Results:** We detected a region in the anterior corpus callosum with significantly lower fractional anisotropy in adults who stutter relative to controls. Within this region, lower fractional anisotropy values predict reduced speech fluency in adults who stutter. In addition to these findings, a statistically significant interaction was found between group and age in two other regions: the left Rolandic operculum and the left posterior corpus callosum.

**Conclusions:** The correlation results suggest that the callosal anomaly in the stuttering group does not indicate beneficial neuroplasticity. As a whole, our findings are consistent with the hypothesis that developmental stuttering is associated with structural anomalies in the left hemisphere, including the left Rolandic operculum, and that recruitment

of the right frontal cortex through callosal changes is an undesirable outcome. We discuss the implications of these findings for current models of intact speech production.

This study is supported by the Israel Science Foundation [513/11 to M.B.-S and O.A], and by a Marie Curie International Reintegration Grant [DNLP 231029 awarded to M.B.-S. by the European Commission]. O.C. and V.K.D are supported by the Israeli Center of Research Excellence in Cognition [I-CORE Program 51/11]. O.C. is also supported by the Center for Absorption in Science, Ministry of Immigration Absorption, The State of Israel.

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## Paper Session 6: Development and Genetics

Moderator: Sarah Raz

3:30–5:00 p.m.

### R. GEVA. The neonatal biological origins of social difficulties: insights from prematurity.

**Objective:** The neonatal biological origins of social difficulties are still unknown. The current study aimed to explore empirically the central role of neonatal brainstem electrophysiological functions in the development of social disengagement and behavioral inhibition.

**Participants and Methods:** Participants 180 preterm neonates participated in a prospective longitudinal study (GA=33.1wks, birth weight =1775g, 51% Females). The infants were tested within the first 2w. of post-natal life with an auditory brainstem-evoked-response test. Based on which they were divided into two groups (compromised, CBSF; normal, NBSF), and were enrolled in a prospective longitudinal follow-up study from birth through 8 years of age.

This report focuses on presenting responses to age dependent socio-emotional challenges using clinical observations and gaze tracking technology, by focusing on gaze regulation measures during dyadic social interaction with an unfamiliar agent, and triadic social engagement paradigm.

**Results:** Results from 4 months, 12 months and from the 8 year testing show that infants with neonatal CBSF seem to be more susceptible to social engagement difficulties and a, resulting in frequent passivity/dependency. Specifically, shorter gaze durations in face-to-face interaction is noted at 4 months; a difficulty to initiate self-regulatory activities in response to a socio-emotional challenge is noted at 12 months, a longer gaze at non-social and non-emotional social agent conditions were noted at 8 years of age in children with CBSF as compared with the NBSF group.

**Conclusions:** These empirical data seem to be compatible with the hypothesis that neonatal brainstem dysfunction intervenes with socio-behavioral development and underscores the role of early emerging neural networks in higher-order competences. Importantly, future work may enable neonatal detection of infants at risk for socio-emotional deficits to enable early initiation of intervention at this most sensitive and highly plastic developmental phase.

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### B.N. PETERS, A.M. HEITZER, J. PIERCY, A.K. DEBASTOS, J.B. NEWMAN, D.G. BATTON, N. OFEN & S. RAZ. Head Growth in the Neonatal Intensive Care Unit and Preschool Neuropsychological Performance.

**Objective:** We investigated associations between early postnatal growth gains and neuropsychological outcome in very preterm-born children.

Specifically, we wished to establish whether relationships exist between gains in head size, from birth to hospital discharge, and intellectual, language, or motor performance at preschool age.

**Participants and Methods:** We recruited 121 preschoolers, born < 33 weeks gestation, graduates of the William Beaumont Hospital Neonatal Intensive Care Unit (NICU) in Royal Oak, MI. Mean gestational age of this singleton sample was  $30.5 \pm 2.93$  weeks (birth weight  $1,557 \pm 563$  g). We excluded children with congenital anomalies, severe sensory deficits, moderate or severe intracranial hemorrhage and cerebral palsy. Cognitive, motor, and language outcomes were evaluated with the Wechsler Preschool and Primary Scale of Intelligence-Revised, Peabody Developmental Motor Scales - 2nd Edition, and the Preschool Language Scale - 3rd Edition, respectively.

**Results:** The difference between head circumference z-scores at birth and hospital discharge was the variable of interest in simultaneous multiple regression procedures. We statistically adjusted for chronological age, sex, socioeconomic status, gestational age, perinatal complications, and intrauterine growth rate. The z - difference score accounted for a unique portion of the variance in global IQ and Verbal IQ ( $F_s [1, 115] = 5.12$  and  $5.00$ ;  $p < .02$  and  $< .03$ , respectively), with trends for relationships with nonverbal intelligence and receptive language ( $p = .07$ ).

**Conclusions:** Greater gains in head size in the NICU are associated with higher preschool intellectual abilities even after statistical adjustment for sociodemographic and perinatal characteristics. Thus, longer term performance of cognitive, but not motor, tasks in nondisabled very preterm children is related to early postnatal growth, as indexed by an anthropometric variable that reflects brain development in the NICU.

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### R. ROELOFS, E. WINGBERMÜHLE, K. FRERIKS, C. VERHAAK, R. KESSELS & J. EGGER. A Comparison of Affective Information Processing in Noonan and Turner Syndromes: Evidence of Alexithymia.

**Objective:** Noonan (NS) and Turner syndrome (TS) are associated with cognitive problems and difficulties in affective information processing. While both phenotypes share physical features, genetic etiology and neuropsychological phenotype differ significantly. The present study examines putative differences in affective information processing and social cognition of patients with NS and TS.

**Participants and Methods:** Two groups of female patients (27 NS, 40 TS) and 40 female controls were matched on age and intelligence, and subsequently compared on (a) alexithymia, measured by the Bermond Vorst Alexithymia Questionnaire, (b) emotion recognition, evaluated by the Emotion Recognition Task (ERT), and (c) social cognition, assessed by the Scale of Interpersonal Behaviour as well as a social cognition factor (SCF) based on subtests of the WAIS-III.

**Results:** Impaired affective information processing was present in the TS group (alexithymia:  $p$ -values  $< .001$ ; ERT happiness:  $p < .01$ ; SCF:  $p < .05$ ) compared with the NS group, whereas patients with NS only had more difficulty in the recognition of angry facial expressions than controls ( $p = .01$ ).

**Conclusions:** Impairments in affective information processing, in particular alexithymia, are more pronounced in patients with TS than in NS. Visuospatial difficulties, typically associated with TS, may explain the results found on the SCF. In NS, some indications were found for sex-specific patterns of alexithymia. Present findings of differential profiles in NS and TS suggest neuropsychological phenotyping to be helpful for the diagnosis of specific cognitive-affective deficits in genetic syndromes, and for the development of personalised treatment.

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**D. ANAKI, T. ZADIKOV, V. GEPSTEIN & Z. HOCHBERG. Factors Underlying Face and Emotion Recognition in Women with Turner Syndrome.**

**Objective:** Turner Syndrome (TS) is a genetic disorder which affects 1/2000 women, and is characterized by a partial or complete absence of the sex chromosome. Women with TS frequently suffer from various physical and hormonal dysfunctions, along with impairments in visual-spatial processing and social cognition difficulties. Recent research shows difficulties in face and emotion perception. In the recent study we examined whether the impairments in face and expression perception observed in TS stem from the perceptual visual dysfunctions exhibited by TS individuals or from their impaired social cognition skills.

**Participants and Methods:** 26 women with TS and 26 control participants were tested on a cognitive-psychological battery to assess general spatial perception, face and emotion perception, social cognition skills and IQ.

**Results:** Women with TS showed difficulties in spatial perception and facial expression processing. They were also less accurate in face perception, yet they exhibited normal face-specific processes, namely, holistic processing. Their social cognition capacities were largely intact. Additional analyses showed that their face perception impairments stemmed from deficits in visual processing.

**Conclusions:** In contrast to past findings our results do not support the claim that women with TS are impaired in face-specific processes. We also did not observe robust impairments in social cognition. Rather, our data point to the possibility that face perception difficulties in women with TS stem from visual impairments and may not be specific to faces. Correspondence: *David Anaki, Bar-Ilan University, 19 Queen Heleni, jerusalem 9510112, Israel. E-mail: david.anaki@gmail.com*

**M.A. ASBE & O. KOFMAN. Temporal Discounting and Strategy Use in School-Aged Children.**

**Objective:** The ability to prefer large delayed rewards over small immediate rewards in delay discounting tasks (DD) develops with age and

is impaired in individuals with disorders such as ADHD and addiction. It is not known how temporal discounting is related to time estimation and strategy use. Presenting the reward options within the framework of a clear rule could minimize discounting in children, allowing them to choose the large delayed reward.

**Participants and Methods:** The effect of dimensionality of the task was tested in 2nd, 4th and 6th grade pupils on two DD tasks using points for rewards and a post-reinforcement pause to equalize task length for all children. In the Unidimensional DD task the large delayed reward and the immediate constant rewards were mapped to a turtle and rabbit, respectively, enabling formation of a clear rule. In the Two-Dimensional DD task all options were represented by the same animal, so that for each choice the child had to compare the numerical values of the delay and reward for each trial. In addition a reactive strategy task, sensitive to ADHD, and a semantic fluency task which enables measurement of spontaneous strategy use (clustering), and a time discrimination task were administered. Intelligence was assessed with the Raven's colored progressive matrices.

**Results:** The DD pattern depended on age and task. The 4th grade group demonstrated steeper discounting than the 2nd grade group, in the unidimensional task but not in the two-dimensional task. A significant correlation was found between the performance on the DD task and Raven Scores among all children, however no significant correlations were found with the other behavioral measures. Data on the other strategy and time discrimination tasks will be presented.

**Conclusions:** Conclusions: This finding concurs with Piaget's theory of centration term and heuristics in young participants compared to teenagers and adults.

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**THURSDAY MORNING, JULY 10, 2014**

**Symposium 4:  
Have Video Demonstrations of Classic  
Neurobehavioral Syndromes Advanced Our  
Understanding of the Neural Substrates of Complex  
Behavior?**

**Chair: Kathleen Haaland**

**10:30 a.m.–12:00 p.m.**

**K.Y. HAALAND. Aphasia and limb apraxia after left hemisphere stroke.**

Video examples of aphasia and limb apraxia after left hemisphere stroke will be presented with emphasis on their qualitative characteristics, lesion location, and current theoretical conceptualizations. More specifically, patients with expressive or receptive aphasia will be shown with delineation of their different pattern of speech fluency and auditory comprehension, shared problems in repetition and word finding, and different non-linguistic characteristics, such as hemiparesis and awareness of deficit. Two limb apraxia cases will also be presented to illustrate the different types of deficits seen with conceptual and ideomotor limb apraxia. Focus will be upon the conceptual apraxic's impaired semantic knowledge of object function with intact spatial and temporal aspects of gestures and the ideomotor apraxic's spatial and temporal impairments of gestures.

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**D. BOWERS. Hemispatial Neglect and Emotion Perception Disorders After Right Hemisphere Lesions.**

This presentation will focus on videos and case examples of individuals with focal lesions of the right hemisphere, primarily stroke. Primary emphasis will be on hemispatial neglect and emotion disturbances secondary to right hemisphere lesions. Variants and subtypes of these disorders will be highlighted in terms of qualitative behavioral features and associated lesion location. The clinical aspects of these disorders will be considered in the context of contemporary theories and models providing insight into underlying neural mechanisms.

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**G. VINGERHOETS. Typical and atypical lateralization of cognitive functions.**

Whereas asymmetries in some cognitive functions such as attention and memory are largely modality driven, other functions show clear lateralization and prefer one hemisphere over the other. The reason behind this preference is unclear and structural brain asymmetries have not provided a full explanation of functional lateralization. The understanding that most cognitive functions consist of interconnected neural networks of which some hubs appear to be more lateralized than others

has only added to the complexity. Still, presentation of symptoms following atypical unilateral brain damage remains a puzzling phenomenon. Here, I will focus on functional co-lateralization to explore typical and atypical cerebral lateralization. I will argue that functional co-lateralization may serve as a kind of brain archeology and can provide a better understanding of the evolutionary links between cognitive functions.

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**R.T. KNIGHT. Gazzaniga's Evaluation of Hemispheric asymmetry after Commissurotomy.**

Split brain cases offer another window into the different functions of the two cerebral hemispheres in patients who have no other significant hemispheric lesions. I will show videos of Gazzaniga's initial split brain patients who are asked to perform unimanual tasks to verbal command with eyes open or eyes closed. When visual input is restricted to the right visual field, these patients can name objects or read the object names without difficulty, but when the information is restricted to the left visual field, they cannot do either but they can draw the object with their left hand, but not their right hand. Similarly, when they manipulate an object in their right, but not their left hand, they can name it or write the name of the object. However, when manipulating the object in their left hand, they can draw the object with their left, but not their right hand. These studies convincingly demonstrated the left hemisphere's specialization for language and the right hemisphere's specialization for spatial skills. . These patients can do mirror movements in each hand to visual command when their eyes are open but cannot make correct movements with their left hand to verbal commands with their eyes closed. Finally, when praxis is assessed by showing these patients a tool and asking them to perform gestures, such as hammering, they are able to perform the movement with the right, but not the left, hand consistent with the left hemisphere's dominance for praxis.

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**K. HAALAND, K.Y. HAALAND, D. BOWERS, R.T. KNIGHT & G. VINGERHOETS. Video demonstrations of classic neurobehavioral syndromes. Have they advanced our understanding of the neural substrates of complex behavior?**

**Symposium Description:** Classic neurobehavioral syndromes have had a strong influence on the development of neuropsychology, behavioral neurology and cognitive neuroscience, especially in the context of hemispheric asymmetry. Early descriptions of aphasia, apraxia, and neglect as well as Gazzaniga's elegant studies of commissurotomy patients have had particular importance. While early conceptualizations were based on strict localization of complex functions, which progressed to disconnection theories, more recent views emphasize distributed processing across neural circuits. This symposium will present videos of aphasia and apraxia (Kathleen Haaland), hemispatial neglect (Dawn Bowers), and Gazzaniga's commissurotomy cases (Robert Knight) in the context of the underlying neural substrates and how these concepts have changed (Guy Vingerhoets) in the 21st century.

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**Paper Session 7:  
TBI (B)**

**Moderator: Philippe Azouvi**

**10:30 a.m.–12:00 p.m.**

**K.D. GAINES. Comparison of Effort Measures, Cognitive Complaints, and Self-reported Neuropsychiatric Symptoms in Blast-Induced Mild TBI.**

**Objective:** To investigate the relationship between compromised effort on neuropsychological measures and self-report of emotional distress and cognitive complaints of U.S. veterans deployed in Iraq or Afghanistan who were diagnosed with blast-related mild Traumatic Brain Injury (mTBI) and PTSD.

**Participants and Methods:** 28 subjects diagnosed with mTBI and PTSD underwent neuropsychological testing as part of an ongoing study. The battery included 2 free-standing measures of test effort (Word Memory Test (WMT) and Dot Counting) as well as 3 embedded measures (WAIS-IV Digit Span ACSS, WAIS-IV RDS, and ROCFT combination score). Subjects completed the BDI-II, BAI, PCL-M, and PAOFI to assess self-reported neuropsychiatric symptoms and cognitive complaints. Of the 28, 8 failed the WMT (<80% on Multiple Choice and Paired Associates). The two groups were compared on demographic characteristics, performance on other effort measures and self-reported complaints.

**Results:** No significant group differences were found in time interval from TBI, age, or education. The failed effort group performed significantly worse on all of the 6 subtests of the WMT, with Multiple Choice being the most significant ( $t(7)=8.12, p < .001$ ), as well as the WAIS-IV Digit Span ACSS ( $t(7)=5.16, p < .05$ ). No significant differences were found for the other effort measures. The failed effort group reported significantly more cognitive complaints in executive functioning ( $t(7) = -5.48, p < .05$ ) and higher levels of anxiety ( $t(7) = -1.15, p = .02$ ).

**Conclusions:** 29% of this preliminary research sample demonstrated suboptimal test effort as defined as failure on the WMT. Subjects in the failed effort group reported significantly more problems in executive functioning and higher rates of anxiety.

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**P. AZOUVI, C. VALLAT-AZOUVI, V. MILLOX, E. DARNoux, I. GHOUT, S. AZERAD, A. RUET, E. BAYEN, P. PRADAT-DIEHL, P. AEGERTER, J. WEISS & C. JOURDAN. Ecological Validity of the Dysexecutive Questionnaire: Results from the Paris-TBI study.**

**Objective:** To assess the validity of the Dysexecutive Questionnaire (DEX, Wilson et al., 1998), self-rating version, four years after a severe traumatic brain injury (TBI).

**Participants and Methods:** The present study is a part of a larger prospective four-year follow-up study of 504 adults with severe TBI recruited from 2005 to 2007 in the Parisian area (Paris-TBI study, Jourdan et al., 2013; 2013). Among 245 survivors, 147 (mean age 33 years, 80% men) were evaluated in a face-to-face interview with a neuropsychologist. A global assessment of cognitive impairments was conducted with the Neurobehavioral Rating Scale-revised (NRS-R). Mood disorders were assessed with the Hospital Anxiety and Depression scale (HAD). Executive dysfunctions in everyday life were assessed with the DEX (self-rated version), which is a 20-item questionnaire using a 5-level Likert-type rating scale.

**Results:** The DEX showed a good internal consistency in this sample. The total DEX score was significantly and inversely correlated with years of education. No injury severity variable was significantly related with the DEX total score. The DEX was however significantly and positively related with cognitive deficits as assessed with the NRS-R, with mood disorders, with dependency in elementary and extended activities of daily living, and with non-return to work. In multivariate analyses,



cognitive and mood impairments were significantly and independently related with the total DEX score.

**Conclusions:** The DEX (self-rated version), is a valid and sensitive questionnaire to assess executive dysfunctions in patients with severe TBI at a chronic stage. The total DEX score was significantly related with cognitive and mood assessment, and with social and vocational outcome. Cognitive deficits and mood impairments both independently contributed to the total DEX score. These findings suggest that the DEX is a multidetermined questionnaire, encompassing both the cognitive and emotional consequences of TBI in daily life.

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**A. LIVNY-EZER, M. WEISER, T. KUSHNIR, S. HARNOF, D. TOMASI, C. HOFFMANN & A. BIEGON. Cognitive Deficits Post Traumatic Brain Injury and their Association with Local Functional Connectivity Density in Resting-State.**

**Objective:** Traumatic brain injury (TBI) is a major cause of disability. Cognitive deficits are common in TBI survivors and may be associated with resting-state functional connectivity alterations.

**Participants and Methods:** Fifty-four TBI patients and 35 healthy controls were administered 3 cognitive tests: similarities, arithmetic, and Raven's progressive matrices-R (RPM-R). Subjects had performed equivalent tests at age 17 as part of pre-military screening; results were obtained from the Israeli Defense Forces. TBI patients were tested a year or more post injury (M, SD=35.2, 17.7 months). A difference in z-scores between post and pre injury scores was calculated. The TBI group was stratified by Glasgow Coma Scale (GCS) scores to mild (mTBI, GCS=13-15, N=19) and moderate-severe (msTBI, GCS=3-12, N=31) injury groups. Their post-pre injury scores were compared using a one way analysis of covariance. Post hoc analyses were further conducted. Ten mTBI and 8 msTBI patients were scanned during a resting-state condition. The preprocessed time series underwent local functional connectivity density (lFCD) mapping. The lFCD strengths of specific regions of interests were then correlated with post-pre injury change scores.

**Results:** Significant ( $p=.00$ ) declines in RPM-R were observed in both mTBI (M, SE= -0.54, 0.18) and msTBI (M, SE= -0.59, 0.15) groups relative to controls (M, SE= 0.24, 0.14). For similarities the msTBI group had the greatest decline (M, SE= -0.04, 0.14), greater than controls (M, SE= -0.01, 0.13) and mTBI (M, SE= 0.19, 0.17). No effect of TBI was found for arithmetic. In addition, a negative correlation ( $r=-0.34$ ,  $p=.038$ ) between the similarities post-pre injury change score and lFCD in the cerebellum was found only in the msTBI patients.

**Conclusions:** These results indicate that TBI has long-term selective effects on cognitive performance which are modulated by injury severity. Furthermore, cognitive deficits post-TBI were associated with hyper-connectivity in a resting-state condition.

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**M. STUDER, B. GOEGGEL SIMONETTI, T. HEINKS, M. STEINLIN, A. LEICHTLE, S. BERGER & A. JOERIS. Serum marker S100B is associated with ongoing cognitive symptoms in children after mild traumatic brain injury and ongoing somatic symptoms in children after orthopedic injuries.**

**Objective:** Although most children after mild traumatic brain injuries (mTBI) recover completely within 3 months, roughly 10 % suffer ongoing post-concussive symptoms (PCS). Due to the high incidence rate of mTBI, it is desirable to find biomarkers indicating children who are at risk for developing cognitive problems after mTBI. Thus, the aim of this study was to explore whether acutely measured serum biomarker S100B is associated with parent-rated PCS in children after mTBI.

**Participants and Methods:** We prospectively investigated children (age 6-16 years) with mTBI (n=38, mean age at injury: 10.86 years, mean GCS: 14.8) and as control group orthopedic injuries (OI, n=30, mean age at injury: 10.34 years). Serum S100B concentration was measured acutely. Four months after the injury, PCS were rated from parents (PCSI Questionnaire).

**Results:** Our results revealed no group differences regarding S100B serum concentration acutely. Furthermore, four months after the injury, no group differences existed concerning the PCS rating. However, group specific Spearman correlations (controlled for age at injury) indicated significant relations between S100B and cognitive PCS ( $r=.55$ ,  $p=.00$ ) in children after mTBI. In children after OI, S100B correlated with somatic PCS ( $r=.38$ ,  $p=.03$ ).

**Conclusions:** Findings indicate that acutely measured S100B in serum as well as PCS ratings four months after the injury were comparable between children after mTBI and OI. However, acutely measured S100B correlated differently with symptoms four months after the injury: While S100B was associated with cognitive symptoms in children after mTBI, S100B was related with somatic symptoms in children after OI. Our results replicate that S100B is not specific for brain injuries and also elevated after OI. Given that acute S100B release is associated with different symptom patterns in the post-acute period, this might indicate that S100B in children after OI is not released by brain tissue but other sources, such as fat tissue. Further investigations are mandatory.

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**R. ASARNOW, E. DENNIS, J. VILLAON, S. DEBOARD-MARION, M. ELLIS, T. BABIKIAN, C. KERNAN, C. GIZA & P. THOMPSON. Effects of White Matter Disruption and Restitution in Children on Cognitive impairments and Recovery During the First Year Following Moderate/Severe Traumatic Brain Injury.**

**Objective:** We tested the hypotheses that following moderate/severe traumatic brain injury (TBI): 1) the post-acute cognitive deficits after non-penetrating pediatric TBI reflect white matter (WM) injury and disconnection and: 2) that cognitive recovery during the first year post-TBI occurs in conjunction with the restoration of neural network connectivity via repair of WM. We focus here on the corpus callosum (CC, which is frequently damaged by TBI) as an exemplar of a neural network disrupted by TBI. Since there is little gray matter in the CC it provides an opportunity to study brain-behavior relations relatively unconfounded by gray matter

**Participants and Methods:** 44 children with moderate or severe TBI and 43 age and gender matched controls between 8-18 years old were studied. Children with TBI were studied longitudinally, 2-4 months and at 12 months post-TBI, using high resolution DTI, structural MRI and fMRI to assess WM connectivity and measures of anterior (a Bimanual Coordination task) and posterior CC function (an ERP measure of interhemispheric transfer time). Age and gender matched controls were studied at the same intervals.

**Results:** We used a new multi-atlas label fusion fiber clustering method to divide the CC into 6 components, according to the Johns Hopkins-MNI-ss atlas: frontal, precentral gyrus, postcentral gyrus, parietal, temporal, and occipital. Post-acutely fractional anisotropy (FA), an index of white matter connectivity, was significantly less in TBI subjects in the frontal and temporal fiber bundles. FA increased significantly in TBI subjects at 12 months compared to 2-4 months post-TBI. Post-acutely IHHT was significantly longer and Bimanual Coordination task performance was poorer in the children with TBI compared to healthy controls (n=43). IHHT and Bimanual Coordination performance improved significantly in TBI subjects at 12 months compared to 2-4 months post-TBI. During this same interval processing speed also improved significantly.

**Conclusions:** These results are consistent with our hypothesis.

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## Paper Session 8: Language

Moderator: **David Anaki**

10:30 a.m.–12:00 p.m.

**A. PINA RODRIGUES, J. REBOLA, H. JORGE, J. MORENO, M. PEREIRA, I. FESTAS, M. CASTELO-BRANCO & M. VAN ASSELEN. Text Reading and Noise Exclusion in Dyslexia.**

**Objective:** Developmental dyslexia is characterized by a reading deficit despite normal intelligence levels. Previous studies suggested that dyslexics have a different processing of the contextual visual noise. It is not clear yet the influence of this different noise processing in a natural reading environment. We aim to understand the influence of the surrounding noise of a text in reading performance by measuring eye movements in dyslexic and normal children.

**Participants and Methods:** Portuguese children with (N=22, mean age±SD =10.29±1.2) and without (N=24, mean age±SD=10.56±0.8) dyslexia were included. The experiment consisted in two text reading tasks. The first (baseline) was presented in a clear white background. In the second text, surrounding visual noise was manipulated by heavily fading all the words that were not being fixated by the child, highlighting the one that was being read.

**Results:** The reading latencies were measured and a main effect of Group was found ( $p<0.01$ ), indicating that dyslexics took more time to read the texts than controls. Concerning eye movements, we analyzed the number and duration of fixations, the number of regressions and the saccadic amplitude. A Repeated Measures analysis showed a main effect of group ( $p<0.01$ ) in both conditions for all the eye movements measures. As expected, dyslexics made more and longer fixations, more regressions and shorter saccades. No significant Group x Noise interaction was found, indicating that both dyslexics and controls were influenced by the exclusion of the surrounding noise in a similar manner.

**Conclusions:** In conclusion, despite the evidence of different visual noise processing in dyslexic children, the current results suggest that, in a more natural reading environment, those deficits don't account for the reading impairments of these children.

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**J. REBOLA, A. PINA RODRIGUES, H. JORGE, J. MORENO, M. PEREIRA, I. FESTAS, M. CASTELO-BRANCO & M. VAN ASSELEN. Word Reading and Noise Exclusion in Dyslexia: Eye Movements and Performance.**

**Objective:** Developmental dyslexia is characterized by a reading deficit despite normal intelligence levels. It has been suggested that dyslexics have deficits in processing surrounding noise. However, it remains unclear whether noise processing in dyslexics can actually influence their reading capacity. Therefore, we aim to understand the influence of different noise levels in word reading by measuring eye movements in dyslexic and normal children.

**Participants and Methods:** Portuguese children with (N=24, mean age±SD=10.29±1.2) and without dyslexia (N=26, mean age±SD=10.56±0.8) were included. Words and pseudowords were randomly presented in the center of the screen under three background noise conditions: no noise (clear white background), symbol noise (abstract symbols) and white noise (random bright and dark dots). Subjects pressed a button to discriminate between words and pseudowords. Eye movements were measured using a remote eye tracker.

**Results:** Accuracy rates and response latencies were analyzed using a Repeated Measures analysis, indicating a main effect for group ( $p<0.01$ ) as well as a Group x Noise interaction ( $p<0.01$ ). Overall, dyslexics were slower and less accurate, with the white noise condition significantly impairing the performance of dyslexics more than that of controls. Concerning eye movements, we measured the number and duration of fixations, regressions and saccadic amplitude. A Repeated Measures ANOVA showed a main group effect ( $p<0.01$ ) for the number of fixations and regressions. As expected, dyslexic children made more fixations and regressions than controls.

**Conclusions:** In sum, the current results suggest that visual noise is processed differently in dyslexic children, which might have a negative effect on their reading ability.

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**M. BIRAN, A. GVION, L. SHARABI & M. GIL. The Relations between Treatment Outcome, the Underlying Deficit and the Representation in the Lexical Process: Evidence from Homophones Naming Treatment.**

**Objective:** Lexical retrieval is a multi-level process. Deficits in the different levels result in different types of naming impairments. An important question is whether each type of deficit requires a different type of treatment. To examine this question we conducted a homophones treatment study. Homophones have one phonological word-form that is shared by more than one semantic meaning (palm - hand; tree). It is controversial whether they also share one phonological representation. Aims: a. To examine the responsiveness of deficits in different levels of the lexical retrieval process to the same treatment protocol. b. To examine whether the treatment of one meaning of the homophones will generalize to the other.

**Participants and Methods:** Participants and Method: Two Hebrew-speaking individuals with aphasia. One with impairment at the phonological output lexicon and one with impairment at the phonological output buffer. Before and after treatment, naming of 39 pictures: 13 homophonic word pairs (in their 2 meanings) and 13 phonologically related words, was tested. 13 words, one of each homophone pair, were treated in 5 consecutive sessions, in which the participant was asked to name the 13 pictures. If he failed, he was given an increasing phonological cue until the correct word was produced.

**Results:** Results: For the participant with the phonological lexicon deficit, improvement in naming of treated and untreated homophones was found, with no improvement in naming of phonologically related words. For the participant with the phonological buffer deficit, no improvement was found.

**Conclusions:** Conclusions: The results indicate that this treatment protocol is appropriate for a phonological lexicon deficit, but not for a phonological buffer deficit, supporting the view that each type of deficit requires a different type of treatment. Furthermore, the results replicate previous studies and support the existence of shared phonological representations to separate semantic representations of homophones.

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**M. MESHULAM, D. GROPE, P. MEGEVAND, M. HAREL, A. MEHTA & R. MALACH. The Cortical Dynamics of Thought: a Data-Driven Analysis of Intracranial Recordings During a Deliberative Task.**

**Objective:** As research of higher cognitive function advances, suggestions of specialized mental processes are constantly debated. At the same time, our understanding of the neuronal processing underlying thought processes remains limited. We set out to study the neuronal interplay underlying performance in a complex visual task, which elicited several seconds of thought in each trial, focusing on the neuronal activity during this time window and capitalizing on the excellent temporal resolution of electrocorticography (ECoG).

**Participants and Methods:** We analyzed 824 electrodes from 8 patients which covered a large part of the cerebral cortex. Trials consisted of questions (“what is the connection?”, “which is bigger?” or “which color appears in both images?”) followed by pairs of visual stimuli. Each trial ended with the patient’s verbal response. Our analysis focused on induced broadband power responses in the high gamma range (80–160Hz), reflecting local neuronal firing rate. We used k-means to cluster electrodes by their response profiles and then tested for periods of significant activation ( $t$ -test,  $p < 0.05$ , FDR).

**Results:** We found electrode clusters with distinct functional and anatomical features which demonstrated early visual, late visual and speech-locked responses. In addition, “processing positive” electrodes, clustered in the posterior central gyrus (PCG) and the dorsolateral prefrontal cortex (dlPFC), showed sustained, though decreasing, positive activation after stimulus offset, as well as a late visual component. On the other hand, “processing negative” electrodes, clustered in the medial temporal gyrus (MTG), showed a reduction in activity following stimuli presentation but increased activity following speech onset.

**Conclusions:** Using a data-driven approach, we uncovered the unique spatio-temporal profiles of networks involved in task performance and discerned two networks which were inversely activated during the thinking stage of a complex task, shedding new light on the elusive neuronal basis of thought.

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#### **D. DOTAN & N. FRIEDMANN. Phonological Pathways of Speech Production: Lexical Information in Post-Lexical Stages.**

**Objective:** Certain aphasic patients produce content words with phonological errors but number words with semantic errors (e.g., 45 → forty three). We investigated the origin of this phenomenon, which we called STEPS (Stimulus Type Effect on Phonological and Semantic errors).

**Participants and Methods:** Six individuals with conduction aphasia were selected based on the existence of phonological errors in their speech. Several tasks of speech production and comprehension were used to assess their functional locus of deficit and their production of words from various categories.

**Results:** All participants had a phonological output buffer deficit, and for two of them this was the only deficit. They all exhibited STEPS, making only semantic errors in number words. Function words and morphological affixes were also produced with semantic errors. However, when the number and function words were presented out of their “natural” semantic context, phonological errors emerged.

**Conclusions:** We concluded that speech uses phonological building blocks of various sizes – single phonemes in content words, whole words in numbers and function words, and morphological affixes. STEPS originates in a speech production deficit that causes substitutions of one phonological building block by another, but each building block is an atomic unit and is rarely broken.

Models of speech production typically assume that words are stored as a sequence of phonemes in a phonological lexicon, and merged into phonological sequences by the phonological output buffer. We suggest that number words, function words, and morphological affixes are stored this way too, but they are also stored as pre-assembled phonological units, ready for articulation, in the phonological output buffer (the only module that was impaired for all participants). These pre-assembled forms are used when a word is activated in the “natural” semantic context.

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### **Poster Session 3: Cognitive Intervention/Rehabilitation, Executive Functions/Frontal Lobes, Memory Functions, and TBI**

**10:30 a.m.–12:00 p.m.**

#### **Cognitive Intervention/Rehabilitation**

##### **S.S. SIMON, C.M. BOTTINO & T.A. CORDÁS. Cognitive Psychotherapy in elders with depression and cognitive deficits: a review.**

**Objective:** Elderly people with depression and executive dysfunction represent a population with significant disability and high likelihood to present slow, poor, and unstable response to antidepressant drugs. Thus, it is relevant to investigate alternative therapies for this population, such as cognitive psychotherapies (CP). The aim of this literature review is to investigate the effectiveness of CP in improving depressive symptoms, disability, and cognition in elderly people with depression and cognitive deficits.

**Participants and Methods:** MEDLINE, EMBASE, PsychINFO and SCIELO databases were searched from 1990 to January 2014. The following inclusion criteria were used: (a) studies that involved a modality of cognitive psychotherapy focused on elderly people with depression and cognitive deficits (b) diagnostic criteria of depressive disorder according to the DSM-III, DSM-III-R, DSM-IV, DSM-IV-TR, DSM-V, CID-9 or CID-10 (c) cognitive deficits objectively identified through neuropsychological tests (d) studies that were written in English, French, Spanish or Portuguese. There was no exclusion criteria regarding methodological design

**Results:** Five studies were eligible for this review. All studies were RCT comparing cognitive psychotherapy to supportive therapy, conducted individually. The main approach used was Problem Solving Therapy, and one study combined PST with cognitive rehabilitation components (compensatory strategies). In all studies, CP showed to be more effective than supportive therapy in improving depressive symptoms and disability. Although there were no changes in the majority of the neuropsychological tests, it was reported improvements in one executive function test and patients reported qualitative gains in problem solving skills, such as generating alternatives and decision making.

**Conclusions:** Cognitive psychotherapies is a promising intervention to treat elders with depression and cognitive deficits, however the present review is limited because of the small number of studies in this field.

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##### **K. MARGELISCH, M. TÖRMÄNEN, B. STUDER-LÜTHI & W. PERRIG. Impacts of a word-picture training on reading and spelling in Swiss elementary school children.**

**Objective:** There is convincing evidence that phonological, orthographic and semantic processes influence children’s ability to learn to read and spell words. So far only a few studies investigated the influence of implicit learning in literacy skills. Children are sensitive to the statistics of their learning environment. By frequent reading they acquire implicit knowledge about the frequency of letter patterns in written words, and they use this knowledge during reading and spelling. Additionally, semantic connections facilitate to storing of words in memory.

Thus, the aim of the intervention study was to implement a word-picture training which is based on statistical and semantic learning. Furthermore, we aimed at examining the training effects in reading and spelling in comparison to an auditory-visual matching training and a working memory training program.

**Participants and Methods:** One hundred and thirty-two children aged between 8 and 11 years participated in training in three weekly sessions

of 12 minutes over 8 weeks, and completed other assessments of reading, spelling, working memory and intelligence before and after training.

**Results:** Results revealed in general that the word-picture training and the auditory-visual matching training led to substantial gains in reading and spelling performance in comparison to the working-memory training. Although both children with and without learning difficulties profited in their reading and spelling after the word-picture training, the training program led to differential effects for the two groups. After the word-picture training on the one hand, children with learning difficulties profited more in spelling as children without learning difficulties, on the other hand, children without learning difficulties benefit more in word comprehension.

**Conclusions:** These findings highlight the need for frequent reading trainings with semantic connections in order to support the acquisition of literacy skills.

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**E. WINGBERMÜHLE, R. ROELOFS, R. KESSELS & J. EGGER. Treatment of Impaired Affective Information Processing and Social Cognition in Neuropsychiatric Patients: A Systematic Review.**

**Objective:** Impairments in affective information processing (AIP) and social cognition (SC) have been associated with psychiatric disorders, inadequate social interaction, and lowered self-esteem. Consequently, problems in AIP and SC impede daily functioning and affect quality of life. Promoting improvement of AIP and SC in patient populations has been the subject of many intervention studies during the last two decades. The aim of the current study is to identify effective elements of these interventions.

**Participants and Methods:** A systematic literature search was performed in PubMed, PsycINFO and Web of Knowledge databases (2003 until 2013). Articles were selected if they described interventions for improving AIP and SC in adult patients with brain damage or neuropsychiatric disorders, and if a pre- and post test design was used. Studies were excluded if a client control group was lacking, outcome measures were not cognitive or behavioural in nature, the sample size was smaller than 10, or effect sizes were unknown.

**Results:** The initial search returned 2,439 hits. After detailed inspection of title and abstract, 261 records were identified to be relevant, of which 24 articles met the inclusion criteria. Described interventions were predominantly developed for people with psychotic disorders, autism spectrum disorders, and anxiety/mood disorders. The majority of studies focused on the amelioration of problems in one or more of the following problem areas: emotion perception, social perception, mentalisation/Theory of Mind, attributional style, cognitive skills, and social functioning.

**Conclusions:** This systematic literature search showed that both targeted and broad based interventions have the potential to improve AIP and SC in neuropsychiatric disorders. However, the different ingredients have still been insufficiently investigated with respect to their unique and combined effects.

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**R. FRIEDMAN, A. MEYER, H. GETZ, D. BRENNAN & T. HU. Telerehabilitation of Anomia in Primary Progressive Aphasia.**

**Objective:** People with neurodegenerative disease may benefit from language and cognitive therapy. However, difficulty traveling may prevent them from accessing such treatment. This study assesses the feasibility and efficacy of remote delivery of treatment for anomia in Primary Progressive Aphasia (PPA).

**Participants and Methods:** WCH, who has logopenic PPA, and ACR, who has the semantic variant, participated. A subset of the evaluation sessions and all of the treatment and practice sessions took place

remotely. 120 nouns that were named consistently correctly (prophylaxis items, Proph) or incorrectly (remediation items, Remed) on three baseline tests were identified and divided among three conditions: reading/writing (RW) treatment, repetition treatment (Rep), and no treatment. Items were matched across conditions for frequency, semantic category, and length. Treatment sessions, conducted using a bidirectional audio/video connection, custom interactive software, and an electronic signature pad for written input, took place semiweekly for the first month and monthly for five months thereafter, and were supplemented by thrice-weekly home practice. Post-testing began one month after treatment ended.

**Results:** WCH showed a significant decline for untrained Proph items (McNemar's Test,  $p < .01$ ), but no significant decline for Proph items in either treatment condition. There were no significant effects for WCH's Remed items, but there was a trend toward improvement in the Rep condition. ACR's naming of Remed items improved significantly in the Rep condition ( $p < .05$ ). There was a trend toward improvement in the RW condition, and there was no change in the untrained condition. There were no significant changes for ACR's Proph items.

**Conclusions:** This study demonstrates the feasibility of a telerehabilitation approach to the treatment of anomia in PPA. The finding of positive treatment effects when treatment is administered remotely holds out hope to homebound patients in need of rehabilitation of cognitive deficits.

