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PHYSIOLOGY OF MEMORY AND LEARNING: HOW DOES THE BRAIN REMEMBER?

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Abstract: This in the article human memory and study processes physiological basics, neurons at the level passing mechanisms and brain structures in the presence of formable complicated processes analysis Memory is short and far term types, their each other dependency and synaptic plasticity phenomenon through of information strengthening wide is illuminated.

In the article various in periods activity carried of scientist’s scientific research separately place In particular, in the 19th century by held experiments as a result forgetfulness The forgetting curve has been determined. is, it is the memory time to pass with decrease dynamics scientific based on gave. Later by previously " neurons " pushed together if activated , their connection "will be strengthened " theory synaptic plasticity main legality recognized as .

Also in the 20th century and his/her partners by held famous clinical observations (HM patient in the example of the hippocampus memory in the formation solution doer importance has that proving given . Next in research by simple animal model — sea on the bell (Aplysia) take visited experiments through of memory molecular and synaptic mechanisms, in particular , long term potentiation (LTP) process wide illuminated .

In the article also sleep , stress and external environment factors to memory Analysis of the impact made , their physiological mechanisms scientific sources based on This is explained . research human of the brain study and remembering stay ability deeper to understand service does and medicine and education in the fields important importance profession will reach .

Key words: memory, learning, neuron, synaptic plasticity, long term potentiation (LTP), hippocampus, forgetting curve, HPA mechanisms, neurophysiology, sleep, stress, information consolidation .

Login : Human memory and study processes modern neurophysiology the most important and complicated from directions one is considered . Memory is external and internal from the environment taken information acceptance to make , to keep and necessary at the time again restoration ability It is central . nerve system of activity main from functions is one . Scientific to research because of memory processes mainly the brain structures , especially hippocampus and cortex activity with closely is related .

20th century second half starting take visited research this showed that memory is a single process not , maybe various kind from systems organization found complicated system . In particular , declarative (conscious) and nondeclarative (mind (sub) memory types separated , their every one separately neuron to mechanisms has that This approach is defined as memory physiology deeper in understanding important step it has been .

Historical in terms of memory study initially psychological experiments based on started if , then neurobiological research with was enriched by Hermann Ebbinghaus in the 19th century . take visited experiments of memory time passing with decrease showing gave In the 20th century , Donald Hebb neurons between connections increase through study happened to be

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scientific based on gave . This theory later synaptic plasticity concept of to the formation take came .

Modern neurophysiological research and of memory molecular and cellular the basics open In particular , the long term potentiation (LTP) phenomenon study and of memory main from mechanisms one as Research this shows that repeated stimulation as a result in the synapses increase to the surface comes and this changes far time during preservation possible . From this In addition , during the LTP process, NMDA receptors , calcium ions and protein synthesis such as complicated biochemical mechanisms participation will reach .

Also by Eric Kandel take visited research simple animal models through of memory cellular mechanisms to explain big contribution added . His works as a result synaptic changes and gene expression memory in the formation important role to play proven .

So memory and study processes many step by step and complicated system are , they are neurons between connections , synaptic plasticity and molecular mechanisms based on is formed . This in the article exactly this of processes physiological basics and historical development wide is illuminated .

Home part : Memory human organism the most important physiological from functions one It is external . and internal from the environment taken information acceptance to do it storage and necessary at the time again restoration ability represents . This process central nerve system complicated activity as a result to the surface comes and human study , thinking and experience increase opportunities by designating gives . Modern scientific to views because of memory permanent changing standing dynamic system is , then neurons between synaptic connections increase or weakening through information is stored or disappears .

Memory about scientific concepts initially philosophical views within formed although , its experimental studied in the 19th century started . In this regard first important scientific The step was taken by Hermann Ebbinghaus becomes , that memory laboratory under the circumstances experimental in a way learned He is considered the first scientist . He is in their experiences meaningless from joints using memory pure mechanisms Ebbinghaus 's research as a result of memory time passing with decrease representative forgetfulness curve line This curve is defined . line of information initially quickly , later and slower to disappear showing gave and memory scientific measurement opportunity created .

Next in periods memory about views further developed , it only storage process not , maybe active again work process that defined by Frederic Bartlett take visited research this showed that man memory information exactly own as it is does not save , but him/her own experience and to their knowledge suitable accordingly again This approach of memory constructive nature open gave and his/her psychological in terms of very complicated process that proved . the 20th century memory in explanation neurophysiological approaches important place by Donald Hebb previously pushed to the theory according to one at the time activated neurons between connection increases and this process study and of memory basis organization This will idea later synaptic plasticity concept of to the formation basis became . Synaptic plasticity neurons between of connections change ability indicates and memory process central from mechanisms one is considered .

