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Power of the human mind

GRAPHICS: THE STRAITS TIMES

THE human mind has always been an enigma and inspiration for philosophers, theologians, spiritualists, psychologists, scholars and artists for millenniums.

More recently, it has become the mainstream interest of healthcare professionals, scientists, engineers, technologists, entrepreneurs and the general public.

The mind is akin to software, the physical body is akin to hardware, and the brain is the hub or central processing unit (CPU) coordinating various body functions.

The mind supervening on the brain organ is the inner sense while the eyes, nose, ears, tongue, and skin are the external five sense organs.

innovation
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Information exchange between mind and external senses is coordinated via the nervous system which comprises of the brain, spinal cord and peripheral nerves.

Neurons are the basic cells of the nervous system. When stimulated, neurons transmit signals and information through changes in electrical and chemicals charges.

Various mind functions emerging from conscious and unconscious mental processes are mediated by the functioning nervous system.

The mind is formless, whereas the brain has a physical structure with four major parts — cerebrum is responsible for cognition, learning, sensory processing and motor control; cerebellum is responsible for motor coordination, muscle tone and balance; brainstem regulates sleep, laughter, alertness, posture, and cognitive motor skills such as typing or piano playing; and diencephalon regulates emotion, attention, consciousness, metabolism, and body temperature.

The brain is responsible for regulating secretion of hormones or chemicals by endocrine system and immune system which carry messages to the body organs and systems.

Imbalance of chemicals is related to health issues such as schizophrenia, Parkinson's disease, depression, Alzheimer's, anxiety, and obsessive compulsive disorder.

The brain undergoes changes over the life span of a human from the foetus stage to death, with corresponding changes in mental functions and abilities. The rate of ageing varies while brain injuries and diseases can also affect mental functions.

Brain communications which underpin various mental functions are directed by synchronised electrical pulses emanating from masses of neurons in different structures of the brain.

Electrical impulses transmitted across the brain tissues aka brainwaves are categorised based on their frequencies or cycles per second, HZ.

These brainwaves are picked up by electroencephalogram, EEG sensors.

By tapping brainwaves, it is now possible to digitally reconstruct the object perceived by the brain.

Scientists anticipate that all mind functions, as derivatives of neurophysical and biochemical changes of the brain and body systems, can be induced to a certain extent.

For example, awareness of sensation or consciousness is related to the activation of certain brain structures by receiving information from the sensory receptors via mechanisms of action potentials of neurons followed by release of neurotransmitter chemicals at synapses of interneurons.

The human brain is highly complex with hundreds of billions of neurons communicating and interacting with other body systems.

Therefore, massive efforts are being made to map which tissues of brain, networks of neurons, and biomolecules involved in each specific mind function and state.

They are correlating mental disorders with specific brain neuronal circuits.

They stimulate the activity of specific neurons with electrical, magnetic, optical, chemical, sound and physical means to alleviate mental functions such as depression and anxiety.

For example, noninvasive transcranial magnetic stimulation technique is developed to treat depression.

Patients are taught neurofeedback techniques to modulate brain wave activity. In other words, conscious thinking to change neuronal networks.

They devised electrode treatments for Parkinson's disease's tremors and epilepsy.

They recently developed brain memory implants to alleviate dementia and to assist people with brain defects.

By emulating brain and mind, computer science and engineering and information sciences and technologies are being advanced.

Artificial intelligence (AI) enabled services and devices emerged in recent years are examples. Technologists mapped brain waves via AI and digitally recreated the dream experienced by a person.

Therefore, the mind is the goldmine for innovations.

The mind inspired technologies is a new frontier, and will change the way we live in the future.

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