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**M. TURON, S. FERNANDEZ-GONZALO, V. GOMEZ-SIMON, B. SALES, J. MONTANYA, M.J. MASDEU, L. BLANCH & M. JODAR. Early Neurocognitive Rehabilitation in Intensive Care Unit: Proof of Concept.**

**Objective:** Patients admitted to the ICU present cognitive alterations that extend beyond the acute phase and impact on quality of life. In order to prevent or ameliorate these alterations, we develop an early neurocognitive stimulation platform. The platform consists in a monitoring module, that allows the control of the patient's physiologic state, and a stimulation software based on a virtual environment where the patient can walk through in and complete cognitive exercises.

In order to explore the technical/functional validity of a neurocognitive stimulation platform for ICU patients, we carried out a proof of concept. The objective was focused in explore the interaction between the subject and the platform in terms of movement recognition and feasibility of the cognitive exercises.

**Participants and Methods:** 6 healthy volunteers were selected to test the early neurocognitive platform in ICU-like environment. All participants were monitored for 20 minutes before, during and after the session of cognitive stimulation, and they interact with the stimulation platform for 20 minutes. Technical problems occurred during the stimulation session were also registered. Moreover, each participant completed a 5 points-likert questionnaire composed by 19-items that assessed his/her experience and satisfaction with the platform.

**Results:** Physiological variables of any volunteer exceeded 20% compared to baseline. Technical problems, such as movement recognition problems and software bugs, were registered. Results of the 5 points-likert Questionnaire are summarized below: Comfort (4.2), Physical fatigue (0.78), Boredom (0.96), Relax (4.13), Interaction (3.65) and General estimation (4.33).

**Conclusions:** Results of this proof of concept suggest that an early neurocognitive stimulation is feasible for bedridden patients. However, it is necessary to solve technical problems, such as movement recognition difficulties and software bugs, before starting clinical trial with critically ill patients.

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**M. PYASIK, A. KISELNIKOV, J. GLOZMAN, A. VARTANOV & S. KOZLOVSKIY. Description of neuropsychological syndrome of stuttering as a basis for successful neurorehabilitation.**

**Objective:** Objective of the study is to quantitatively specify the pattern of defects in neurocognitive functioning in people with stuttering.

**Participants and Methods:** All subjects participated in complex neuropsychological assessment (Luria, 2013) with quantitative analysis of the results (Glozman, 2012). The assessment was designed to evaluate the following cognitive functions: visual functions, motor functions, speech, memory, intellectual processes, neurodynamics component of cognitive activity. The frequency manifestation of the discovered symptoms was calculated for each of these functions (registered in 'penalty points' on a scale from 0 to 3). The discovered symptoms were also attributed to a certain brain region by calculating the distribution of these symptoms, normalized for the number of symptoms, which can be potentially caused by each brain region (calculated in %).

Subjects. 33 patients with clinically verified diagnosis of stuttering (23 men, 10 women, mean age 24.5±5.3 years old).

**Results:** The highest 'penalty point' score was discovered for memory (0.88); moreover, it is higher for visual memory than for the verbal. Relatively high scores were also obtained for the neurodynamics component of cognitive activity (0.42) and motor functions (0.37). The results of symptoms localization show the following pattern: posterior frontal region of the brain is the most involved in the syndrome of stuttering (25.2%), along with basal and deep brain structures (16.3%) and parietal-temporal-occipital area (16.7%). This neuropsychological syndrome adds to the speech fluency defects in stuttering.

**Conclusions:** Neurorehabilitation of people with stuttering should focus not only on the defects of speech fluency but also on the specific neurocognitive defects.

This study was partially supported by Russian Foundation for Humanities project # 13-06-00570.

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**A. KISELNIKOV, J. GLOZMAN, A. VARTANOV, S. KOZLOVSKIY & M. PYASIK. Rehabilitation of impaired interactions of brain structures in stuttering.**

**Objective:** Objective of the study is to describe rehabilitation dynamic of interactions of brain structures in readiness for speech moment in stuttering.

**Participants and Methods:** 25 adult patients with stuttering and 20 age and sex balanced fluent speakers were assessed with EEG recording before and after complex speech and psychological rehabilitation. Subjects had to perceive and repeat Russian words and then 'readiness for speech ERPs' (averaged brain potentials preceding speech onset on 600-ms latency) were localized on MRI-scans with the special algorithm of 'paired' equivalent electrical dipoles calculations. Special indices of interhemispheric ('interhemispheric' paired-dipoles ties as % of all ties) and anterior-posterior ('anterior-posterior' paired-dipoles ties as % of all ties) interactions in readiness for speech moment in people with stuttering comparing to norm and in rehabilitation dynamic were extensively studied.

**Results:** Interhemispheric interactions are seriously and significantly reduced in subjects with stuttering in readiness for speech moment (index for norm = 82%, for stuttering = 42%,  $p < 0.05$ ). Complex speech and psychological rehabilitation improves these differences (index for follow-up = 50%). Anterior-posterior interactions are also impaired in subjects with stuttering in readiness for speech moment (index for norm = 67%, for stuttering = 59%,  $p < 0.05$ ). Complex speech and psychological rehabilitation improves these differences at hypercompensational level (index for follow-up = 72%). These findings consist with previous EEG and MRI investigations.

**Conclusions:** Interactions of brain structures in stuttering are impaired both in interhemispheric (more) and anterior-posterior (less) aspects and these differences are subjects of successful corrections in process

of complex speech and psychological rehabilitation. This study was partially supported by Russian Foundation for Humanities project # 13-06-00570.

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## Executive Functions/Frontal Lobes

**N. DEV, J. NARAYANAN, S. CHUKKALI, R. SEETHARAM & A. JANSARI. Exploring Executive Functioning in Patients with Frontal and Temporal Lobe Epilepsy Using a Novel Ecologically-Valid Virtual Reality Task: The Jansari Assessment of Executive Functions (JEF©).**

**Objective:** Epilepsy is a condition affecting about 0.5% of the population in the world. Studies show that executive dysfunctions occur in Frontal Lobe Epilepsy (FLE); however, while studies show memory problems in Temporal Lobe Epilepsy (TLE), recent studies have suggested that there are also executive impairments in these patients. We aimed to address this by evaluating performance on a novel ecologically valid measure of executive functions, JEF©.

**Participants and Methods:** We compared the performance of 10 TLE and 10 FLE patients to a group of healthy individuals (HC:  $n=20$ ) matched for age, education and gender. We used the Auditory Verbal Learning Test, Rey-Osterrith Complex Figure Test, Trail Making Tests A & B and the Jansari Assessment of Executive Functions (JEF©: Jansari, 2009). JEF© is a non-immersive virtual-reality task that mimics aspects of the Multiple Errands Task (MET) and resembles playing a computer game. Performance is evaluated on eight subtasks designed to test constructs central to executive function.

**Results:** As a group, relative to controls the epilepsy patients were significantly impaired on total JEF© score as well as a number of the sub scales (Wilks'  $\lambda = .671$ ,  $F(8, 31) = 1.90$ ,  $p < .05$ ). Importantly, however, while the FLE group had significantly higher impairments than the HC group, they could not be differentiated from the TLE group. In contrast, no significant between-group differences were seen on the standard tests.

**Conclusions:** Our findings demonstrate executive impairments in FLE using a novel ecologically-valid assessment. Additionally, as the performance of the TLE patients fell midway between that of FLE and HC groups, the results suggest that there is a spectrum of executive deficits. Larger scale studies to strengthen our findings will have significant implications for clinical care, diagnosis, treatment, surgery management and rehabilitation for TLE and FLE patients.

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**A. HAYEK, N. GABEL, D. KALMBACH, J. MAROLA & L. BIELIAUSKAS. Cognitive Reserve and Executive Dysfunction: Impact on Judgment of Health and Safety in an Inpatient Veteran Population.**

**Objective:** Poor executive functioning (EF) is related to poor judgment of health and safety in older adults (Bell-McGinty, 2002). However, the impact of cognitive reserve (CR) on the relationship between judgment and EF has not been assessed.

**Participants and Methods:** Participants were 211 Veteran medical inpatients. EF was operationally defined as completion time for Trail-Making Test Part B (higher score = worse performance). An estimate of CR was obtained using the Peabody Picture Vocabulary Test-4 standard score, and judgment was assessed using the Independent Living Scale. Effort and global cognitive functioning were included in analyses as potential confounds using Reliable Digits from the WAIS-IV Digit Span and the Mini-Mental Status Examination.

**Results:** A hierarchical regression analysis demonstrated that better EF ( $\beta = -.25$ ,  $p = .02$ ) was associated with better judgment. An interaction

effect between EF and CR was also demonstrated ( $\beta=1.37$ ,  $p=.03$ ) such that the relationship between EF and judgment was stronger for individuals with lower standard scores on the PPVT.

**Conclusions:** This finding indicates that while EF is related to judgment, it is especially important in individuals with lower CR.

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**M. HALLER, L.M. ROSENBERG, P. VARMA, N.E. CRONE, E.F. CHANG, J. PARVIZI, R.T. KNIGHT & A.Y. SHESTYUK. High Gamma Duration in Human Prefrontal Cortex Predicts Decision Time.**

**Objective:** The prefrontal cortex (PFC) is critical for decision-making and is involved in stimulus evaluation, response planning and behavioral monitoring. The temporal dynamics of PFC engagement from stimulus perception through response execution are undefined, and the temporal engagement of PFC subregions during decision-making processes is largely unknown. We examined the spatio-temporal dynamics of decision-making using electrocorticography (ECoG), wherein neural signals are recorded from subdural electrodes in patients with intractable epilepsy.

**Participants and Methods:** Local field potential power in the broadband high gamma range (HG; 70-150Hz) indexed local cortical activity. Subjects ( $n=13$ ) performed between one and seven tasks ranging in difficulty. Electrodes with HG increases over baseline were classified as task-active (23% of all analyzed electrodes, FDR adjusted  $p<0.05$ ). Duration electrodes were defined as electrodes exhibiting a significant correlation between HG duration and reaction times.

**Results:** Duration HG activity was evident in all tasks and cortical regions (46% of active electrodes), with the majority of duration electrodes (52%) observed in PFC. Within PFC, the majority of active sites (60%) exhibited duration activity, and the proportion of PFC sites with duration activity significantly increased with task difficulty ( $p<0.01$ ). HG onset times increased with task difficulty across PFC subregions. The onset of duration activity in inferior frontal gyrus preceded middle frontal gyrus onset in difficult, but not easy, tasks, providing evidence that task difficulty influences the order of prefrontal engagement.

**Conclusions:** The similarity of the duration effect across a diverse set of tasks, spanning the spectrum from simple perceptual choices to abstract categorical judgments, provides evidence that temporally sustained neural activity in the PFC supports diverse decision-making processes. NSF GRFP DGE1106400, NRSA 5F32MH075317, NINDS NS21135, PO4813, NS40596, NS065120, NS07839601, the Nielsen Corporation. Correspondence: *Matar Haller, Helen Wills Neuroscience Institute, UC Berkeley, 132 Barker Hall, Knight Lab, Berkeley, CA 94720-3190. E-mail: matar@berkeley.edu*

**O. LINKOVSKI, E. KALANTHROFF, A. HENIK & G.E. ANHOLT. A call for control: The Relations between Inhibition and Doubt.**

**Objective:** Obsessive-compulsive disorder (OCD) patients and their healthy family members suffer from deficient response inhibition. There are two possible explanations for this: 1) it is an epiphenomenon, resulting from continuous efforts to control one's thoughts, and 2) the deficit precedes OCD symptoms. However, untangling the role of this deficit in OCD remains a challenge. A previous study used a visual search task to demonstrate that individuals with high obsessive-compulsive symptoms take longer to indicate a target is absent, due to increased checking. In the current research we experimentally manipulated the level of inhibition and tested its effect on doubt in a visual search task. We hypothesized that increased inhibition would shorten duration of checking.

**Participants and Methods:** Fifty-one healthy participants completed a visual search task that was interweaved with auditory stop signals. The objective of each trial was to determine whether a target was present or absent. Upon hearing a stop signal, participants were required to stop searching and wait for the next experimental trial. Proportion of

stop signals varied between 2 experimental groups—30 % for the high inhibition group and 10 % for the low inhibition group. OCD symptoms were assessed via self-report questionnaires and a Structural Clinical Interview for DSM-IV-TR (SCID).

**Results:** We found a main effect for the type of trial; reaction times for trials without a target were longer compared to trials with a target. Furthermore, participants in the high inhibition group were faster to indicate the target is missing compared to the low inhibition group.

**Conclusions:** Our main conclusion is that increased inhibition may reduce doubts and possibly the duration of compulsive-like acts, while low inhibition possibly prompts such actions. Current results suggest that the executive deficit of OCD patients precedes and affects OCD symptoms. Correspondence: *Omer Linkovski, Psychology, Ben-Gurion University, Sderot Rager, Be 653, Israel. E-mail: omerlink@post.bgu.ac.il*

**A. EMMANOUEL, R. KESSELS, D. BOELEN & L. FASOTTI. Sensitivity of the Everyday Description Task, an 'Open-Ended' Script Generation Task, to Anterior Executive Dysfunction.**

**Objective:** Difficulties in planning multistep goal-directed activities of daily living have been related to executive impairments in script generation, i.e. disability to retrieve and process knowledge of familiar actions generated in correct sequence. Grafman (2002) predominantly attributed deficits in script generation to damage in frontal lobes. However, other lesion and fMRI studies showed that not only the frontal regions are involved in script generation (Boelen et al. 2011).

The main aim of the present study was to investigate the validity of the Everyday Description Task, (EDT; Dritschel et al., 1998), an 'open-ended' script-generation task, to adequately identify dysexecutive performance mainly related to anterior pathology.

**Participants and Methods:** We compared the performances of 30 patients with anterior lesions and those of 22 posteriorly damaged patients, all previously defined as dysexecutive, on the following EDT measures (Boelen's et al. scoring method, 2011): 1) the number of correct actions (CA) varied in centrality: Central (CCA), Trivial - not so central still relative (TCA), and Relevant intrusions - answers with lower centrality still belonged to the script (RICA) and 2) Errors (E): Irrelevant Intrusions (IRE), Perseverations (PE) and Errors in sequencing (SE). Twenty-nine healthy adults were included as controls. Two-tailed parametric (Dunnett's) and nonparametric (Mann-Whitney) multiple pair-wise comparisons were conducted among the 3 participant groups.

**Results:** Our results showed that all the above EDT measures can define brain pathology except for the RICA. Significant differences were revealed between the two patient groups in all the other EDT variables except for the IRE, probably attributed to their lower centrality to the activity.

**Conclusions:** Our findings indicate that the EDT variables are sensible but not specific to anterior executive dysfunction and that centrality may play an important role in the differential diagnosis and treatment of anterior executive dysfunction.

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**M. ARENY, T. ROIG & M. JÓDAR. Cognitive flexibility as a predictor of decision making performance in the Ballon Analogue Risk Task (B.A.R.T).**

**Objective:** A number of studies have raised the importance of certain executive functions such as attention, cognitive flexibility, response inhibition, and working memory in decision-making. The purpose of this study is to study whether or not working memory and cognitive flexibility can explain the changes in the performance of patients with acquired brain damage in BART. If performance in BART depends on

the working memory and cognitive flexibility of these patients, it is to be expected that these cognitive functions will be good predictors of decision-making.

**Participants and Methods:** 73 patients with acquired brain damage and 30 healthy subjects were assessed with the Balloon Analogue Risk Task (B.A.R.T), a computerised task that simulates characteristics present in decision-making. Letter-Number (LN) and Wisconsin Card Sorting Test (WCST) were also used.

**Results:** In the clinical group, there was a positive correlation between Total\$ BART and WCST ( $p=0.00$ ,  $r^2=0.73$ ) and a negative correlation between Total \$BART and WCST perseverative responses ( $p=0.00$ ,  $r^2=-0.62$ ), as well as between Total\$ BART and TMTB ( $p=0.00$ ,  $r=-0.73$ ). In the control group, there was a negative correlation between Total\$ BART and TMT B ( $p=0.00$ ,  $r^2=-0.73$ ) and a positive correlation between WCST and Total\$ BART ( $p=0.01$ ,  $r^2=0.48$ ). In the clinical group, the only variables studied that were included to explain the variation in Total \$BART were TMTB ( $p=0.00$ ) and WCST ( $p=0.00$ ). Only the years of studies ( $p=0.005$ ) was included to explain the variation in Total\$ BART score. In the control group, the only variables that were included to explain the variation in Total \$BART were LN ( $p=0.05$ ) and WCST ( $p=0.01$ ).

**Conclusions:** The changes in the performance of our patients with acquired brain damage in BART could be explained by cognitive flexibility. Performance in BART depends on the cognitive flexibility of these patients; therefore, it is to be expected that this capacity will be a good predictor of decision-making.

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#### M.A. WITKOWSKA. What's So Special About Professional Gamers?

**Objective:** The process of the massive transfer of everyday life to the virtual world is one of the reasons of metamorphosis sport into an e-sport (electronic sport). E-sport athletes (e-players) compete during professional gaming tournaments (pro-gaming). The differences between "normal" sport and e-sport mainly refers the psychological determinants of the latter. E-sports is not focused on the players' physical condition but his broadly defined mental abilities. Unfortunately most researches focus on players' aggressive behavior, and internet addiction, ignoring e-gamers cognitive functioning. Therefore it can be assumed that successful pro-players must have a highly developed executive functions, working memory, prospective memory, attention, cognitive flexibility, visuo-spatial abilities and be able to learn fast to quickly gain game proficiency. The main aim of this research is to create a general characteristics of cognitive functioning of e-players and identify pro-players special abilities.

**Participants and Methods:** Several memory, attention and executive functions tests (i.e. Complex Figure Test, CAMPRMPT, WCST) were administered to pro-players ( $n=20$ ), and the two control groups - amateurs and people who do not play video games at all or do it occasionally ( $n=20$  each).

**Results:** Preliminary analysis seems to support the hypothesis of a higher level of cognitive functioning of pro-players, compared to the other groups in the field of prospective ( $M=30.4, SD=4.05$ ) and visual memory ( $M=33.63, SD=3.9$ ). Pro-players also produced less perseverative responses in WCST ( $M=6.2, SD=3.32$ ) in comparison to other types of players.

**Conclusions:** A linear relationship between gaming proficiency and executive functioning is noted. That leads to the conclusion that being a professional gamer increases the level of cognitive functioning.

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## Memory Functions

#### E. HAMPSON, S.D. PHILLIPS, S.J. DUFF-CANNING, K.L. EVANS, M. MERRILL, C.N. SOARES & M. STEINER. Working Memory Impairment During Pregnancy: Association With Antepartum Depression?

**Objective:** Diminished concentration and memory are often self-reported by women in the second or third trimesters of pregnancy. Yet well-validated memory measures generally have failed to detect objective impairment. In a departure from most existing work, which has focused on declarative memory, we evaluated working memory (WM) in pregnant women ( $n=28$ ) with and without antepartum depression using tests that emphasized the active maintenance and manipulation of information within WM, processes known to recruit the prefrontal cortex. We hypothesized that increased numbers of WM errors would be apparent among women in late gestation.

**Participants and Methods:** Two groups of pregnant women (depressed, nondepressed) were assessed at 34-38 weeks gestation, and were compared with 3 groups of age- and education-matched non-pregnant or postpartum controls. All women were administered two WM tasks and a set of control tasks. The depressed women met DSM-IV criteria for major depression with peripartum onset.

**Results:** ANOVA revealed significantly poorer performance by the depressed antepartum women on two measures of WM, but not on a measure of declarative memory that depends primarily on the medial temporal lobe. Non-depressed antepartum women showed no impairment and performed at a level similar to, or better than, non-pregnant controls. Concentrations of two steroids measured in maternal serum (cortisol, estradiol) and severity scores on clinical depression scales, but not sleep variables, significantly predicted variation in WM performance in multiple regression analyses.

**Conclusions:** It is concluded that memory disturbance during gestation might not be as widespread as commonly believed, but may be seen among women suffering from or at risk for antepartum depression.

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#### A. KATZOFF & N. MARK ZIGDON. Best Conditions for Declarative Memory: Multiplication Facts as a Model.

**Objective:** The aim of this study is to extend our knowledge regarding the best conditions for declarative memory formation in the classroom. As a model for declarative memory we used learning of basic 1-digit $\times$ 1-digit multiplication facts (e.g.,  $8 \times 7 = 56$ ) because of its importance as a basis for learning complex mathematical procedures. Recent neurocognitive studies provided evidence that memorized multiplication facts involve mostly verbal brain areas. Therefore, we combined neurobiology research on memory with pedagogical findings on learning multiplication facts, in keeping with approach of educational neuroscience. New declarative memories are initially fragile and a consolidation process is needed for their stabilization. During consolidation, memory can be impaired if new competing learning tasks turn up. For decades it has been assumed that memories are not subject to further modification once they are consolidated. In recent years, however, there is renewed interest in the idea that reactivating a consolidated memory renders it labile to interference again, thus requiring another period of stabilization, referred to as reconsolidation.

**Participants and Methods:** In order to explore the best conditions for multiplication facts memory, we trained third grade children (at school) while using different conditions at the two labile phases of the memory. For the consolidation phase we used different kinds of interferences (similar versus different learning information) and at the reconsolidation phase different time windows for reactivation (24h versus 1 week).

**Results:** We found that memory was disrupted if there was interference during the two labile phases with new competing learning especially with similar information. We found also that the time that passed between

initial learning to reactivation influences the strength of the interference on reconsolidation.

**Conclusions:** These results have practical application for teaching declarative information in general and specifically for declarative mathematical information.

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**S. KOZLOVSKIY, M. PYASIK, A. KOROTKOVA, A. VARTANOV, A. KISELNIKOV & J. GLOZMAN. Selective Involvement of Lingual Gyrus in Working Memory and Perception of Different Types of Visual Stimuli.**

**Objective:** Present study explores brain activity related to memorizing different types of visual information.

**Participants and Methods:** Participants were 15 subjects (33.5±14.5 years old). Working memory testing consisted of two series, which differed in the level of difficulty (0- and 1-back tasks), and control task - passive observation of the same stimuli. Presented stimuli were square patterns 9\*9, which included grey (RGB: 100;100;100) and black (RGB: 0;0;0) squares set in three types of configuration (three types of stimuli, 16 variations each) – schematic faces, letters and geometric figures. In each part of the test stimuli were presented in 3 blocks of 120 stimuli (blocks of ‘faces’, ‘letters’ and ‘figures’). During the tests EEG (21 channels, monopolar) was registered. We calculated averaged ERPs of all subjects for each part of the test and stimuli type.

Each individual ERP was presented as a number of equivalent dipole sources (two-dipole model, dipole coefficient > 0.95). The amount of dipole sources, located in each of the brain structures, according to Talairach atlas, was calculated for each ERP for 0-500 ms post stimulus. This allowed to further evaluate the probability of difference of the amount of dipole sources between each stimuli and task type (Student’s t-test,  $p < 0.05$ ).

**Results:** During the analysis of the obtained data, many facts were revealed, but in present study we would like to focus on the following findings. The activity of left lingual gyrus is significantly higher during memorizing faces (both for 0- and 1-back tasks) than during memorizing letters and geometric figures. On the other hand, the activity of right lingual gyrus was found in passive perception of letters and geometric figures but not in perception of faces.

**Conclusions:** Thus, lingual gyrus is selectively involved in memory and perception of different types of visual stimuli.

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**H. BLACHSTEIN & E. VAKIL. Verbal Learning Across the Lifespan: An Analysis of the Components of the Learning Curve.**

**Objective:** Developmental progress in childhood and performance decrements in aging adults is well documented in a variety of cognitive domains showing an inverted-U performance curve across life span, with similar achievement at its two poles. Previous studies in separate child and adult populations on the acquisition process of verbal material also revealed a mean recall performance U-shaped. However mixed results regarding the learning curve rate, for each of the age populations are reported. Several researchers claim that there are indications that a side of the similarity in performance in episodic memory, different mechanisms could be involved in the same cognitive function at childhood and in old age. To characterize possible different learning mechanisms involved in the acquisition process across learning trials, the learning curve was decomposed by a finer grain analysis.

**Participants and Methods:** The Rey Auditory Verbal Learning Task was reproduced for participants aged 8-91years ( $n = 1471$ ). Typical trial summary scores and an analysis of trial-by-trial single word recalls were utilized that included omissions-missed recalls for words

previously recalled, additions-recalling previously missed words, and touched words-words ever recalled.

**Results:** An age effect on the number of words recalled with the typical inverted U pattern was shown. However, underlying similar learning curves the component measures disclosed different patterns: children’s acquisition showed a higher number of touched words, and a higher turn-over of additions and omissions. By contrast, older adults’ acquisition showed a lower number of touched words with a lower turn-over of additions and omissions characterized by a distributed profile across trials.

**Conclusions:** The results are interpreted in terms of the specific mechanisms of maturational characteristics, on the one hand, and compensative characteristics, on the other, for the two ends of the lifespan.

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**I. ZANNONI, M. BRAZZAROLA, S. MARANGONI, C. BARBERA & G. DALLA BARBA. Impaired Temporal Consciousness and preserved Knowing Consciousness in confabulation and amnesia.**

**Objective:** The aim of this study is to provide further evidence concerning the dissociation between Temporal Consciousness (TC), i.e. the ability to remember the personal past, to be oriented in the present and to predict the personal future, and Knowing Consciousness (KC), i.e. the ability to access impersonal past and future information, in confabulators and non confabulating amnesiacs.

**Participants and Methods:** 16 confabulating amnesiacs (CA, 8 female, mean age: 57.7, mean years of education: 12.1) and 5 non confabulating amnesiacs (NCA, 2 female, mean age: 44.4, mean years of education: 12.0) and 21 age and education matched normal controls entered the study. Participants were administered 15 questions for three domains tapping TC (episodic memory, e.g. “What did you have last night for dinner?”, orientation in time and place, e.g. “Where are you now?”, episodic plans, e.g. “What will you do tomorrow?”) and 15 questions for three domains tapping KC (historical and recent general semantic memory e.g. “What happened to Louis XVI?”, and, e.g. “Who is currently the President of the United States?”, and semantic plans e.g. “What will be one of the most important breakthroughs in the medical domain in the next ten years?”).

**Results:** Normal controls performed at ceiling in answering all types of questions. CA produced approximately the same amount of correct responses in TC and KC questions (40%). However, they produced significantly more confabulations in the domain of TC compared to KC, 28% and 18%, respectively. NCA produced less 7% of confabulations and in both domains and 60% and 51% of correct responses in TC and KC questions, respectively.

**Conclusions:** The present results provide further support to the notion that TC and KC are both theoretically and experimentally dissociable and that confabulation is more frequently observable for questions tapping TC.

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**S. MARANGONI, M. BRAZZAROLA, I. ZANNONI, C. BARBERA & G. DALLA BARBA. Varieties of confabulations.**

**Objective:** The aim of this study was to evaluate the amount of different types of confabulations in a group of confabulating amnesiacs.

**Participants and Methods:** 15 confabulating amnesiacs (7 female, mean age: 58.0, mean years of education: 12.0) entered the study. Patients were administered the Confabulation Battery, which involves the retrieval of various kinds of information and consist of 165 questions, 15 for each of the 11 following domains: Personal Semantic Memory, Episodic Memory, Orientation in time and place, Linguistic Semantic Memory, General Semantic Memory (Recent, Contemporary, Historical), Semantic Plans, Episodic Plans and questions to which the appropriate response would be ‘I don’t know’, both semantic and episodic.



Confabulations in the various domains were classified according to the following criteria: Habits Confabulations (HC), i.e. personal habits, which are considered by the patient as specific personal episodes, Misplacements (M) i.e. true episodes and facts misplaced in time and place, Memory Fabrications (MF), i.e. plausible memories without any recognizable link with personal or public events, Memory Confusions, i.e. confusions with other personal or public events related to the target memory, Autoreferential Contaminations (AC), i.e. patients, questioned about public or historical events, refer to the event in a personal context, Semantically Anomalous (SA), i.e. confabulations with an extremely bizarre and semantically anomalous content.

**Results:** Overall patients produced 449 confabulations. 34.1% were HC, 16.5% M, 23.8% MC, 22.0% MF. AC and SA confabulations were less than 10%.

**Conclusions:** These results confirm previous findings showing that Habits confabulations are the more frequently observed type of confabulation. We suggest that habits confabulation reflects the patients' tendency to mistake repeated events for unique events.

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### C. BARBERA, I. ZANNONI, M. BRAZZAROLA, S. MARANGONI & G. DALLA BARBA. Confabulation and awareness of memory impairment.

**Objective:** It is clinically well known that patients who confabulate are unaware of their memory impairment. The aim of this study is to experimentally measure the possible correlation between confabulation and awareness of memory impairment.

**Participants and Methods:** 8 confabulating amnesiacs (3 female, mean age: 53.0, mean years of education: 10.25) entered the study. Patients were administered the Confabulation Battery, which involves the retrieval of various kinds of information and consists of 165 questions, 15 for each of the 11 following domains: Personal Semantic Memory, Episodic Memory, Orientation in time and place, Linguistic Semantic Memory, General Semantic Memory (Recent, Contemporary, Historical), Semantic Plans, Episodic Plans and questions to which the appropriate response would be 'I don't know', both semantic and episodic. To evaluate awareness of memory impairment, a 12-item Self-Rating scale of Memory Functions (SRSMF) was administered to the patients and to 15 age and education matched normal controls. The SRSMF is devised to assess individuals' feelings about different aspects of their memory abilities. Single item scores ranged from 0 (very bad) to 4 (very good), for a total score range of 0-48.

**Results:** Overall patients produced a mean of 22.03% of confabulations. Confabulations in response to questions tapping Episodic Memory, Orientation in time and place and Episodic Plans accounted for 33.63% of the total number of confabulations. The score at the SRSMF didn't differ between patients and normal controls.

**Conclusions:** These results confirm experimentally the clinical observation that confabulators are unaware of their memory impairment and further support the notion that anosognosia for memory impairment plays a crucial role in confabulation.

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### M. BRAZZAROLA, I. ZANNONI, S. MARANGONI, C. BARBERA & G. DALLA BARBA. A longitudinal study of confabulation.

**Objective:** Confabulation is an infrequent and mainly a transitory sign shown by patients who suffer from an organic memory disorder. The aim of this study was to evaluate the persistence (quantity) and the consistency (quality) of confabulation over time.

**Participants and Methods:** 8 confabulating amnesiacs (4 female, mean age: 57.0, mean years of education: 12.3) entered the study. Patients were administered the Confabulation Battery (CB) at T0 and at T1 (mean 14 months). The CB involves the retrieval of various kinds

of information and consists of 165 questions, 15 for each of the 11 following domains: Personal Semantic Memory, Episodic Memory, Orientation in time and place, Linguistic Semantic Memory, General Semantic Memory (Recent, Contemporary, Historical), Semantic Plans, Episodic Plans and questions to which the appropriate response would be 'I don't know', both semantic and episodic.

**Results:** Overall at T0 patients produced a mean 22.0% of confabulations. Confabulations in response to questions tapping Episodic Memory, Orientation in time and place and Episodic Plans accounted for 40.7% of the total number of confabulations. At T1 patients produced a mean of 19.1% of confabulations. Confabulations persisted in response to questions tapping Episodic Memory, Orientation in Time and Place and Episodic Plans (41.0% of the total number of confabulations). The tendency to produce the same type of confabulation to the same questions at T0 and T1 was 65.1%.

**Conclusions:** These results show that confabulations may decrease, but tend to persist over time with the same content and being elicited by the same questions. They also provide further support to the notion that confabulations are more frequently observable in response to questions concerning personal temporality, i.e. personal past, present and future. Correspondence: *Marta Brazzarola, Centro Medico di Foniatria, via Bergamo 10, Padua 35142, Italy. E-mail: marta.brazzarola@libero.it*

### G. SELA, F. ANDELMAN, E. NOSSEK, Z. RAM, H. ELRAN & J. ROTH. The impact of colloid cysts and their treatment on neurocognition.

**Objective:** Colloid cysts are typically located at the roof of the third ventricle, adjacent to the foramina of monro and the fornices. As such, colloid cysts may lead to CSF obstruction, and symptoms of elevated intracranial pressure. However, some may cause local forniceal distortion with no CSF obstruction. Additionally, surgical treatment for colloid cyst, whether endoscopic or microsurgical, may lead to additional forniceal injury. In the current study, we prospectively performed neurocognitive evaluation for all patients with colloid cysts, whether operated or followed.

**Participants and Methods:** 40 patients with an MRI based diagnosis of colloid cyst underwent neurocognitive evaluation. This included estimate IQ, verbal abilities, verbal and spatial memory and attention and working memory (verbal and spatial). Of the 40 patients, we have neurocognitive follow up of 10 non-operated patients, and pre and post-operative NC evaluation for 20 operated patients.

**Results:** Non-operated patients have a higher neurocognitive function at presentation compared to preoperative surgical patients in regard to attention, learning verbal memory for words, spatial memory and recognition.

Amongst the operated patients, they improved in all measures (attention, learning verbal memory for words, spatial memory and recognition) postoperatively. This improvement was evident as early as 3 months after surgery.

**Conclusions:** There are baseline differences in the neurocognitive function of nonsurgical colloid cysts patients compared to surgical patients with the former being at a higher performance level. However, following surgery, patients improved in all measures.

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### P. PARK, H. YAMAKADO, R. TAKAHASHI, S. DOTE, S. UBUKATA, T. MURAI & T. TSUKIURA. Impaired recognition of faces encoded by emotional and semantic processes in patients with Parkinson disease.

**Objective:** Cognitive declines in patients with Parkinson disease (PD) are often observed. Previous studies have reported that PD patients are impaired in the processing of emotion-related information such as recognition of facial expression and in the processing of semantic elaboration such as verbal fluency of categorical classification. However,

little is known about how the effects of emotional and semantic processes on episodic memories are disturbed in PD patients. The current study examined recognition of face memories encoded by emotion-related and semantics-related processes in PD patients and age-matched normal controls (NC).

**Participants and Methods:** In this study, we employed 20 PD (mean age: 66.3) and 30 NC (mean age: 64.9) participants. During encoding, all participants were presented with unfamiliar faces one by one, and encoded them under three conditions including the emotional (E) judgments, semantic (S) judgments, and perceptual (P) judgments of faces. During retrieval, participants were presented with old and new faces at a random order, and recognized whether each face was old or new in high and low confidence responses.

**Results:** Corrected recognition scores in both high and low confidence responses were computed in each condition, and were compared among three conditions in each group of PD and NC. Results of NC participants showed significantly better recognition of faces encoded in E and S than those in P, but the memory enhancement was identified only in high confidence responses. However, in PD patients, we found no significant difference of recognition scores among three conditions in both high and low confidence responses.

**Conclusions:** The findings suggest that impairments of emotional and semantic elaboration processes during encoding could cause the disturbed enhancement of face recollection by these encoding strategies in PD patients, and that the impairments could be associated with the dysfunction in dopaminergic modulation of emotion-related regions and the fronto-striatal deficits.

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**J. SALVADOR, C. ARMENGOL DE LA MIYAR, F. GORDILLO LEÓN & L. MESTAS HERNÁNDEZ. Some developmental aspects of semantic memory in children: Lessons from a sample of Mexican middle school children.**

**Objective:** Semantic memory is key to registering, encoding, consolidating, retaining and recalling information. It is fundamental to higher order learning and essential to executive functions. Its impact on learning during the school years is significant and understanding its functioning is fundamental to effective teaching approaches (Polychroni et al., 2011). Of particular interest are children 8+, an age at which metamemory strategies appear to undergo important qualitative changes (Meijs et al. 2013; Bjorklund & Douglas, 1997). Research on how children organize verbal information at various developmental stages is sparse (Meijs et al., 2013). The aim was to investigate characteristics of semantic memory in Mexican children.

**Participants and Methods:** 96 school-age Mexican children aged 9-12. Instruments: Sedo's (2012) Five Digit Test, TAVECI (Test de Aprendizaje Verbal Española-Complutense Infantil), and a neurological and psychiatric history questionnaire.

**Results:** Retention and storage capacity showed a progressive developmental trend characterized by a higher capacity for retention and storage, along with qualitative changes in complexity and type of strategies utilized for storage and retrieval

**Conclusions:** In addition to replicating Meijs et al. 2013, the qualitative analysis demonstrates the influence of cultural factors on metamemory strategies in this sample. Results are compared to those obtained in a native Mexican (Otomi) population (Salvador, Aclé & Armengol, 2014). Correspondence: *Judith Salvador, Ph. D., Posgrado, FES Zaragoza. UNAM, Cda. Gorrión 17, Rincónada de Aragón, México 55140, Mexico. E-mail: salradcj@yahoo.com*

**D.A. LEVY, S. BEN-ZVI & N. SOROKER. Parietal Lesion Effects on Cued Recall Following Pair Associate Learning.**

**Objective:** We address the issue of involvement of posterior parietal cortex in episodic retrieval in a lesion-effects study of cued recall of picture-sound, picture-picture and verbal pair associate learning.

**Participants and Methods:** Patients who had experienced first-incident cerebro-vascular accidents causing damage that included lateral posterior parietal regions were tested within an early post-stroke time window. They performed repeated study-test trials for pairs of words, pairs of object pictures and pairs of object pictures and environmental sounds. Patients' brain CT scans were subjected to quantitative analysis of lesion volumes and lesion-symptom correlations.

**Results:** An indication for involvement of the lateral ventral parietal cortex in cued recall following pair associate learning was demonstrated.

**Conclusions:** These results suggest greater involvement of parietal areas in more demanding forms of retrieval, such as cued recall, than in recognition memory.

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**S. BEN-ZVI, D.A. LEVY & N. SOROKER. The Brain and the Scale: Lesion Effects on Measures and Indices of the Wechsler Memory Scale.**

**Objective:** The Wechsler Memory Scale (WMS) is widely employed as a tool of neuropsychological assessment, yet little is known about how damage to various brain areas impacts on performance in its subtests and indices. We have attempted to delineate the neural basis of performance on the WMS-III battery by applying voxel-based lesion-symptom mapping (VLSM).

**Participants and Methods:** We have attempted to delineate the neural basis of performance on the WMS-III battery by applying voxel-based lesion-symptom mapping (VLSM). This was based on post-acute high resolution computerized tomography from patients after first-incident cerebro-vascular accidents with primarily cortical (especially middle cerebral artery territory) and some subcortical damage. Patterns of damage were calculated for WMS test scores and indices.

**Results:** Results indicate a complex pattern of lesion-symptom correlations that implicate several brain regions not traditionally thought to be substrates of mnemonic abilities in the performance of several memory tests of the battery.

**Conclusions:** The pattern of lesion effects also suggest that alternative methods for clustering of subtests, data organization, and the interpretation of scores on the WMS may be beneficial for understanding mnemonic impairments and their possible amelioration by individually-tailored rehabilitative approaches.

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**A. BLOCH, H. COHEN, M. OHAYON & V. ELI. Eye Activated Sequence Learning in Older Populations.**

**Objective:** Older adults reportedly perform poorly as compared to younger adults on different memory tasks. The goal of this research was to compare older and younger adults' performance on an SRT eye-activated task. The task was designed to study sequence learning without incorporating motor functioning that is known to decline with age.

**Participants and Methods:** Performance of sixteen older and sixteen younger adults was compared on an eye-activated serial reaction time task. Participants in the older group were volunteers (10 males, mean age 71.1 years, range 67-82), while the younger group consisted of students (3 males, mean age: 23.38 years, range 20-39 years).

Participants performed an SRT task in which their eye movements were recorded. The task required fixation on the correct stimuli on the screen for a 100ms duration, instead of the traditional key presses on the computer keyboard. The participants were instructed to locate the target with their eyes and focus on it until it disappeared. The same sequence was used in each of the 6 blocks in the SRT task, starting from a different point in each block. The task included eight blocks in total: blocks 1-6 and 8 using the same sequence, and block 7 using a different one. Every block presented the sequence nine times.

**Results:** The older participants' learning rate was significantly slower than that of the controls. Both groups displayed a learning effect in the first 6 blocks, a transfer effect when transitioning from block 6 to block 7, and a significant recovery effect. Overall, there was no difference in reaction time.