Taken in the 1970s visited experiments of memory cellular level in understanding big turn made . Bliss and Lomo by discovery done far term potentiation event synapses far time during increase possible showed . This process repetitive nerve from impulses then to the surface comes and synaptic of connections to the stabilization take comes . In this case cell inside

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calcium ions entry , NMDA receptors activation and new proteins synthesis important role plays . As a result information far term during preserved remains .

Of memory molecular mechanisms Eric Kandel in the study works separately importance It has a name Aplysia. simple nerve to the system has organism on experiments passing by , memory short and far term types various biological to mechanisms has that proved . His to research short , according to term memory there is synaptic of connections temporary change with related if , long term memory and new proteins synthesis and gene expression with related without is formed .

Also , clinical research and memory mechanisms in understanding important role played by Brenda Milner take visited famous HM patient on top observations hippocampus new memories in formation solution doer importance has that showed . This in the patient hippocampus from damage then new information remembering stay ability lost , but old memories preserved left . This situation of memory various types and brain structures between clear dependency proving gave .

Modern neurophysiology memory one how many from systems consists of complicated process as seeing comes out . Declarative memory conscious accordingly remembering remaining information own inside if , nondeclarative memory automatic skills and reflexes cover This systems various brain structures with related is , their mutual cooperation human complete cognitive activity provides .

Memory disorders various in diseases Alzheimer 's disease disease the most wide widespread memory from the disorders one then neurons degeneration as a result memory slowly disappears . From this except for amnesia cases of memory short or far term disappearance with manifestation will be , dementia and general cognitive of functions decrease with is characterized by . Traumatic brain injuries and memory to the processes serious impact to show possible .

So memory human in the body passing complicated biological , neurophysiological and molecular processes complex It is historical . development during various scientific from stages past and today's on the day deep scientific based system as is being studied .

Memory study in history various in periods held experiments his/her mechanisms further deeper to understand big contribution added by . 20th century by Ivan Pavlov at the beginning done increased conditional reflexes according to experiments memory and study processes between dependency in explanation important role played . Pavlov in dogs food from being given before call sound with repetitive together impact transfer through , later only call of the sound He is also a slob. divorce brought release This experiment showed external signal and memory based on formed conditional answer between connection scientific based on gave .

Later by Carl Lashley take visited experiments of memory brain inside where preservation about to the question aimed at He was an animal . of the brain various parts surgery way with take abandoned , learned behavior and learned of tasks preserved stay level Lashley 's memory one clear in the center not , maybe whole brain along distributed system in the form of preservation possible said to the conclusion This idea came later the concept of "engram" to develop basis it has been .

Modern John O'Keefe in neurophysiology by discovery The "place cells" experiments also tested memory and spatial orientation between dependency open He gave the rats hippocampus study through known neurons only organism certain to the place when you go activation This discovery brain inside " inside " "map " exists and spatial memory special neuron systems through management showed .

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Also , Morris water labyrinth experience memory and study processes in evaluation wide applicable experimental to the model This has become in experience rats to the water filled in the basin hidden the platform to find They learn . Simple under the circumstances they time passing with the platform faster to find learns , but hippocampus damaged in animals this ability disappears . This is hippocampus spatial memory and study in the processes important role again one there is confirms .

From this outside , modern in neurobiology held experiments of memory reconsolidation also open the process This process because , before formed memory again remember taken at the time temporary unstable to the situation will pass and again again This is strengthened . process during to memory new information joining or his/her change possibility This discovery was discovered memory static not , maybe permanent updated standing dynamic process that proved .

Thus, various in periods held classic and modern experiments memory not only psychological event , maybe complicated neuron networks , synaptic changes and molecular mechanisms with controllable biological process that obvious showing gave .

Current time neurophysiology and in neurobiology memory about views sharp developed It is a simple " save " not " process " , but permanent changing standing complicated neuron networks activity as interpretation Modern research this memory shows one how many brain regions between dynamic cooperation as a result takes shape and he only one in the center not , maybe scattered neuron networks along is encoded .

