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Motor-cognitive interactions in the nervous system: Obesity and sedentary behavior dumbs down cognitive function in childhood

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Objectives: To demonstrate that motor and cognitive processes are not separate, but likely share similar evolutionary history.

Methods: We review data that motor processes contribute to cognitive function.

Results: Motor and cognitive processes have dynamical bidirectional relationships. Rodent research has revealed that exercise influences the striatum by increasing dopamine signaling and angiogenesis. In children, higher aerobic fitness levels are associated with greater hippocampal volumes, superior performance on tasks of attentional and interference control, and elevated event-related brain potential indices of executive function.

Conclusions: We endeavor to integrate the Neurosciences, Cognitive Psychology and Biomechanics in providing a fundamental understanding of the relation between intention, decision-making, and movement in the context of functional connectivity, awareness, attention, and action. Evidence, the SMA is involved in the organization of motor sequences based on plans, the PM is involved in the preparation of a specific action, the prefrontal cortex is involved in the initiation and in the temporal organization of action, and the cerebellum is involved in the temporal control of action sequences. All these regions show anticipatory activity in relation to a forthcoming action. Motor cognition relies on a multicomponent system, with many distinct processes occurring simultaneously in different brain regions that support different neural networks. The lack of movement represented in office work and youngsters fettered to video games reduces the ability to formulate effective connectivities. Because children are becoming increasingly overweight, unhealthy and unfit, understanding the neurocognitive benefits of an active lifestyle during childhood has important public health and educational implications.

Biography

Gerry Leisman is the Director and Professor of the National Institute for Brain and Rehabilitation Sciences in Nazareth, Israel and Professor of Restorative Neurology at Universidad de Ciencias Médicas Facultad Manuel Fajardo, Havana, Cuba. He has examined self-organizing systems in the nervous system applied to cognitive functions in memory, kinesiology, optimization, consciousness, and autism. He has applied optimization strategies to movement, gait, and cognition. In the 1970's, he was one of the first to identify functional disconnectivities in the brain. His work in rehabilitation sciences, has applied the tools of Industrial Engineering to those with developmental disabilities.

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