**Conclusions:** The novelty of this research is the paradigm of activating an SRT task using eye movements alone. This offers the possibility of exploring cognitive learning processes while neutralizing psychomotor influences. When successfully bypassing the motor decline that is typical of elderly populations, we found that their processing speed was the same as that of young adults, although their learning rate was slower. Correspondence: *Ayala Bloch, Neurorehabilitation, Sheba Medical Center, 1st Mizra Uvda st., Ariel 40700, Israel. E-mail: oshblo@gmail.com*

## TBI (Adult)

**K.R. GOULD & J.L. PONSFORD. A Longitudinal Examination of Positive Changes in Quality of Life After Traumatic Brain Injury.**

**Objective:** Traumatic brain injury (TBI) is a common and debilitating condition in young people. Studies of quality of life (QOL) after TBI reveal a largely negative picture, yet there are potentially some survivors who show positive changes in their QOL. Understanding an individual's QOL may assist clinicians in facilitating post-injury adjustment. The aims of the current study were to prospectively explore changes in QOL from pre- to post-injury, identify those with positive change (PC) and examine predictive and associated factors.

**Participants and Methods:** 95 participants were recruited from consecutive admissions to a rehabilitation hospital and were prospectively assessed once or more post-injury at 6, 12, 24, 36 and 48 months. Measures of QOL, psychiatric disorders, coping style and psychosocial outcome were administered at each assessment.

**Results:** Participants' mean QOL was in the average range pre-injury and at follow-up assessments. A third demonstrated PC post-injury and most continued to show improvement over time. PC participants tended to rate their relatives as of greater importance than other participants, but did not rate their health as highly. Group membership was not predicted by pre-injury demographic or injury factors, but it was significantly associated with psychosocial and functional outcome.

**Conclusions:** This study demonstrates that even after a significant brain injury, some individuals show sustained improved QOL, and provides some preliminary guidance into potential explanatory factors – such as lack of “good old days” bias, and increased value placed on family, which may have important clinical utility.

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**H. ROSENBERG, S. MCDONALD, M. DETHIER, R.P. KESSELS & R.F. WESTBROOK. Facial Emotion Recognition Deficits following Traumatic Brain Injury: Re-Examining the Valence Effect and the Role of Emotion Intensity.**

**Objective:** Individuals who sustained Traumatic Brain Injury (TBI) are less accurate in recognising the emotions experienced by others, with a greater impairment in the recognition of negative (such as fear, disgust, sadness and anger) compared to positive emotions (such as happiness and surprise). It has been questioned whether this ‘valence effect’ might be an artefact of the widely used conventional measures of facial emotion recognition (i.e., tasks requiring the labelling of full-blown emotional expressions) rather than a real consequence of brain impairment.

**Participants and Methods:** We used a recently developed task of emotion recognition to investigate the valence effect in TBI, while examining emotion recognition across different intensities (low, medium and high). Twenty-seven individuals with TBI and 28 age, sex, education,

and pre-injury occupation matched control participants took part in this research.

**Results:** The TBI group was more impaired in overall emotion recognition, and less accurate in the recognition of negative emotions. However, examining the performance across the different intensities indicated that this difference was driven by some emotions (e.g., happiness) being much easier to recognise than others (e.g., fear and surprise).

**Conclusions:** Our findings strengthen the argument for the inadequacy of conventional measures of facial affect recognition, and cast doubt on the notion that dissociable neural pathways are underlying the recognition of positive and negative emotions, which are differentially affected by TBI and other neurological or psychiatric disorders.

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**H. ROSENBERG, S. MCDONALD, M. DETHIER, R.P. KESSELS & R.F. WESTBROOK. Facial Emotion Recognition after Moderate-Severe Traumatic Brain Injury: The Role of Task Difficulty, Injury Severity, and Neuropsychological Functioning.**

**Objective:** Traumatic Brain Injury (TBI) impairs the ability to recognise emotions in others. Perception of negative emotions (such as sadness, disgust, fear, and anger) is reportedly affected more than perception of positive emotions (such as happiness and surprise). It has been argued that this reflects a distinct, specialised neural network underpinning negative emotions that is especially vulnerable to brain injury. However, studies to date have not equated for differential difficulty between emotions. We aimed to examine valence specific emotion recognition deficits in people with TBI while equating task difficulty. We also aimed to determine whether perception deficits might be accounted for by other cognitive processes.

**Participants and Methods:** Twenty seven people with TBI and 28 control participants matched for age, sex, pre-injury occupation and education identified the 6 basic emotions across different levels of intensity. We compared groups on each emotion at (i) the conventional 100% intensity and (ii) an intensity selected to yielded comparable accuracy rates with the other emotions, based on the control group (“equated emotions”).

**Results:** (i) 100% intensity: the TBI group were impaired in the recognition of anger, fear and disgust, but not happiness, surprise and sadness, and poorer in recognising negative than positive emotions (ii) “equated” emotions: the TBI group were poorer overall, but not differentially poorer in recognising negative emotions compared to controls. Regression analysis revealed that while processing speed and executive processes were associated with emotion accuracy, the only unique predictor was injury severity.

**Conclusions:** When measures of emotion recognition are equated on difficulty, individuals with TBI show an overall difficulty in emotion recognition, rather than a selective deficit in recognising some emotions. Implications for the need for measures that are not confounded by task difficulty are discussed.

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**J.R. GOODEN, J. PONSFORD, J.L. CHARLTON, M. BÉDARD, S. MARSHALL, P. ROSS, S. GAGNON & R. STOLWYK. Self-Awareness of On-Road Driving after Traumatic Brain Injury.**

**Objective:** Return to driving is often a key goal in rehabilitation following traumatic brain injury (TBI); however, difficulties associated with TBI can delay or prevent people successfully reaching this goal. Reduced self-awareness is one such difficulty; however, little research has been conducted that explores the role of self-awareness with regard to on-road driving. Therefore, the aim of this study was to explore self-awareness of

on-road driving ability in individuals with TBI using a newly developed measure of self-awareness.

**Participants and Methods:** Participants recruited thus far include 23 individuals with moderate to extremely severe TBI (PTA duration  $M = 32.36$  days,  $SD = 30.51$ ), and 20 healthy age, gender and education matched controls. Participants completed an on-road assessment with an Occupational Therapy (OT) specialist driving assessor and driving instructor. Following the assessment, TBI participants and OTs independently completed a new measure of self-awareness of on-road driving. TBI participant ratings were subtracted from OT ratings to compute a discrepancy score indicative of driving-related self-awareness.

**Results:** Preliminary analysis revealed no significant difference in self-ratings between TBI and control groups. However, a between-group comparison revealed discrepancy scores between TBIs and OTs ( $M = 2.00$ ,  $SD = 5.73$ ) were significantly higher compared to controls and OTs ( $M = -2.60$ ,  $SD = 4.07$ ), indicating that TBI participants were significantly overestimating their driving ability ( $p < .05$ ).

**Conclusions:** Individuals with moderate to extremely severe TBI making a return to driving significantly overestimated their driving ability compared to controls. This indicates that individuals with TBI may be unaware of a significant portion of errors made while driving which may impact on their ability to adequately compensate and adjust for changes in driving ability as a result of their TBI. These findings have applications for driver retraining post-injury.

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**A. DYMOWSKI, J.L. PONSFORD, C. WILLMOTT, J. OWENS, C.J. RICHARDSON & G. SPITZ. Attention and Executive Functioning Following Traumatic Brain Injury.**

**Objective:** Deficits in attention and executive functioning are common following traumatic brain injury (TBI) and can impact engagement in rehabilitation. This study aimed to investigate the performance of individuals with TBI on tasks assessing speed of thinking, working memory, divided attention and inhibition. Factors influencing attention and executive functioning such as injury severity were also investigated.

**Participants and Methods:** 40 individuals who had sustained a moderate to severe TBI (24 males) with mean age 35.22 years, mean post traumatic amnesia (PTA) of 31.44 days and mean time post-injury of 9.57 months (range 1.64 to 45.40 months) were compared to age-, gender- and education-matched controls. Participants completed the North American Reading Test, Symbol Digit Modalities Test (SDMT), Digit Span (WAIS-IV), Trail Making Test (TMT) and Hayling Test.

**Results:** Independent samples t-tests revealed that patients with TBI made significantly more errors and were slower on both speed of verbal response initiation and verbal response inhibition on the Hayling Test than controls. Once Bonferroni corrections were applied, there were no significant differences between groups on the SDMT, TMT or the Digit Span tasks. Increased duration of PTA was associated with completion of fewer SDMT items and increased completion time on the verbal response inhibition task. Worst GCS score was not significantly correlated with task performance.

**Conclusions:** These findings demonstrate that aspects of attention and executive functioning are differentially impaired following TBI. Specifically, patients with TBI have significant impairments in inhibitory control as demonstrated on the Hayling Test, a task with high executive loading and language component. Duration of PTA is also associated with slowed speed of information processing in the post-acute phase. This study exemplifies the need for targeted post-acute rehabilitation of specific aspects of attention and executive functioning following TBI. Correspondence: *Alicia Dymowski, BBNSc(Hons), Monash-Epworth Rehabilitation Research Centre, Monash University, 185-187 Hoddle Street, Richmond, VIC 3121, Australia. E-mail: alicia.dymowski@monash.edu*

**N.A. GRIMA, M.P. PASE, S.W. RAJARATNAM & J. PONSFORD. Characterising Sleep Dysfunction after Traumatic Brain Injury: A Systematic Review of Objective and Self-Report Measures.**

**Objective:** Sleep disturbances commonly occur following traumatic brain injury (TBI), with over 50% of people suffering from some form of sleep disorder. While objective and self-report measures have provided important insights into the nature of sleep difficulties, discrepancies across studies has precluded an exact characterization of sleep post TBI. The aim of the current systematic review was to establish the most prominent sleeping difficulties in TBI patients by comparing them with healthy controls.

**Participants and Methods:** Online databases were searched by two independent researchers for studies comparing adult TBI patients with age-and-gender matched controls on validated subjective and objective sleep measures. Controls were matched for age and gender, given the known changes in sleep with increasing age, as well as gender differences in sleep architecture in the presence of mood disturbance.

**Results:** The eligible studies revealed the Pittsburgh sleep quality index (PSQI) and Epworth sleepiness scale as commonly used subjective measures, whereas Polysomnography (PSG) was the most widely utilized objective sleep measure. When TBI individuals, with or without sleep symptomatology were compared with healthy controls on global PSQI scores, TBI patients on average, self-reported poorer quality of sleep.

**Conclusions:** The review will outline and summarize the most common features of sleep disturbed post TBI in order to characterize the most pertinent subjective and objective features. Future research should target intervention on alleviating poorly perceived sleep quality, as this is particularly distressing for a large majority of TBI individuals.

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**T. RADO & C. KNAGGS. Community Neurorehabilitation: The Challenge of Working With Apathy; A Single Case Study Design Combining Holistic Neuropsychological Rehabilitation and Methylphenidate to Treat a 55 Year Old Man More Than 3 Years Post Traumatic Brain Injury.**

**Objective:** Damage to prefrontal networks resultant from Traumatic Brain Injury is well documented to cause difficulties with executive function and emotion regulation. The combination of deficits encountered after sustaining prefrontal damage is typically debilitating and detrimental for achieving independent living. Further impairments of energisation can arise from prefrontal damage, affecting drive and readiness for rehabilitation.

**Participants and Methods:** In this case-study we evaluate the impact of a multidisciplinary community based holistic neuropsychologically-led approach to case BB, a 55 year old male who sustained a severe right frontal contusion as a result of a road traffic accident 3 years ago. A primary feature of his presentation was low energisation or drive resulting in significant personality change and associated with cognitive impairments impacting particularly on attention and executive function. Difficulties with engagement and readiness for rehabilitation were targeted with an intensive community-based rehabilitation approach. Methylphenidate, which has been shown to increase prefrontal functionality by acting as a dopamine-norepinephrine reuptake inhibitor, was introduced as an adjunct to therapy. Rehabilitation goals targeted daily structure and routine, community integration, independent living skills and physical and emotional well-being.

**Results:** Baseline measures of behaviour, mood, apathy, insight and awareness were completed alongside neuropsychological evaluation of executive function, attention and memory. Routine participation levels, social competence, initiative taking and everyday problem solving have been obtained across a six month period from support records. A decrease in apathy was observed during the early stages of the programme. A systematic reduction in support is underway.

**Conclusions:** The efficacy and treatment effects observed during the programme of community-based neurorehabilitation and methylphenidate 3 years post closed head injury, are to be presented and discussed. Correspondence: *Tara Rado, Psychologia Ltd, 10 Harley Street, London W1G 9PF, United Kingdom. E-mail: tara.rado@psychologia.co.uk*

**B. BALDIVIA, N. MORON, F. CHAMMAS, R. AMORIM, M. JACOBSEN, A.F. ANDRADE & M.C. LUCIA. Brain Injury Family Intervention applicability in a brazilian sample of relatives of Traumatic Brain Injury victims diagnosed with Diffuse Axonal Injury.**

**Objective:** To evaluate the applicability of the program "Brain Injury Family Intervention" (BIFI) in a Brazilian sample of caregivers of Traumatic Brain Injury (TBI) victims.

**Participants and Methods:** A group of six female participants (42,67 ± 4,76 years old, 9,17 ± 3,6 years of schooling. The group underwent 12 sessions of two hours which included discussions of typical effects of brain injury, coping with loss and change, managing stress and intense emotions, effective problem-solving, setting reasonable goals and taking care of one self. Pre and post intervention with outcomes measures including Burden Interview Scale (BIS), Behavioral Symptoms Inventory (BSI-18), European Brain Injury Questionnaire (EBIQ) and Ways of Coping Scale (WCS) were adopted.

**Results:** Kruskal-Wallis analysis showed significant increases of caregiver burden levels (BIS  $z = 0,04$ ;  $p = 0,04$ ), perception of impulsivity and cognitive impairments (EBIQ  $z = 0,04$ ;  $p = 0,04$ ) after intervention group. Spearman correlation test showed positive correlation between emotional burden levels and coping strategy based on social support before intervention ( $r = 0,9$ ). Before intervention, somatic complaints levels (EBIQ) were negative correlated to solving problems coping strategy ( $r = -0,94$ ) and religious practice ( $r = -0,9$ ). After intervention, this correlation was not found and burden levels were positive correlated to social support and religious strategies

**Conclusions:** The theme proposals by BIFI program were feasible to Brazilian sample, and this study shows evidence that the BIFI is perceived as helpful and that treatment method facilitates the development and change of coping strategies.

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**F. CHAMMAS, B. BALDIVIA, M. JACOBSEN, R. AMORIM & M.S. DE LUCIA. Contributions of personality assessment in understanding cognitive and affective disorders after TBI.**

**Objective:** the objective of this study is to describe through a case of, that the association of neuropsychological assessment to a review of detailed personality may provide a better understanding of the cognitive and behavioral changes after TBI and affective aspects. Thereby it is possible to draw up a comprehensive and individualized rehabilitation plan and neuropsychological intervention.

**Participants and Methods:** The patient was submitted to neuropsychological assessment and the Rorschach Test. Furthermore were conducted anamnesis with the patient and family members in order to determine prior to the accident behaviors

**Results:** The results obtained in this study, led us to raise the hypothesis the presence of personality traits consistent with conduct disorder, previously set to trauma. Planning strategies for the process of cognitive intervention took place aimed at offsetting changes in cognitive function resulting from brain injury and perhaps, the development of some aspects of personality in order to achieve a better functional adaptation and quality of life.

**Conclusions:** The combination of different methods of assessment not only provides a better opportunity to establish diagnostic hypotheses, but also better reflect the psychological functioning of the patient in order to better tailor and plan treatment.

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**Y. BOGDANOVA, S. KARK, G. LAFLECHE & V. HO. Neuropsychiatric and Functional Status in Veterans with Blast TBI.**

**Objective:** Neuropsychiatric symptoms and cognitive difficulties are common in OEF/OIF veterans but the relation between these symptoms is not well understood. Alexithymia, an impairment of affective and cognitive emotional processing, have been associated with traumatic brain injury (TBI) and posttraumatic stress disorder (PTSD). We examined the expression of neuropsychiatric symptoms (alexithymia and PTSD) and their effect on cognitive and social functioning in returning veterans with blast-induced mild (m)TBI.

**Participants and Methods:** Thirty-eight blast-exposed OEF/OIF veterans with mTBI ( $n = 22$ ) and without TBI ( $n = 16$ ) who presented with cognitive complaints were administered a series of neuropsychiatric measures, including Toronto Alexithymia Scale-20 (TAS-20), as well as standardized neuropsychological and functional status measures, including Dysexecutive Questionnaire (DEX) and Social Connectedness Scale-Revised (SCS-R).

**Results:** Forty-four percent of the blast-exposed veterans were categorized as alexithymic, which is three times higher than in the general population. There was a significant association between alexithymia level and number of blast exposures. Alexithymia levels were associated with TBI severity, and were significantly higher in TBI as compared to non-TBI group. Both, alexithymia and PTSD were strongly related to difficulties with executive control (DEX) and interpersonal connection (SCS-R). Regression analyses, however, indicated that alexithymia was the strongest predictor of dysexecutive symptoms and level of social connectedness.

**Conclusions:** Our results suggest that the higher rate of alexithymia in veterans with blast TBI may reflect a direct consequence of the blast-related changes to the frontostriatal system and its cortical connections, resulting in neuropsychiatric deficits. In our study alexithymia was associated with dysexecutive symptoms and problems with interpersonal connectedness. These findings highlight the need for early identification and treatment of alexithymia in this population.

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**TBI (Child)**

**R. STARGATT, J. PAPOUTSIS & S. ROSSITER. Can Reading Delay In Complicated Mild And Moderate Traumatic Brain Injury (TBI) Be Distinguished From Developmental Reading Delay On Neuropsychological Tests?**

**Objective:** Reading problems are common in children with TBI. One of the common questions asked in medico-legal assessment of children is whether identified reading delay is a result of a TBI sustained in infancy. The aim of this study is to determine whether or not the underlying cognitive deficits associated with developmental reading delay differ from the underlying cognitive deficits associated with TBI.

**Method:**

**Participants and Methods:** Seventy-one children who sustained a TBI before 4 years of age underwent neuropsychological testing 7-8 years following injury. Injury severity varied from uncomplicated mild (18) complicated mild (34) to moderate (18).

Results were compared with those of controls (33) matched on SES, age & gender.

**Results:** Chi square found higher frequencies of reading delay in children with complicated mild TBI and moderate TBI compared with controls ( $X^2 = 4.43$ ,  $p < .05$ ). ANOVA indicated significant differences across groups on tests of cognitive function,  $F(9, 294) = 1.924$ ,  $pillai's$

trace = 1.67,  $p < .05$ , partial eta sq = .06. Post Hoc analyses indicated TBI impacted on cognitive skills related to reading: phonological processing, speeded naming, Verbal IQ, as well as simple (Digit Span, Sky Search Attention) and complex attention (Sky Search Dual Task). Correlation and regression analyses indicated associations between cognitive skills, poor behavioural attention regulation (CBCL Attention) and reading proficiency differed across groups suggesting that attention and executive deficits impacted reading outcomes in TBI more so than in controls.

**Conclusions:** Reading delay in TBI is associated with lowered performance on tests of skills that underpin reading acquisition and additional tests of cognitive function. Reduced performance on tests of simple and complex attention and increased features of poor attention regulation may help to distinguish reading delay due to TBI from developmental reading delay.

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**M. SANZ PALAU, A. LÓPEZ SALA, M. TURON VIÑAS, L. CALLEJON POO, A. PALACIO NAVARRO, C. BOIX LLUCH, A. SANS FITÓ & R. COLOMÉ ROURA. Assosiation between age and Executive Functions and IQ in a TBI pediatric sample.**

**Objective:** Traumatic Brain Injury (TBI) is a common cause of death and disability in pediatric population. From early vulnerability perspective, recent research findings suggest that early brain injury has worse consequences and greater risk of disruption. The aim of our study is to analyze the profile in Intelligence (IQ) and executive functions (EF), and to examine the association of age at TBI.

**Participants and Methods:** 71 participants with moderate to severe TBI, aged 6-16 years, were assessed on measures of Intelligence (WISC-IV) and Executive Functions (TOL, NEPSY, Color Trail, CPT-II, ROCF) and compare with normative data using T-Student test. In another step, the sample was divided in 4 groups (infancy stage, aged 0-3years; preschool stage (4-6years); early schoolar stage (7-9years); late schoolar stage (>10years) and Kruskal-Wallis test was performed in order to explore the association of age at TBI and EF performance.

**Results:** Comparing with normative data, T-Student test showed that the sample of this study shows low-performance statically significant in all WISC-IV index (FSIQ, PRI, PSI and WMI), excepting for VCI ( $p = .24$ ). Results in EF measures show significant differences in TOL-movements, TOL- problem solving time, TOL-rule violation, Color Trail Test 1 and 2, NEPSY-inhibition and NEPSY-animal sorting. Kruskal-Wallis test showed significant differences in PSI, ROCF and NEPSY-animal sorting in infancy stage group, and TOL-problem solving time

in preschoolar stage group. Statistical significance for all analysis was established for  $p\text{-value} < 0.05$ .

**Conclusions:** Children with TBI are at increased risk for impairment across all aspects of Intelligence and EF. Children sustaining TBI in infancy and preschool stages have an increased risk and more global effects in IQ and some aspects of EF. These findings contribute to a better understanding of the sequelae of TBI in children in order to assist on rehabilitation plan and readaptation to functional life. Project funded by Fundació Marató TV3.

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**J.K. AL-DIWAN. Mental Health Consequences Of Wars And Terrorism In Iraq: A Preliminary Report.**

**Objective:** The work was carried out to report on mental health consequences of wars and conflicts on youth and children in Iraq

**Participants and Methods:** A total of 210 university students resident in Baghdad (their age 18 - 24 years with male to female ratio of 0.8:1) selected randomly and 230 school children from Al-Sader city selected by multistage random sample (their age was 9 - 20 years with male to female ratio 1:1.2). A questionnaire was filled for each participant. Requested data were demographic information, data on school achievement and Harvard Trauma questionnaire (exposure to war trauma, posttraumatic stress disorder and substance use disorder). Variables were dichotomized (PTSD vs non PTSD; academic achievement (poor vs good). Chi square was used to examine the association between exposure and PTSD, substance use disorder and poor academic achievement. Regression was used to demonstrate dose effect association between exposed number of events and score of PTSD and depression.

**Results:** Out of the total, 209 (99.5%) and 151 (71.9%) of university children and school children, respectively, were exposed to trauma. Of the exposed there were 39 (18.7%) and 65 (43%), respectively, with PTSD; 22 (10.5%) and 19 (12.6%), respectively, with substance used disorder; and 53 (25.4%) and 49 (32.4%) had poor academic achievement. High rates of PTSD, substance use disorder and poor academic achievement were significantly associated with exposure to accumulated trauma events (> 5 events), among university students and school children ( $p = 0.001, 0.001, 0.006, 0.003, 0.02$  and  $0.002$ , respectively).

**Conclusions:** High exposure rates to trauma events and high prevalence of PTSD, SUD and poor academic achievement were observed. Accumulated exposure to trauma events was significantly associated with high rates of PTSD, SUD and poor academic achievement.

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## THURSDAY AFTERNOON, JULY 10, 2014

**Symposium 5:  
New Views on Hippocampal Function: Memory and Beyond**

**Chair: Asaf Gilboa**

**Discussant: Mieke Verfaellie**

**3:45–5:15 p.m.**

**A. GILBOA, M. VERFAELLIE, R. ROSENBAUM, J. RYAN, A. LEE & A. GILBOA. New Views on Hippocampal Function: Memory and Beyond.**

**Symposium Description:** The hippocampus and related Medial Temporal Lobe (MTL) structures have been a focus of neuroscientific research for decades, but theoretical understanding of their functional significance varied considerably, going through several drastic transformations or ‘revolutions’. While considered initially an affective structure as part of the limbic lobe, the case of HM has led to the ‘mnemonic revolution’. For decades, the consensus was that hippocampal lesions impair declarative memory while leaving intact functions such as perception, short term (working) memory, language skills, executive functions such as problem solving and decision making and non declarative forms of memory such as priming, conditioning and skill learning. In recent years, however, there appear, to be the beginnings of a new ‘revolution’ in the conception of the functions of the hippocampus and related MTL structures, implicating them in non-mnemonic functions (or domains). The present symposium presents examples of these novel directions. We will challenge traditional divisions between domains (perception vs. memory: Dr. Lee); describe common underlying processes of memory and high-order functions such as prospection, creativity, problem solving and decision-making (Dr. Verfaellie and Dr. Rosenbaum); and contest strict distinctions within the memory domain (short-term vs. long-term memory: Dr. Ryan; declarative vs. non-declarative: Dr. Gilboa). We will present new evidence and new interpretations of old evidence regarding those newly suggested functions of the hippocampus. Where possible, the implications of these novel insights to understanding and intervening with the difficulties experienced by patients with damage to the MTL will be addressed.

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**J.D. RYAN. The Contributions of Hippocampal Relational Binding to Ongoing Processing.**

There is considerable support regarding the role of the hippocampus in the establishment of lasting memory representations for the relations among distinct elements. However, because hippocampal relational memory binding is engaged rapidly and obligatorily, the resultant representations may be used in service of multiple cognitive operations beyond long-term memory and over a variety of delays. Consequently, damage to the hippocampus results in changes to ongoing processing and the manner by which even successful memory performance is achieved. I will present eye movement evidence from amnesic cases to demonstrate that viewing of items and scenes is altered with hippocampal damage, suggesting that ongoing perceptual processing is impacted by hippocampal function, even when behavioral performance is similar to that of healthy controls. Findings from magnetoencephalography will also be presented which show that in healthy young adults, increases in theta power track ongoing binding operations and are predictive of subsequent short-delay visuospatial memory performance. Such increases in theta power are not apparent in healthy aging or in a developmental amnesic case, H.C., despite intact memory performance, suggesting that although the hippocampus can contribute to cognitive operations

outside of long-term memory, the conditions under which the hippocampus provides a critical contribution to performance remain to be defined. Correspondence: *Jennifer D. Ryan, 3560 Bathurst St., Toronto, ON M6A2E1, Canada. E-mail: jryan@research.baycrest.org*

**M. VERFAELLIE. Cognitive Impairments in MTL Amnesia: Beyond Episodic Memory.**

The hallmark of medial temporal lobe (MTL) amnesia is the inability to retrieve memories of personally experienced events. In recent years, however, neuroimaging work has suggested a role for the MTL not only in remembering past events, but also in imagining future events. Consistent with this notion, we have shown that amnesic patients have difficulty imagining future personal (episodic) events. However, our subsequent work has demonstrated that MTL patients are also impaired at imagining future impersonal (semantic) scenarios. It has been hypothesized that the MTL is necessary for episodic prospection because it allows (a) retrieval of event details from memory and (b) flexible recombination of details into novel scenarios. To evaluate whether the MTL contribution to semantic prospection can be understood in the same way, we evaluated patients’ ability to (a) retrieve details of well-established semantic narratives, and (b) recombine semantic information to generate novel concepts. MTL amnesics were impaired in both tasks. These findings suggest that the MTL may subserve semantic prospection through its role in retrieving semantic details and in combining semantic information in novel ways. This body of findings implicate the MTL in a number of functions – episodic prospection, semantic prospection, and creative use of concepts – that have not been traditionally linked to the MTL.

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**A. GILBOA. The Hippocampus And High Order Conditioning: Implications To Decision-Making And Choice Behaviour.**

Neutral stimuli acquire motivational salience when paired with intrinsic reinforcement in first-order conditioning and also when paired with previously conditioned stimuli in high-order conditioning (HOC). Both types of conditioning represent non-declarative learning, and so presumably are independent of the hippocampus. However, HOC entails more complex associations and we recently found that rats with hippocampal damage are severely impaired in expression and acquisition of HOC in appetitive Pavlovian conditioning despite normal first order conditioning. These findings have far reaching consequences both for models of the neural bases of memory and learning and for understanding animal and human behavior. Behavior in the real world is only rarely motivated by primary conditioned stimuli (CS1) that have been directly associated with potent intrinsic reinforcers (unconditioned stimuli; US). Instead, humans and other animals are motivated by complex chains of high order associations (CS2) that are only indirectly linked with intrinsic rewards. Data will be presented showing that hippocampal amnesics demonstrate difficulty in imagining the future coupled with lack of concern for it, and I will argue that HOC may represent a fundamental mechanism that contributes to this deficits. I will also argue that other types of future cognition, such as temporal discounting are normal in amnesia only so long as they involve simple and likely primary incentives, but not when choice is made about more complex, high-order incentives. The critical contribution of the hippocampus for representing the complex relationships that are formed among stimuli and internal states during high order conditioning exemplify the constructive nature of hippocampally-mediated representations that support flexible use of memory in the service of complex future planning, decision-making and choice.

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### A.C. LEE. Relating Perceptual Processing To Mnemonic Function In The Medial Temporal Lobe.

There has been an accumulation of work suggesting that the medial temporal lobe (MTL) structures do not subservise long-term declarative memory exclusively but also contribute to higher-order visual perception. In particular, the hippocampus has been suggested to contribute to complex spatial perception, whereas the perirhinal cortex is involved in complex object perception. Two important and inter-related questions have arisen out of these findings: (1) whether demonstrations of MTL involvement in perception actually reflect mnemonic processing; and (2) if not, how a role for the MTL in memory can be reconciled with a role for the same structures in perception. In this talk, I will present data to address both these issues. Using findings from amnesic patients and functional neuroimaging in neurologically healthy participants, I will first argue that MTL involvement in perception cannot be explained by a role for the MTL in long-term memory or even short-term memory. I will then suggest that MTL-perceptual data argue for a representational understanding of the MTL, in which the hippocampus and perirhinal cortex are critical for processing conjunctions of spatial and object features, respectively. These representations are necessary whenever a task places a demand on them, for example, due to the type of stimuli used, and they can be recruited irrespective of the type of cognitive process involved (e.g. memory vs. perception).

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### R. ROSENBAUM & D. KWAN. Dissociations in future thinking following episodic memory loss.

Amnesic people with impaired episodic memory (EM) for personal experiences are often thought of as being “stuck in time,” but to what extent is this true? It is the case that EM allows us to mentally revisit a specific time and place and recollect the details of events. A growing literature indicates that damage to the hippocampus and adjacent medial temporal lobe (MTL) structures, resulting in EM loss, also results in an inability to imagine future experiences, a finding supported by neuroimaging. However, recent research suggests that just as there are multiple forms of memory, there are likely multiple forms of future thinking and decision-making, with only some forms affected by MTL damage. In this talk, I will describe findings that people with EM loss from MTL damage and from healthy aging who have difficulty imagining future events are nonetheless able to decide advantageously about immediate vs. future rewards on tests of intertemporal choice and that this is likely achieved via an alternate, non-episodic strategy. These groups of participants differ from each other and from younger adults in the extent to which discounting of future rewards is influenced by a) cueing individuals to imagine specific future episodes in which they might spend the money, and b) whether the recipient is someone close to the participant or is an unknown person. The existence of dissociations in thinking and making decisions about the future and for oneself vs. other people are of both theoretical and practical importance in knowing how neural and cognitive capacities work together to potentially compensate for areas of impaired function.

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## Paper Session 9: Interventions

Moderator: Ronny Geva

3:45–5:15 p.m.

### D. BERTENS, L. FASOTTI, D. BOELEN & R.P. KESSELS. Effects of Combining Errorless Learning and Goal Management Training on Daily Executive Functioning after Acquired Brain Injury.

**Objective:** Many brain-injured patients referred for outpatient rehabilitation have executive impairments that lead to difficulties in the execution of everyday-life tasks. Goal Management Training (GMT) is an effective treatment for these problems. GMT entails learning and applying an algorithm, in which daily tasks are subdivided into multiple steps. Main aim of the present study is to examine whether using an errorless learning approach (preventing the occurrence of errors during the acquisition phase of learning) contributes to the efficacy of GMT in the performance of complex daily tasks.

**Participants and Methods:** The study is a double blind randomized controlled trial, in which the efficacy of GMT with an errorless learning approach is compared with conventional GMT, based on trial and error learning. In both conditions 30 patients with acquired brain injury of mixed etiology were enrolled. Main outcome measure was the performance on two individually chosen untrained everyday-tasks before and after treatment, using a standardized observation scale.

**Results:** Preliminary analyses showed a significant interaction effect between time (pre- and post-treatment) and treatment condition (GMT-errorless learning and conventional GMT) ( $p < .001$ ). The patients who underwent GMT combined with errorless learning improved more (mean difference score=60.5,  $sd=26.6$ ) on task performance than the patients whom were given conventional GMT (mean difference score=11.6,  $sd=20.4$ ).

**Conclusions:** The present results indicate that combining errorless learning and GMT improves the execution of complex daily life tasks in brain-injured patients. The study may contribute to the optimization of the treatment of executive deficits.

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### N. KIVILIS-MEIRI & D. HOOFIEN. Associations Between Family Burden, Daily Functioning and Psychological Reactions Among Patients With Brain Injury, Before and After Out-patient Neuropsychological Rehabilitation.

**Objective:** To examine the predictors of burden, as reported by family members of adults with brain injury, before (T1) and after (T2) a neuropsychological rehabilitation program.

**Participants and Methods:** Seventy-one individuals (22 females, mean age at T1: 33.0 SD 11 years) who participated in a rehabilitation program at the National Institute for the Rehabilitation of the Brain Injured. As part of a long-term follow-up system, demographic, neuropsychological, cognitive and psychological data were collected before the treatment. Upon graduation (about 14 months later on average) the following measures were re-examined: Patient's perceived quality of life (PQOL), mood (WSRS), community integration (CIQ), relative's burden (Burden Questionnaire) and relative's evaluation of patient's behavior (BEC).

**Results:** Rates of perceived family burden did not change between the two testing times. However, different patterns of correlations and regressions were found between burden scores and the other functional and psychological measures. At T1, PQOL, BEC and CIQ total score together explained 25% of burden variance. At T2, BEC scores correlated very strongly with burden ( $r=0.802$ ,  $p < 0.0001$ ) and together with PQOL explained 65% of burden variance. Looking into CIQ components, we found a significant difference in CIQ productivity domain between T1



and T2 ( $t_{70}=3.309$ ,  $p=0.001$ ), so that at T2 the score was significantly higher than at T1.

**Conclusions:** Though burden did not change significantly between T1 and T2, it had different predictors at each time. At T1, predictors were CIQ total score, PQOL and BEC. At T2, predictors were PQOL and BEC, together explaining a much higher percentage of burden variance as compared to T1. This difference may be explained by the improvement in CIQ productivity domain: As the patient becomes more productive, the family burden becomes more correlated with (or 'focused' on) behavioral/emotional variables. Thus, it may be that the focus of burden changes while its rate remains the same.

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### S. DAVIDOVITCH, N. MOR & I. YOVEL. Brooding Regarding Negative Experiences: From an Actor to an Observer Perspective.

**Objective:** Negative experiences in our life may lead us to think thoughts such as: why am I always reacting the way I do? Why do I have problems other people don't have? These kinds of thoughts are called brooding, the harmful subtype of rumination self-focus, characterized by a repetitive self-critical thinking. Brooding is connected to maladaptive coping strategies and to passive problem-solving. It also increases depression and its duration. It has been suggested that rumination thinking mode is the maladaptive aspect of rumination rather than its negative content. Accordingly, we define the mode of brooding-thinking as "locked-in-the-self," and suggest a self-distanced stance regarding brooding. This study examine whether adopting a self-distanced perspective from brooding concerning negative experiences can alleviate negative consequences of brooding.

**Participants and Methods:** For this goal we have developed a novel lab-based method that compares two types of perspectives toward brooding - a "self-distanced perspective" and a "first-person perspective", when focusing on the content of brooding. These two experimental conditions were compared to each other, and to a control distraction condition among 85 participants, Hebrew speaking. The effect of these perspectives was tested on negative emotions, levels of brooding and negative attributions.

**Results:** The results indicated that participants in the Self-distance group reported less negative emotions and lower levels of brooding than participants in the First-person group, but showed higher levels on these measures than did participants in the Distraction group. In addition, the results demonstrated a positive correlation between brooding and internal attribution style, with no difference between the groups.

**Conclusions:** The findings demonstrate that a self-distanced perspective regarding brooding compared with a first-person perspective is an effective method for decreasing negative emotions and for lower levels of brooding, but not for decreasing negative attributions.

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### M. DÍEZ CIRARDA, N. IBARRETXE-BILBAO, J. PEÑA, M. GÓMEZ-BELDARRAIN, I. GARCÍA-COROSTIAGA & N. OJEDA. Improving Functional Disability, Depression and Cognition in Parkinson Disease with REHACOP Program.

**Objective:** Mild cognitive impairment is common in non-demented Parkinson disease (PD) patients and specific strategies of intervention are uncommon. The aim of this study is to assess the efficacy of an integrative cognitive rehabilitation program (REHACOP) in PD.

**Participants and Methods:** The sample included 42 PD patients without dementia (mean age=67.40 ± 6.60; Hoehn & Yahr stages 1-3; UPDRS=36.80 ± 17.85; years of disease evolution= 6.71 ± 5.40). Patients were randomly assigned to two groups: cognitive rehabilitation group (REHACOP) and control group. We found no significant differences

between groups in age or years of education. Both groups underwent a neuropsychological and clinical battery at baseline and after cognitive rehabilitation assessing: cognition (processing speed, verbal memory, visual memory, executive functioning and theory of mind), neuropsychiatric symptoms, depression, apathy and functional disability. Reha-cop group received a total of 36 sessions of intervention in addition to treatment as usual. Control group received other group activities with the same frequency.

**Results:** Participants attending REHACOP exhibited significant improvements in processing speed ( $d=0.80$ , 95% CI=0.15 to 1.41), visual learning and memory ( $d=0.76$ , 95% CI=0.12 to 1.38), theory of mind ( $d=0.92$ , 95% CI=0.18 to 1.44), depression ( $d=0.66$ , 95% CI=0.03 to 1.27) and functional disability ( $d=1.06$ , 95% CI=0.36 to 1.65) compared to controls. Improvement in verbal learning and memory was only marginally significant ( $p=0.06$ ). However, no significant changes were detected in executive functioning, apathy or neuropsychiatric symptoms.

**Conclusions:** In this randomized controlled trial of cognitive rehabilitation, PD patients demonstrated statistically significant and clinically meaningful improvements in processing speed, visual memory, social cognition, depression and functional disability. These findings support the integration of cognitive rehabilitation into the standard of care for patients with PD.

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### T. SHANY-UR & D. HOOFIEN. Predictors of community integration in acquired brain injury patients undergoing neuropsychological rehabilitation: the role of cognitive abilities and self-reported life satisfaction and mood.

**Objective:** Community integration (CI) is a significant goal for patients with acquired brain injuries (ABI). Our objective was to identify predictors of CI in ABI patients undergoing comprehensive neuropsychological rehabilitation. We hypothesized that in addition to cognitive abilities, CI would be predicted by affective factors such as self-reported life satisfaction and mood.

**Participants and Methods:** A retrospective longitudinal follow-up study examined the value of multiple factors in predicting CI among 96 adults with ABI at a post-acute outpatient neuropsychological rehabilitation center. Outcome measure was the Community Integration Questionnaire (CIQ) total score before and after rehabilitation. Predictors were pre-rehabilitation self-reports of mood appraisal (Wimbledon Self Report Scale score) and life satisfaction (Perceived Quality of Life [PQoL] score), WAIS III verbal comprehension, processing speed and working memory index scores, age and etiology (traumatic injury vs. illness).

**Results:** Stepwise regression analysis revealed that pre-rehabilitation CI was predicted by self-reported life satisfaction ( $p<.001$ ), processing speed, and verbal comprehension ( $p<.05$ ). One year post rehabilitation, CI improved and was predicted by pre-rehabilitation self-reported life satisfaction ( $p<.001$ ) and verbal comprehension ( $p<.05$ ). Self-reported mood was significantly correlated with pre- and post-rehabilitation CI, and with self-reported life satisfaction, but was not a significant predictor of CI in the final model.

