סימפוזיון מחקר

מדעי המוח וחינוך : אקו־נוירוביולוגיה והתפתחות מוחית

Neuroscience and Education: Eco-Neurobiology and Brain Development

Key words: Neuroeducation, Brain Development, Early Experiences, Educational Intervention, Emotional Development

יושבת ראש : ד״ר ראניה חוסין פראג.

Chairperson: Dr Rania Hussein Farraj

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<u>הרצאה ראשונה</u>

למידה מבוססת מוח: חלון הזדמנויות בלתי־מנוצל

פרופ׳ ג׳רי ליסמן

Prof. Gerry Leisman

אוניברסיטת חיפה

Brain-based learning: An untapoed window of opportunity

Brains are built over time, from the bottom up, with intra-regional connections being developed throughout the lifespan but intensely during early childhood. Early experiences affect the quality of brain architecture by establishing either a study or a fragile foundation for all of the learning, health, and behavior that follows. After the rapid proliferation of connections in the preschooler, these connections are reduced through pruning, thereby optimizing brain circuitry. Sensory pathways like those for basic vision and hearing are the first to develop, followed by early language skills and higher cognitive functions. Connections proliferate and prune in a prescribed order, with later, more complex brain circuits built upon earlier, simpler circuits. Genetics and interactive experience shape brain development. Inadequate or inappropriate early experiences will affect the circuitry and architecture of the brain, associated with disparities in learning, behavior, and development .

The presentation will translate key findings in developmental cognitive neuroscience into practical applications for classroom exercises and curriculum design.

In the numerous studies integrated into the presentation, 64-lead electrophysiological recordings provided data analized using Hilbert-Huang transform, providing a computational analysis of brain networking during various aspects of skill and knowledge acquisition. Participants ranged in age between 6-17 years from schools in Havana, Cuba and from the Brian Balance® centres in the USA. Additional testing included the Weschler Individual Achievement Test (WIAT. Linear regression was applied to provide a global analysis of the data to allow converging data from clinical neurophysiology, psychometrics, cognitive psychology, and neuroscience to support the curriculum design ramifications.

Neuroplasticity is greatest during early development, with specialization and its resulting optimization occurring later in development. The brain then becomes less able to reorganize and adapt to new situations. Intellectual disability is defined as reduced efficiency in this adaptation. While age-appropriate in early childhood, reduced effective adaptability to the environment with advancing age is not. There is greater ease in influencing preschool brain architecture than in rewiring parts of its

circuitry in the adult years. Cognitive, emotional, and social capacities are inextricably intertwined throughout life. The brain is a highly interrelated organ, and its multiple functions are richly coordinated. The mechanisms affecting optimized connectography will be discussed in the context of teaching strategies that can optimize learning with “the brain in mind ”

מילות מפתח:

Neuroeducation; Functional connectivity; Neuroplasticity; Curriculum design; Neuro-pedagogy

הרצאה שנייה

למידה מבוססת מוח: תהליכי חיקוי ולמידה בקרב ילדים

ד״ר רחלה אלפסי

Dr. Rahela Alfasi

אוניברסיטת חיפה

Brian based learning - Changes in Imitation Learning between ages 5-10

The human brain is one of the most complex and fascinating organs in nature. It serves as the center of all our thinking, learning, and behavioural processes. Imitation is a central process in learning, where an individual learns by observing the behavior of others. Imitation not only aids learning but also serves as a cornerstone for social and emotional development, allowing for efficient understanding and response to the environment.

At the heart of the imitation process are mirror neurons, cells in the nervous system first discovered in monkeys and also proven to exist in humans. These neurons activate when we perform a specific action, but also when we observe others performing the same action. They enable us not only to imitate behaviors but also to understand the intentions and emotions of others, thereby contributing to the development of empathy and social skills.

Learning through imitation is a central process in child development, allowing them to acquire skills, knowledge, and behaviors from their social environment. Children ages 5-10 are in a critical stage of cognitive, emotional, and social development, where imitation plays a significant role.

This study introduces a unique perspective on the role of imitation in learning processes among children, emphasizing the significance of mirror neurons in educational settings. By focusing on the interplay between imitation and emotional engagement, we aim to provide insights that can reshape teaching methodologies.

Sixty male and students at United School of Panama, were randomly selected and aged between 5-10 years of age. We observed a 10-minute learning circle in which the teacher taught children a song through singing and hand and body movements. We recorded the activity in order to analyze the patterns of learning through imitation. We collected questionnaires (supported by short interviews with the teachers) designed to characterize the learning and socialization patterns of the children who participated in the learning course.

Data was analyzed in a repeated measures design by MANOVA and significance was set at .05.

In a preliminary study we conducted, we found significant changes in the imitation patterns of children aged 5-10. Findings showed significant effects of age on the processes of learning through imitation. The findings indicated that there are changes in two key parameters: changes in imitation patterns and the influence of the environment on the processes of learning through imitation. We are currently in advanced stages of data collection and analysis. During the presentation, I will present the findings that will emerge from the follow-up research.

מילות מפתח:

Neuroeducation Imitation; mirror neurons; Curriculum design; Neuro-pedagogy

<u>הרצאה שלישית</u>

השפעת משך השינה על התפקוד הקוגניטיבי ועל המצב הרגשי בקרב מתבגרים

גב׳ סלמה חדאד, ד״ר ראניה חוסין פראג׳, גב׳ קורל כהן, ד״ר ראיד מועלם

Salma Haddad, Rania Hussein Farraj, Coral Cohen and Raed Mualem

מכללת אורנים

The impact of sleep duration on cognitive functions and emotional state in adolescents

Sleep is essential for cognitive function, emotional stability, and academic success. Adolescents often experience sleep deprivation due to academic demands and social habits, which may impair memory, concentration, consolidation and emotional regulation. This study explores the impact of sleep duration on cognitive performance and emotional well-being among high school students.

The study aims to:

1. Investigate how different sleep durations affect memory and concentration.
2. Assess the influence of sleep deprivation on academic performance.
3. Analyze the impact of reduced sleep on stress, depression, and fatigue.

This study provides empirical evidence linking sleep duration with cognitive and emotional outcomes. The findings support the need for educational and mental health policies promoting adequate sleep in adolescents.

A within-subject quantitative study was conducted with 50 high school students (ages 17–18) from northern Israel. Each participant completed cognitive and emotional assessments under two conditions:

- Optimal sleep (8–10 hours)
- Sleep deprivation (4–6 hours)

Cognitive assessments included a memory test (computerized card game), a concentration test (feature deduction game), and a chemistry exam. Emotional states were measured using the Profile of Mood States (POMS) questionnaire. Statistical analyses involved paired t-tests and Wilcoxon Signed-Rank Tests to evaluate performance variations. Sleep time was

controlled using an alarm clock, ensuring awakening at the predetermined time.

Sleep duration significantly impacts adolescents' cognition and emotions. Sleep deprivation (4–6 hours) reduced memory (20.39%), concentration (22.72%), and chemistry scores (35.88%). Mood disturbances worsened, with tension (+64.92%), depression (+63.39%), anger (+46.85%), and fatigue (+64.92%), while vigor declined (-57.80%). Promoting adequate sleep is essential for academic success and emotional stability and supporting school and mental health policies.

The study highlights the necessity of promoting adequate sleep duration among high school students to enhance cognitive efficiency and emotional stability. These findings provide compelling evidence supporting the integration of sleep education into school policies and mental health initiatives, ensuring better academic and psychological outcomes for adolescents.

מילות מפתח:

Sleep Duration; Cognitive Performance; Emotional State; psychological outcomes; adolescents