Last in years take visited scientific research has explored the concept of "engram" further more precisely explained . Engram is of memory physicist traces it is clear neurons in the group is stored . Optogenetics methods using held experiments this showed that it is known to memory answer giver neurons artificial activation through that's it memory again call It is possible . This is memory only chemical process not , maybe clear neuron networks at the level encoded biological structure that proves .

Current modern in views memory consolidation The process is also new. interpretation Research is being done . see , sleep during , especially slowly wavy sleep in the stage , the brain day during taken information again works and him/her far term to memory In this process hippocampus and neocortex in the middle active information exchange happened it will be , this and of memory to strengthen take is coming .

From this outside , modern neuroscience memory and neuroplasticity between dependency further deeper is studying . Neuroplasticity is brain own structure experience based on change ability is , it is not only childhood during the period , perhaps preserved even in adults Functional MRI and other neuroimaging methods using It turns out that learning in the process brain regions activity changes and new synaptic connections harvest will be .

Last research memory violations treatment also new in direction opportunities open Alzheimer 's disease and other neurodegenerative beta- amyloid in diseases proteins gathering and tau proteins pathological change synaptic of connections to the violation take arrival has been identified . Therefore modern therapy methods exactly this molecular processes stop or to slow down focused .

Also , artificial intellect and neuroscience integration also memory in learning new direction as is developing . Computer modeling and neuron networks using human of memory work principles simulation is being done , this and in the future memory restoration and reinforcement technologies create opportunity is giving .

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So modern science - memory static process as not , maybe permanent variable , branched and plasticity has complicated neurobiological system as seeing is coming out .

Conclusion : Memory human central nerve system the most complicated and vital important from functions one It is external . from the environment taken information acceptance to make , to keep and again restoration processes own inside takes . Historical and modern scientific research this memory shows simple storage mechanism not , maybe neuron networks , synaptic connections and molecular processes based on formable dynamic is a system .

Memory about scientific views by Hermann Ebbinghaus in the 19th century started experimental from research from Donald Hebb in the 20th century synaptic plasticity theory and Eric Kandel molecular level until their discoveries noticeable at the level developed . This research of memory neurons at the level to be codified , to be strengthened and again activation such as processes scientific basically to explain opportunity Brenda Milner held clinical observations and hippocampus new memory in formation solution doer role confirmed .

Modern neurophysiology memory scattered neuron networks based on working , permanent changed standing system as interpretation Engram theory , optogenetics and neuroimaging methods memory traces clear neuron in populations preservation also showed that sleep , neuroplasticity and reconsolidation processes of memory strengthening and again in the formation important role play determined .

Memory disorders , including Alzheimer's disease , amnesia and dementia such as situations and this complicated of the system violation as a result to the surface comes and current on the day them treatment in the direction of wide extensive scientific research take is going .

Conclusion as in other words , memory human mental activity determinant main biological from mechanisms one to be , to be deep to be studied medicine , neuroscience and cognitive sciences development for big importance profession will reach .

Foydalanilgan adabiyotlar:

1. Ebbinghaus, H. (1885). On Memory: A Contribution to Experimental Psychology. Leipzig: Duncker & Humblot.
2. Hebb, D. O. (1949). The Organization of Behavior: A Neuropsychological Theory. Wiley.
3. Kandel, E. R. (2001). The molecular biology of memory storage: a dialogue between genes and synapses. Science, 294(5544), 1030–1038.
4. Bliss, T. V. P., & Lømo, T. (1973). Long-lasting potentiation of synaptic transmission in the dentate area of the anaesthetized rabbit. Journal of Physiology, 232(2), 331–356.
5. Milner, B., Squire, L. R., & Kandel, E. R. (1998). Cognitive neuroscience and the study of memory. Neuron, 20(3), 445–468.
6. Squire, L. R., & Dede, A. J. O. (2015). Conscious and unconscious memory systems. Cold Spring Harbor Perspectives in Biology, 7(3).
7. Bear, M. F., Connors, B. W., & Paradiso, M. A. (2016). Neuroscience: Exploring the Brain. Wolters Kluwer.
8. Kandel, E. R., Schwartz, J. H., & Jessell, T. M. (2013). Principles of Neural Science (5th ed.). McGraw-Hill.
9. Squire, L. R. (2009). Memory and brain systems: 1969–2009. Journal of Neuroscience, 29(41), 12711–12716.

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10. Scoville, W. B., & Milner, B. (1957). Loss of recent memory after bilateral hippocampal lesions. Journal of Neurology, Neurosurgery & Psychiatry, 20(1), 11–21.