**Conclusions:** Better community integration of ABI patients was predicted by higher self-reported life satisfaction, as well as greater processing speed and verbal comprehension. Neuropsychologists should consider diverse factors when predicting rehabilitation outcome, selecting therapy directions, and identifying patients at risk for poorer integration. The results support comprehensive neuropsychological rehabilitation programs incorporating both psychotherapeutic and cognitive treatment approaches.

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**Paper Session 10:  
Cognitive Neuroscience (A)**

**Moderator: Simone Shamay-Tsoory**

**3:45–5:15 p.m.**

**A. SEDDA, D. OVADIA & G. BOTTINI. Grasping: from lab to rehab.**

**Objective:** Integration of visual and motor systems is crucial to reach our goals. The understanding of apparently simple movements such as grasping involves not only these systems, but also attention and spatial processing. When grasping a cup of tea we also consider whether the cup contains poison or tea (objects selection) and where the cup is located (on the left or on the right space). Cognitive rehabilitation needs to take over all these notions in order to generalize the clinical outcome outside the lab. A typical example is rehabilitation of neglect that rarely produces appreciable effects in the ecological environment. We hypothesize that translating the most relevant features of finalistic motor behaviour into focused rehabilitation programs for specific neurological diseases might sensitively improve the ecological validity of neuropsychological rehabilitation.

**Participants and Methods:** Publications on grasping and multisensory integration have been identified in MEDLINE and PubMed. Key words were the following: “grasping”, “multisensory information”, “kinematics hand”. Only studies providing descriptions of the paradigm and including healthy volunteers have been considered. Further, only studies using a setup compatible with Virtual Reality and with patients’ conditions environment have been selected (i.e. studies using drugs have been excluded).

**Results:** At least 20 studies presenting compatible paradigms have been found. Most studies adopt integration between visual, auditory or somatosensory information. The main limitation of these paradigms is the length of the task. On the other hand the main strength is the possibility to boost neuroplasticity through multiple sensory channels.

**Conclusions:** It appears possible to build a virtual reality platform based on paradigms for grasping and multisensory integration. There are a large number of possible tasks that should be tailored for different neuropsychological syndromes making use of ecological movements.

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**D. TARAGIN, D. TZURIEL & E. VAKIL. Mental Rotation: The Effects of Processing Strategy and Gender on Children’s Performance and Eye Movements’ Pattern.**

**Objective:** This study’s purpose is to investigate which processing strategy is most effective in mental rotation (MR) task and how the strategy is reflected in eye movements pattern (EMP), among boys and girls with global and local orientation.

**Participants and Methods:** Fourth grade students (39 girls, 44 boys) participated in this study. They performed Global-Local judgment task, MR task and self report about the strategy they used (global/ local/ combined). The MR task included 2 difficulty levels. Level 1 required rotating 3/9 squares, level 2 required rotating 3/9 squares containing black triangles. MR items were displayed on a computer screen in order to measure participants’ EMP. The main hypotheses were: 1. Boys will be more accurate than girls and will have less fixations and saccades. 2. Students who use global strategy will be more accurate and will have less fixation and saccades compared with participants who use local strategy.

**Results:** Boys were more accurate than girls and had different EMP: At level 1, requiring rotation of the entire shape together, boys had less saccades and fixations. At level 2, requiring more focus on details, girls had less saccades and fixations compared to boys. Participants that reported using local strategy, compared with those who reported global/combined strategy showed less accuracy and more fixations at the wrong answers. Participants who used global strategy performed

better at level 1. Participants who used a combined strategy performed better at level 2.

**Conclusions:** The EMP contributed to our understanding of gender differences and of the optimal strategy that should be used for MR tasks. The global strategy was effective when MR required rotating the entire shape together. The combined strategy was effective when MR required rotation and focus on details as well.

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**H. ZADKA, H. BERGMAN & E. VAKIL. Patients with Parkinson’s Disease Are Able to Learn in a Probabilistic Feedback-Based Learning Environment When Level of Uncertainty Is Reduced.**

**Objective:** The basal ganglia (BG) have been shown to be sensitive to levels of uncertainty in the environment. Thus, we hypothesized that when the level of uncertainty is high the role of the BG in feedback-based learning will be critical, such that patients with Parkinson’s disease (PD) will exhibit abnormal performance on the task. In contrast, the same task with lower level of uncertainty might enable learning with lower levels of dopaminergic activity, and thus might enable patients with PD to perform normally on such tasks.

**Participants and Methods:** We compare the behavioral results of healthy participants (age- and education-matched to the patients group, N=24) and patients with Parkinson’s Disease (H&Y  $\leq$  2.5, N=32), divided into denovo patients (N=10) and on-medication patients (N=22). The experiment included two conditions of a probabilistic feedback-based learning task. In the balanced condition (high level of uncertainty), the two outcomes appeared the same number of times, and in the unbalanced condition (low level of uncertainty), one of the outcomes appeared significantly more frequently than the other.

**Results:** We found better performance of all groups on the unbalanced relative to the balanced condition. On the balanced condition, patients with PD obtained significantly lower learning scores than healthy participants. However, on the unbalanced condition, patients with PD performed on a comparable level to healthy participants.

**Conclusions:** Our results suggest that while the intact function of the dopaminergic system is crucial when level of uncertainty is high, reducing the level of uncertainty enables learning when this system is dysfunctional, as evidenced in patients with PD. This might imply either the involvement of other neural systems in learning when the level of uncertainty is low, or that a partly functional dopaminergic system is able to perform the relatively simple computations required in such an environment.

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**J. LANDA, O. BAR, T. KRASOVSKY & J. AHONNISKA-ASSA. Growing up with Acquired Visual Disorientation and Body Schema Disorder: 10 Years of Clinical Observation and Neuropsychological Follow-up.**

**Objective:** Parietal bilateral brain lesions may cause visual disorientation and body schema disorder. Consequences of visual disorientation include misjudgment of locations and distance of objects, as well as misjudgment of relative distance between two objects despite adequate visual acuity. Body schema disorder refers to difficulty of the person to comprehend the structure of his own body and that of another and to difficulty to comprehend the relations of the parts of the body. This presentation follows the development and rehabilitation outcome of a young girl with acquired visual disorientation and body schema disorder (from age 12 to age 22) as a result of parietal bilateral lesion.

**Participants and Methods:** The neuropsychological assessments were performed at age 13, 15 and 22. Additionally at the age of 12 and 22 the visual orientation and body-schema abilities of the patient were assessed by personally adjusted tasks including constructional and gestural praxis, visual scanning and visually guided reaching.

**Results:** The neuropsychological assessments demonstrated a severe and persistent impairment in visuo-spatial perception and in eye-hand co-ordination. Significant difficulties in body-schema, motor praxis and finger discrimination can be found even at the age of 22, and their implications in daily life functioning will be presented in video recordings. However, she had an average verbal intelligence and verbal memory. Also her attentional and executive functions fell within normal limits. She described independent daily functioning including adequate interpersonal relationship and progress in her academic studies.

**Conclusions:** In spite of severe and persistent difficulties in visual orientation and body-schema disorder, ten years after the brain lesion the patient demonstrates a significant improvement in her daily functioning, apparently as a result of intact verbal, attention and executive functions which have led to efficient implementation of compensation strategies.

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**S. FRENKEL-TOLEDO, D.G. LIEBERMANN, S. BENTIN & N. SOROKER. Dysfunction of the Human Mirror Neuron System in Parietal Ideomotor Apraxia: Evidence from Mu Suppression.**

**Objective:** Execution of a motor act and observation of that act performed by others were found to activate a common neural substrate, primarily in the fronto-parietal cortex, termed the mirror neuron system (MNS; in humans – hMNS). The hMNS is thought to play a crucial role in action imitation. Patients with lesions in the inferior parietal lobule (IPL), where a major component of the hMNS is thought to reside, often exhibit apraxia, with difficulty imitating simple gestures. Our aim was to explore the relationship between behavioral manifestations of apraxia following IPL damage and hMNS functioning, as signaled by the magnitude of mu (alpha range) suppression during observation of manual activity.

**Participants and Methods:** We examined the modulation of EEG oscillations in the lower alpha range (8-10 Hz) at central electrode sites, in first-event stroke patients with right (n = 5) and left (n = 5) IPL damage, and in 12 healthy controls, during observation of video clips showing different manual movements. A suppression index was determined relative to observation of a non-biological movement (using a log transform of the ratio; values significantly less than zero indicate mu suppression). Normalized lesion data were used to quantify the amount of IPL tissue loss. Manual gestures imitation was tested using DeRenzi's apraxia test.

**Results:** Healthy subjects showed, as expected, significant mu suppression during observation of manual movements. In contrast, patients with right or left IPL damage showed a similar level of suppression during observation of manual and non-biological movements (suppression not significantly different from zero). Failure to properly imitate manual gestures, correlated with diminished mu suppression in the affected hemisphere. This pattern was evident in right and the left parietal patient groups.

**Conclusions:** The current study points to a role for disruption of the parietal component of the hMNS in the failure imitating actions of others, typically exhibited by patients with ideomotor apraxia.

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## Poster Session 4: Cognitive Neuroscience, Language and Speech Functions, and Medical/Neurological Disorders/ Other

3:45–5:15 p.m.

### Cognitive Neuroscience

**I. RANNIKKO, M. HAAPEA, J. MIETTUNEN, J. VEIJOLA, G.K. MURRAY, J.H. BARNETT, A. HUSA, P.B. JONES, M. ISOHANNI & E. JÄÄSKELÄINEN. Changes in verbal learning and memory in schizophrenia and non-psychotic controls in midlife: A nine-year follow-up in the Northern Finland Birth Cohort 1966 study.**

**Objective:** Neurocognitive deficits are a core feature of schizophrenia, but controversy exists about whether and when further progression in neuropsychological impairment may occur (Ekerholm et al., 2012). Findings on longitudinal change of cognitive performance are extremely variable especially in the case of verbal memory and learning.

The aim of this study was to compare the change in verbal learning and memory in individuals with schizophrenia in midlife 10-20 years after the illness onset and healthy controls during a 9-year follow-up in the general population-based Northern Finland 1966 Birth Cohort (NFBC 1966).

**Participants and Methods:** The present study is based on those 41 schizophrenia individuals and 73 controls from the NFBC 1966 for whom California Verbal Learning Test (CVLT) data was available in both baseline (at around age 34 years) and follow-up (at age 43 years). The mean follow-up time for schizophrenia was 9.1 years (SD 0.6) years and 8.5 (SD 0.7) years for the control group.

**Results:** Compared to non-psychotic controls, cases had poorer cognitive performance in many different dimensions of verbal learning and memory in cross sectional analyses at age 34 and 43 years. Both cases and controls declined in performance in 9-year follow-up. There was no overall difference in the amount of change of verbal learning and memory over time in cases and controls, except that cases had more decline in the measures of the learning slope and recall consistency, out of total 20 analysed CVLT variables.

**Conclusions:** We found no evidence of greater decline in verbal learning and memory over nine years in middle-aged individuals with schizophrenia compared to controls. Cases had lower cognitive ability at the baseline, but the decline during the follow-up was almost similar in both cases and controls. These results imply that verbal learning and memory in schizophrenia declines in a normative fashion with aging at the same rate as in the general population.

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**I. RANNIKKO, E. JÄÄSKELÄINEN, J. MIETTUNEN, J. VEIJOLA, G.K. MURRAY, A. HUSA, M. ISOHANNI & M. HAAPEA. Longitudinal change of verbal and visual learning and memory in midlife in general population sample. A nine-year follow-up in the Northern Finland Birth Cohort 1966 study.**

**Objective:** While it is clear that more and more people now live longer than ever before in history, it is widely considered as an obvious, that cognitive abilities decline across adulthood. Though as people age, their performance on many psychometric tests changes systematically (Ramscar et al., 2014), it is still unclear how precisely cognitive abilities vary with aging and what sociodemographic and clinical factors might contribute these changes. Our goal was to analyse the change of verbal and visual learning and memory in general population between ages 34 and 43 years. Additionally, we examined if several socio-demographic and clinical factors predict change in verbal and visual learning and memory.

**Participants and Methods:** The sample included 73 randomly selected individuals (45 males and 28 females) from the Northern Finland Birth Cohort 1966. Data on socio-demographic and clinical factors

were gained from the national registers, hospital notes and interviews at around ages 34 and 43 years. Verbal and visual learning and memory was measured at around ages 34 and 43 years with similar measures at both study points. Socio-demographic and clinical predictors of change of cognition were acquired from interviews in 34- and 43-years.

**Results:** There was statistically significant decline in 13 out of 20 California Verbal Learning Test (CVLT) items, but not in Visual Object Learning Test (VOLT). Only gender associated significantly to change in both CVLT and VOLT. Regarding verbal learning and memory, in apprehension, immediate free recall, and short delay free recall males had larger decrease compared to females, but number of intrusions increased more in females. Performance in VOLT increased in males but decreased in females.

**Conclusions:** We found evidence of significant decline in several different dimensions of verbal learning and memory over nine years in middle-aged individuals. Gender seems to affect the change in the cognitive performance in midlife.

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#### **M. BALCONI & R. FINOCCHIARO. Reward Sensitivity, Cognition and Metacognition in Gambling Behavior.**

**Objective:** The present research explored the main factors able to influence the subjects' choices and strategies in the case of decisions, distinguish between high- and low-risk decisions. Behavioral responses (IGT), meta-cognitive strategy, and ERP (FRN and P300) effects were used as predictive markers of gambling behaviour.

**Participants and Methods:** BAS-Reward measure was applied to distinguish between high-BAS and low-BAS. Twenty two healthy volunteers took part in the study (ten women, age range 19-25,  $M = 23.78$ ,  $SD = 2.60$ ). The Iowa was used (adaptation for an online Italian version). EEG recordings were performed. To localise the source of neural activity, we used the low resolution electromagnetic tomography (sLORETA) method

**Results:** It was found that higher-BAS opted in favor of the immediate reward (loss strategy). High-BAS subjects were less able to represent their own strategy. Finally, a consistent "reward bias" affected the high-BAS performance with a reduction of P300 and mainly FRN in response to unexpected (loss) events. The cortical localization (sLORETA) of these two deflections showed the contribution by the anterior (left DLPFC and ACC for FRN) and posterior (parietal for P300) cortical areas.

**Conclusions:** The present findings indicate that individuals scoring very high on reward component attribute higher motivational salience to immediate reward compared to more delayed conditions. This is reflected in the reduction of behavioural gaining choices, the absence of a functional metacognitive representations, the reduction of the classical "enhanced effect" for FRN and P300 in case of unexpected (loss) choices. Deficiencies concerning feedback mechanisms were apparent in those individuals who extremely focused on reward (reward bias) than individuals who did not base their decisions on immediate reward. Thus, we propose to consider reward salience as an important aspect in feedback processes in subjects with high-risky attitudes.

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#### **M.E. VANUTELLI, R. STOPPELLI & M. BALCONI. Arousal Modulation In Disturb Of Consciousness: How about the Semantic Meaning Process?**

**Objective:** One common question regarding Disturb Of Consciousness patients (DOC) is about the preservation of their linguistic ability. The present study aimed to explore the DOC semantic skills by monitoring their autonomic correlates, in terms of arousal (Skin Conductance Response, SCR; and Heart Rate, HR), during an auditory linguistic task. Since arousal is modulated by enhanced cognitive effort we expected

significant autonomic activity in response to semantic congruence violations for patients with partially preserved linguistic skills.

**Participants and Methods:** The sample included 24 patients and 20 control subjects. According to Coma-Near Coma and Disability Rating Scale scorings, DOC patients were subdivided into two subgroups: Vegetative State (VS) and Minimally Conscious patients (MCS). The participants were required to implicitly process congruous vs. incongruous auditory word sequences, each composed of four words with a semantic related or unrelated final word.

**Results:** Two sets of ANOVA were applied to SCR and HR with two independent factors: group (2) and congruence (2). It was found a significant increasing in the autonomic activity (SCR and HR) for both patient and control groups in response to incongruous than congruous condition. Moreover, the comparison between VS and MCS revealed an even stronger autonomic activity for MCS as compared with VS. On the contrary, no difference was observed for congruous condition across the two groups.

**Conclusions:** The similarity of behavior revealed by patient and control subjects in the detection of semantic incongruence may underline that some relevant cognitive linguistic functions were preserved in DOC. However VS appear generally less responsive to incongruence than MCS, a difference which may be considered more "quantitative" than "qualitative". This fact goes against the general supposition on the poor conceptual skills of VS patients. Finally, the present contribution indicates the autonomic measure as an important tool for explore consciousness. Correspondence: *Maria E. Vanutelli, MD, Psychology, Catholic University of Sacred Heart, Milan, Largo gemelli, 1, Milan 20123, Italy. E-mail: MariaElide.Vanutelli@unicatt.it*

#### **O. SEMYONOV, R. DOTCH, A. TODOROV & H. AVIEZER. What You See Is What You Get? Mechanisms of Impaired Emotion Recognition in Developmental Visual Agnosia.**

**Objective:** The current study examined the perceptual mechanisms of impaired emotion recognition in LG, a rare case of Developmental Visual Agnosia (DVA), which presents with severe deficits in the visual processing of objects, face identity and face emotion despite normal low-level vision and intelligence. In the current study, we examined a possible cause leading to impaired emotion recognition in DVA: the lack of clear inner representation of distinct emotional face categories.

**Participants and Methods:** LG and eight age matched controls completed two different tasks: 1) recognition of basic facial expressions, and 2) Reverse Correlation tasks. The Reverse Correlation method enables us to generate images that visualize participants' internal representations of face categories. Observers impose their internal perceptual expectations by categorizing random patterns of noise imposed on a neutral face. Subsequently, the researcher reconstructs and captures these internal representations from the numerous categorizations of the "noisy faces". LG and controls completed this task for both happiness and anger categorizations.

**Results:** Similar to previous findings, compared to the control group, LG showed poor overall emotion recognition during the Ekman recognition task. Moreover, his pattern of errors was highly atypical (e.g., misrecognizing angry scowls as happy smiles).

Interestingly, LG's performance in the Reverse Correlation tasks was comparable to that of the control group. Thus, LG displays a dissociation between impaired categorization of basic face expressions and intact inner representations of facial expression categories.

**Conclusions:** These findings suggest that in DVA, deficient recognition of facial expressions results from impaired, bottom up, visual - attentional processing of the face stimuli, and not from poor inner representations of emotional categories.

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**Y. GLIKSMAN, S. NAPARSTEK & A. HENIK. A Case Study of Acalculia.**

**Objective:** We investigated the essential role of the IPS (intraparietal sulcus) in basic non symbolic numerical processing.

**Participants and Methods:** We describe NO, a 22 year old right-handed female with acalculia. NO had a cerebral infarction in the left medial cerebral artery (MCA). Neuropsychological testing showed NO had normal IQ abilities (as measure by the Raven's matrices test, percentile 40) with normal language abilities and lower than normal working memory abilities. We investigated her arithmetic abilities, along with basic numerical processing (automaticity of magnitudes). In her arithmetic abilities NO showed a dissociation between procedural knowledge and calculation skills. Both her calculation and procedural knowledge abilities were lower than those of age-matched controls, but this difference was more profound in procedural knowledge. We also tested NO on a numerical Stroop-like task. She was presented with pairs of digits that differed in either numerical value or physical size, and was asked to choose the larger digit in value or size, in different blocks. The two digits were either congruent (i.e., the numerically larger digit was also physically larger; e.g., 3 5), incongruent (i.e., the numerically larger digit was physically smaller; e.g., 3 5), or neutral (i.e., the two digits differed only in one dimension; either physically, e.g., 3 3, or numerically, e.g., 3 5).

**Results:** NO's performance in this task was different than that of controls. Specifically, the controls showed a congruity effect in both tasks, whereas NO showed no congruity effect in the numerical task and a reverse facilitation effect in the physical task. Such reverse facilitation was previously described in children and in a case study of a patient with acalculia following a ischemic stroke.

**Conclusions:** These findings suggest automatic processing of both physical and numerical magnitudes was affected. The implications of our findings on existing models of numerical cognition will be discussed. Correspondence: Yarden Glikman, Psychology, Ben Gurion University, Ilanot building (97), room 105, Beer Sheva 8410501, Israel. E-mail: yarden.glikman@gmail.com

**M. WAPP, Y. BURREN, F. KELLNER-WELDON, M. EL-KOUSSY, A. FEDERSPIEL, P. MICHEL, G. SCHROTH & R. EVERTS. Cognitive Improvement in Patients with Carotid Artery Disease is Independent of Treatment Type.**

**Objective:** Treatment of the carotid artery in patients with carotid stenosis can enhance the cerebral blood flow and therefore likely leads to an improvement of cognitive performance. However, current literature yields divergent results regarding the effects of different carotid stenosis treatment types on cognitive functions. The aim of this study is to evaluate cognitive changes in patients with carotid artery stenosis (treated with endarterectomy, stenting or best medical treatment). We hypothesized that treatment of the carotid artery leads to an improvement of cognitive performance and analyzed the therapy effects based on the type of treatment.

**Participants and Methods:** Sixty-one patients (mean 69.4 years) with asymptomatic or mildly symptomatic extracranial carotid artery stenosis >70% were included. Patients underwent neuropsychological assessments before treatment (TP1) with carotid endarterectomy (n=21), stenting (n=10) or best medical treatment (n=30) and one year later. Executive functions, language skills (verbal fluency, word production), visual and verbal memory, and the emotional state were assessed.

**Results:** Across the three treatment groups there were no significant differences regarding cognitive improvement, age, gender, education, stenosis side, risk factors and performance at TP1. Patients showed significant improvement of executive functions, verbal fluency, verbal short term memory and visual memory, irrespective of the treatment modality after one year. There were no significant changes in word production and emotional state after treatment. Patients with low cognitive performance before treatment benefit the most from revascularization.

**Conclusions:** Cognitive improvement after treatment of carotid stenosis was most prominent in patients with low cognitive performance before

treatment. The results highlight the potential positive effect of active treatment of carotid stenosis on cognitive performance irrespective of the choice of treatment.

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**C. ITOI, K. HIROMITSU, S. SAITO, R. YAMADA, N. SHINOURA & A. MIDORIKAWA. Cognitive traits predict sleepiness during awake surgery.**

**Objective:** Awake brain surgery is a procedure performed to remove a brain tumor safely. During the surgery, in order to prevent a functional deficit, the patient was asked to perform several tasks spontaneously such as moving a hand or naming pictures. Some patients, however, had difficulty to do the tasks, because of sleepiness, although anesthesia had run out. In this study, we examined factors associated with sleepiness during the awake brain surgery.

**Participants and Methods:** Before the brain surgery, 37 patients (18 males, 19 females, mean age was 60.30 years, range of 26 to 77 years) were assessed their cognitive functions using the Japanese version of Neurobehavioral Cognitive Status Examination (COGNISTAT). During the surgery, several factors such as performance of the tasks, attitude, and utterance were recorded as a function of patients' intraoperative status. After the surgery, their arousal level was evaluated retrospectively and classified into six degrees from 0 point (hard to wake) to 5 point (clearly awake).

In order to find explanatory variables of sleepiness during the surgery, a multiple regression analysis was performed. We put cognitive subdomains of the COGNISTAT, brain lesions, sex, and age as explanatory variables.

**Results:** The results showed that preoperative cognitive functions could predict the sleepiness during awake surgery (comprehension ( $\beta = -.55$ ,  $p < .005$ ) and construction of the COGNISTAT ( $\beta = .70$ ,  $p < .001$ ), ( $R^2 = .385$ ,  $F(1, 34) = 11.97$ ,  $p < .005$ ). Other factors were not associated with the level of arousal.

**Conclusions:** Preoperative cognitive functions, especially "comprehension" and "construction" ability predict sleepiness of patients during awake brain surgery.

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**M. DÍEZ CIRARDA, N. IBARRETXE-BILBAO, J. PEÑA, A. CABRERA, J. ONTAÑÓN, M. GÓMEZ-BELDARRAIN, I. GARCÍA-GOROSTIAGA, O. LUCAS-JIMÉNEZ & N. OJEDA. The Relationship Between the Uncinate Tract and Verbal and Visual Memory is Mediated by Processing Speed in Parkinson Disease.**

**Objective:** Previous studies suggest that disruption of the uncinate fasciculus (UF), specifically of the right hemisphere, is related to memory impairment. The aim of this study is to assess the relation between the UF fractional anisotropy (FA) and verbal (VM) and visual (VIM) memory in Parkinson disease (PD) and explore the existence of mediational effect by other cognitive variables such as processing speed (PS).

**Participants and Methods:** 37 non-demented PD patients (mean age =  $68.64 \pm 6.53$ ) underwent a neuropsychological battery of tests assessing VM, VIM, and PS among other cognitive functions. Magnetic resonance was acquired and DTI images were analyzed. Once the FA maps were extracted, Region of Interest (ROI) analysis was performed. The following specific white matter tracts were selected and their mean FA values were extracted, including bilateral tracts: cingulate, uncinate, inferior and superior longitudinal, inferior frontooccipital, optic radiation, corticospinal and anterior thalamic radiation.

**Results:** Correlation between VM, VIM and the mean FA of the right UF tract was found but it disappeared when introducing PS as a covariate. We first tested the PS mediation hypothesis on VM: In the first step, FA of the right UF significantly predicted VM ( $\beta = .398$ ,  $p = .02$ ); Secondly,

PS was regressed on the right UF (FA) ( $\beta=.418, p=.01$ ). Thirdly, PS ( $\beta=.489, p<.01$ ) and the right UF (FA) ( $\beta=.194, p=.22$ ) were introduced simultaneously in the regression analysis. Sobel equation result was significant at  $p=.04$  for PS ( $z=2.04$ ), suggesting full mediation and explaining 51.30% of the relationship. Also, we tested the PS mediation hypothesis on VIM. The relation between UF (FA) and VIM was reduced from  $\beta=.338$  ( $p=.04$ ) to  $\beta=.051$  ( $p=.71$ ), and Sobel equation result was significant at  $p=.01$  for PS ( $z=2.37$ ), suggesting full mediation and explaining 85.03% of the relationship.

**Conclusions:** These results suggest that the integrity of the right UF is related to VM and VIM performance in PD patients, but this relation is mediated by the PS.

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**O. LUCAS-JIMÉNEZ, M. DÍEZ-CIRARDA, N. IBARRETXE-BILBAO, J. PEÑA, A. CABRERA, J. ONTAÑÓN, M. GÓMEZ-BELDARRAIN, I. GARCÍA-GOROSTIAGA & N. OJEDA. Structural Brain Alterations and Cognitive Disturbances in Parkinson's Disease Patients with Impaired Processing Speed.**

**Objective:** There is clear evidence of processing speed (PS) impairment in Parkinson's disease (PD). The aim of this study was to investigate the differences between patients with preserved and impaired PS in neuropsychological performance, white matter fractional anisotropy (FA), and brain volume, expecting lower values in those patients with impaired PS.

**Participants and Methods:** Forty-four non-demented PD patients (mean age=68) were assessed with an extensive neuropsychological battery, including Salthouse and Trail Making Test A as indicative of PS ( $\alpha=.85$ ). Two groups were created based on the sum of total correct responses, being assigned the patients with a score below 1.5 S.D regarding the mean of the matched control group to PS impaired group ( $n=12$ ) and referring patients to the PS preserved group ( $n=32$ ). T1-weighted and diffusion tensor imaging were acquired on a Philips Achieva 3T TX. Volumetric measures were obtained using SPM8 and FA values were calculated after running Tract-based spatial statistics as implemented in FSL. ANCOVA analysis was performed including years of education and illness duration as covariate to control statistical differences between groups.

**Results:** Patients with impaired PS in comparison with patients with preserved PS showed significant differences in the FA of right uncinate fasciculus ( $F=6.34, p=.017$ ), and brain ratio volume (total brain volume divided by total intracranial volume) ( $F=4.40, p=.044$ ) and several cognitive domains including verbal fluency ( $F=13.84, p=.001$ ), working memory ( $F=8.73, p=.005$ ), visual ( $F=10, p=.003$ ) and verbal memory ( $F=11.13, p=.002$ ), executive functions ( $F=7.27, p=.011$ ), sustained attention ( $F=13.79, p=.001$ ), naming ( $F=8.19, p=.007$ ), and visuospatial ability ( $F=9.50, p=.004$ ).

**Conclusions:** These results demonstrate that PD patients with PS impairment have greater neuropsychological impairment, gray matter atrophy and white matter FA reduction compared to PD patients with preserved PS.

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**D. RIVOLTA, A. WOOLGAR, M. BUTKO, R. PALERMO & M.A. WILLIAMS. Multi-voxel pattern analysis (MVPA) of fMRI data reveals aberrant face-discriminant ability in people with congenital prosopagnosia.**

**Objective:** The ability to identify faces is mediated by a network of cortical and subcortical brain regions in humans. It is still a matter of debate which regions represent the functional substrate of congenital prosopagnosia (CP), a condition characterized by a severe lifelong impairment in face recognition.

**Participants and Methods:** By using functional Magnetic Resonance Imaging (fMRI) CPs ( $N=7$ ) and healthy controls ( $N=10$ ) were shown faces, objects, bodies and body parts in a one-back task. Data were analysed using both univariate (i.e., statistical parametrical mapping, SPM) and multivariate (i.e., multi-voxel pattern analysis, MVPA) statistics.

**Results:** Univariate analysis did not highlight any difference between the two groups. However, MVPA showed that the pattern of neural activity within the right occipital face area (OFA) and bilateral fusiform face area (FFA) in CP is less accurate in differentiating faces from the other categories of visual stimuli.

**Conclusions:** This study shows that right OFA and bilateral FFA appear to represent a neural locus of face-specific difficulties in CP. This study also directly demonstrates that MVPA is a more sensitive tool for the analysis of fMRI data compared to univariate approaches.

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**N. SALNER, N. FRIEDMANN & E. CHAJUT. Spatial Attention Affects Letter Position Errors in Reading in Short Exposure.**

**Objective:** Letter Position Dyslexia (LPD) is a reading deficit caused by a selective impairment to letter-position encoding, manifested in transpositions of middle letters (e.g., reading TRIAL as TRAIL). It has been suggested that LPD is related to a deficit in attention allocation while reading. This study tested the effect of an attentional manipulation on the reading of LPD and normal readers.

**Participants and Methods:** 15 normal readers (7 males, mean age 27) and 6 LPD readers (1 male, mean age 27) performed a Posner-like task. 50 Hebrew migratable words (words in which middle-letter transposition creates another existing word, e.g., TRIAL) and 30 potentiophones (words that can be read via letter-to-sound conversion as another existing word, e.g., NONE) were each presented for 100ms in a valid and invalid condition. Overall cue validity was 70%. The participants read each word aloud. Reading errors were analyzed, focusing on letter transpositions (trial→trail) and sublexical reading (none→known).

**Results:** The attentional manipulation induced letter transpositions in normal readers: they made more transpositions in the unattended compared to the attended condition ( $F(1,14)=7.34, p=.017$ ). This pattern was not observed for the LPD readers ( $F(1,5)=2.07, n.s.$ ). The attentional effect was specific: cue validity did not affect errors of sublexical reading. Word type affected the rates of reading errors: all participants made more letter transpositions in migratable words than in potentiophones, and more errors of sublexical reading in potentiophones compared to migratable words ( $F(1,19)=183.17, p<.001$ ).

**Conclusions:** The increase in letter transpositions shown by normal readers in the unattended condition suggests that processes governed by allocation of attention are involved in letter position encoding. The performance of the LPD readers implies that allocation of attention to the whole word may not suffice and that correct encoding of letter position may require allocation of attention to specific letter positions. Correspondence: *Neta Salner, M.A., Tel Aviv University and the Open University of Israel, 7 Yeverboim st., Rishon Lezion 7523572, Israel. E-mail: netadavi@post.tau.ac.il*

**I. AREND, H. OKON-SINGER & A. HENIK. Dissociating Emotion and Attention Functions in the Pulvinar Nucleus of the Thalamus.**

**Objective:** Recent models on emotional processing consider a major role for the pulvinar in the coordination of emotion processing; however, these models are not specific regarding the functional role of the different pulvinar subdivisions. In this opinion paper, we focus on the role of the different pulvinar subdivisions in emotion and attention. We revise a number of neuropsychology studies that indicate that the medial nucleus of the pulvinar is critical for intact emotional processing. We discuss the implications of this data in light of models accounting for the role of the medial pulvinar in emotion processing, and highlight the need for a comprehensive model that specifies the role of the pulvinar subdivisions in emotion-attention interplay.

**Participants and Methods:** We carefully examined individual data for patients with focal pulvinar lesions that was provided in different reports. The analysis of this individual data allowed us to address the anatomical-functional correspondence involving attention and emotion processes along the anterior and the posterior pulvinar subdivisions.

**Results:** By linking these detailed neuropsychology reports to recent neuroimaging findings, we show that attention and emotion are regionally dissociable in the pulvinar; that is, lesions to specific parts of the pulvinar can dramatically affect attention processes while leaving emotion processing spared.

**Conclusions:** We suggest that this data calls for a comprehensive model that specifies the functional role of the different pulvinar subdivisions in emotion-attention interplay. Moreover, we propose that the impairments in emotional processing following lesions to the medial pulvinar may be related to the role of this nucleus in working memory and feature binding processes.

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## Language and Speech Functions/Aphasia

**Y. NEUMANN-WERTH, B. EPSTEIN & V. SHAFER. An Electrophysiological Investigation of the Lateral Anterior Positivity: Clinical Implications.**

**Objective:** The purpose of this study was to perform planned comparisons of function vs. content words, in the same discourse contexts, using ERPs. We hypothesized that findings would support the theory that the right LAP serves a general index of linguistic processing, regardless of word class.

**Participants and Methods:** Nine healthy, right-handed young adults participated in the study. Participants listened to an auditorally-presented story of naturally spoken discourse and answered questions related to the events in the story. ERPs following processing of “the” and “cats” were measured.

**Results:** A 2 (Condition: “the”, “cats”) x 5 (Time: 250-300; 300-350; 350-400; 400-450 ms post-stimulus offset) x 4 (Site: anterior, superior, inferior, posterior) repeated measures ANOVA revealed a main effect of time ( $F(4, 32) = 5.67, p = .001, \eta^2 = .415$ ) and interactions of condition and time ( $F(4, 32) = 4.95, p = .003, \eta^2 = .382$ ) and time and site ( $F(12, 96) = 5.27, p < .001, \eta^2 = .397$ ). Tukey’s post-hoc tests indicated that the difference waves for “the” and “cats” were significantly different from 350-400 ms ( $p < .01$ ) and 400-450 ms ( $p < .001$ ) post-stimulus offset.

Pearson’s ( $r$ ) correlation among the four conditions (Cats Discourse, Cats Nonsense, The Discourse, The Nonsense) were also computed. The results of the discourse and nonsense comparisons revealed high similarity. However, the discourse and nonsense contexts for both “cats” and “the” were highly dissimilar. Voltage maps revealed a negativity in the nonsense condition for “cats” from 300-700 ms.

**Conclusions:** This study found that the right LAP was elicited similarly for both function and content words at the onset of meaningful utterances in discourse, corroborating findings of Shafer et al. (2005). Future studies should investigate the LAP to study discourse processing in clinical populations, e.g. aphasia, traumatic brain injury, autism.

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**N. FRIEDMANN & A. GVION. Anomia in the phonological output lexicon: another source for Surface dyslexia.**

**Objective:** Lexical retrieval and reading aloud are often described as two separate processes, in separate models. However, they are not completely separate, as they share components. This study assessed the effect

of an impairment in a shared component, the phonological output lexicon, on lexical retrieval and on reading aloud, examining the possibility that such impairment forces reading aloud via the sublexical route.

**Participants and Methods:** The participants were three individuals with acquired anomia following CVA and four with developmental anomia. An extensive test battery of 20 naming, working memory, repetition and semantic tests diagnosed their deficit in the phonological lexicon output. To assess their reading and the locus of impairment in their reading, we tested their reading using words sensitive to surface dyslexia: irregular words and potentiophones, in reading aloud, lexical decision and semantic tasks.

**Results:** All seven participants showed, in addition to anomia in the phonological lexicon, also the typical surface dyslexia errors in reading aloud. Importantly, all the participants performed flawlessly on pseudohomophone lexical decision and on homophone/potentiophone reading comprehension, indicating spared orthographic input lexicon and spared access from it to lexical semantics. These results applied to both acquired and developmental anomia.

**Conclusions:** These results thus suggest a principled relation between anomia and dyslexia naming, and point to a new type of surface dyslexia. They further show the possibility of good comprehension of written words even when the phonological stages are impaired.

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**L.R. CHERNEY, L.M. ROGERS, X. WANG, R. HURWITZ, L. PITTS, E.M. BABBITT & T.B. PARRISH. Transcranial Direct Current Stimulation: A Pilot Study of Anodal, Cathodal and Sham Stimulation in Aphasia.**

**Objective:** To assess the safety of prolonged transcranial direct current stimulation (tDCS) to the left hemisphere (1mA for 13 minutes, 5 days a week for 6 weeks) in combination with intensive speech and language therapy (SLT) and to compare language outcomes from anodal, cathodal and sham stimulation.

**Participants and Methods:** Twelve participants (8M) with chronic aphasia (Mean (SD) TPO = 34.78 (41.98) weeks) were randomized to receive anodal, cathodal or sham tDCS to the left hemisphere for six weeks, concurrent with intensive SLT. An fMRI scan identified an individualized site for tDCS electrode placement. tDCS was delivered via an 8cm<sup>2</sup> oblong saline soaked sponge electrode over the previously identified scalp location. A reference electrode (48 cm<sup>2</sup>) was placed above the contralateral orbit. SLT (90 minutes) involved reading aloud sentences on a computer screen. The first 13 minutes of SLT was concurrent with the 13 minutes of tDCS. Temperature, blood pressure and self-reported side effects were measured before and after stimulation and at the end of each treatment session. The primary outcome measure was the Aphasia Quotient (AQ) of the Western Aphasia Battery (WAB-R). The Communication Effectiveness Index (CETI) served as a secondary outcome. Assessments were conducted at three time points: pretreatment; post-treatment; and at six-weeks follow-up.

**Results:** No adverse events were reported. Both anodal and cathodal groups demonstrated clinically significant improvements for the WAB AQ (>5 point gain) and CETI (>12 point gain) from pretreatment to post-treatment and pretreatment to follow-up. The sham group did not meet criteria for clinical significant gains for the AQ or CETI.

**Conclusions:** Prolonged tDCS to the left hemisphere in combination with SLT was safe and has the potential to enhance outcomes. Furthermore, cathodal stimulation to the left hemisphere may be a viable option and should not be overlooked in future research on tDCS and aphasia. Supported by Grant # 5R21DC009876 from the NIDCD.

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**L.R. CHERNEY, J.B. LEE & S. VAN VUUREN. Computer-Directed Sentence-Level Writing Treatment for Persons with Chronic Aphasia.**

**Objective:** To evaluate a novel computer-directed writing treatment for persons with aphasia (PWA) that combines choral reading with repeated writing of sentences.

**Participants and Methods:** Five right-handed persons with chronic stroke-related aphasia (Age 46-62 years; TPO 12.3-48.9 months; Western Aphasia Battery-Revised (WAB-R) Aphasia Quotient 52.5-81.7) participated in this experimental ABA design. Treatment used state-of-the-art technology in which a computer agent read each target sentence aloud in unison with the PWA. Using a smart pen, the PWA copied the target, wrote it from memory, reviewed the target and made corrections. Participants worked intensively (90 minutes/day, 6 days/week, for 6 weeks) and independently on their home computer which was connected to a central server. Progress was monitored remotely and writing samples were captured by the smart pen. Trained and untrained written sentence probes administered at baseline (4 times), weekly during treatment, immediately post treatment and at a 6-week follow-up were scored for accuracy. Graphs were analyzed visually, and then quantitatively using Tau-U, a measure that controls for positive baseline trend and combines nonoverlap between phases with trend within the intervention phase. The writing subscale of the WAB-R was also administered at baseline, post-treatment, and follow-up.

**Results:** For all subjects, there was increasing trend during the intervention phase with the mean of treatment phase probes being greater than baseline probes for trained and/or untrained probes. For three subjects, Tau-U was significant ( $p < .05$ ) for trained and/or untrained writing probes. Four participants showed improvements on the WAB-R writing scale from baseline to follow-up that ranged from 8 to 27 points.

**Conclusions:** Intensive computer-directed writing treatment may potentially improve sentence writing skills in PWA. Improvements generalized to untrained writing samples and were maintained for at least 6 weeks. Supported by grant H133G120123, U.S. Department of Education.

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**S. KISELEV. Investigation of brain holistic mechanism in Russian-speaking children with weakness in grammar understanding.**

**Objective:** The goal of this research was to examine the hypothesis that weakness in brain holistic mechanism may cause the problem in the development of specific cognitive abilities, in particular, in the acquisition of grammatical constructions.

**Participants and Methods:** 156 children at the age of 6 were assessed with the Rey-Osterieth Complex Figure Test to reveal children with different level of holistic abilities. We have revealed 23 children with immature (part-oriented) strategy in copying Complex Figure. These children were included in the experimental group with weakness in holistic abilities. The control group included 20 children with holistic strategy in copying Complex Figure.

Both groups were assessed by Grammar Understanding Test from Luria's neuropsychological assessment technique.

**Results:** One-way ANOVAs revealed significant differences between groups for scores in the Grammar Understanding Test. Children from experimental group had weakness in grammar understanding.

**Conclusions:** In view of the obtained results, it can be assumed that brain mechanism responsible for holistic abilities has influence on the development of grammar understanding in preschool children.

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**J. VÁZQUEZ DE SEBASTIÁN, I. LEIVA-MADUEÑO, L. JANZ, M.L. BERTHIER, G. DÁVILA, A. ESTÉVEZ-GONZÁLEZ & C. GARCÍA-SÁNCHEZ. Efficacy of the Spanish Version of the Constraint-Induced Aphasia Therapy in Post-Stroke Aphasia.**

**Objective:** To analyse the efficacy of the Spanish version of the Constraint-Induced Aphasia Therapy (CIAT) (Pulvermüller et al., 2001) in post-stroke aphasic patients. The Spanish version of CIAT has been termed REGIA (Rehabilitation Grupal Intensiva de la Afasia) (Berthier et al., 2013)

**Participants and Methods:** Fourteen patients ( $n = 14$ , mean age:  $62.7 \pm 12.3$ ) with post-stroke aphasia (Mississippi Aphasia Screening Test; MAST  $< 90$ ) and different time of evolution (months:  $20.2 \pm 21.7$ ) were treated with REGIA (3 hours/day during 10 consecutive days). Several tests and questionnaires were administered before and after treatment: aphasia global severity (Aphasia Quotient of the Western Aphasia Battery; AQ-WAB), naming performance (Boston Vocabulary Test; PALPA 54), word repetition (PALPA 53) and comprehension (Token Test). A patient's close relative completed the Starkstein's Apathy Scale (SAS), the Stroke Aphasic Depression Questionnaire (SADQ), the Communicative Activity Log (CAL), and the Stroke and Aphasia Quality of Life (SAQoL-39)

**Results:** Two weeks of REGIA induced significant benefits in comparison to baseline assessment in measures of aphasia severity (AQ-WAB;  $p = 0.000$ ), naming (PALPA 54,  $p = 0.000$ ) and word repetition (PALPA 53,  $p = 0.037$ ). Significant improvements were also seen in communication in activities of daily living (CAL,  $p = 0.022$ ), quality of life (SAQoL-39 total  $p = 0.011$ ; psychosocial scale  $p = 0.034$ ; communication  $p = 0.006$ ; and physical condition  $p = 0.022$ ), apathy (SAS,  $p = 0.005$ ) and depression (SADQ,  $p = 0.005$ ).

**Conclusions:** REGIA significantly improved deficits in language and communication as well as depression, apathy and quality of life (psychosocial, communication and physical condition) in post-stroke aphasia patients.

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**I. LEIVA MADUEÑO, J. VÁZQUEZ DE SEBASTIÁN, L. JANZ, R. PARENTI, M.L. BERTHIER, G. DAVILA, A. ESTÉVEZ-GONZÁLEZ & C. GARCÍA-SÁNCHEZ. Beyond Language: Melodic Intonation Therapy Improves Communication, Behaviour and Quality of Life in Subacute and Early Chronic Post-Stroke Aphasia.**

**Objective:** Melodic Intonation Therapy (MIT) is a highly popular intervention aimed to improve speech production in non-fluent Broca's aphasia in patients with chronic stroke. A recent study demonstrated possible benefits of MIT early in the recovery of non-fluent aphasia (Conklyn et al., 2012). The aim of the present study was to examine the efficacy of MIT in aphasic patients with subacute and early chronic strokes in language, communication, behaviour, and quality of life.

**Participants and Methods:** Twelve patients ( $n = 12$ , age:  $66.4 \pm 13$ ) with subacute and early chronic (aphasia duration:  $3.75 \pm 2.22$  months) post-stroke aphasia (Mississippi Aphasia Screening Test; MAST  $< 90$ ) were evaluated with the Western Aphasia Battery-Aphasia Quotient (WAB-AQ) at baseline and after two weeks of MIT. A reliable caregiver completed the Starkstein's Apathy Scale (SAS), the Stroke Aphasic Depression Questionnaire (SADQ), the Communicative Activity Log (CAL) and the Stroke and Aphasia Quality of Life (SAQoL-39). MIT was administered by a certificated music-therapist (3 hours a day for 10 consecutive days).

**Results:** MIT significantly improved aphasia severity (WAB-AQ,  $p = 0.040$ ), communication in activity of daily living (CAL,  $p = 0.015$ ) and quality of life (SAQoL-39,  $p = 0.048$ ; psychosocial scale:  $p = 0.014$ , and communication scale  $p = 0.045$ ).

**Conclusions:** Although spontaneous improvement can not be excluded in some patients, our preliminary results show that gains obtained with MIT in aphasia severity can be translated to both communication and activities of daily living.



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### **I.L. TRINCZER & N. FRIEDMANN. Who Moved the Middle? Effect of Reading Direction and Morphology on Visual Perception of Written Words.**

**Objective:** This study has set out to investigate two unique features of Hebrew, as reflected in the bisection task. The bisection task is a widely used methodology enabling the evaluation of the visual-spatial perception of the stimuli presented. The first part of this study explores the influence of reading direction of Hebrew orthography (right-to-left) on crossing various stimuli. The purpose of the second part was to explore the effect of the Hebrew morphology on the visual-spatial perception of written words.

**Participants and Methods:** Fifty Hebrew-speaking Israeli participants aged 20 to 40 years were asked to mark the middle of various stimuli visually presented on a tablet screen. An application specifically designed for this research was developed.

**Results:** We replicated results of previous studies on line bisection performance by right-to-left readers, showing a consistent rightward bias from the subjective midpoint, as opposed to the consistent leftward bias found for left-to-right readers. In addition, we explored for the first time orthographic stimuli bisection by right-to-left readers. The results indicate a consistent rightward bias in orthographic stimuli bisection, opposite to that found for left-to-right readers in previous studies. Clear evidence of the effect of the morphological structure on the bisection task has been found for the first time. The position of the root morpheme modulated word bisection. The root position effect also affected the bisection of pseudo-words that kept the morphological structure of the Hebrew language.

**Conclusions:** These findings support morphological decomposition in the early stage of the reading process, prior to lexical access and guided by structural-orthographic analysis.

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### **N. GAWRON, A. PLUTA, M. SOBANSKA & E. LOJEK. Narrative Discourse in Individuals with Subcortical Ischaemic Vascular Dementia (SIVD).**

**Objective:** SIVD is one of the most frequent types of vascular related brain impairment, resulting in psychomotor slowing and executive dysfunction. However, very little is known about discourse abilities in SIVD. The study aimed at investigating discourse features as well as the relationships between discourse and other cognitive functions in SIVD.

**Participants and Methods:** Fourteen SIVD patients, 14 persons with mild Alzheimer's disease (AD), and 14 healthy controls (HC) matched in age, gender, and education took part in the study. Neuropsychological test battery included measures of verbal memory, executive functions, psychomotor speed, attention, and reasoning. Discourse was elicited with tasks of story retelling. The retellings were analyzed at the levels of micro-, macro-, and superstructure of discourse organization.

**Results:** As expected, the SIVD group showed significantly slower performance in psychomotor tests, whereas AD patients performed lower in verbal memory and reasoning tests comparing to HC. Both clinical groups also showed significant discourse deficits in comparison to HC. Namely, the SIVD group produced markedly less correct propositions and morals, and displayed a tendency to make more irrelevant comments ( $p < .058$ ). AD patients produced significantly less propositions, topics and morals, used less correct pronouns, employed significantly more pragmatic expressions (e.g. you know) than the HC group. There was only one difference between clinical groups on discourse measures: SIVD patients recalled more correct propositions ( $p < .005$ ) than AD individuals. In SIVD patients the number of irrelevant comments correlated inversely with memory performance ( $r = .538$ ;  $p < .05$ ), whereas

the number of pragmatic expressions correlated inversely with executive functions ( $r = -.542$ ;  $p < .05$ ).

**Conclusions:** The study shows that SIVD patients may experience problems with discourse production mainly at the level of macrostructure. The discourse impairments are related to neurocognitive shortcomings in this group.

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### **N. FRIEDMANN & R. GUGGENHEIM. Previously Undescribed Type of Developmental Phonological Dyslexia.**

**Objective:** The defining symptom of phonological dyslexia is the selective impairment of reading aloud of nonwords relative to words (Coltheart, 1996; Temple & Marshall, 1983). According to the dual-route model of word reading, phonological dyslexia is caused by a selective impairment to the sublexical reading route. The sublexical route contains three components, parsing, conversion, and blending (Coltheart et al., 2011). Typically, phonological dyslexia is described as a deficit in the conversion component. The phonological output buffer is the component in this model responsible for blending, and the short-term maintenance of phonological units until their articulation, as well as for phonological and morphological composition (Gvion & Friedmann, 2012; Dotan & Friedmann, 2007).

**Participants and Methods:** In this study, 15 adults and children with a deficit in the phonological output buffer, identified based on their performance in phonological working memory tests (FriGvi Friedmann & Gvion, 2002; Gvion & Friedmann, 2012). We assessed reading aloud and repetition of nonwords and morphologically complex and simple words. Grapheme-phoneme conversion was assessed by parsing each nonword in the list of nonwords that were read aloud, to small phonological units of consonant and vowel (pirtkel: pi, r, t, ke, l). We compared participants' performance in nonword reading aloud to their reading of single letters and CV units.

**Results:** The participants were able to read single letters and CV units when they were presented separately, but not long nonwords. They made errors in both repetition and reading aloud of nonwords. Their reading and repetition of morphologically complex words was also impaired.

**Conclusions:** Our results show a previously undescribed type of phonological dyslexia, resulting from a deficit in the phonological output buffer. This deficit causes difficulties not only in nonword reading but also in nonword repetition, with intact grapheme-phoneme conversion. Correspondence: *Rerital Guggenheim, Tel Aviv University, Harakefet 9, Tel Aviv 6794909, Israel. E-mail: guggenheim@mail.tau.ac.il*

### **N. BALABAN, M. BIRAN, I. DAYAN, M. GIL, Y. SACHER & N. FRIEDMANN. Brain Damage, Theory of Mind and Language.**

**Objective:** Theory of mind (TOM) is the cognitive ability that allows a person to see the world through the eyes of others and to relate mental states to behavior in social situations. An everyday activity that depends on this ability is engaging in discourse. Previous research related TOM impairment to right brain damage (RBD) and to Traumatic Brain Injury (TBI). Therefore, it can be expected that linguistic abilities that depend on TOM will be impaired in these conditions.

**Participants and Methods:** The participants were 42 patients with brain damage, 25 of whom with a selective damage to the right hemisphere, and 17 with TBI and a control group of age-matched control participants. First, using a battery of 14 TOM tasks (the a-TOMic battery) we assessed the TOM ability of each participant. Next, we presented linguistic tasks that rely on the need to consider others viewpoint during conversation. For example, the ability to use reference terms appropriately (e.g., when is a full noun phrase appropriate and when a pronoun?) the use of definiteness in referring to new or known entities in discourse (e.g., the difference between 'hand me a pen' and 'hand me the pen'), and the way the patients consider the informational needs of

hearers in a story retelling task. We also administered tasks that tested language abilities that are not related to TOM (syntactic tasks).

**Results:** We found that 23 of the brain damaged patients were a-TOMIC, TOM-impaired. The aTOMIC group performed significantly worse on language tasks that relied on TOM compared to brain damaged participants with good TOM and healthy controls. Their performance on syntactic tasks that do not require TOM was similar to that of the two control groups.

**Conclusions:** Language difficulties can result from TOM impairment and hence occur without damage to linguistic centers of the brain. TOM impairment selectively affects certain language tasks that require TOM, leaving other language abilities intact. Assessing TOM abilities for each individual with brain damage is necessary.

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**B.M. BEN-DAVID, N. MULTANI, D.A. NICOLE, R. GREEN & P.H. VAN LIESHOUT. A New Tool for Assessing Impairments of Identification of Emotions in Spoken Language Following Traumatic Brain Injury - the Test of Rating of Emotions in Speech (T-RES).**

**Objective:** Traumatic Brain Injury (TBI) has devastating social and cognitive effects. An often-neglected issue relates to difficulty in identifying emotions in spoken language, which has been found to have a major impact on the quality of life of TBI patients. We present analysis of novel data showing the specific difficulties TBI patients have in identifying semantic and prosodic emotional content and in integrating them.

**Participants and Methods:** Eleven case studies of TBI patients were compared to the data of 80 healthy controls

**Stimuli:** Lexical sentences, reliably associated with one of five emotions (anger, fear, sadness, happiness and neutral), were recorded spoken in corresponding five prosodies. The stimulus-set comprises each possible combination of dimensions, creating congruent, incongruent and neutral pairings (e.g., "I am so happy" spoken in a happy, angry and neutral prosody, respectively).

**Procedure:** Listeners were asked to rate each spoken sentence on four scales, relating to how much they agree that speaker was \_\_\_\_ (happy/angry/ sad/ fearful) in three tasks: (A) Prosody — selectively attending only to the prosody; (B) Semantics — selectively attending to the semantics, and (C) Combined-dimensions — rating the sentence as a whole using both dimensions.

**Results:** More than half of TBI patients tested showed severe limitations in identifying specific emotions. The most consistent limitation was in identifying Happiness. Second, when asked to rate the speech naturally, many TBI patient have underrepresented the prosody. Third, the pattern of these impairments was idiosyncratic in nature.

**Conclusions:** We believe T-RES can be useful as a tool to improve the reliability of the assessment and the rehabilitation of communication skills in various populations with mild cognitive impairments.

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**A. KESSELMAN, M. YACHINI & N. FRIEDMANN. Dyslexia & SLI: A Double Dissociation.**

**Objective:** This research examined whether there is a relation between dyslexia and specific language impairment (SLI) by looking for double dissociations between reading and syntactic and lexical impairments.

The literature includes many reports of individuals who have both dyslexia and SLI. The problem is that often these reports relate only to group averages, without reporting individual data. They also do not address the fact that dyslexia and SLI are multifaceted impairments, with various different subtypes. More than 10 types of dyslexia are currently known (Coltheart & Kohnen, 2012), as well as at least 4 types of SLI, caused by selective deficits in syntax, lexical retrieval, phonology, semantics or pragmatics.

Therefore, in this study we examined the ability of each subject separately, focusing on the fine characterization of the types of dyslexia and SLI.

**Participants and Methods:** The participants were 90 Hebrew speakers between the ages 10-14, who were diagnosed as having learning disability. We examined each participant using an extensive diagnostic battery that included reading, syntactic comprehension and production, lexical retrieval, and phonological tests. For each participant, we created an individual profile of impairment in the various domains. Participants were considered to have dyslexia or SLI when their error rate was significantly higher than the control group in the relevant domain.

**Results:** We found that 45 of the children had dyslexia without lexical SLI, 10 of the children had dyslexia without syntactic SLI and 10 had syntactic SLI without dyslexia.

**Conclusions:** This study demonstrates that reading disabilities and language disorders are separate, and that the existence of one does not require the existence of the other. This indicates that dyslexia does not result from a language impairment in either syntactic, lexical, or phonological abilities. Therefore, it is necessary to accurately diagnose the types of disabilities one suffer from, only accurate diagnosis could ensure appropriate treatment.

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**Medical/Neurological Disorders/Other (Adult)**

**M. HARCIAREK, J.B. WILLIAMSON, B. BIEDUNKIEWICZ, A. DEBSKA-SLIZIEN & B. RUTKOWSKI. Defective performance on Trail Making Test in adequately hemodialyzed patients: A general slowing or an executive phenomenon?**

**Objective:** Patients with end-stage renal disease receiving hemodialysis have been repeatedly shown to present with impaired performance on cognitive tests, measures of executive functions in particular. Nonetheless, many tests of executive function are timed, and it has been shown that patients on hemodialysis often present with psychomotor slowing. Thus, it remains unknown whether the defective performance of hemodialyzed patients on timed measures of executive function is driven by these patients' executive deficits or rather their general slowing. This study addresses this question in regard to the Trail Making Test (TMT) part B, a task typically applied in the population of dialyzed patients to assess executive functioning.

**Participants and Methods:** Twenty-seven adequately hemodialyzed patients and 30 demographically matched normal controls were the participants of this study. Cognitive measures included MMSE as well as the TMT (A, B).

**Results:** Despite normal general mental state, hemodialyzed patients needed significantly more time to complete the TMT, both part A and B ( $p < .001$ ). The calculated ratio score (B/A) showed, however, that the performance of dialyzed patients was accounted for by a general slowing. Further, the error analysis revealed that dialyzed patients committed literally no errors while performing the TMT. Moreover, the obtained ratio score was significantly correlated with the level of creatinine ( $p < .05$ ) but not other disease-related factors (e.g. depression, hypertension).

**Conclusions:** The defective performance of adequately hemodialyzed patients on timed measures of executive function seems to be related to these patients' general slowing, associated with a level of kidney disease-induced (neuro)toxicity, rather than executive difficulties (e.g. monitoring). Future studies are needed to test if this psychomotor slowing results from a specific brain dysfunction (fronto-medial mediated energization) or an autonomic-brain arousal interaction due to the kidney disease-related changes.

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**M. ZURAWEL, Y. POLLAK, M. LEVI, T. GUREVICH, N. GILADI, I. FRIED & F. ANDELMAN. The Effect of Surgery, Surgery Type and Cognitive Reserve on Neuropsychological Outcome after STN DBS Surgery in Parkinson Disease Patients.**

**Objective:** Deep brain stimulation (DBS) of the subthalamic nucleus (STN) is a well-established treatment for patients with severe Parkinson's disease (Benabid et al 2009). Recent studies suggest that although bilateral surgical procedures have been shown to provide greater motor benefits compared to unilateral procedures, they seem more likely to be associated with increased acute and long-term cognitive dysfunction (Albert et al 2008). The goals of the present study were to investigate the effects of DBS surgery, of stimulation condition (unilateral versus bilateral) and of cognitive reserve (low cognitive reserve versus high cognitive reserve) on post-operative neuropsychological outcome.

**Participants and Methods:** Thirteen bilateral and twenty two unilateral candidates for DBS surgery were examined pre- and post-operatively. The neuropsychological battery selected evaluated the integrity of the frontal-subcortical circuits. Pre- and post-operative test scores served as repeated within-group factors, whereas stimulation condition (bilateral/unilateral) and cognitive reserve (low/high) served as between group factors.

**Results:** The data were analyzed using a series of two-way repeated measures ANOVAs and MANOVAs. Statistically significant post-operative decline was found on measures of verbal fluency ( $p < 0.001$ ), psycho-motor speed ( $p < 0.01$ ) and cognitive flexibility ( $p < 0.02$ ) in the whole patient group, regardless of the patients' stimulation condition or cognitive reserve.

**Conclusions:** The results suggest that certain neuropsychological functions may be affected by the surgical intervention, regardless of the laterality of surgery or the patient's cognitive reserve. Importantly, most post-operative neuropsychological results were not statistically significant, as compared to the patients' preoperative function. In sum, the DBS STN surgery in Parkinson disease patients, though considered mostly cognitively safe, may result in isolated neuropsychological deficits.

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**C. RUIS, I. HUENGES WAJER, P. ROBE & M. VAN ZANDVOORT. Awake craniotomy and coaching.**

**Objective:** The importance of monitoring cognition during awake craniotomy has been well described in previous studies. The relevance of being coached during such a procedure has received less attention and questions about what factors are most important herein remains still unanswered.

**Participants and Methods:** Twenty-six patients who underwent awake craniotomy received a questionnaire about their experiences during the procedure. The questions concerned different aspects of the pre-operative part, the operation itself and coaching aspects.

**Results:** Two thirds of the twenty patients who responded to the questionnaire reported anxiety in the days before or during the operation, varying from general anxiety for being awake during surgery to anxiety for very specific aspects. The constant presence of the neuropsychologist and a transparent communication were reported as helpful in staying calm.

**Conclusions:** Results of this descriptive study underline that coaching is important for patients and it enables valid cognitive monitoring during awake craniotomy. This study provides handhelds for clinicians in improving their role as a coach.

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**M. TAL SABAN, A. ORNOY & S. PARUSH. Participation Profile of Young Adults with Developmental Coordination Disorder (DCD).**

**Objective:** The purpose of this study was to assess the daily functioning of young adults with DCD, their emotional state and the impact of DCD on formulation of specific and executive strategies during activity performance.

**Participants and Methods:** Participants and Method: A random sample of 2379 adolescents and young adults aged 19-25 ( $M = 20.68$ ,  $SD = 3.42$ ) was recruited through the Israel Army Health Survey. Based on the cutoff point of the Adolescents & Adults Coordination Questionnaire (AAC-Q), three study groups were identified ( $N = 429$ ): DCD ( $n = 135$ ), borderline DCD ( $n = 149$ ) and control ( $n = 145$ ). The groups were compared based on their participation and functional ability. Subjects completed: The AAC-Q (an ecological tool used to screen adolescents and young adults for motor coordination deficits), The Daily Life Functions Questionnaire (assessing non-academic and academic functioning), The Recent Emotional State Test (assessing feelings resulting from task performance), the Internal Factors Attributed to Success questionnaire and The Problem Solving Questionnaire (assessing strategy use).

**Results:** Results: The study showed that DCD continues into adulthood and can affect academic and non-academic function as well as the emotional state of the individual. MANOVA revealed a statistically significant between-group difference ( $F[7,422] = 16.19$ ;  $p < 0.001$ ;  $\eta = .197$ ). post-hoc analyses revealed differences for all measures (except the problem solving questionnaire) with study groups performing consistently worse than control group. logistic regression that non-academic functioning was most significant predictor of group placement ( $B = -1.32$ ;  $p < .001$ ).

**Conclusions:** Conclusion: The study results show that DCD appears to continue into adulthood and effects participation, function and emotional state. As the demand for evidence based practice continues to grow there is a need to continue to expand the current knowledge base regarding DCD in adulthood.

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**S. CAVACO, J. DOMINGOS, F. CORREIA, J. DAMÁSIO & M. MAGALHÃES. Cognitive Functioning in Acquired Hepatocerebral Degeneration.**

**Objective:** Acquired hepatocerebral degeneration (AHD) is a chronic neurological disorder, characterized by extrapyramidal and neuropsychiatric symptoms in advanced liver disease patients with portosystemic shunt. Although the cognitive dysfunction is the rule in AHD patients, the neuropsychological profile is yet to be established. The study aim was to characterize the neuropsychological profile in a cohort of AHD patients.

**Participants and Methods:** Nineteen AHD patients (14 men and 5 women; mean age=55.8, sd=7.6; mean education=8.5y, sd=4.3) performed a series of neuropsychological tests, including the Dementia Rating Scale-2 (DRS-2), the Auditory Verbal Learning Test, the Phonemic Fluency, the Semantic Fluency (animals) and the Trail Making Test were performed. The raw scores were then demographically adjusted, according to national normative data. The 5th percentile of the regression-based norms was used as cutoff of deficit.

**Results:** The frequencies of deficit were: DRS-2 - total score (42%), attention subscale (5%), initiation/perseveration subscale (37%), construction subscale (11%), conceptualization subscale (16%), and memory subscale (26%); Auditory Verbal Learning Test - trial 1 (21%), 30' recall (37%), 30' recognition (42%), total learning index (26%), learning over trials index (11%), and long-term percent retention index (26%); Phonemic Fluency (41%); Semantic Fluency (35%); Trail Making Test - part A (42%), part B (63%), and ratio B/A (42%).

**Conclusions:** The neuropsychological profile in AHD patients includes impairments in multiple cognitive domains, being Trail Making Test part B the most prevalent neuropsychological deficit.

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**A. NORDLUND, J. BERGGREN, A. HOLMSTRÖM, M. FU & A. WALLIN. Frequent Mild Cognitive Deficits in Several Functional Domains in Elderly Patients with Heart Failure without Known Cognitive Disorders.**

**Objective:** One of the most common age-related diseases that keeps increasing globally is heart failure (HF) which is characterized by decreased heart function as a consequence of a variety of cardiovascular diseases. During recent years research has shown that cognitive impairment is prevalent in HF. The objective of the present study was to investigate to what degree mild cognitive deficits are present in patients with HF despite absence of any known cognitive disorder.

**Participants and Methods:** A well defined group of patients (N=40) with heart failure completed a cognitive screening check list, a depression screening questionnaire and a short cognitive battery consisting of neuropsychological tests assessing five different cognitive domains; speed/attention, memory, visuospatial, language and executive functions. The neuropsychological results were compared with those from a group of healthy controls (N=40).

**Results:** The patients with HF displayed cognitive impairment in comparison with the control group within the domains speed and attention, episodic memory, visuospatial functions and language. Among them 34 HF (85%), patients could be classified as mild cognitive impairment (MCI), the majority as non-amnesic MCI.

**Conclusions:** Considering the high occurrence of mild cognitive deficits among HF patients without known cognitive disorders, closer attention should be paid to their self care and compliance. Inadequate compliance could lead to more frequent hospitalizations. Furthermore, considering the high frequency of cognitive deficits, HF patients may be at increased risk of dementia, especially vascular dementia.

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### Medical/Neurological Disorders/Other (Child)

**A. MARYNIAK, M. ROSZKOWSKI & K. DRABIK. Pure alexia in a teenage girl after the removal of a large astrocytoma in the third ventricle and the left lateral ventricle.**

**Objective:** Pure alexia, or alexia without agraphia, occurs most often as a result of damage to the posterior left hemisphere.

**Participants and Methods:** In a sixteen years old girls, for a few months, there were episodes of visual disturbances, and slight deterioration in academic performance was observed. MRI revealed a large tumor filling the third ventricle and the left lateral ventricle. The tumor was completely removed surgically. Histologic examination confirmed pilocytic astrocytoma, with a very long growth period (estimated over ten years).

**Results:** After the surgery, in the girl appeared severe alexia (she didn't recognize single letters), color anomia, and a small degree of anomia and fresh memory deficits. Agraphia was not noted, the identification of numbers and complex shapes was correct.

After three months of the surgery, there was observed gradual resolution of alexia up to full return of reading skills. The patient estimates that particularly helpful in the first period of rehabilitation was "tracing words" – she recognized the movement of the hand, which enabled to recall and recognize the image of letters and words. During the one-year follow-up, memory deficit and anomia subsided and patient's school performance significantly improved compared to preoperative levels.

**Conclusions:** The slow growth of the tumor allowed the developing brain to adapt to structural anomalies, thus the preoperative symptoms were minor, and disorders that occur after surgery, withdrew completely. Tracing may be a way to supporting the rehabilitation of patients with pure alexia.

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**A. MARYNIAK. Are children with pilocytic astrocytoma in the cerebellum especially intelligent?**

**Objective:** The cerebellum play an important role in the cognitive and emotional development. One of the most common brain tumors of childhood and adolescence is the pilocytic astrocytoma, located in the cerebellum.

**Participants and Methods:** The study included 31 patients (age 7-18) after the removal of the cerebellar pilocytic astrocytoma. Patients came from all over the country, the group was representative of the population in terms of SES. A detailed interview with caregivers was carried out. Caregivers also completed the survey on the functioning of children (speech, emotions, school achievement). The neuropsychological tests were performed (WISC-R, RCF, trials examining executive functions).

**Results:** Analysis of test results and information from caregivers indicate that in 22 patients (71%) the symptoms of cerebellar cognitive affective syndrome are present. Despite the observed dysfunction, parents emphasized good school achievements of children, both in the period prior to the illness and after the operation.

IQ scores in the examined group varied between 75 and 142 (mean=104.6; SD=16.37). The results in the group draw attention to the high percentage of children with intellectual functioning at upper extreme level - IQ $\geq$ 130 (4 patients - 12.9%, in population 2.1%). The difference between the distribution of results in the examined group, and in the population is statistically significant, p = 0.0001.

**Conclusions:** The question arises whether the results are an artifact resulting from the small number of the study group or indicate any significant effect. Recent studies point to the importance of glial cells in information processing and cognitive stimulation. So we can consider whether the increased activity of glial from one side does result to the exceptionally good cognitive development, on the other hand is associated with an increased risk of abnormal cells growth, leading to the formation of brain tumor.

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**Y. HSU, Y. CHEN, M. HUA, H. LIU, M. KUO & C. YANG. Improvement of Verbal Ability Correlated With Increased Left Temporal Perfusion Following Encephaloduroarteriosyngiosis in Pediatric Patients with Moyamoya Disease.**

**Objective:** Moyamoya disease is characterized by progressive bilateral internal carotid artery stenosis. Previous research revealed cerebral hypoperfusion that related to impaired intellectual development in pediatric patients. The current study aimed to further investigate the dynamic relationship between brain perfusion in particular regions and specific domains of cognitive functions following surgical treatment.

**Participants and Methods:** Pre- and post-encephaloduroarteriosyngiosis (EDAS) cognitive functions and perfusion computed tomography (CT) results were collected in seven children diagnosed with moyamoya disease. Cognitive measures included intelligence, verbal learning, and semantic fluency tests. Spearman sign rank correlations were performed to explore relationships between changes of cognitive performances and parametric time-to-peak (TTP) at bilateral temporal and frontal areas after EDAS.

**Results:** The results showed there was no significant relationship between changes of intelligence quotient (IQ) and brain perfusion at any regions of interest. However, a positive correlation was found between

performance improvement on the semantic fluency test and increased perfusion at the left temporal area.

**Conclusions:** This preliminary analysis supported a promising surgical effect of EDAS on improvement of specific cognitive function evidenced by changes of correlational neurosubstrates. Further studies with a larger sample size and sophisticated methodology were suggested. Correspondence: *CHI CHENG YANG, Ph.D., Division of Clinical Psychology, Master of Behavioral Sciences, Chang-Gung University, 4F., No.9-1, Alley 30, Lane 14, Sec. 7, Zhongshan N. Rd., Shilin District, Taipei 111, Taiwan. E-mail: ccyang@mail.cgu.edu.tw*

#### **L. HAIN. Relationship between Neonatal Hypoxia-Periventricular Leukomalacia and Neuropsychological Sequelae.**

**Objective:** The objective of this presentation is to broaden the understanding of early brain injury resulting from hypoxic neonatal events and subsequent neurocognitive impairments. At the completion of the presentation, participants will be able to: identify the early warning signs of hypoxia on brain maturation and developmental processes, state specific neuropsychological assessments that are sensitive to the effects of periventricular leukomalacia, and state specific findings of neuropsychological evaluations that are linked to individualized interventions based upon the neurocognitive profile

**Participants and Methods:** This study utilized a case control design in comparing single case studies to normative controls. The sample size included three adolescent male students who had suffered neonatal hypoxia. These students were each administered a comprehensive neuropsychological evaluation along with MRI or fMRI.

**Results:** Results demonstrated neuropsychological impairments across all three cases when compared to controls. Each profile was unique depending on the inferred brain abnormality based on MRI results, but several themes were noteworthy across cases. In this regard, neuropsychological tests assessing frontal-subcortical functions were relatively impaired across all cases regardless of location of brain injury. The neuropsychological subtests that were most sensitive to deficits were those defined as facilitators and inhibitors of higher level cognitive processes (i.e., inhibition, shifting, self-regulation, working memory, processing speed).

**Conclusions:** The implications of this study show promise for understanding that early hypoxic events will lead to demonstrable deficits on neuropsychological assessments more so in adolescence, especially those subtests that target the integrity of the prefrontal cortex as it matures. Intervention is to be aimed at improving these children's abilities to engage in proper inhibition, working memory, and processing speed.

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#### **J. PIERCY, B.N. PETERS, A. HEITZER, A.K. DEBASTOS, J.B. NEWMAN, D.G. BATTON & S. RAZ. Neuropsychological Functioning and Linear Growth in Very Preterm-Born Preschoolers.**

**Objective:** Very preterm children are at increased risk for both physical growth deficits and suboptimal neuropsychological functioning in the preschool years. While head circumference and body-height share common variance, attributable to both genetic and environmental factors, we wished to determine whether each of these anthropometric variables accounted for a unique portion of neuropsychological outcome variance.

**Participants and Methods:** We used data from 207 very preterm-born (< 33 weeks gestation) preschoolers, graduates of the William Beaumont Hospital Neonatal Intensive Care Unit, in Royal Oak, MI. We examined the associations between neuropsychological outcome and two anthropometric indices, head circumference and height (stature). The Wechsler Preschool and Primary Scale of Intelligence-Revised, Peabody Developmental Motor Scales - 2nd Edition, and the Preschool Language Scale - 3rd Edition, were used to measure neuropsychological performance in the cognitive, motor, and language domains, respectively.

**Results:** Preschool stature, but not head circumference, accounted for a significant portion of the variance in eight of nine outcome measures,

over and above the variance explained by chronological age, socioeconomic status, sex, multiplicity, gestational age, perinatal complications, and antenatal growth. Greater stature was associated with higher global and verbal IQ ( $F_s [1,192] = 4.61$  and  $3.98$ ;  $p < .05$ ), improved global, expressive and receptive language performance ( $F_s [1, 191] = 8.67, 7.08,$  and  $6.81$ ;  $p < .01$ ), and greater global, fine, and gross motor skills ( $F [1, 191] = 5.8, 3.97,$  and  $3.97$ ;  $p < .05$ ).

**Conclusions:** In very preterm children, stature attained at preschool age was associated with developmental outcome in all measured domains: cognitive, language, and motor. Investigating the effect of postnatal nutritional factors on physical growth, brain development, and neuropsychological outcome may contribute to understanding the mechanism underlying the observed relationships.

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#### **A.K. CHISHOLM, E.A. HUTCHINSON, L.M. KELLY, J.K. GUNN, M.M. MORAN, S.M. GREAVES & R.W. HUNT. Intellectual, Academic and Psychosocial Functioning in School-Aged Children with Oesophageal Atresia.**

**Objective:** Oesophageal Atresia (OA) is a congenital abnormality occurring in one in 2500-4500 live births. Neurocognitive impairment in this population may relate to altered embryogenesis or potential neurotoxic effects of surgical repair on infant brain development. Severe and chronic illness can also compromise parental functioning and place children at risk of psychosocial maladjustment. Given the paucity of research in this group, this study aimed to evaluate intellectual, academic and social-emotional functioning in children with OA.

**Participants and Methods:** Participants were recruited from a Neonatal Clinic and comprised 39 children with OA aged 5 or 8 at the time of evaluation (mean 6.6,  $\pm 1.54$ ). The age appropriate measure of general intellectual functioning was administered: WPPSI-III or WISC-IV. Academic measures comprised Word Reading, Spelling and Math Computation from the WRAT4. T-tests were used to compare scores derived from scales with normative data. Parents completed the Parent version of the BASC-2 and rates of disorder were examined via chi-square analyses.

**Results:** No significant differences were found for any IQ measures when comparing the OA group with normative data. However, 29% of children with OA demonstrated below average (<85) FSIQ scores ( $p < 0.05$ ), which is significantly more than population expectations. Children with OA scored below expectations on measures of literacy and mathematics (all  $p < 0.05$ ). Parental ratings revealed significantly higher than expected incidence of elevated anxiety (32%,  $p < 0.05$ ) and increased somatization (40%,  $p < 0.01$ ) in the OA group.

**Conclusions:** Children with OA displayed higher incidence of anxiety, somatization symptoms and reduced general intellect, and lower levels of academic functioning. Given the heterogeneity of scores, medical variables predictive for poorer outcome will be discussed. Despite the variable presentation of OA children, results support the importance of comprehensive neuropsychological evaluation to facilitate early recognition and intervention.

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#### **E. HAKKARAINEN, T. KOPONEN & J. AHONNISKA-ASSA. Arithmetic Fluency in Youth with Cerebral Palsy.**

**Objective:** Cerebral palsy is a permanent, nonprogressive motor disorder, often accompanied with cognitive deficits. Math disability is frequently reported in this group, but arithmetic fluency in youth with cerebral palsy has not been widely studied. It is important to study this subject, since more complicated operations are enabled by fluent arithmetic skills. In the present study, it is expected that arithmetic fluency is altered in youth with cerebral palsy.

**Participants and Methods:** 32 children with cerebral palsy (age range 9 to 17) participated to the study. In the present study, we used computerized method to evaluate arithmetic fluency in addition and subtraction tasks in the extent of 1 to 20. Arithmetic fluency was defined in terms of response speed and response accuracy. General intelligence was measured with Raven's Progressive Matrices Test and verbal IQ was measured with Peabody Picture Vocabulary Test. Visual working memory and verbal working memory were also measured.

**Results:** The results indicate that the arithmetic performance was not fluent in approximately half of the group. Age or the type of cerebral palsy were not associated with the arithmetic fluency. Further, it was found that general and verbal IQ together with short term memory were associated with the arithmetic fluency.

**Conclusions:** The results suggest that since the arithmetic fluency is not associated with age in youth with cerebral palsy, it is crucial to carefully investigate the factors behind the problems to focus the rehabilitation in appropriate manners.

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**E.L. SUDIKOFF, E.A. HUSTON-WARREN, A.M. VALLORANI, J.C. ISENBERG, D.H. GUTMANN & D.A. KAUFMAN. Electrophysiological Evidence of Attentional Network Disruptions in Children with Neurofibromatosis Type 1.**

**Objective:** Neurofibromatosis type 1 (NF1) is a disorder of autosomal inheritance associated with cognitive deficits in specific domains, such as attention. Recent research suggests that visual attention is comprised

of three dissociable yet interactive neural networks: 1) alerting, 2) orienting, and 3) executive control. This study examined the electrophysiological correlates of these attentional networks in children with NF1 in order to better characterize their overall attentional difficulties.

**Participants and Methods:** Participants consisted of 7 NF1 patients and 11 healthy controls who completed the Attention Network Test (ANT) while high-density EEG was acquired. Clinical impairments in attention were documented by several clinical measures (TEA-Ch, CPT, Conners-3). Event-related potentials were used to examine the efficiency of attentional networks and elucidate their neural time-course.

**Results:** Across all conditions of the ANT, children with NF1 performed more slowly and less accurately than controls. Reaction time contrasts revealed behavioral deficits in alerting and orienting networks in NF1, while participant groups did not differ in executive control. Alerting cues were associated with alterations in P1 and P3 potentials, while spatial orienting cues were associated with reductions in P3 amplitude.

**Conclusions:** Children with NF1 did not benefit from alerting and spatial cueing during the ANT. These deficits in alerting and orienting were accompanied by abnormalities in ERP components associated with cue-related processing in these domains. Although attentional deficits associated with NF1 are broad, these findings help to clarify the nature of specific attentional network disruptions that underlie these difficulties. Further understanding of these attentional network differences could help to better characterize this patient population and provide valuable clues for interventions.

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## FRIDAY MORNING, JULY 11, 2014

### Symposium 6: Life-Span Development of Episodic Memory: Neural Correlates and Modifiers

Chair: Naftali Raz

Discussant: Ulman Lindenberger

10:30 a.m.–12:00 p.m.

**N. RAZ, N. OFEN, L. BACKMAN, E. DUEZEL & U. LINDENBERGER. Life-Span Development of Episodic Memory: Neural Correlates and Modifiers.**

**Symposium Description:** Diverse facets of everyday functioning depend on ability to store and retrieve information acquired on specific occasions (episodic memory, EM), and many instances of EM malfunction are familiar to neuropsychologists. Like many cognitive functions, episodic memory changes across the life span but relatively little has been done to develop an integrative view of memory development from infancy to senium. In this symposium, we survey the state-of-the-art knowledge of life-span changes in EM and its neuroanatomical and functional correlates and modifiers. We will present the findings from cross-sectional and longitudinal studies covering various EM paradigms and spanning the age range from children (Noa Ofen) to older adults (Lars Backman, Emrah Duezel, and Naftali Raz). We will examine the patterns of structural (Noa Ofen and Naftali Raz) and functional (Noa Ofen and Lars Backman) age-related differences and change in brain and memory. We will highlight the role of neurochemical (Lars Backman, Emrah Duezel) and vascular (Naftali Raz) risk factors in shaping age-related differences in EM. We will conclude with a summary of the current state of the field (Ulman Lindenberger).

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**N. OFEN. Development of Episodic Memory in Children and Young Adults.**

Episodic memory, an ability to encode, maintain and retrieve information is critical for everyday functioning at all ages, yet little is known about the development of episodic memory systems and their brain substrates. The use of neuroimaging methodologies including magnetic resonance imaging (MRI) in the study of episodic memory development is providing new insights into the neural underpinnings that support improvements in episodic memory. I will survey current views on the neural underpinnings of episodic memory, and highlight evidence that demonstrate how functional and structural brain development underlies developmental effects in memory functioning. Data from several recent studies demonstrate age-related increases in memory-related activations in prefrontal cortex (PFC), a region that also shows protracted structural development across the substantial part of the life-span. Age-related increases in functional contribution of the PFC to memory may be directly related to improvement in the use of mnemonic strategies with age. The hippocampus, known to be critical for the integrity of episodic memory, shows a more complex pattern of functional development that may be dependent on its involvement in binding and associating among increasingly large knowledge base through development. I will present novel data from ultra-high-resolution imaging of the hippocampus that identified developmental trends unique to specific subfields of the hippocampus, the CA3/Dentate Gyrus (DG), whereby reduced CA3/DG volume from childhood to young adulthood partially accounts for age-related improvement in episodic memory. I will summarize the current evidence regarding normative development of brain systems

that support episodic memory, and discuss the implications of these developmental trends when evaluating atypical development.

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#### **N. RAZ. Linking age-related changes in brain “hardware” and memory: why is it so hard?**

Cross-sectional studies reveal associations between age, episodic memory (EM) and regional brain volumes, which are modified by many factors (hypertension, genetic variants, and iron content in the hippocampus). Longitudinal studies show reliable regional brain shrinkage and alterations in white matter (WM) organization, especially in brain structures supporting EM. However, age-related changes in EM performance occur only towards the end of the life and, because of practice effects, are difficult to assess. The magnitude of gain from repeated testing may be a useful index of age-related changes in EM. In healthy adults spanning the age range from the second to eighth decade and measured twice over two years, we observed mean EM improvement and preservation of individual differences, in contrast to significant and individually variable brain shrinkage over the same time. Better baseline EM predicted lesser shrinkage in LPFC, but not in the hippocampus and visual cortex. Memory for faces at baseline was associated with higher WM anisotropy (FA). Higher baseline FA in cingulum, forceps minor, and inferior longitudinal fasciculus predicted retest gains in name-face associative memory. Traditionally, research on brain substrates of EM focused on the MTL and the PFC, but many other regions participate in EM performance and may be in turn affected by EM training. For example, cerebellum was the only region to show reduced shrinkage after an intensive training program that resulted in significant improvements of EM. Depending on task demands, memory shows different trajectories over time. In virtual water maze navigation task, ability to learn but not the level of skill is preserved between the measurement occasions. Thus, the procedural aspects of learning may be not retained. Future studies of age-related memory declines need to address strategic and procedural aspects of EM and their neural substrates.

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#### **U. LINDENBERGER. Discussant’s statement.**

I will discuss the paper contributions to this symposium on the premise that humans accumulate and structure the sediments of their experiences while undergoing maturational and senescent changes in areas and circuits of the brain that support episodic memory (EM). Noa Ofen’s work shows that EM development in childhood is linked to increasing memory-related activations in prefrontal cortex, a region with a protracted maturational course. Her work also suggests that hippocampal involvement in EM development during childhood may be more complicated than often assumed. Lars Bäckman and Emrah Düzel address the effects of dopamine on individual differences in EM in adulthood and old age. Bäckman suggests that physiological changes in the aging brain follow a sequence, or cascade, and Düzel shows how circuits for motivation and memory interact in the aging brain. Naftali Raz presents a large array of evidence, which, taken together, demonstrates that the associations between physiological characteristics, such as regional volumes, and different aspects of EM, such as strategic versus procedural, are not unitary. I will discuss how far we have come in identifying important sources of individual differences in EM development, note differences and commonalities between EM development early and late in life, and suggest designs and questions for future research.

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#### **E. DUZEL. Motivational regulation of episodic memory consolidation in older adults.**

Studies in humans and animals indicate that dopaminergic neuromodulation originating from the substantia nigra/ventral tegmental area

(SN/VTA) enhances hippocampal memory consolidation and has a motivationally energizing effect on behavior through striatal mechanisms. The dopamine precursor L-DOPA administered to older adults during encoding improves episodic memory consolidation as evident from enhanced recollection after a long retention interval of 6 hours. When appropriate behaviors to obtain rewards and avoid punishments need to be learned concurrently, older adults are better at learning to act (‘go’) for reward, but not at learning to not act (‘no-go’) to avoid punishment. However, participants with greater structural integrity of the SN/VTA are more flexible and thereby more likely to overcome this asymmetry. I will discuss how these seemingly disparate mechanisms of dopaminergic neuromodulation interact and thus modify the ability to form stable long-term memories.

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#### **L. BÄCKMAN & L. BÄCKMAN. Dopamine and Episodic Memory.**

Dopamine (DA) has traditionally been linked to working memory (WM) and psychomotor speed. However, I review research indicating that DA is critically involved in episodic memory (EM), and may be implicated in age-related EM deficits. These patterns have been observed in a variety of EM tasks, including word recall and recognition, paired-associate learning, and face recognition. In addition, I describe a new project, entitled Cognition, Brain, and Aging (COBRA). This is a longitudinal study with three measurement points across 5-year retest intervals. 180 subjects between 64 and 67 years are recruited at baseline. The protocol involves structural and functional MRI, PET assessment of dopamine D2 receptors, an extensive cognitive battery (EM, WM, speed), and thorough measurement of lifestyle activities. A key issue is whether different brain variables age in parallel or whether some variables show earlier onset of decline than others, and thus act as a primary mechanism of decline in brain and cognition. Baseline data collection is ongoing and will be terminated this summer. I will present relevant findings from the COBRA iproject.

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### **Paper Session 11: Executive Functions**

**Moderator: Yehuda Pollak**

**10:30 a.m.–12:00 p.m.**

#### **A. JANSARI, A. DEVLIN, B. KERROUCHE, Y. GILBOA, M. DAVIES, H. FISHER, M. CRACKNELL, A. MARILLER, C. CANIZARES, T. LEADBETTER & M. CHEVIGNARD. C’est Ma Fête! Can A French Adaptation Of A Virtual Reality Assessment Of Children’s Executive Functions (JEF-C<sup>®</sup>) Work And Be Used With Paediatric Patients With Acquired Brain Injury?**

**Objective:** The Jansari assessment of Executive Functions for Children (JEF-C<sup>®</sup>) has been developed as an ecologically-valid measure using non-immersive virtual reality. JEF-C<sup>®</sup> assesses eight cognitive constructs: planning, prioritisation, selection, creative-thinking, adaptive-thinking, action-based prospective memory (PM), event-based PM and time-based PM. Our three aims were to assess the ability of JEF-C<sup>®</sup> to map development of executive functions (EF) in typically-developing children, to translate it to another language and finally to see if it is feasible with children with Acquired Brain Injury (ABI), who often suffer EF impairment.

**Participants and Methods:** Sixty healthy children (HC) in three age groups (7-10, 12-14 & 16-18) performed JEF-C<sup>®</sup> in English to assess viability. Next, JEF-C<sup>®</sup> was translated into French and used to assess 20 children with ABI (aged 10-16) in Paris and results compared to

healthy controls. In addition to JEF-C<sup>®</sup> participants performed the Six Elements test from the BADS-C and their parents answered the BRIEF. **Results:** A significant main effect was found for age group in the HC group,  $[F(16,86)=3.19, p<0.001, Wilks \lambda=0.39, \text{partial } \eta^2=0.37]$  demonstrating that JEF-C<sup>®</sup> is able to differentiate children of different ages. The results were in line with BRIEF ratings given by parents while BADS-C was unable to differentiate the age groups. French JEF-C<sup>®</sup> was found to be feasible in children with ABI and more engaging than traditional forms of assessment. Further, using a case series approach, we were able to demonstrate that underlying strengths and weaknesses are revealed for individuals in a manner not possible with existing tests. **Conclusions:** JEF-C<sup>®</sup> was found to differentiate children of different ages better than the Six Elements from the BADS-C. Further, a French version of JEF-C<sup>®</sup> has proven to be potentially at least as useful as existing EF tests. The fact that a range of performance is seen both across patients and cognitive constructs demonstrates that the task is sensitive at a number of levels.

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**N. MOTA, E.A. ROCHA, M.L. ANTUNES & M.A. CAMPELO. Action Decision in Moral Dilemma Vary With Deliberated Self-Control Among Healthy Female University Students: A Preliminary Study.**

**Objective:** Neuroscience has broadened its interest onto moral issues but not also onto its neurocognitive processes. Opposite of common sense, our hypothesis proposes that principles-guided choices (moral/empathetic) might demand more self-regulation than circumstantial benefits-guided ones (pragmatic). Also, principles-guided choices could present more association with self-regulation functions (mesial frontal activation) than with information management functions (dorsolateral frontal activation). This study analyzes correlation between types of decision in moral dilemma and executive functions, in late adolescence neurodevelopmental stage.

**Participants and Methods:** Preliminary sample was formed by 15 healthy female university students (19 - 20 years-old), without personal history of neurologic/psychiatric diseases, whom attended to a clinical interview and neuropsychological assessment (dorsolateral and mesial prefrontal functions). A moral dilemma was presented with 2 options (moral/empathetic or pragmatic) for action decision (Malti et al., 2010).

**Results:** Action decision in moral dilemma correlated with self-monitoring variables: span on Letter-Number Sequencing (WAIS-III),  $r_s = .561, p = .015$ ; perseverative errors on SOPT,  $r_s = -.535, p = .020$  and on Stroop color denomination,  $r_s = -.583, p = .011$ . Also, it correlated with tasks that require comprehension, Matrix Reasoning (WAIS-III),  $r_s = .468, p = .039$ , and adaptation to unfamiliar perspective, IGT,  $r_s = .637, p = .010$ , and WCST: errors,  $r_s = -.463, p = .041$ , perseverative errors,  $r_s = -.617, p = .007$  and learning to learn,  $r_s = .671, p = .012$ . Principle-guided choices are associated with best performance on these variables.

**Conclusions:** Principles-guided choices seem to be an index of self-monitoring and external adaptation, expressing deliberated self-control, already in late adolescence neuromaturational stage. Further analysis and other initiatives might explore it more detailed, clarifying its relationship with self/life satisfaction.

Acknowledgments: FAPERJ.

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**E. HELED, D. HOOFIEN, E. BACHAR & R.P. EBSTEIN. Executive Functions among Current and Recovered Anorexia Nervosa Patients: Quantitative and Qualitative Analyses.**

**Objective:** Previous examinations of the neuropsychological characteristics of patients with Anorexia Nervosa (AN) and of recovered patients

have yielded inconsistent findings. The aim of this study was to further explore this issue, focusing on Executive Functions (EF) and compare their performances in the verbal and visual modalities as well as quantitative and qualitative measures.

**Participants and Methods:** Thirty-five AN patients, 33 recovered patients and 48 healthy controls participated in this study. The following neuropsychological EF tapping tests were used, chosen for their qualitative analysis design: the Verbal Fluency test, the Delis-Kaplan Executive Functions System Sorting Test, the Rey Complex Figure Test, the Trail Making Test, and the 5 Point Test.

**Results:** A Multivariate Analysis of Variance was carried out, comparing the three groups. AN patients showed poorer performance in measures of memory and visual-spatial ability as compared to the other two groups. Analysis of EF showed that the AN and recovered patients groups performed poorer on most measures involving visual features as compared to tasks with verbal features. These results were more salient when examined by means of qualitative measures rather than by means of quantitative measures.

**Conclusions:** Women with past or present diagnoses of AN show difficulties in visuo-perceptual EF, whereas their verbal EF seem to be preserved. Qualitative measures proved to be useful in detecting EF difficulties amongst AN patients during the acute stage and even after recovery.

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**S.G. LAZER, D. STEIN & R. GEVA. Differentiation Between "Cold" and "Hot" Executive Functions in Eating Disorders: Implications for Intervention.**

**Objective:** Executive functions (EF) are responsible for coordination between cognitive functions in order to achieve individual goals. "Hot" EFs coordinate social behavior and emotional reward while "cold" functions are based on sustaining delay and data manipulation. Our aim was to evaluate the differentiation between "hot" and "cold" functions in patients with eating disorders namely restrictive anorexia nervosa (R-AN), binge-purge anorexia nervosa (AN-BP) and bulimia nervosa (BN), hypothesizing that "hot" ETs will be impaired among patients with binge-purge eating disorder (BP including AN-BP and BN) compared to "cold" EFs impairment among R-AN patients.

**Participants and Methods:** This prospective study included two evaluations: during acute phase of illness and towards hospitalization discharge. 113 participants (ages 12-27) were divided to three groups: BP (N=50), R-AN (N=27) and healthy controls (N=36). "Hot" functions were evaluated by a modified Emotional Day Night Task which included 8 stimuli types: neutral and food stimuli with 4 emotional icons (E-EDNT). "Cold" functions were evaluated by the Continuous Performance Test (CPT).

**Results:** R-AN demonstrated difficulties in most CPT parameters before and after treatment: adding mistakes, increased variability in response time and more preservative responses. BP patients showed deficient accuracy before treatment in the emotional stimuli of the E-EDNT.

**Conclusions:** "Hot" and "cold" executive functions seem to be discretely affected in specific eating disorders. BP have demonstrated "hot" EF impairment which may correspond with their tendency to emotional impulsivity. R-AN have demonstrated "cold" executive impairment as a consequence from their cognitive impulsivity. Moreover, R-AN deficits were resistant to treatment while BP showed improved performance after treatment. Focused treatments on group's EF impairment may lead to improved prognosis.

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**Paper Session 12:  
Cognitive Neuroscience (B)**

**Moderator: Roy P. Kessels**

**10:30 a.m.–12:00 p.m.**

**N. MAYSELESS & S. SHAMAY-TSOORY. Modulating creativity by altering the balance between right and left inferior frontal gyrus with tDCS.**

**Objective:** Creativity is defined as the ability to produce responses that are both novel (i.e., original and rare) and suitable (i.e., useful). Previous research indicated that while regions in the right hemisphere are implicated in the production of new ideas, damage to the left inferior frontal gyrus (IFG) is associated with increased creativity, indicating that left IFG damage may have a “releasing” effect on creativity. To examine this, in the present study we used transcranial direct current stimulation (tDCS) to modulate activity of the right and the left IFG.

**Participants and Methods:** Sixty healthy adults participated in two experiments. In the first experiment participants were administered bilateral tDCS stimulation, with the cathodal electrode placed over the LIFG and the anodal over the RIFG (L-R+) for Group 1, or with the cathodal electrode placed over the RIFG and the anodal over the LIFG (L+R-) for Group 2. In the second experiment we were interested in testing the unilateral effect of either diminishing activity in the left IFG (Group 1) or enhancing activity in the right IFG (Group 2). Each participant took part in only one stimulation session, receiving both stimulation and sham counterbalanced. During stimulation, participants completed the Alternate Uses tasks and a verbal fluency task.

**Results:** In the first experiment we show that whereas anodal tDCS over the right IFG coupled with cathodal tDCS over the left IFG increases creativity, the reverse stimulation does not affect creative production. To further confirm that only alteration of the balance between the two hemispheres is crucial in modulating creativity, in the second experiment we show that neither unilateral cathodal tDCS over the left IFG nor unilateral anodal tDCS over the right IFG results in changes in creativity.

**Conclusions:** These findings support the balance hypothesis, according to which creativity requires a balance of activation between the right and the left frontal lobes, and more specifically, between the right and the left IFG.

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**A. SHABI & M. COHEN-ZION. The Effects of Chronic Sleep Loss on Information Processing Speed and Subsequent Effects on Other Cognitive Abilities in Adolescents.**

**Objective:** Information processing speed (IPS) is a measure of cognitive proficiency and involves the ability to perform relatively simple or over-learned mental tasks (e.g. simple arithmetic problems) in an automatic manner, especially when high mental efficiency is required (e.g. in timed tasks). IPS ability develops in predetermined bursts from childhood to young adulthood and has been found to be correlated with measures of general intelligence. Given the clear relevance of IPS among developing youth, the current study aimed to examine the causal impact of sleep loss on IPS in adolescents and whether IPS may mediate the relationship between chronic sleep loss and deficits in other cognitive abilities.

**Participants and Methods:** Twenty-six high school students (17.1 years; 11 male) participated in the study. Each participant underwent 2 counterbalanced experimental conditions, sleep restriction (SR; 6-6.5 hours in bed/night) and sleep extension (SE; 10-10.5 hours in bed/night), for 4 consecutive nights each. Following each sleep condition, a computerized cognitive assessment battery (MindStreams®, Neurotrax Corp.) was used to measure performance in cognitive domains of interest: attention, memory, IPS, motor skills, and executive function.

**Results:** IPS performance (speed and accuracy) was poorer following SR when compared to the SE condition ( $p < .05$ ). The reduction in

IPS (speed) following SR, mediated the reduction in tests of executive function ( $p < .05$ ) and problem-solving ( $p < .05$ ), but not in motor skills ( $p = ns$ ).

**Conclusions:** Not only was IPS negatively affected by continuous partial sleep deprivation when compared to the well-rested condition, but this reduction in IPS performance mediated observed decreases in other important cognitive functions. These findings are of great concern given the ubiquitous presence of sleep loss among teens today and thus the possible widespread consequences of insufficient sleep on cognitive function during this critical developmental period.

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**F.G. HILLARY, S.M. RAJTMAJER & C. ROMAN. Hyperconnectivity in brain networks as a marker of recovery following traumatic brain injury.**

**Objective:** In the functional brain imaging literature examining connectivity, there is increasing evidence that traumatic brain injury (TBI) results in hyperconnectivity in critical subnetworks such as the default mode network (DMN) and executive control network (ECN). The role of this increased connectivity remains unclear, but one possible explanation is that networks dedifferentiate and become more homogenized. It was a goal to examine brain connectivity via functional MRI during the first year after moderate and severe injury.

**Participants and Methods:** The study participants included 13 individuals with moderate and severe TBI between the ages of 19 and 53 years and 13 healthy control subjects (HCs) of comparable age and education. Individuals with TBI underwent functional MRI data collection and cognitive testing at 3-months, 6-months, and 12-months after emerging from posttraumatic amnesia. We used independent components analysis to determine network nodes and a graph theoretical approach to examine network connectivity. We hypothesized that increased connectivity in networks is associated with less differentiation within network “hubs”, or the brain’s most highly connected regions.

**Results:** Analysis revealed significantly greater number and strength of connections in the TBI sample compared to the HC group. There was also evidence of altered modularity in the TBI sample resulting in distinct network community structure after injury.

**Conclusions:** A whole brain analysis of functional brain imaging data revealed important shifts in network connectivity occurring during the first year after injury including increases in whole-brain network connectivity in individuals with TBI.

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**S. RAJTMAJER & F.G. HILLARY. Modeling plasticity in brain networks after neurological disruption: a critique of connectivity modeling approaches.**

**Objective:** The goal of this presentation is to provide a critical overview of the current approaches used to examine functional brain connectivity in neurologically impaired samples. There is now a growing literature using functional imaging methods to examine brain network changes and it is a goal in this presentation to offer a critique of the current methods used to examine brain pathology and aging including possible pitfalls and advantages of each approach.

**Participants and Methods:** We conducted a literature review of over 1400 studies examining neural networks in multiple sclerosis, traumatic brain injury, mild cognitive impairment, and Alzheimer’s disease. We outline the current approaches used to examine connectivity modeling in the brain, focusing the review on several critical decision points in connectivity modeling including: 1) data pre-processing, 2) region-of-interest selection, 3) network creation and modeling, 4) network variability and issues surrounding stationarity, and 5) integration of behavior. We

discuss the robustness of connectivity findings to various approaches including issues surrounding non-stationarity and network thresholding. **Results:** This critical review reveals a number of possible approaches for determining region of interest selection and defining connectivity in a network. The primary methods for selecting network “nodes”, or brain regions, remains: 1) anatomical atlases, 2) independent components analysis and 3) seed-based approaches. Less commonly graph theoretical approaches are being used. Importantly, consistent findings emerge even given the diversity of approaches.

**Conclusions:** Connectivity modeling of brain networks holds incredible promise for the understanding of neurological disorders. While a number of approaches currently exist, there remain important methodological challenges for mapping brain functioning and these critical issues require continued attention.

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#### **N. RAZ, H. SHAMES & N. LEVIN. Beyond the Eye - Behavioral and Cortical Assessment in Posterior Cortical Atrophy (PCA).**

**Objective:** Posterior cortical atrophy (PCA) is a neurodegenerative syndrome characterized by progressive and relatively selective decline in visual processing. Age of onset is typically 50-65 years old and the underlying pathology is associated with Alzheimer disease. Even though the syndrome is been recognized for more than two decades, PCA is relatively neglected by clinicians and researchers and the patients are often referred to recurrent visual evaluation and face considerable delays in diagnosis.

**Participants and Methods:** Six PCA patients and six age matched controls underwent a comprehensive set of visual tests aimed to differentiate between lower and higher visual functions as well as between dorsal and ventral-related cortical functions. fMRI was performed on 3 patients addressing the neuronal substrate of the visual dysfunctions.

**Results:** Visual acuity and color perception were within normal limits in all patients. Impaired saccadic eye movements were evident in all patients; and were significantly different from the controls. Stereopsis was impaired in 3 patients. Deficits in visual perception were mainly seen within dorsal-related functions. These include simultaneous perception, image orientation, figure-from-ground segregation, visual closure, spatial orientation, motion coherence and monocular depth perception. Face perception, letter reading and color naming were intact. In accordance with the behavioral findings, fMRI revealed intact activation in ventral visual regions responsible for face and objects perception. Comparing cortical activation during local and global processing (using Navon letters) revealed greater activation for local processing in the visual cortex as well as in the Temporo-Parietal junction (TPJ), known to be involved in Gestalt perception.

**Conclusions:** Beyond raising the attention to PCA, understanding this syndrome has great implication for understanding neurodegeneration in systems less accessible for investigation.

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### **Poster Session 5: Assessment/Psychometrics/Methods, Cross Cultural, Drug/Toxin-Related Disorders, Electrophysiology, Forensic Neuropsychology, Demyelinating Disorders, and Psychopathology/ Neuropsychiatry**

**10:30 a.m.–12:00 p.m.**

#### **Assessment/Psychometrics/Methods (Adult)**

##### **B.N. AXELROD, J.E. MEYERS & J.J. DAVIS. Using Finger Tapping as a Measure of Performance Validity.**

**Objective:** The primary goal of this study was to cross-validate and compare the three embedded PVTs using Finger Tapping Test (FTT). The measures include dominant hand performance (<35 taps per 10 second trial), total of both hands (<62 taps per 10 second trial), and an algorithm estimating FTT based on performance of other measures. Group differentiation of these FTT measures was examined in samples clearly dichotomized by performance validity.

**Participants and Methods:** The scoring systems were evaluated in neuropsychology cases from clinical (n=264) and independent (n=80) practices, in which veracity was determined based on passing all effort measures or failing two or more validity indices. Samples averaged 42 to 45 years of age and 13 years of education. All examinees were administered the FTT according to standardized procedures.

**Results:** Each FTT scoring method presented with specificity rates at approximately 90% and sensitivity of slightly higher than 40%. When suboptimal performance was based on the failure of ANY of the three scoring methods, as opposed to failure on ONE of the methods, the overall specificity was unchanged and sensitivity improved to 50%. By doing so, we have importantly increased sensitivity without losing specificity.

**Conclusions:** The results are discussed in terms of the utility of combining multiple scoring measures for the same test as well as benefits of embedded measures administered over the duration of the evaluation. Further, our study to create new cutoff scores for each of the three methods using our two novel samples found results not significantly different from the previously published cutoff scores. Although initial cutoff scores published for the three different methods were developed on samples different from the current samples, the present data offer support for the generalizability of those cutoff scores to these data. Clinicians should continue to determine if embedded cutoff scores indeed can be applied to their specific clinical setting.

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##### **Z. BOUMAN, M.P. HENDRIKS, R.P. KESSELS & A.P. ALDENKAMP. Validation of the Dutch version of the Wechsler Memory Scale – Fourth Edition in patients with Temporal Lobe Epilepsy.**

**Objective:** The Wechsler Memory Scale is the most commonly used test battery to assess different memory functions in impaired patients with brain dysfunctions of different etiologies. This study investigates the validation of the Dutch version of the Wechsler Memory Scale – Fourth Edition (WMS-IV-NL) in patients with Temporal Lobe Epilepsy (TLE).

**Participants and Methods:** A group of 32 patients with TLE (mostly surgical candidates) enrolled the study (17 males, mean age= 43.8, sd=15.1). Besides neuropsychological assessment including the WMS-IV-NL, patients underwent a thorough interview and extensive medical investigations. Patients with a clearly identified and localised epileptic focus based on video EEG monitoring and MRI were divided into two groups according to the lateralization of the abnormalities (13 left TLE and 16 right TLE). 32 Matched controls were also examined with the WMS-IV-NL.

**Results:** Results showed significantly poorer memory performance of patients compared to controls (p<.05). This is seen on all five indices

(Auditory Memory, Visual Memory, Visual Working Memory, Immediate Memory and Delayed Memory) and most subtests (except for Logical Memory I ( $p=.06$ ) and Spatial Addition ( $p=.16$ )). Moreover, patients with left or right temporal focus performed equally on all indices and subtests ( $p>.05$ ). Also, within-subject analyses revealed no differences between the Auditory Memory Index and the Visual Memory Index in both patient groups ( $p>.10$ ).

**Conclusions:** The WMS-IV-NL is capable of detecting memory problems in patients with TLE, indicating sufficient validity of this memory battery. Moreover, the findings support previous research, showing that the WMS-IV-NL has limited value in identifying material specific memory deficits for either left or right TLE patients.

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**R. DEL PINO SÁEZ, N. IBARRETXE-BILBAO, J. PEÑA LASA, A. AZNAR, B. SANCHIZ CORTES, L. LOPEZ SANCHEZ & N. OJEDA DEL POZO. Validation and Normalized Data for the M-WCST (NORMACOG Project) in Spanish Population.**

**Objective:** Neuropsychological assessment in Spanish population is conditioned by the limited standardization processes. The available instruments are restrictive in terms of age ranges and demographics, particularly educational levels. The NORMACOG Project was designed to validate and normalize several neuropsychological tests taking into account the sociodemographic characteristics in Spanish speaking population in Spain. The aim of this specific work is to provide age and education adjusted norms for the Modified Wisconsin Card Sorting Test (M-WCST) in Spanish population, as part of the NORMACOG Project.

**Participants and Methods:** Five hundred healthy participants (age range: 18–90) were recruited from 8 different geographical locations in Spain and were representative of the population distribution according to the Spanish Statistical Institute in gender, age and educational level. Participants were volunteer and not paid. They should have Spanish as mother tongue or been bilingual. The M-WCST was chosen for not having been validated into Spanish population. Compared to attention or memory, there are fewer neuropsychological instruments validated into Spanish population measuring executive functions. Therefore, this work represents an opportunity to provide the neuropsychology community with a new assessment instrument which adds significant value to the available tests materials.

**Results:** The results were standardized by 8 age ranges and 4 educational levels. Means, standard deviation and percentiles for each sociodemographic range are presented. We obtained raw scores, the percentiles and the scalar scores adjusted by age and education.

**Conclusions:** As expected, there were significant differences in the M-WCST performance obtained in the same age range depending on the educational level. Normative data obtained of the M-WCST varied by different ranges of age and education. Our results emphasize the need to consider both variables in the scoring and interpretation of the M-WCST.

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**R. DEL PINO SÁEZ, J. PEÑA LASA, N. IBARRETXE-BILBAO, E. BENGOTXEA NOREÑA, A. AZNAR, B. SANCHIZ CORTES, L. LOPEZ SANCHEZ & N. OJEDA DEL POZO. Comparison of the Verbal Fluency Performance with letter P and Letter L in a Spanish Sample.**

**Objective:** In Spain, the most frequently used letter to measure Verbal Fluency (VF) is the letter P. According to the CIFA Test (Schretlen and Vannorsdall, 2010), the fourth most frequent letter in any language should be used to evaluate verbal fluency. However, in the Spanish frequency dictionary, letter P is placed in the ninth position, while letter L

is the fourth. The aim of this study is to analyze the influence of the letter frequency in the assessment of VF performance in a Spanish sample.

**Participants and Methods:** We recruited 325 healthy participants to assess their performance on VF. One hundred forty three participants were assessed with letter P (age mean=37.23; SD=14.19) and one hundred eighty two participants with letter L (age mean=41.38; SD=16.46). Both groups statistically differed in age ( $t=2.39$ ;  $p=.017$ ). Analysis of Covariance (ANCOVA) was used to analyze the differences of the VF performance between letter P and letter L

**Results:** Analyses showed significant differences ( $F=70.18$ ;  $p=.000$ ,  $\eta^2p=.179$ ) between the VF performance with the letter P ( $M=16.32$ ;  $SD=4.79$ ) and with letter L ( $M=12.24$ ;  $SD=3.98$ ). These differences remained significant even after controlling the socio-demographic characteristics.

**Conclusions:** According to our results, the frequency of the letters is a very relevant factor to be considered in the VF performance. Even when the socio-demographic variables were controlled, the less frequent letter (letter P) obtained better performance (compared to letter L). The consideration of the frequency ratio of a letter could be biased by the inclusion of functional words which are included in the frequency dictionaries but excluded from VF performance test. Therefore, we recommend adapting and validating the VF tasks reevaluating the position of the letters in each language's dictionary.

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**E. BOLCEKOVA, K. CECHOVA, H. MARKOVA & S. JOHANIDESOVA. The Bicycle Drawing Test: A Useful Method for Assessing Visuospatial and Executive Functions.**

**Objective:** The Bicycle Drawing Test (BDT), originally developed by Piaget to evaluate cognitive development in children, is commonly used to assess visuoconstructive and executive functions in cognitively impaired patients. It is simple to administer and does not take more than a couple of minutes. However, it is still not widespread in the Czech Republic, partly for the lack of normative data. The aim of this study is to assess psychometric characteristics of BDT.

**Participants and Methods:** 160 bicycle drawings were included in the study. There were three clinical groups: mild cognitive impairment (MCI,  $n=20$ ), probable Alzheimer's disease (AD,  $n=20$ ), and Frontotemporal lobar degeneration in the stage of dementia (FTLD,  $n=20$ ). Consensus diagnosis was stated by a cognitive neurologist and a clinical neuropsychologist on the basis of complex neuropsychological assessment, MRI and neurological examination. Fourth group consisted of cognitively healthy older adults ( $n=100$ ). All drawings were evaluated according to two different scoring systems (Lezak, 2004 and Greenberg, 1994) by four independent raters.

**Results:** Inter-rater reliability for both scoring systems is assessed. Psychometric characteristics of the scoring systems are counted: sensitivity, specificity, positive and negative predictive values. ROC curves are presented. We focus on the ability of BDT to differentiate between three different clinical groups in comparison to cognitively healthy older adults.

**Conclusions:** We attempt to show the advantages of using BDT in neuropsychological diagnostics of cognitive impairment, namely during early stages of neurodegenerative diseases. This outcome was created within the scope of the project "Standardization of the Bicycle Drawing Test as a Diagnostic Method for Neuropsychological Practice" supported by the Faculty of Arts, Charles University in Prague, from the resources for specific university research in the year 2014.

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**E. LOJEK, J. STANCZAK & A. WOJCIK. The Value of the Activity in Coping and Positive Attitude Scale in the Assessment of Depression in Healthy Persons, Brain Damaged Individuals and Patients with Major Depression.**

**Objective:** Reflecting the postulates of positive neuropsychology (Rabinowitz, Arnett, 2013), the new Polish Questionnaire for the Measurement of Depression (QMD; Lojek, Wojcik, Stanczak, 2014) includes an additional scale for the assessment of psychological reserves that buffer depression: the Activity in Coping and Positive Attitude Scale (ACPA-S).

**Participants and Methods:** The ACPA-S consists of 15 simple statements related to the willingness to take action, overcome difficulties, look for solutions, employ positive thinking, not give up, and optimism. The direct inspiration for constructing these statements was experience in work with patients suffering from neuropsychological deficits. The general idea of the ACPA-S is congruent with the concepts of cognitive and emotional coping. Psychometric values of the QMD including the ACPA-S have been tested in studies on different populations.

**Results:** In a normalization study of healthy participants (N=389) the ACPA-S scores were significantly negatively correlated with the results on the MMPI-2 D, RC2 and INT Scales (greater positive emotional engagement, lower discouragement, helplessness, and feeling of failure). The study of 46 BD patients with attention and executive dysfunctions demonstrated significant positive correlation between the ACPA-S score and the level of self-esteem, but not with the level of cognitive impairment or social support. The QMD has been also used in a longitudinal study aimed at testing executive functions and depression level in patients with major depression (N=88) before and after hospital treatment. Regression analysis showed that, contrary to other measures, results on the ACPA-S in the pretest were a significant predictor of the mood level after the therapy in patients with major depression.

**Conclusions:** These results suggest that the ACPA-S may be a promising method for the assessment of psychological reserves related to coping. They also confirm the need to include coping in the diagnosis of depression in different clinical populations.

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**M. RIOS-LAGO, G. LUBRINI, R. VIEJO & J. PERIANEZ. Construct Validity Of The Stroop Colour-Word Test: Influence Of Speed Of Information Processing, Verbal Fluency, Perceptual Interference, Motor Inhibition, Cognitive Flexibility, And Working Memory.**

**Objective:** Seventy-nine years after the description of the Stroop interference effect neuropsychological assessment handbooks still indicate a lack of consensus regarding the cognitive constructs underlying the scores from standardized versions of the test [Strauss, E., Sherman, E. M. S., & Spreen, O. (2006). *A Compendium of Neuropsychological Tests: Administration, Norms, and Commentary* 3rd ed. New York: Oxford University Press]. The aim of the present work was to clarify the cognitive mechanisms underlying scores from Golden's standardized version of the Stroop test.

**Participants and Methods:** After a comprehensive review of the literature 7 target cognitive processes were selected for the analyses: perceptual and motor speed of processing, verbal fluency, perceptual interference control, motor inhibition, cognitive flexibility, and working memory. These constructs were operationalized by means of scores of 7 specific cognitive tasks. A sample of 105 healthy participants (17-67 years old) was considered for analysis. Correlation and regression analyses were used to clarify the joint and unique contribution of the selected cognitive constructs to the prediction of Stroop scores.

**Results:** Results revealed that Stroop word-reading (WR) reflected perceptual/motor speed of processing and verbal fluency. Stroop colour-naming (CN) reflected perceptual/motor speed of processing and working memory. Stroop colour-word (CW) reflected perceptual/motor speed of processing, and motor inhibition. The ratio score (CW/CN) was the best derived index of motor inhibition, besides Stroop Interference and Stroop difference scores. Derived interference indexes minimizes

visual search, verbal and working memory demands, providing relatively pure indicators of motor inhibition.

**Conclusions:** The present results on Stroop validity will help the clinician to interpret altered patient scores in terms of a failure of the cognitive mechanisms detailed here.

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**E.L. BOYCHEVA, I. CONTADOR, V. PUERTAS-MARTÍN, D. CIFUENTES, B. FERNÁNDEZ-CALVO, F. BERMEJO-PAREJA & F.R. CAMPOS. Clinical Validity Of The Spanish Version of Mattis Dementia Rating Scale in Patients with Mild Alzheimer's Disease and Mild Cognitive Impairment.**

**Objective:** The Mattis Dementia Rating Scale (MDRS), a widely known multidimensional neuropsychological battery for assessing cognitive impairment in elders, has limited scientific evidences about its accuracy for differentiating between patients with Mild Cognitive Impairment (MCI) and dementia. The aim of this study was to examine the validity of the MDRS-2 (global score/subscales) in discriminating between patients with mild Alzheimer's Disease, MCI and elderly normal controls (NC).

**Participants and Methods:** A sample of 17 patients with probable mild AD (age = 77.7±5.92) and 21 MCI patients (age = 75±6.7) were recruited from clinical consecutive series at the University Hospital "12 de Octubre" (Madrid, Spain). AD patients were diagnosed by neurologists according to NINCDS-ADRDA criteria, whereas diagnosis of MCI was based on Petersen's amnesic MCI criteria. Psychiatric or neurological conditions were ruled out in normal controls (n=19; age=73.4±8.28). All participants underwent a comprehensive neuropsychological assessment and signed a written informed consent. Receiver operator characteristics (ROC) curves were used to examine the area under the curve (AUC) and optimal cut-offs for the global score and five subscales scores of the MDRS-2.

**Results:** The ROC curve showed that the MDRS-global score differentiated accurately between patients (AD and MCI) and normal controls (AUC > 0.90). However, its discrimination power was significant but lower for MCI vs. AD groups (AUC = 0.78). Among all MDRS subscales, Memory (AUC = 1.00) and Initiation/Perseveration subscales (AUC = 0.85) were the best to discriminate between AD vs. NC groups. Finally, the Memory subscale was also the best for discriminating between AD vs. MCI (AUC = 0.88) and MCI vs. NC (AUC = 0.97) groups.

**Conclusions:** MDRS-2 and particularly its Memory subscale could be optimal instruments for the detection of AD and differentiating MCI from early-dementia stage in Spain.

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**K. ASANO & K. FUSEGI. Word Retrieval Process Analyzed by Clustering and Switching Components in Phonemic Verbal Fluency Test by Japanese with Parkinson's Disease.**

**Objective:** Clustering and switching words process in verbal fluency performance were examined in patients with Parkinson's disease with Dementia (DPD) in order to illustrate the word retrieval process. Patients with Parkinson's disease (PD) often claim difficulty expressing language ability. The number of words produced in the Verbal Fluency Test is less in patients with PD. However, a qualitative analysis has seldom been conducted. By analyzing the word process in phonemic approach, it would be useful for oral rehabilitation.

**Participants and Methods:** Mini-Mental State Examination and Phonemic Verbal Fluency Test ("ka" as an assigned-letter) were performed for 93 Japanese PD. Ten normal control groups also participated in PVF. In order to examine the word retrieval process in phonemic fluency, besides utilizing four phonemic characteristics of clustering (First letters, Rhymes, First and last sounds, and Homonyms) proposed by Troyer et al. (1997), semantic cluster were also analyzed.

**Results:** PD patients generally produced fewer words than NC in PVF and more severe in DPD (11.80 by NC, 10.91 by NPD, 5.05 by DPD). On average, phonemic characteristics of clustering such as “First Letters” was used 1.60 times by NC, 0.87 times by NPD and 0.18 times by DPD. Phonemic Clustering used semantic retrieval process was observed mostly 0.93 times by NPD. In addition to the unique word process, DPD produced the words containing with nasal phoneme. DPD switched significantly less than NPD in clustering frequency.

**Conclusions:** Our qualitative analysis illustrated that more cognitively impaired PD patients produced less words and difficulty with clustering in PVF. Interestingly, PD patients used not only phonemic but also semantic clustering components for strategic word retrieval even in phonemic task. This may suggest to the difficulty in their expressive language ability. PD retrieved the words more and smoothly especially with a certain type of phoneme such as nasal sounds, which would apply to the patients’ words production rehabilitation.

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**J.A. CALDERÓN CHAGUALÁ, H. CHACON PERALTA, G. VERGARA TORRES & J. ARANGO LASPRILLA. Neuropsychological Profile of Tolimenses Athlete.**

**Objective:** This study was aimed at determining raised neuropsychological profile athletes from department of Tolima, Colombia.

**Participants and Methods:** Linked to various sports such as Soccer, Indoor Soccer, Athletics, Fencing, Swimming, Volleyball, Basketball, Tennis, Skating. Inclusion criteria for participants were: take at least one year playing the sport and not have a history of learning disabilities or brain damage. For this investigation 50 athletes of both genders were selected, they applied a full battery of neuropsychological tests that included the following instruments, color-word test ( Stroop ), Trail Making Test - TMT- ( Trail Making Test ), Test of Attention (BTA ), Mini -Mental State Examination ( MMSE ), Patient Health Questionnaire (PHQ -9), Barthel Scale, Rey Complex Figure, modified Wisconsin Card Sorting ( M- WCST ), Brief Test Test semantic and phonological verbal fluency, Boston Naming Test, Test and digit symbol, Hopkins verbal Learning Test -Revised, TOMM, Test Simulation of Memory Problems, The Wechsler intelligence Scale, Cattell personality questionnaires. 16PF.

**Results:** The results show a higher neuropsychological profile of cognitive processes in athletes, compared to the control group made up of people with similar sociodemographic characteristics and completely sedentary, who have not practiced any sport throughout their life. The differences are significant ( $p < 0.01$ ), in areas such as memory, attention, visuospatial recognition, executive function, speed of information processing.

**Conclusions:** The operation of specific cognitive processes for performance and execution of certain task improves with regular practice of sport. It highlighted the importance of sport and brain relative performance of athletes also find differences with the control group, procedural memory, perception and quick reaction to stimuli, attention, emotional states and personality.

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**J. MICHALEC, O. BEZDICEK, T. NIKOLAI, P. HAVRÁNKOVÁ, R. JECH, J. ROTH, P. HARSA & E. RUZICKA. Validity of the Tower of London Task for Detection of Planning Impairment in Patients with Parkinson Disease Mild Cognitive Impairment.**

**Objective:** Tower of London (TOL) is a planning task and has been suggested as a standard diagnostic tool for the assessment of Parkinson

disease mild cognitive impairment (PD-MCI) at Level II (Executive function domain, Litvan et al.; 2012).

The main objective of our study was to identify the discriminative properties of the TOL (Shallice version, 1983) to identify planning impairment in PD-MCI. PD-MCI diagnosis was determined on the basis of comprehensive neuropsychological battery (Level II; performing -1.5 SD below the mean).

**Participants and Methods:** We evaluated TOL discrimination potential comparing the planning abilities of two groups matched according to age and education levels: 46 PD-MCI patients (mean age:  $59.5 \pm 7.3$ , education:  $13.8 \pm 2.7$ ) and 65 controls (NC; mean age:  $57.6 \pm 9.2$ ; education:  $14.6 \pm 2.6$ ). We compared groups in both TOL original scores: S1 (number of problems out of 12 solved without error with total time < 60 seconds for the problem) and S2 (time score with range 0 – 36 points).

**Results:** The TOL discrimination potential computed as ROC analysis for S1 was: Area Under ROC Curve (AUC) = .701 (95% CI = .606–.802;  $p < .001$ ), for S2 score AUC was .757 (95% CI = .664–.850;  $p < .001$ ). The S1 cut-off with maximum combined sensitivity (.674) and specificity (.662) was 8/9 and the S2 cut-off with maximum combined sensitivity (.587) and specificity (.846) was 24/25 points.

**Conclusions:** TOL used as a sole test seems to have a satisfactory validity for detection of planning impairment in PD-MCI as derived from a comprehensive battery at Level II. TOL can be recommended as an appropriate tool for the assessment of the Executive function domain at Level II.

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**Assessment/Psychometrics/Methods (Child)**

**A. KYRIAKOU, R. PAPAGEORGIOU, K. PAMPOULOU, N. KONSTANTINOY & K. KONSTANTOPOULOS. Sensitivity of the Children Color Trails Test (CCTT) in bilingual Cypriot children.**

**Objective:** The Children Color Trails Test (CCTT) is a neuropsychological test that measures perceptual tracking, sustained and divided attention and was created as a culture-free alternate to Trail Making Test. Recently, its use has been increased in clinical populations such as seizures and learning and/or language disabilities. The aim of the present study was to assess the culture-free character and the sensitivity of CCTT in bilingual Cypriot children.

**Participants and Methods:** A total of 59 bilingual Cypriot children (native language is Greek with a Cypriot dialect) and 59 pair-matched in age and gender healthy children took part in the study. Exclusion criteria involved the existence of other neurological and psychiatric diseases, mother history of alcoholism and drug abuse during pregnancy, birth prematurity, hearing loss and visual problems.

**Results:** The mean age of the bilingual group was 121.95 months ( $SD=23.27$ ) and the mean age of the control group was 122.14 months ( $SD=23.38$ ). The mean value for the CCTT1 in the bilingual group was 40.43 seconds ( $SD=18.00$ ) and the mean value for the control group was 38.99 seconds ( $SD=14.21$ ). The mean value for CCTT2 in the bilingual group was 65.93 seconds ( $SD=24.21$ ) and the mean value for the control group was 64.57 seconds ( $SD=24.33$ ). There was no significant difference between the bilingual group as compared to the control group in both CCTT1 ( $U=1726.00$ ,  $N=118$ ,  $p=0.938$ ) and CCTT2 ( $U=1805.50$ ,  $N=118$ ,  $p=0.726$ ).

**Conclusions:** CCTT is a promising tool for the measurement of attention in the bilingual Greek speaking Cypriot children. Further studies are needed to prove the culture-free character of this test.

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**K. GONCALVES, S. NAVARRO & M. MORENO DE IBARRA.**  
**Neuropsychological Functioning of Children with Attention Deficit Hyperactivity Disorder, with High Functioning Autism and Without Diagnosis. From Research to Intervention.**

**Objective:** Compare neuropsychological functioning among children with Attention Deficit Hyperactivity Disorder (ADHD), children with High Functioning Autism (HFA) and children Without Diagnosis (WD) by NEUROPSI Attention and Memory.

**Participants and Methods:** 45 children, 6-16 years (15 in each group) with CI  $\geq$  70. Assessment: WISC-IV and, Neuropsi. Measures of central tendency, exploratory data analysis and Factorial Analysis of Variance were done.

**Results:** Statistically significant differences between the 3 groups were seen. HFA and ADHD performed worse than children WD with a characteristic neuropsychological profile. HFA: better performance in visual processing and integration, verbal short-term memory (encoding simple words, word recall by clues) and recognition of words with little semantic involvement, with less false memory illusion. Focus their attention on certain tasks and respond appropriately to the demand for it, keeping some degree of attentional control; showed deficit in selective attention, focusing on irrelevant items, in sequencing, response, inhibition and flexibility as well as in processing of contextual cues, language and social judgment. ADHD: better performance focusing a relevant stimulus to a given instruction (selective attention), achieving process important visual details more easily, as well as in use context clues and perception of social information. It were shown deficit in sustained attention, use of strategies and organization of material for recovery, which implies a deficit in long-term memory, due to faulty functions in gaining access to previously encrypted information.

**Conclusions:** Neuropsi discriminates neuropsychological profile in terms of executive functions, memory and attention between HFA, ADHD and WD children, so these processes should not be evaluated in a unified way but considering the subcomponents of each cognitive or neuropsychological domain, taking into account the task employed for evaluation in order to design cognitive intervention.

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**D.Z. GUEDES, M.R. MARTELETO & B.I. KOPELMAN.**  
**Neuropsychological screening and assessment in Brazilian infants under risk conditions.**

**Objective:** Underdevelopment country children face multiple adversities and are subjected to biological and social risk factors, and daily fight against mortality. Preterms are children at risk for neurological abnormalities and developmental delays. This research purpose was to investigate the effectiveness of Bayley Infant Neurodevelopmental Screening – BINS (Aylward, 1995) while screening Brazilian children under risk and its psychometric properties accuracy.

**Participants and Methods:** BINS was administered to 61 children, low-income families, Brazilian unified health system users, in 2 groups: 31 children-12 months (12m), 30 children-24 months (24m), both sexes, birth weight < 2000g.

Neurologists examined them through Amiel-Tison Test. Pediatricians administered Denver-DDST-II.

Neuropsychologists screened infants with BINS-12m/24m and Bayley Scales-BSID-II, golden standard instrument.

BINS is a low cost fast screening instrument. It takes 10 minutes to be administered. Consists of 11-13 items and assesses cognitive processes, receptive, expressive functions and basic neurological functions/intactness. The items failed, shows the levels of risk: low, moderate or high risk for neurological impairment or developmental delay.

**Results:** Sociodemographic aspects, birth risk conditions presented homogeneous characteristics. From 61 infants screened, 54 were eligible for the Early Intervention Program in Brazil: 30 infants(12m) and 24

infants(24m). Children were referred to specialists (developmental pediatricians, neurologists, optometrists, speech pathologists, psychologists). BINS reliability indexes were over requested standards. Validity evidences based on external variables were positive moderated and BINS(24 m)/BSID-II (mental) presented high correlation. Validity evidences based on content were attested by expertise. High sensitivity was found.

**Conclusions:** BINS is a satisfactory screening tool and presents adequate psychometric properties. It's also able to screen children under biological and social risk conditions.

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**R.M. OLIVEIRA, H.H. CHARCHAT-FICHMAN & D.D. MOGRABI.**  
**Normative data for Brazilian children on the RAVLT, Verbal Fluency and Stroop paradigms.**

**Objective:** This study presents normative data for Brazilian children on the Rey Auditory Verbal Learning (RAVLT), Verbal Fluency (VF) and Stroop Test (ST).

**Participants and Methods:** Children aged 7 to 14 years (N=396), without neurological or neuropsychiatric disturbances, were tested. The version of the RAVLT had 4 learning trials, followed by an interference trial, free recall, delayed recall and a final recognition trial. VF included phonemic (F, A, M) and semantic (animals, fruits, clothes) tasks. The Victoria version of the ST was used. For each test, differences in performance were explored with mixed-model ANOVAs, with age as a between-subject factor (four levels: 7-8, 9-10, 11-12 and 13-14 years) and test phase, list or stimulus type as a within-subject factor (number of levels depending on the test). Planned pair-wise comparisons followed significant interactions and main effects.

**Results:** There were main effects of age for all tests. The interaction between age and test phase was significant only for the ST, both for completion time and number of errors; for completion time there were no differences between participants aged 11-12 and 13-14 in the color naming phase, with differences in the other phases. The 7-8 age group performed worse than all other groups in the interference phase only. For VF, more words were produced in the semantic than in the phonemic phase, and in F and S compared to A, as well as in the category animal than fruits and clothes. In the ST, subjects were slower in the interference relative to the other phases and in word naming relative to color naming. For the RAVLT scores increased along the learning phases, more words were recalled in the first learning phase than in the interference list, and there was no difference between the other free recall phases. Recognition was easier than free recall.

**Conclusions:** These results are in agreement with data from children in other countries in previous studies.

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**H. CHARCHAT-FICHMAN, R.M. OLIVEIRA & D. MOGRABI.**  
**Evidence of reliability on the RAVLT, Verbal Fluency and Stroop Paradigms applied to Brazilian children.**

**Objective:** There are very few studies to explore the psychometric properties of neuropsychological measures with Brazilian samples. This includes classical paradigms, such as the Rey auditory verbal learning test (RAVLT) for episodic and working memory, semantic and phonemic Verbal Fluency tasks (VF) for semantic memory and executive functions, and the Stroop test (ST) for selective attention. This study presents reliability evidence on these 3 paradigms from data of Brazilian children.

**Participants and Methods:** Subjects (N=396) between 7 and 14 years, without neurological or neuropsychiatric disturbances, were tested in the three paradigms. The version of the RAVLT used had 4 learning trials, followed by an interference trial, free recall, delayed recall and a

final recognition trial. The VF included phonemic (letters F, A, M) and semantic (animals, fruits, clothes) tests. The Victoria version of the ST was used. A cluster analysis was conducted to explore the classification of the different cognitive variables in the current sample. Clustering was done with between-groups linkage, and the squared Euclidian distance was used as a similarity measure. Values were standardized with z-scores. To determine the stability of results, the sample was randomly divided into two halves and the cluster analysis was repeated on each.

**Results:** Analysis of both the agglomeration matrix and the dendrogram suggested the existence of two clusters, one with scores on the ST, reflecting executive functions, and another with all memory variables. Further inspection of the dendrogram indicated, within the memory domain, clustering of semantic memory variables (VF), episodic memory (RAVLT Word list A variables) and working memory (RAVLT word list B variables). Results of the cluster analysis were consistent after repeating the analysis with the sample randomly divided in half, suggesting good stability of findings.

**Conclusions:** These results are coherent with previous validity evidences for each of the three paradigms.

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## Cross Cultural

### B. KOTIK-FRIEDGUT. Cultural Neuropsychology: Roots and New Branches.

**Objective:** To discuss the cultural-historical approaches developed by Vygotsky and Luria as roots of contemporary cultural neuropsychology. Review of modern developments based on research, which confirm the appropriateness of these approaches will be presented. Systemic-dynamic Lurian analysis of the working brain is based on the Vygotskian concept of higher mental functions. As mediators (material or symbolic) are considered to be intrinsic components of higher mental functions, the principle of the extra-cortical organization of psychological processes is fundamental in the development of Lurian neuropsychology.

**Participants and Methods:** According to Vygotsky the role of external factors (stimulus-mediators, symbols) in establishing functional connections between various brain systems is, in principle, universal. However, different mediators and means, or significantly different details within them (e.g., the specific writing system, the strategies used in spatial orientation, etc.), may and in fact do develop in different cultures. The development of new media and new virtual ways of communication also need to be considered as factors influencing brain development and functioning. Neuropsychological diagnostic tools must be adapted to the differing cultural contexts and their dynamics.

**Results:** The discussion will be focused on brain flexibility and the interaction of neurobiological and sociocultural systems as an integral part of the discussion concerning the dilemma of biological vs. social in human psychological processes.

**Conclusions:** Appropriateness of Systemic-Dynamic approach to analysis of influence of culture on brain functions will be demonstrated.

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### A. CARACUEL, D. RIVERA, I. PANYAVIN, L. OLABARRIETALANDA, P.B. PERRIN, H.L. ROGERS & J.C. ARANGO-LASPRILLA. Prevalence of Perceived Ethical Misconduct: A National Survey of Neuropsychology Professionals in Spain.

**Objective:** To examine the prevalence of perceived ethical misconduct in clinical practice, teaching, and research in the field of neuropsychology in Spain

**Participants and Methods:** 349 self-identified neuropsychology professionals in Spain completed an online survey from July to December of 2013 (completion rate of 75%). Respondents had an average age of 35.7 years. 92% of the sample had at least a bachelor's degree, while 49% went on to obtain a specialist degree, 71% a master's degree, 30% a doctorate, and 7% a post-doctorate. In the ethics section of the survey, participants were asked to identify if neuropsychologists they know who work in their country engaged in specific kinds of ethical misconduct.

**Results:** 43% reported receiving formal training in professional ethics. The clinical findings are as follows. Half know others who present themselves/work as neuropsychologists without adequate training or expertise. One out of three knows others who break patient-client confidentiality and/or who do not report child abuse, suicidality, or danger to others when necessary. One out of four reports knowing someone who diagnoses using inadequate data or ignore important sources of data. One out of five knows others who testify in court without the appropriate expertise. Approximately 15% know someone who knows their patients outside of their professional relationship and/or provides interventions of questionable effectiveness or that may be harmful to patients and/or withholds or provides substandard services to patients unable to pay for services. No one reports knowing anyone who engaged in sexual relationships with their patients.

**Conclusions:** Less than half of survey respondents reported receiving ethics training. It is possible that introducing more or improved ethics courses into pre-graduate and/or graduate school curriculums, and/or requiring continuing ethics education certification may reduce perceived ethical misconduct among neuropsychological professionals in Spain.

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### D. RIVERA, I. PANYAVIN, P. PERRIN, H. ROGERS & J. ARANGO-LASPRILLA. Prevalence of Perceived Ethical Misconduct: An International Survey of Neuropsychology Professionals across Latin America.

**Objective:** To examine the prevalence of perceived ethical misconduct in clinical practice, teaching, and research in the field of neuropsychology across Latin America (LA).

**Participants and Methods:** 942 self-identified professionals in neuropsychology from 17 countries in LA completed an online survey between July and December of 2013 (completion rate of 71%). Respondents had an average age of 36.6 years. 88% identified as psychologists, 73% were women; 89% of the sample had at least a bachelor's degree, while 49% went on to obtain a specialist degree, 43% a master's degree, 18% a doctoral degree. In the ethics section of the survey, participants were asked to identify whether neuropsychologists they know who work in their country engaged in specific kinds of ethical misconduct.

**Results:** 64% of the sample reported receiving formal training in professional ethics. More than half (57%) knew others who present themselves / work as neuropsychologists without adequate training or expertise. One out of three knew someone who does not report child abuse, suicidality, or danger to others when necessary and/or diagnoses using inadequate data and/or does not provide understandable interpretations of neuropsychological test results and/or withholds or provides substandard services to patients unable to pay for services. One out of four knew others who break patient-client confidentiality. One out of five knew others who testify in court without the appropriate expertise. 15% knew someone who knows their patients outside of their professional relationship. Only one person knew anyone who engaged in sexual relationships with their patients.

**Conclusions:** Only two thirds of survey respondents reported receiving ethics training. It is possible that introducing more or improved ethics courses into pre-graduate and/or graduate school curriculums and/or requiring continuing ethics education certification may reduce perceived ethical misconduct among neuropsychological professionals in Latin America.

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**J.C. ARANGO LASPRILLA, D. RIVERA, H.L. ROGERS, I. PANYAVIN & P.B. PERRIN. A National Survey of the Neuropsychology Professionals in Latin America.**

**Objective:** Given that, in Latin America, neuropsychology is a young field that is not very regulated, the aim of this study is to understand who makes up the population of neuropsychologists in Latin America, what kind of training they received, what kind of work they do, and perceived barriers in the field.

**Participants and Methods:** 942 self-identified professionals in neuropsychology from 17 countries in Latin America completed an online survey between July and December of 2013 (completion rate of 71%). Respondents had an average age of 36.6 years and 73% were women.

**Results:** 88% identified as psychologists. 89% of the sample had at least a bachelor's degree, while 49% went on to obtain a specialist degree, 43% a master's degree, 18% a doctoral degree, and 3% post-doctorate. Of those with advanced degrees, 17% and 23% received their master's and doctoral degrees, respectively, outside of Latin America. 79% engage in evaluation, 59% in rehabilitation, 58% in research, and 55% in teaching. They work an average of 22.2 hours per week in the field of neuropsychology. 24% work in private practice, 21% in universities, 16% in private clinics, and 14% in hospitals. Clinicians primarily work with individuals with learning problems, ADHD, dementia, stroke, and TBI. 89% believe that clinical neuropsychologists should have a degree in neuropsychology and 79% believe they should have a degree in psychology. The top perceived barriers to the field include: academic formation, clinical formation, attitude towards professional collaboration, and access to tests. 61% of clinicians indicate that normative data for their countries do not exist.

**Conclusions:** There is a need in Latin America to increase regularization, improve graduate curriculums, enhance existing clinical training, develop professional certification programs, validate existing neuropsychological tests, and create new, culturally-relevant instruments.

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**P.B. PERRIN, D. RIVERA, I. PANYAVIN, A. CARACUEL, L. OLABARRIETA LANDA, H.L. ROGERS & J. ARANGO LASPRILLA. A National Survey of the Neuropsychology Professionals in Spain.**

**Objective:** Given that, in Spain, neuropsychology is a young field that is not very regulated, the aim of this study is to understand who makes up the population of neuropsychologists in Spain, what kind of training they received, what kind of work they do, and perceived barriers in the field.

**Participants and Methods:** 349 self-identified professionals in neuropsychology from Spain completed an online survey between July and December of 2013 (completion rate of 75%). Respondents had an average age of 35.7 years and 76% were women.

**Results:** 93% identified as psychologists. 92% of the sample had at least a bachelor's degree, while 49% went on to obtain a specialist degree, 71% a master's degree, 30% a doctoral degree, and 7% a post-doctorate. Approximately 4% of those with advanced degrees received them outside of Spain. 88% received their neuropsychological training in post-graduate studies. 88% engage in evaluation, 73% in rehabilitation, 59% in research, and 58% in teaching. They work an average of 29.4 hours per week in the field of neuropsychology. 29% work in hospitals, 17% in not-for-profit rehabilitation centers, 14% in universities, 13% in private clinics, and 9% in private practice. Clinicians primarily work with individuals with stroke, TBI, and dementia. 97% believe that clinical neuropsychologists should have a degree in neuropsychology and 94% believe they should have a degree in psychology. The top perceived barriers to the field include: clinical formation, attitude

towards professional collaboration, and academic formation. Approximately 60% of clinicians indicate that normative data for Spain do not exist and/or are not adapted to their culture.

**Conclusions:** There is a need in Spain to increase regularization, improve graduate curriculums, enhance existing clinical training, develop professional certification programs, validate existing neuropsychological tests, and create new, culturally-relevant instruments.

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**Drug/Toxin-Related Disorders (Including Alcoholism)**

**A.R. AMBROZIAK. Subjective Well-Being in Drug Addicted Patients: Indications for Neuropsychologists.**

**Objective:** There is an increasing number of drug addicted patients admitted to neurorehabilitation following brain damage. Currently, the effects of both drug addiction and brain damage on subjective well-being (SWB) are elucidated. This study examines the relationship between particular dimensions of SWB and descriptive variables in drug addicted population.

**Participants and Methods:** Out of 115 participants, eighty-three were receiving drug addiction treatment: individual out-patient ( $n=28$ ); group out-patient ( $n=24$ ); and group in-patient ( $n=31$ ). Controls ( $n=32$ ) were active drug addicts not receiving treatment due to personal choice. Participants primarily abused marijuana, amphetamine, heroin, and cocaine. SWB was assessed with: Beck (1988) Hopelessness Scale; Cantril's (1965) Self-Anchoring Ladder; Czapinski's (2005) tools measuring Quality of Life; and Antonovsky's (1987) Sense of Coherence Questionnaire SOC-29. Data on demographics, treatment and drug use was collected.

**Results:** Particular dimensions of SWB differed due to treatment type and drug type. Significant differences between treatment types were found in the levels of: hopelessness, happiness, desire to live, satisfaction with the current life ( $p \leq .001$ ); and sense of meaningfulness ( $p = .05$ ). Group out-patient participants exhibited the highest levels on most SWB aspects. Significant differences between drug types were found in passion of life ( $p = .026$ ) and sense of coherence ( $p = .04$ ), with the lowest scores obtained by participants addicted to heroin and amphetamine.

**Conclusions:** The results reveal that characteristics of treatment and addiction, especially type of treatment and drugs abused, may suggest the pattern of diminished SWB. Such information may be crucial for neurorehabilitation planning in case of drug addicted patients.

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**B.D. HILL, M.P. SANTA MARIA, J. KLINE, A. BOETTCHER & M. LEFAUVE. Cognitive Intra-Individual Variability Predicts Historical Lead Exposure but Academic Intra-Individual Variability Does Not.**

**Objective:** Blood lead (Pb) concentrations >10 micrograms per deciliter (ug/dl) are associated with suppression of IQ. Others have found that blood Pb concentrations < 10ug/dl can also cause cognitive and academic deficits. We recently reported that blood Pb is associated with greater cognitive intra-individual variability (IIV). The present study examined whether both cognitive and academic IIV could predict Pb exposure in a high blood Pb level group (HPb>10ug/dl), low blood Pb level group (LPb<10ug/dl), and control group.

**Participants and Methods:** Forty-one individuals comprised the LPb [85% African American, 51% Male; mean values: age=19.2 (SD 1.6) and education = 10.2 (SD 2.3)] while 55 individuals fell in the HPb [79% African American, 67% Male; mean values: age=19.8 (SD age=1.7) and education=10.9 (SD 1.6)]. The 43 controls were 65%



African American and 67% male [mean values: age= 19.7 (SD 3.4) and education=10.7 (SD 1.9)]. All cases passed TOMM or WMT validity criteria. Cognitive IIV was calculated for each participant by computing the standard deviation of their overall test battery mean on the WAIS-IV (c-OTBM SD). Academic IIV was also calculated as the standard deviation of their OTBM on the WJ-III Tests of Achievement (ac-OTBM SD). **Results:** Logistic regression found that c-OTBM SD significantly predicted classification in the HPb group or control group [ $\chi^2=6.137$ ,  $df=1$ ,  $N=69$ ,  $p=.013$ ] explaining 8.5-11.7% of the variance but ac-OTBM SD did not,  $p=.843$ . Models predicting LPb group or control classification were not significant for either cognitive or academic OTBM SD. The correlation between c-OTBM SD and blood Pb was  $r=.19$  while ac-OTBM SD and blood Pb level was only  $r=.03$ .

**Conclusions:** These results support our previous finding that early exposure to Pb results in later increases in cognitive intra-individual variability and suggest that blood Pb level has no association with academic intra-individual variability.

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## Electrophysiology/EEG/ERP

### H. ERLBECK, A. KÜBLER, B. KOTCHOUBEY & S. VESER. Effects of Attentional Modulation on the Mismatch Negativity (MMN) in a Single vs. Multifeature Oddball.

**Objective:** The mismatch negativity (MMN) is frequently used to investigate discrimination skills and residual cognitive functioning in patients with disorders of consciousness. Traditionally, the MMN is studied in oddball designs using one standard and one rare deviant, thus focusing on only one feature of auditory stimuli. However, attention span of those patients is short, so paradigms have to be brief but at the same time allow for a reliable detection of MMNs in single subjects. To achieve this goal, multifeature oddball designs have been proposed comprising tones that deviate from the standard stimulus in several dimensions. With this study we addressed whether (1) the MMNs elicited by physically identical stimuli differ as a function of paradigm (single vs. multifeature oddball), (2) the magnitude of the standard vs. deviant difference (SDD) would affect the MMN amplitude, and (3) the effect of manipulating attention would be different as a function of paradigm.

**Participants and Methods:** Event-related potentials were recorded from 28 healthy participants who listened to three oddball paradigms (two single, one multifeature). Attention was manipulated such that subjects either passively listened to the oddball or were required to direct attention to a secondary task. Single oddballs comprised 900 standards (75ms) and 100 deviants (37 and 50ms). In the multifeature paradigm, every other tone of 1600 stimuli was a deviant varying in one of four dimensions (duration, frequency, location intensity).

**Results:** Results were obtained in repeated measures ANOVAS and revealed that (1) duration deviants elicited larger MMNs in the multifeature oddball, (2) amplitudes of the MMN increased with increasing SDD, and (3) only when the SDD was small, MMN amplitude tended to decrease when attention was directed away from the oddball.

**Conclusions:** Taken together, duration oddballs elicit reliable MMNs also in multifeature paradigms. Furthermore, large SDDs increase MMN effects and tend to elicit MMNs robust to attentive changes.

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### T. SOLLFRANK, D. HART, R. GOODSELL, J. FOSTER, A. KÜBLER & T. TAN. Effects of 3D Visualisation Modalities on Motor Related Potentials.

**Objective:** When pathways for normal motor function are interrupted e.g. after stroke, brain-computer interfaces (BCI) can be used as an

alternative channel for communication or to influence brain plasticity processes to induce recovery of normal motor control. Local cortical connections are continuously reorganized and especially after neural injury sensorimotor rhythm-based BCIs might be able to guide newly sprouting axons to the appropriate cortical regions by repetitive motor imagery practice. This study investigated if a three dimensional feedback can amplify motor related potentials during motor imagery. We hypothesize that at the perceptual level, the 3D feedback might be more effective during the instrumental conditioning process, which results in more pronounced event related desynchronisation (ERD) of the mu band (10-12Hz) over the sensorimotor cortex.

**Participants and Methods:** 15 healthy BCI naïve participants were instructed to watch attentively, 2D and 3D videos of three different movements of the upper extremities on a True3Di monitor (stereoscopic glasses) and to replicate these subsequently by motor imagery. EEG signals were recorded from a grid of 40 Ag/AgCl scalp electrodes.

**Results:** Characteristic patterns of mu ERD for left and right upper limb motor imagery were present over the sensorimotor cortex. Largest desynchronisation in mu band power was elicited after 3D offline feedback (left: -8.3 dB; right: -8.5 dB from baseline; 2D left: -4.9 dB; right: -8.3 from baseline).

**Conclusions:** Motor imagery is a promising technique for motor rehabilitation and these results support the hypothesis that the choice of feedback modality can have effects on motor related potentials. By inducing changes in the features of brain activity, 3D BCI protocols might be able to guide this plasticity to promote recovery of motor function. This work was funded by the DAAD and partly supported by the GK Emotion and the GSLs of the University of Würzburg.

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### T. SHEVTSOVA, A. ZHARIKOVA, O. MAKSAKOVA, E. KUSHNIR & L. ZHAVORONKOVA. Dual-Tasks as an Approach to Estimation of Functional Capacity under Information Loads in Patients with Traumatic Brain Injury and Healthy Persons.

**Objective:** Previous reports demonstrated long-term multiple brain dysfunctions in traumatic brain injury (TBI) that may be detected by using special research approaches. Dual-task performance requires flexible attention allocation to 2 information streams. The aim of study was to determine functional resources involved in task coordination under information loads in TBI patients compared to healthy persons

**Participants and Methods:** 25 healthy subjects ( $25\pm 0.7$ ) and 17 patients ( $26.8\pm 2.8$ ) after TBI (from 3 till 12 months) participated in the study. FIM, MPAI, MMSE clinical scales were used for examination of functional abilities. All persons performed cognitive and postural tasks both separately and concurrently (dual task). Analysis was focused on measures of psychological, stabilographic, EEG data and clinical scales

**Results:** The results showed that 30% of healthy subjects better performed dual-task comparing to isolated tasks. They demonstrated the large cognitive resources. Stabilographic data showed minimal values of the amplitude and velocity of fluctuations. EEG analysis revealed specific markers of dual-task performance: the increase of EEG coherence in theta- and alpha-bands for long diagonal pairs between frontal and parietal areas. The poor dual-task performance was accompanied by increase of EEG coherence between local as well as long pairs of leads for different spectral bands. Compared to controls, TBI patients showed a lower quality of dual-tasks. EEG changes such as diffuse increase of coherence for different spectral bands without activation of long diagonal pairs have been observed in all TBI patients including thus who demonstrated recovery estimated by clinical scales

**Conclusions:** Dual-tasks could be used as a diagnostic tool for estimation of adaptive possibilities to everyday life in TBI patients and an indicator of functional abilities of healthy persons. Quality of dual tasks performance and specific EEG-markers can be used as a measure of the brain recovery in TBI patients during their rehabilitation

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**S. ANDERSSON, T. MOBERGET, N. ZAK & T. ELVSSÅSHAGEN. Sensory Evoked Potential Modulation – an Index of LTP-like Stimulus-Specific Neocortical Plasticity?**

**Objective:** Long-term potentiation (LTP) represents a fundamental mechanism for learning, memory consolidation and skill acquisition elicited by a persistent increase in synaptic strength following high-frequency stimulation. LTP is most commonly studied in vivo from animals or in vitro from slices of hippocampal tissue, but in recent years some reports from in vivo sensory evoked potential studies in both rodents and human using auditory or visual sensory stimulation have proposed this to be a valid non-invasive method of studying LTP-like neocortical synaptic plasticity in humans.

**Participants and Methods:** This presentation will focus on both methodological and clinical aspects of stimulus-selective response potentiation (SRP) by modulating components of the visual evoked potential (VEP) presenting results from a series of studies in healthy controls and patients with psychiatric conditions.

**Results:** In addition to present study design, stimulus paradigms, and temporal stability in healthy controls, evidence of reduced synaptic plasticity in patients with bipolar disorders will be presented together with preliminary findings relating VEP plasticity to self-reported level of physical activity and to concentration of cortisol in saliva, and associations of SRP to learning and memory capacity measured by conventional neuropsychological methods.

**Conclusions:** Although further research is required to validate this method, we argue that SRP represents a possible index of neocortical plasticity that might prove promising in studying basic mechanisms underlying some of the neurocognitive deficits, including impairment of attention, processing speed, working memory, learning, and memory, which are seen in a variety of neuropsychiatric disorders.

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**S. JANG, H. CHOI, D. KIM & I. PARK. The effect of hypersonic wave sound for EEG.**

**Objective:** Ultrasound is a sound wave in an inaudible frequency range that is impossible to hear in everyday life. It also refers to the frequency of 22KHz or higher, and it is often called HFCs (High Frequency components). The sound of ocean waves is known to induce the alpha waves in the brain, giving sense of serenity to people, possibly because the ocean waves include a large amount of HFCs. In this experiment, we designed an electronic circuit to produce the portion of the ultrasonic waves, corresponding to the sound of ocean waves that resembled the ultrasonic components.

**Participants and Methods:** 60 subjects from 19 years to 59 years participated in the experiment.

Subjects were divided into two groups. Waves sound and HFC experimental group, the other Baseline and waves sound control group.

Brain wave was measured through QEEG-8 (Fp1, Fp2, F3, F4, T3, T4, O1, O2). We used ANOVA analyses between control group exposed on waves sound and experimental group, on HFC and waves sound.

**Results:** Alphawave was increased in Fp1 and Fp2 with significance probability between two groups. Beta-wave was decreased in Fp1, Fp2, with significance probability between two groups.

**Conclusions:** In this experiment, high-frequency transmitter, having directional characteristics, emitted high-frequency to volunteers, focusing on the pre-frontal lobe, shows significant brain wave variability in the pre-frontal lobe.

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## Epilepsy/Seizures

**L. KRAMSKA, Z. VOJTECH, T. PROCHAZKA, I. MARECKOVA & M. KALINA. Cognitive performance in patients with psychogenic non-epileptic seizures.**

**Objective:** The aim of this study is to evaluate cognitive performance in patients diagnosed with PNES. We also assessed developmental stress, family functioning, social/model learning, and recent relationships, which are considered to influence emotional functioning as contributing factors in the development of PNES (not involved in this study).

**Participants and Methods:** 99 patients with PNES were neurologically and neuropsychologically assessed at least one year after video-EEG monitoring at Na Homolce Hospital. For the purpose of this study, patients were examined using RBANS (Czech research version).

**Results:** Mean performance was - Immediate memory 89.6 (17.1), Visuospatial/Constructional 85.5 (14.8), Language 96.5 (14.6), Attention 72.7 (18.5), Delayed Memory 84 (18.3) and Total Scale 81.5 (15). Differences in all parameters (except Language) in comparison with norms were significant ( $p < .001$ ).

**Conclusions:** "Organicity" was identified as a significant factor in patients with PNES. In accordance with the results of other studies, it is useful to point to a multifactorial approach in the understanding of pathogenesis of PNES.

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## Stroke/Aneurysm

**L. KRAMSKA, M. NINA, J. HRADIL & M. PREISS. Assessment of cognitive decline in patients treated for cerebral aneurysm using Czech Reading Test.**

**Objective:** The aim of the study was to assess cognitive performance and premorbid intellect level using Czech Reading Test.

**Participants and Methods:** Since 2004-2011, 241 patients (163 f/78 m) with diagnosed cerebral aneurysm were treated at the Dept. of Neurosurgery, Regional Hospital Liberec. Of these patients, 105 were able to undergo neuropsychological assessment at least one year after intervention (patients with good neurological outcome). Standardized psychological tests were used to assess cognitive functions (WAIS-R, Wechsler, 1983; Czech Reading Test, Kramska, 2014). One treatment protocol was used by the same team.

**Results:** Observed Full-Scale IQ was 95.3 (14.3), Verbal IQ was 95.2 (14.1) and Performance IQ was 95.7 (14.4). CRT predicted Full-Scale, Verbal and Performance IQ were 105.2 (10.6), 105.8 (11.3) and 103 (7.6), respectively. The observed FS-IQ, VIQ and PIQ were significantly lower in comparison with CRT predicted quotients ( $p < .001$ ).

**Conclusions:** It is useful to involve tests of premorbid intellect in patients after SAH from cerebral aneurysms. In most cases there is absence of information about premorbid performance level and tests results from premorbid period. Czech Reading Test seems to be appropriate method in patients after SAH with good neurological outcome.

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## Forensic Neuropsychology

**P. WILLSON & S. ROBBINS. The Utility of MMSE as a Predictor of Real-Life Testamentary Capacity.**

**Objective:** Neuropsychologists are often asked to assess Testamentary Capacity (TC) in older clients. In most Western legal systems the criteria are simple, and Testators must know only three elements: 1) the Natural Objects of their Bounty (NOB; i.e., logical heirs), 2) their assets, and 3)

understand the specific legal act. Regarded as a “low bar,” people found legally incompetent to manage financial and personal affairs are still presumed to have TC. MMSE scores have previously been correlated with informed consent, medical decisions, financial capacity, ability to name a Power of Attorney, and in British and Israeli studies, with analogues of TC. We examined the ability of MMSE and other measures to predict real-life TC.

**Participants and Methods:** Subjects were 132 adults age 44-98 referred by attorneys for evaluation of TC in a forensic context between 2006-2013 in Arizona, USA. Measures were Folstein MMSE, Boston Naming Test, WMS III-IV Logical Memory, WRAT-4 Arithmetic, given as part of a standard clinical-forensic evaluation. TC was objectively determined by subjects’ knowledge of the three elements in their own situation (provided to the examiner by each subject’s attorney) during testing.

**Results:** MMSE (3-30, Mean 21.3) was equal to or better than other measures in predicting overall TC status; age-gender-education were not significant. One-third of subjects with only mild impairment (MMSE 20-26) failed at least one of the legal criteria. Of the 45 clients scoring  $\leq 19$  on formal MMSE, 90% lacked TC, as did 100% of those scoring  $\leq 15$ .

**Conclusions:** Contrary to the idea that TC requires much less ability than other types of decision-making, we suggest TC is comparable in complexity to financial/contractual capacity. MMSE staging can identify clients where explicit verification of TC is appropriate before document execution.

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#### A. STARZA-SMITH & E. TALBOT. Neuropsychological Risk Factors for Offending in Children/Adolescents Post Acquired Brain Injury (ABI): Two Case Studies - Pyromania and Sexual Disinhibition.

**Objective:** Predictive risk factors for offending in youngsters post ABI are often evident in early neuropsychological rehabilitation. Prevalence of TBI among UK prisoners is as high as 60% (Repairing Shattered Lives, Williams, 2012). With indications that ABI may increase risk of offending, research has informed policy makers on early intervention (Maggie Atkinson, Children’s Commissioner for England 2012). We present serial neuropsychological assessment of 2 youngsters and their contact with the criminal justice system. We highlight early presenting post-ABI risk factors and propose rehabilitation steps to reduce offending risks.

**Participants and Methods:** Serial neuropsychological assessment data (D-KEFS; WISC-IV UK; RoF; CMS; BRIEF) spanning 10 and 5 years for two boys post-ABI (Case 1-TBI; Case 2-ADEM) with history of post-injury offending (pyromania and sexual disinhibition) is presented, highlighting specific early risk factors. We demonstrate developmental evolution of personality, cognitive and social factors highlighting early risks for future offending.

**Results:** Case 1: assessments from age 6 - 16 years; average overall IQ, low verbal comprehension; late identification of bilateral frontal damage on MRI scans; complex attachment issues post TBI, social disruption, evolving pyromania. Case 2: average IQ and memory, deficits in executive function including behavioural regulation/hyperactivity; impulsive and disinhibited behaviour disrupting secondary education and family life.

**Conclusions:** We examine evolution into criminal behaviour of specific neuropsychological factors identified on post-ABI assessment, with failings in social and educational support due to poor availability of rehabilitation services for children with offending risk factors. Collaborative, multi-agency rehabilitation approach (in community and neuro-psychology, social care, education) is recommended where specific risk is identified in post-ABI assessment, placing demands on costly services and shortage professions (e.g Paediatric Neuropsychology).

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#### T. DAMRY, Y. BRAW & E. HELED. A Novel Symptom Validity Test (SVT) Based on the Delis Kaplan Executive Function System (D-KEFS) Card Sorting Test.

**Objective:** Symptom validity tests (SVTs) for the detection of malingering in cognitive domains other than memory are numbered. The lack of validated SVTs is particularly evident in the domain of executive functioning (EF). The Card Sorting Test of the Delis Kaplan Executive Function System (D-KEFS) is a well validated task of abstract thinking, categorization, conceptualization and thought flexibility. In the current study we assessed the test’s efficacy for the detection of EF malingering.

**Participants and Methods:** A computerized version of Card Sorting Test was created using forced-choice responses for test items. A novel component (forced-choice recognition memory) was added as a secondary measure of malingering. Subjects were randomly assigned into two groups: simulators and controls (n=60 in each group). The subjects then performed the novel SVT, an established SVT (Dot Counting Test, DCT) and standard cognitive tasks (e.g., WAIS-3 subtests).

**Results:** Simulators performed more errors than controls in the task. Examination of classification accuracy revealed satisfactory sensitivity and specificity rates (58.3% and 93.3%, respectively). The groups however did not differ in the type of errors performed by the subjects. High sensitivity and specificity rates (81.7% and 98.3%, respectively) were evident in the forced-choice recognition memory component.

**Conclusions:** The findings tentatively suggest the usefulness of the task for the detection of EF malingering. More research is needed in order to further develop and validate the task. Such research is needed in light of the increasingly sophisticated malingerers encountered during neuropsychological assessments.

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### Multiple Sclerosis/ALS/Demyelinating Disorders

#### A. GÓMEZ, O. RILO, N. IBARRETXE-BILBAO, J. PEÑA, A. CABRERA, J. ONTAÑÓN, A. ANTIGÜEDAD, M. MENDIBE & N. OJEDA. Cognitive Impairment and Brain Structural Alterations in Multiple Sclerosis Patients.

**Objective:** Nowadays it is widely known that Multiple Sclerosis (MS) patients show cognitive impairment which is often accompanied by brain atrophy with the consequent cerebrospinal fluid (CSF) volume increase and reduction of white matter (WM) integrity in comparison with healthy controls (HC). The aim of this study was to determine the differences in cognitive functions, grey matter (GM), WM and brain volumes, including the brain parenchymal fraction (BPF), as well as in WM mean Fractional anisotropy (FA), between MS patients and HC.

**Participants and Methods:** We recruited 27 MS patients (age=43) and 27 HC (age=43) who were assessed with an extensive neuropsychological battery which included cognitive functions such as processing speed (PS), executive functions (EF), semantic and phonetic verbal fluency (VF), working memory, attention and memory. T1-weighted and diffusion tensor images were acquired on a Philips Achieva 3T TX, for all MS patients and 12 of the 27 HC. Volumetric measures were obtained using SPM8 and FA values of WM tracts were calculated after running Tract-based spatial statistics (TBSS) as implemented in FSL. Both groups differed significantly on the Fatigue Severity Scale (FSS) and Geriatric Depression Scale (GDS) score, so these variables were included as a covariate in ANCOVA analyses.

**Results:** MS patients showed a significantly worse performance when compared to HC in PS ( $F=11.58, p<.05$ ), EF ( $F=4.66, p<.05$ ), semantic

( $F=5.85, p<.05$ ) and phonetic fluency ( $F=6.7, p<.05$ ), working memory ( $F=15.15, p<.01$ ), sustained attention ( $F=10.68, p<.05$ ), and verbal learning ( $F=6.87, p<.05$ ). Significant differences were also found in BPF ( $F=14.744, p<.01$ ), WM mean FA ( $F=16.64, p<.01$ ) and CSF volume ( $F=10.343, p<.05$ ).

**Conclusions:** The results suggest that the cognitive impairment occurring in MS is accompanied by brain structural alterations involving BPF as well as the whole brain WM mean FA in comparison with HC. Correspondence: *Ainara Gómez, Deusto University, Avenida de las Universidades, 24, Bilbao 48007, Spain. E-mail: ainara2292@hotmail.es*

### Psychopathology/Neuropsychiatry (Other)

#### E. HELED, D. HOOFIEN, E. BACHAR & R.P. EBSTEIN. Extreme “Fragmented Perception” in the ROCFT - A Neuropsychological Case Study of Patient with Anorexia Nervosa.

**Objective:** The study of the neuropsychological profile of Anorexia Nervosa (AN) patients reveals inconsistencies in cognitive functions and is yet unclear. One of the explanations offered is that not all adult AN patients exhibit alterations in cognitive performance, but only a subgroup of them has cognitive deficiencies. While global processing weakness (fragmentation) was found to be a main feature in AN, its prevalence was less examined. The purpose of this study was to test the hypothesis that there is incongruence in AN cognitive functioning with a focus on fragmentation, and to illustrate the extent to which it can reach compared to other cognitive abilities.

**Participants and Methods:** 34 AN patients and 44 matched controls performed the Rey-Osterrieth Complex Figure Test (ROCFT). In addition, the performance of a 19 year old AN patient (E.L.), exhibiting unusual performance, in the form of extreme fragmentation, was compared to matched five AN patients and five healthy controls. The battery of neuropsychological tests included the Verbal Fluency Test, the Delis-Kaplan Executive Functions System Sorting Test, the ROCFT, the Trail Making Test, and the 5 Point Test.

**Results:** The AN group performed worse than controls on the fragmentation measure. However, qualitative analysis of the patients' function in this measure showed a non-gradual scattering of the scores as opposed to controls. Furthermore, E.L. performed much worse than the two comparison groups on both the copy and the memory tasks of the ROCFT, exhibiting an example of extreme fragmentation deficiency. No other differences were found on almost all the other tests.

**Conclusions:** There may be a sub-group of AN patients who perform worse than others in global processing, while the extent of fragmentation reaching excessive proportions and possibly serving a more prominent feature than other cognitive deficiencies.

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#### L. LICHTENSTEIN-VIDNE, H. OKON-SINGER, N. COHEN, D. TODER, B. NEMETS & A. HENIK. Distracting Stimuli and Affective Disorders: The Interactive Relationship between Task-Relevance, Anxiety and Depression.

**Objective:** Both anxiety and major depression disorder (MDD) were reported to be holding a maladaptive selective attention mechanism, associated with a bias toward negative stimuli (i.e., negativity bias). Importantly, previous studies investigating the negativity bias used distracting information that was nevertheless task-relevant. Based on our former findings (Lichtenstein-Vidne et al., 2012), the current study examined attention bias to distracting emotional content that was task-irrelevant (i.e., had no association with the task and was presented outside the focus of attention) in clinical anxiety and MDD.

**Participants and Methods:** Three groups: anxiety disorders patients, MDD patients and control participants, were asked to ignore peripheral distractors. Aside from the emotional content, the peripheral distractors

simultaneously presented task-relevant spatial information (i.e., was associated with a spatial task- location discrimination of the target). This allowed us to examine the general susceptibility of the anxiety and MDD patients toward both emotional and non-emotional distracting stimuli.

**Results:** Anxiety disorders group corroborated previous findings regarding the strong negativity bias, but showed no indication for a general selective attention failure as had been suggested. Results from the MDD group documented an interaction effect between task-relevant and task-irrelevant data. These findings suggest that depressed individuals are distracted by task-irrelevant emotional (mainly negative but also positive) content, but only under specific conditions (i.e., under spatially neutral conditions).

**Conclusions:** These results show that despite the strong association between anxiety and MDD, the two disorders are characterized by different processing patterns respective of various sorts of distracting stimuli.

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#### S. NAPARSTEK, L. GERTNER, H. SHALEV, O. PORAT & S. LEOR-AVIN. When personality meets memory.

**Objective:** Previous studies have documented high correlation between the MMPI validity scales and invalid scores in neuropsychological Symptom Validity Testing (SVT). Here, we report two case studies of patients presenting discrepancy between their performance in SVT and their MMPI validity scales.

**Participants and Methods:** Patient IZ, a 41 year old male and patient IM, a 44 year old female, were both referred to our clinic following a blunt head trauma without any evident neurological finding. Both complained of memory deficit and underwent a complete neuropsychological assessment.

**Results:** The neuropsychological assessment revealed lower-than-expected performance on memory tests. As part of the assessment, the Test of Memory Malingering (TOMM) was administered twice, approximately 2 months apart. While the patients performed poorly in both administrations of the TOMM, in the MMP12 inventory, they presented a valid profile as was deduced from the validity scales. A closer examination of the data revealed the MMPI2 profiles of both patients were similar, with high to very high scores in the Hysteria, Depression and Hypochondriasis scales (i.e., The Neurotic Triad).

**Conclusions:** These findings suggest certain personality characteristics, in combination with memory deficits following head trauma, might lead to a malingering-like cognitive profile. Such findings call for caution when interpreting SVT data in clinical settings.

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### Psychopathology/Neuropsychiatry (Schizophrenia)

#### A. CIOBANU, A. DUMBRAVA, I. GOTCA & M. TOBA. Deductive reasoning in schizophrenia.

**Objective:** Despite initial considerations, it is nowadays well accepted that schizophrenia is characterized by cognitive deficits in reasoning and logical thinking. On the other hand, even “healthy” individuals show clear distortions in simple reasoning problems such as those involved in the Wason Selection Task, which require the subject to choose which are the most appropriate ways to check if a rule expressed by the common judgment “if p then q” is respected or not in given conditions.

**Participants and Methods:** In order to verify if schizophrenics are affected by the same type of errors presented by the “healthy” subjects, we presented two versions (using deontic versus non-deontic rules) of judgments to be checked in a Wason Selection Task, to three equivalent (in respect to usual psycho-demographic and, when appropriate, clinical

variables) groups of medicated schizophrenics (n=38), medicated non-schizophrenic psychiatric patients (n=29), and “psychologically healthy” subjects (n=34) (all diagnosis being based on DSM-IV criteria). **Results:** The data analysis showed no statistically significant differences, on neither type (deontic versus non-deontic) of judgments, between any of the investigated groups of subjects.

**Conclusions:** It seems that schizophrenics and non-schizophrenics shows similar patterns of cognitive (dys)functioning in the Wason Selection Task. Such result is finally commented in an evolutionary psychological framework.

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**A. CIOBANU, A. DUMBRAVA, I. GOTCA & M. TOBA. Theory of mind kind of humor understanding seems to be specifically altered in schizophrenia.**

**Objective:** Schizophrenia proved to be characterized by both theory of mind and humor understanding deficits. The present study aims to investigate how these disturbances interact in the minds of subjects affected by schizophrenia.

**Participants and Methods:** Twenty cartoons (from The New Yorker collection), depicting “physical characteristics” versus “theory of mind” kind of jokes, were pseudo-randomly presented for comments concerning their content to three equivalent (in respect to usual psycho-demographic and, when appropriate, clinical variables) groups of medicated schizophrenics (n=39), medicated non-schizophrenic psychiatric patients (n=30), and “psychologically healthy” subjects (n=34) (all diagnosis being based on DSM-IV criteria).

**Results:** The performances of psychiatric patients proved significantly lower than those of the “healthy” controls; however, schizophrenics showed no difference between the answers to the two types of jokes, in contrast with either the “healthy” or the psychiatrically disordered controls, who were significantly better on the “theory of mind” kind of cartoons.

**Conclusions:** These results confirm that schizophrenics have a humor interpretation deficit and suggest that it is even more obvious whenever the source of humor is relying on some kind of theory of mind inferences. This type of theory of mind deficit as reflected in jokes understanding and interpretation seems specific to schizophrenia among psychiatric disorders.

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**S. FERNANDEZ-GONZALO, T. MARC, E. POUSA, C. HERNÁNDEZ, R. GARCÍA, W. EVA, P. DIEGO & M. JODAR. A New Social and Non-Social Cognitive Rehabilitation Computerized Program for Schizophrenia/Schizoaffective Disorders in Early Stages: Preliminary Efficacy Results and Maintenance at 3months Follow-up.**

**Objective:** People with schizophrenia and schizoaffective disorders present neuropsychological deficits which can be observed before illness onset, suffering a significant decline on the first episode. Neuropsychological deficits are linked with a poorer daily-living functioning, but recently, authors have demonstrated that social cognitive impairments have even a greater impact in functional outcomes. Cognitive rehabilitation (CR) has demonstrated consistent effects improving cognitive performance as well as ameliorating symptoms and psychosocial functioning. However, the preventive role of the CR and the active key of these interventions for generalization remain unknown. To present the preliminary efficacy results and their maintenance at follow up of a new social and non-social cognitive computerized program for people with schizophrenia/schizoaffective disorder in early stages of the illness.

**Participants and Methods:** 25 patients that met inclusion criteria were randomized between treatment and control groups. A comprehensive assessment of social and non-social neuropsychological and functional variables was carried out before, after treatment and at 3months follow up.

**Results:** Student T-test showed significant differences between groups in Logical Memory Recognition (p=0.04), Block design (p=0.05) Pictures of Facial Affect (p=0.04) and Quality of Life (p=0.02). A tendency to signification was observed in Tower of London violation rules (p=0.06) and Calgary score (p=0.06). At 3 months Calgary score remained significant (0.01) and Logical Memory Recognition showed a tendency to signification (0.06).

**Conclusions:** This new intervention showed preliminary efficacy results for planning, inhibition, executive aspect of memory and emotional processing as well as affective and functional outcomes. Maintenance of some results was observed at follow up. The importance of social and non-social cognitive rehabilitation as a preventive tool in early phases of psychosis is discussed. Project funded by Fundació la Marató TV3  
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## FRIDAY AFTERNOON, JULY 11, 2014

### Symposium 7: Creating Accessible Measures for Children with Motor and Communication Impairments

Chair: **Tamar Silberg**

12:00–1:30 p.m.

**T. SILBERG, M. LEVAV, S. WARSCHAUSKY, J. KAUFMAN, J. AHONNISKA-ASSA & M. GOFER-LEVI. Creating Accessible Measures for Children with Motor and Communication Impairments.**

**Symposium Description:** Neuropsychological assessment of children with motor and/or communication disorders is often challenging due to difficulties with motor and speech response demands.

Recent technological innovations, including augmentative and alternative communication (AAC), assistive technologies and eye-gaze systems, may enhance the accessibility of neuropsychological assessments.

Preliminary reports have indicated that children with severe neurodevelopmental impairments may benefit from the use of such devices; however, these new technologies are not effective for all children, possibly due to additional cognitive and/or learning impairments. Moreover, further research on the psychometric properties of neuropsychological assessment with AAC and other technological devices, is still needed.

The purpose of this symposium is to describe the clinical importance of using modified neuropsychological assessments for children with severe motor and communication impairments. The speakers will present cutting edge findings on the development of accessible assessment methods for these populations, including the psychometric properties of alternative and modified accessible cognitive assessment instruments (S. Warschausky), administering accessible test strategies to evaluate auditory and visual-spatial working memory among children with cerebral palsy (CP) (J. Kaufman), and using eye-tracking technology to evaluate cognitive functioning among girls with Rett Syndrome (J. Ahonniska-Assa).

In addition, the implication of differences in learning abilities assessed by implicit skill learning tasks will be discussed (M. Gofer-Levi & T. Silberg), as these differences may play a significant role in the implementation of such technologies among children with special needs.

Video demonstrations illustrating cognitive performance assisted with various technological aids will accompany the presentation.

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### **S. WARSCHAUSKY. Studying the psychometric properties of alternative and modified accessible cognitive assessment instruments.**

**Objective:** To describe research issues that emerge from a series of psychometric studies (Kaufman et al., in press; Shank et al., 2010; Warschausky et al., 2012) conducted in an adapted cognitive assessment laboratory that utilizes assistive technologies and alternative testing strategies for persons with significant motor and speech impairments.

**Participants and Methods:** The pooled samples were comprised of children age 6-16, 56.1% male, including 79 children with congenital cerebral palsy (CP), primary tone 85.7% spastic, 7.9% dystonic and 6.3% ataxic, 44.3% hemiplegic, 73% preterm, 22.1% with history of seizure disorder, and 89.9% GMFCS Levels I-III, and 126 typically developing (TD) peers. Participants were administered standardized and technology-assisted versions of the PPVT-III, Raven's CPM, PIAT-R Reading, CTOPP Elision tests, as well as standard and modified versions of an Inspection Time (IT) task.

**Results:** Measurement agreement for standardized and modified versions of the quadrant forced-choice format tests, PPVT-III and PIAT-R, were adequate in both groups, as indicated by intraclass correlation coefficients and Bland-Altman tests. Ravens CPM measurement agreement was adequate only in the group with CP. Measurement agreement also was demonstrated for the standard and modified versions of the IT task.

**Conclusions:** In developing technology-assisted accessible instruments, modified forced-choice quadrant tests appear to maintain psychometric properties but modifying tests with more complex response demands alters some psychometric properties. Target population needs highlight the importance of increased gradations of difficulty at the lower extremes of neuropsychological functioning. Assistive technology responding may alter cognitive loads in task demands.

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### **J. KAUFMAN. Accessible assessment of auditory and visual working memory in children with cerebral palsy.**

**Objective:** This study was conducted to examine auditory and visual-spatial working memory (WM) using accessible test strategies in children diagnosed with cerebral palsy (CP). Working Memory (WM) has been extensively studied in the typically developing (TD) population due to its underlying involvement in higher cognition and academic achievement including reading and math skill acquisition. Although the importance of WM functioning in the development of higher cognition is clear, studies are largely with TD children and those able to participate in standardized clinical assessments. Children with communication and motor impairments often cannot demonstrate capabilities and needs using traditional test methodologies and therefore confront barriers to full educational participation. This study, conducted as part of a larger study of WM in children with CP, utilizes largely accessible computerized instrumentation.

**Participants and Methods:** Children ages 6-16, mean 12.34 (2.56), PPVT-IV>70, including 27 with congenital CP, GMFCS I-IV, MACS I-III, 23.8% preterm, 30% with history of seizure; and 66 typically developing (TD) controls. Instruments included two E-Prime administered Auditory and Visuospatial WM tasks, each with four load conditions and two delay conditions.

**Results:** Mixed effects ANCOVAs indicate significant main effects for group, load and delay for both the Auditory and Visuospatial WM tasks. Load-Delay interactions were only significant under the medium load conditions, suggestive of floor and ceiling effects in both groups.

**Conclusions:** Findings are suggestive of quantitative but not qualitative differences in the working memory profiles of children with CP compared with TD peers. Implications for working memory assessment and research with children with CP are discussed.

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### **J. AHONNISKA-ASSA, T. SILBERG, O. POLACK, E. SHRAF, J. WEIN & B. BEN-ZEEV. Using Eye-tracking Technology in Assessing Cognitive Functioning among Girls with Severe Motor and Communication Limitations.**

**Background:** Many individuals with severe developmental impairments fail to develop speech and demonstrate significant difficulties in using augmentative and alternative communication (AAC). While caregivers often report on informal behaviors used for communication, it is difficult to determine whether these behaviors serve as a consistent communicative function. Recent technological innovations, i.e., eye-tracking technology (ETT), might improve the transparency of the communication, and enable more valid cognitive assessment.

**Objectives:** To investigate whether ETT could enable children with very severe motor and speech impairments to respond consistently in forced-choice tasks.

**Methods:** Participations were 12 girls with Rett syndrome (M=9:06 years; SD=3.02). Their ability to respond by eye-gaze was practiced with computer games using PC-ETT. After the practice, their receptive vocabulary was assessed by Peabody Picture Vocabulary Test-4 (PPVT-4). Target words were orally presented and participants responded by focusing their eyes on preferred picture.

**Results:** Although all participants had very limited communication abilities, remarkable differences were demonstrated using ETT. About 75% of the participants chose explicitly between the stimuli, answered correctly to the easy items and made increasingly more mistakes with more difficult items. 25% of the participants showed very limited eye-fixation which did not enable eye-gaze calibration and the cognitive assessment. Among the participants who could respond consistently, the PPVT-4 results ranged from low average to very low levels. Video demonstration illustrating task performance will accompany the presentation.

**Conclusion:** ETT seems to improve the communication abilities among the majority of participants even with severe motor and speech limitations. It may enhance efficient use of AAC for daily communication, learning and also for assessment purposes.

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### **M. GOFER-LEVI, T. SILBERG, A. BREZNER & E. VAKIL. What can implicit measures tell us about learning abilities among children with Cerebral Palsy (CP)?**

**Objective:** Using implicit learning tasks among children with different levels of motor and communication limitations may provide an uncontaminated measure of their underlying cognitive abilities. In the current study we examined differences between children with spastic CP and matched controls in implicit learning using different skill learning tasks.

**Methods:** Participants were 25 children with spastic CP and 25 matched healthy controls, aged 9-19 years. All children performed three tasks: (1) the Serial Reaction Time (SRT) task in which learning is studied via a repeated sequence of finger movements; (2) a non-motor (nm) SRT task, in which participants respond only to one location of the repeated sequence, thus decreasing the amount of motor effort in the acquisition of the skill, and (3) a Probabilistic Classification Learning (PCL) task in which cue-outcome associations are learned gradually over trials.

**Results:** In the SRT task a marginal improvement in performance was found in both groups. Yet, children with CP were significantly slower

than controls. Additionally, their improvement in performance was a result of general decrease in reaction time only, indicating they did not learn the implicit sequence. In the nm-SRT task, only the CP group improved in performance, possibly due to a floor effect in the control group. In the PCL task, a significant improvement in performance between younger and older children was found for controls, but not for the CP group.

**Conclusions:** Using implicit skill learning tasks enabled us to distinguish between different components of learning among children with CP. Although children with CP demonstrated impaired implicit learning; they were able to acquire a general skill when provided with explicit instructions and sufficient practice. Understanding the difficulties children with CP have in implicit learning may help planning efficient interventions including use of technological devices for communication and learning.

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### Paper Session 13: Memory

Moderator: **Daniel A. Levy**

12:00 p.m.–1:30 p.m.

#### **Y. PERTZOV. Remembering What Was Where, From Cognitive Mechanisms to the Clinic.**

**Objective:** It has been suggested that objects are maintained as integrated units in working memory and when forgotten they are lost as a whole, without leaving any trace. To study the relevance of this claim to real-life situations, we investigated how object-location information is remembered – and forgotten.

**Participants and Methods:** We used a localization task with a continuous, analogue scale of reporting rather than binary (correct / incorrect recall) responses, with difficult-to-verbalize stimuli and variable delays.

**Results:** Analysis of the distribution of localization errors made by healthy participants showed that items were sometimes mislocalized precisely near the original position of other items in memory ('swap errors'). Moreover, when objects were forgotten they did not disappear completely from memory, but rather the links (bindings) between identity and location became vulnerable with time, so swap errors increased with longer retention intervals. Maintaining object-location links was found to be especially fragile in patients with focal, bilateral damage of the medial temporal lobes (MTL), specifically the hippocampus. Increased binding errors also occurred in pre-symptomatic carriers of an autosomal dominant gene (PSEN1 or APP) which gives 100% risk of developing Alzheimer's disease. Hippocampal volume in these individuals, who scored within normal range in standard neuropsychological tests, correlated inversely with the number of binding errors.

**Conclusions:** These findings offer an insight into the early cognitive deficits associated with Alzheimer's disease and strengthen the claim that the hippocampus is necessary for maintaining associative information across short retention intervals, challenging traditional accounts of MTL function as exclusively involved in long term memory. The results are also a proof of concept for the ability of continuous report tasks to measure and quantify early (asymptomatic) impairments in memory disorders. The research was done with the help of many others, especially Masud Husain from University of Oxford.

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#### **A. BLOCH, D. TAMIR, G. ZEILIG & E. VAKIL. Motor and Non Motor Sequence Learning in People with Spinal Cord Injury.**

**Objective:** There is only a little evidence for cognitive impairments, especially in learning and memory, in some patients with spinal cord injury (SCI), and without brain damage. Changes in brain functioning in several areas were found in SCI, especially in basal ganglia. The role of the basal ganglia in skill acquisition is well documented. The aim of this study was to evaluate whether people with SCI encounter sequence learning deficits.

**Participants and Methods:** 7 patients with paraplegia (mean age 31) participated in this study, all within 2 years from injury. 7 controls were matched to cases on age, gender and dominance. Those with brain injury were excluded from the study.

Motor and non-motor versions of the Serial Reaction Time (SRT) task were used. Participants were presented with repeated sequence of 12 positions in six learning blocks, then a transfer block with a different sequence and then a block with the original sequence. The motor and non-motor versions of the task were administered in a counterbalance order with two weeks apart. All participants were also tested with verbal and non verbal intelligence and memory tests and answered the QUIDS depression questionnaire.

**Results:** The learning rate of the paraplegics was significantly slower than that of the controls in both SRT tasks. Within the paraplegic group, there was no learning effect in the first 6 blocks and no transfer effect from block 6 to block 7. A significant recovery effect was found in the motor task but not in the non-motor task.

**Conclusions:** These findings suggest that paraplegics may encounter difficulties in learning new motor and non-motor tasks during their rehabilitation process, especially in acquisition of new self-care skills, adjustment to occupational changes and coping with new medical and functional conditions. Therefore, personalized adaptations should be considered while building their rehabilitation program.

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#### **M. ALTGASSEN, L. ARIESE, R. KESSELS & A. WESTER. Executive Control Load Affects Prospective Memory Performance in Individuals with Korsakoff Syndrome.**

**Objective:** Prospective memory (PM) refers to the self-initiated delayed execution of intended actions. Successful prospective remembering involves retrospective memory and executive functioning and for both cognitive functions severe deficits in individuals with Korsakoff's syndrome have been found. Despite its high relevance for everyday life, PM performance in Korsakoff patients has only been addressed by one study and here severe deficits were found. The present study set out to explore under which conditions PM performance improves in Korsakoff syndrome and which possible underlying factors contribute to this deficit.

**Participants and Methods:** Sixteen individuals with Korsakoff syndrome and 12 individuals with chronic alcohol abuse (without amnesia) performed a picture-based categorization task into which a PM task was embedded that put either high or low demands on executive control processes by using cues of low or high perceptual salience.

**Results:** Overall, Korsakoff patients showed less correct PM responses than alcoholic controls. However, executive control load interacted significantly with group status: Individuals with Korsakoff's PM performance was better when executive control load was low than when it was high, while there were no differential effects for alcoholic controls.

**Conclusions:** Thus, while overall Korsakoff patients' PM showed a global PM deficit, the extent of this deficit seems to be related to executive control demands of the task applied.

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**A. STANILOIU & H.J. MARKOWITSCH. Chronic Functional Amnesia after Anesthesia.**

**Objective:** Functional amnesia has historically been assigned a psychological causation. However it often onsets on a background of psychological stress and mild physical insults. Herein we review three patients with functional retrograde amnesia after seemingly uncomplicated general anaesthesia for gynaecological operation, knee surgery and medulloblastoma removal, respectively.

**Participants and Methods:** Patients (a 35-year old woman, a 22 year-old man and a 29 year-old man) were investigated medically, neuro-psychologically and neuroradiologically.

**Results:** All patients had lasting pronounced retrograde memory impairments, preponderantly in the episodic-autobiographical memory domain, with onset after awakening from objectively seemingly unproblematic anaesthesia and surgery. The first female patient had amnesia for personal and public events, encompassing the last 13 years of life. The last two male patients showed amnesia for personal episodes spanning the entire past life. All patients performed within normal limits on standard anterograde memory tests. The first patient showed deficits on complex attention tasks and tests for executive functions and theory of mind, mild depressive symptoms and past conversion symptoms. The second patient performed sub average on tests for emotional processing and theory of mind. The third patient showed attentional and executive function deficits. No patient had identity loss. A history of psychological stress preceding the onset of amnesia was elicited in all cases. Findings from structural brain imaging were unremarkable in the first two patients and did not match the neuropsychological picture in the last case.

**Conclusions:** Although anaesthetics may affect mnemonic processing, the neuropsychological findings, neuroimaging and anamnesis supported a diagnosis of functional amnesia. The biological mechanisms through which anaesthetics interact with psychological stress and compound the risk for persistent retrograde amnesia are topics of future research.

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**R.S. BREZIS, L.S. MCKAY & J.I. PIGGOT. Neural Correlates of Self-related Memory in Youth with Autism Spectrum Conditions.**

**Objective:** Previous studies of Autism Spectrum Conditions (ASC) have pointed to behavioral difficulties in autobiographical memory, and abnormal brain activations during different aspects of self-processing in ASC. Yet to our knowledge, this is the first study to examine the functional neural correlates of memory for self-processed words, in both ASC and Typically Developing (TD) youth.

**Participants and Methods:** Twelve youths with ASC and 15 TD youths, matched for age (range: 8-18; mean=13.3±2.9), gender (70% male) and IQ (FSIQ range: 81-141; mean=115±15) participated in the study.

**Scanning parameters:** T1-weighted anatomical images, and functional T2-weighted Pace-Moco EPI sequences (TR=2000ms) were acquired on a Siemens 3T Tim Trio MRI scanner.

**Experimental Task:** While in the scanner, subjects evaluated 60 trait-words as self-descriptive or not. Thirty minutes later, outside the scanner, subjects had to identify the 60 words they had previously seen from among 60 additional distracters.

**Results:** Behavioral: There were no group differences in response or response time in the study phase ( $t$ 's < 1.071,  $p$  > .30), nor in recognition accuracy ( $F$ (1,24) = .40,  $p$  = .53).

**Brain activation:** When contrasting remembered > forgotten words a significant reduction in the fMRI signal was observed ( $p$  < 0.005, cluster-size threshold estimation  $p$  < 0.05): for TD youth, in the left Inferior Parietal Lobule (BA 40, TAL:  $x$  = -31  $y$  = 28  $z$  = 15); and for ASC youth, in the left Inferior Frontal Gyrus (BA 46, TAL:  $x$  = -46  $y$  = 28  $x$  = 15) and left Insula (BA 13, TAL  $x$  = -40  $y$  = -5  $z$  = 18).

**Conclusions:** Though ASC and TD youth showed no behavioral differences in their evaluations of trait-words and their recognition, ASC

youth showed reduced activation in areas traditionally involved in emotional and cognitive processing, while the TD youth showed a reduction in an associative region of the parietal cortex. These results suggest that ASC youth engage a different neurobiological network when encoding self-related information in memory.

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**Paper Session 14:  
Cognitive and Behavioral Neurology****Moderator: Fofi Constantinidou****12:00–1:30 p.m.****G. GEFFEN, S. GEFFEN & L. GEFFEN. Maladaptive Neuroplasticity Reversal By Multidisciplinary Intervention: A Case Study Of Complex Regional Pain Syndrome (CRPS).**

**Objective:** CRPS comprises chronic pain in a limb, disproportionate to the injury, changes in skin colour, temperature, hypersensitivity, sweating, swelling, altered sensorimotor maps, pain gating and sympathetic reflexes. CRPS progresses from burning pain, muscle spasm, stiff joints and skin changes to dystrophic skin, bone and muscle with contractures. Can multimodal psychological and physical interventions reverse these changes?

**Participants and Methods:** CB aged 15 presented with end stage CRPS following a shoulder dislocation 2 years previously. She had undergone multiple medical, surgical, psychiatric and physiotherapy interventions including sympathetic nerve block, shoulder arthroscopy, spinal cord stimulator implant, medication and psychotherapy without relief. Her right arm was partially flexed and immobile with marked wasting and dystrophic changes. She avoided water, used only cloth ablutions and required anaesthesia to debride skin and cut nails. She slept sitting, had poor self esteem, was socially avoidant and had missed 2 years school.

**Results:** Group therapy improved coping skills and understanding of CRPS. Individual therapy included controlled breathing during graduated exposure first to air, then touch (self and other) and finally to debriding. Lying horizontal, limb immersion and showering were progressively introduced. She exercised her right hand in a mirror box while viewing a virtual normal hand (her left). Behaviour therapy extinguished conditioned avoidance and motivational therapy enhanced generalisation of acquired life skills. Physical interventions included splinting with progressive mobilization, botulinum toxin to reduce spasticity and specific arm exercises. After 3 weeks, CB was discharged on a home program. She had normal arm function when assessed 3 years later.

**Conclusions:** Multimodal interventions directed at progressively restoring limb function can reverse even end-stage CRPS and warrant inclusion in treatment.

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**F. CONSTANTINIDOU & A. MAKRI. Benign Rolandic Epilepsy and memory performance in elementary school-age children: Not so "benign" after all?**

**Objective:** Recent neuropsychological studies have shown that rolandic spikes could interfere with specific cognitive and behavioral functions in children with Benign Rolandic Epilepsy (BRE). The aim of this study was to determine whether differences on verbal and visual memory skills, on executive abilities and on speed of processing are present at children with BRE when compared with children without epilepsy. Further, to investigate the effects of stimulus presentation modalities on verbal learning performance.



**Participants and Methods:** A battery of neuropsychological tests assessing memory skills was given to a total number of fifty children, who were all Greek Cypriots, between the ages of 7 and 12 years old. Twenty-six participants comprised the experimental group (children with BRE) and twenty-four the control group (children without epilepsy).

**Results:** The results revealed statistically significant differences between the experimental and the control groups for the tasks assessing verbal-auditory memory, visual search, scanning, mental flexibility, executive functions, and visual-spatial sketchpad. The visual memory of the children with BRE, their auditory and visuo-spatial attention span, as well as their speed of processing was not found to be affected. The visual presentation of items resulted in improved learning and recall performance for both groups of children.

**Conclusions:** The present results support the existence of a working memory deficit in children with BRE. The findings suggest that the visual presentation of information provided extra support to children with BRE and perhaps facilitated executive control and processing of verbal material in working memory. It is evident that children with BRE are likely to have impairments in their auditory-verbal memory that interfere with their learning process and their academic progress in the school setting.

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**J. EVANS, B. CULLEN, L. PAUL, L. FREI, J. NORRIE & C. O'LEARY. Understanding and Assessing Dual-tasking Deficits in People with Multiple Sclerosis (PWMS).**

**Objective:** To investigate if cognitive-motor dual-tasking problems in PWMS result from the increased cognitive demands of certain tasks (situational overload effect), or from a central divided attention impairment that affects dual-tasking more generally; To determine if cognitive-motor dual-tasking can be assessed using a paper-and-pencil tracking task or a self-report questionnaire.

**Participants and Methods:** Independently mobile PWMS and matched healthy controls (n=33 per group) performed cognitive (digit span) and motor (walking; or tracking with a pencil) tasks under single and dual conditions. Cognitive demand was manipulated within conditions: high demand (individual's highest digit span length) and low demand (highest span length minus 2). The primary outcome measure was a dual-task decrement score, calculated separately for digit recall, gait parameters, and tracking performance: ((single task score-dual task score)/single task score)x100. Participants also completed questionnaires on mood state, fatigue, everyday cognitive failures and everyday dual-tasking problems.

**Results:** Factorial ANOVA of a gait parameter (double support time variability) showed a main effect of group (p=0.01) and an interaction between group and cognitive demand (p=0.03). While the double support time variability decrements shown by PWMS were greater than those shown by controls, this was not significantly different for PWMS between the two levels of task demand. No significant group or interaction effects were found for digit recall or tracking performance. Although the dual-task questionnaire correlated significantly with objective dual-task deficits in PWMS, correlations were stronger between self-reported fatigue impact and objective dual-task deficits.

**Conclusions:** Some evidence was found for a central divided attention impairment in PWMS, affecting dual-task performance independent of task demand. Self-report measures can identify PWMS who have objective dual-tasking deficits.

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**I. HUENGES WAJER, C. CREMERS, M. VAN ZANDVOORT, M. VERGOUWEN, I. VAN DER SCHAAF, B. VELTHUIS, J. DANKBAAR, P. VOS, A. VISSER-MEILY & G. RINKEL. Relationship between CT-perfusion on admission and cognitive functioning 3 months after aneurysmal subarachnoid hemorrhage.**

**Objective:** Many patients who survive an aneurysmal subarachnoid hemorrhage (aSAH) have persisting cognitive dysfunctions. The underlying causes of these dysfunctions are however not completely clear. In the acute phase after aSAH cerebral blood flow (CBF) is reduced. The aim of this study is to investigate the relationship between CT-perfusion (CTP) in the acute phase and cognitive outcome 3 months after aSAH.

**Participants and Methods:** We included a series of 71 patients admitted to the University Medical Center Utrecht with a routine CTP performed within 24 hours after ictus and with a neuropsychological examination after 3 months. Perfusion parameters were measured in predefined regions of interest, after which absolute and relative values for two parameters: CBF and time to peak were calculated. The relationship with global cognitive functioning was examined by linear regression analyses. Adjustments for age, sex, education, method of aneurysm treatment and presence of non-acute medical complications were made if significantly associated with cognition.

**Results:** A significant relationship was found between age and cognitive functioning (B=-.02, 95% CI -.030 to -.007). After adjustment of age, both the absolute and relative perfusion parameters were not significantly associated to global cognitive functioning.

**Conclusions:** Perfusion in the acute phase is not associated to cognitive outcome 3 months after aSAH and therefore cannot explain the neuropsychological dysfunctions in the long term.

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**R.F. MENESES, V. LINHARES & J. PAIS-RIBEIRO. Quality of life in epilepsy across time: Does it change? Why (not)?**

**Objective:** Considering the key definitions of quality of life (QoL), and the

construct's theoretical characteristics, patients' QoL is supposed to change with time. Nevertheless, this kind of data is still not systematically/routinely assessed and/or published. The same is true for the role of spirituality in patients' QoL. Consequently, the aims of the present study are: (a) to compare the QoL reports of individuals with epilepsy one year apart; and (b) to analyse the predictive power of spirituality.

**Participants and Methods:** To do so, a sample of 60 individuals, 56.7% female, between 17 and 65 years of age (M=38.07; SD=10.25), with a diagnosis of epilepsy for 4 to 49 years (M=21.91; SD=10.79), 96.4% of which taking antiepileptics, answered to a Socio-demographic and Clinical Questionnaire, to the SF-36 v1.0 (QoL), and to the Escala de Avaliação de Espiritualidade em Contextos de Saúde (a Portuguese 5-item scale of spirituality).

**Results:** Comparing patients' QoL in both moments, it was found that all QoL scores were higher (i.e., better) in the first moment (M1), with the exception of Physical Function, that increased in M2. This was the higher score in both moments. In both moments, the lower scores were: Vitality and General Health. Regarding spirituality, the Beliefs score was higher and the Hope/Optimism score was lower, in both moments. From M1 to M2 there was a decrease in both scores. Spirituality scores (M1) revealed no statistical significant correlation with the QoL scores (M2), suggesting no predictive power of spirituality regarding QoL.

**Conclusions:** These results suggest that, as far as QoL (and spirituality) is concerned, the first year after diagnosis is not necessarily the most difficult one for epilepsy patients, something that the health care team not always remembers. Further studies, with bigger samples, have to be made in order for (Portuguese) clinicians to provide the best possible care for epilepsy patients.

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# Keyword Index

## International Neuropsychological Society

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