EDITORIAL

Memory effect: The study of mind

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ABSTRACT

Behavioral, clinical, and neuroimaging data have revealed multiple memory systems in the brain over the last few decades. A memory system is a type of memory that uses unique mechanisms to process a certain type of information and has discrete neural correlates. As a result, memory is a collection of independent systems rather than a single capacity. From the standpoint of development, each memory system follows its path. This explains the diversity of children's memory abilities: 3-year-olds, for example, acquire a lot of new words and concepts every day yet have problems recalling an event that happened a week ago in detail. We provide recent findings on the development of declarative memory (i.e., episodic and semantic memory) and the relationship between the maturity of their neural correlates and the occurrences of infantile and childhood amnesia in this paper. Finally, we discuss some of the future research directions that could be pursued.

Key Words: *Psychology; Behavioral science; Episodic and semantic memory; Memory*

INTRODUCTION

Memory refers to the ability to remember and retain information from the past. Encoding, storage, and retrieval are the three stages of memory. Encoding when the brain gets new information, it forms a network of connections to represent it [1]. Those links could lead to the knowledge you already have in your head. Many forms of information necessitate close attention to be effectively encoded. Storage: Even if you aren't using those previously made connections, they are kept in your brain. Retrieval when you recall or recognize knowledge from the past, your brain recreates or activates the connections that reflect previously encoded information.

This is a straightforward explanation of how memory works. Keep in mind that these stages, as well as the processes that occur inside them, are not without flaws. Memory is flawed in and of itself [2]. A witness to a robbery may recall seeing the robber wearing a blue shirt whereas the thief was dressed in green. Such forgetting isn't always an indication of amnesia, but it is a marker of it. Memory comes in a variety of forms. The following are the two most important for comprehending amnesia Declarative/Explicit: Everyday knowledge of facts and happenings. These memories can be erased through amnesia. Nondeclarative/implicit: knowledge is the knowledge that is not consciously acquired. These "ingrained" memories will not be erased by amnesia. Even if you have amnesia, you should be able to walk and ride a bike.

Depending on the type of memory you're developing and how long it may be stored, different brain areas are engaged in remembering. Short-term memory lasts for as long as you keep the knowledge 'in mind,' which is usually between five and 30 seconds [3]. You can juggle an average of seven pieces of information during that period for example, seven letters, seven words, or seven figures. This sort of remembering necessitates the use of the frontal and parietal lobes. Long-term memory: It can last anywhere from a minute to a lifetime. In principle, your long-term memory has no bounds. However, your ability to recollect such information is limited. The hippocampus and surrounding temporal lobes of the brain are critical for long-term information storage and retrieval. Long-term memory, on the other hand, involves many distinct sections of the brain, and injury to many different parts of the brain can result in amnesia.

Amnesia is a neurobehavioral disease marked by a selective loss of memory in the presence of otherwise normal intelligence and cognitive abilities [4]. A variety of etiologies that injure neuronal systems in the limbic system of the basal forebrain might result in permanent amnesia. Patients with amnesia have difficulty gaining new knowledge (anterograde amnesia), as well as recovering information obtained before the onset of amnesia (retrograde amnesia). An important source of knowledge regarding the cognitive and neurological architecture of memory systems is clinical aspects of anterograde and retrograde amnesia.

Some types of amnesia arise organically as part of a person's psychological development. Adults, for example, rarely recall much

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from their childhood: the earliest recollection is usually between the third and fourth birthdays, and it is limited to a small number of isolated fragments until they are around 5 or 7 years old. Childhood amnesia does not appear to be a result of the extended time between childhood encoding and adult retrieval: something unusual appears to happen to memories of childhood events [5]. Only personal memories are affected by infantile and childhood amnesia. Children learn a large amount of information as well as a diverse set of cognitive and physical skills that they carry with them into adulthood.

A shortage of oxygen to the brain, such as during a cardiac arrest, or other disorders such as limbic encephalitis or Alzheimer's disease can damage the hippocampus. Selective injury to the hippocampus has long been recognized to cause amnesia, with patients unable to recall prior events.

The lack of language, as well as the immaturity of the neocortex and other essential brain structures, may contribute to infantile amnesia, which can last for a year or two. All memories of early childhood are repressed, save for a couple of boring screen memories that promote repression by providing the person something to recall, according to the hypothesis, because the young child's entire mental existence is concentrated with these issues. Even the healthy elderly, at the other end of the life cycle, appear to have trouble learning new knowledge and recalling recent occurrences. Normal aging does not influence primary or short-term memory, as evidenced by digit span and the recency component of the serial-position curve; but, it has a significant impact on secondary or long-term memory, particularly after somewhat lengthy retention intervals [6]. The elderly do not lose their store of semantic information (though they may grow slower on semantic-memory tests like word-finding), and their repertoire of procedural knowledge remains intact, given that they have been able to preserve these skills via practice.

Memory problems are complicated by dementing illnesses that are commonly connected with age, such as Alzheimer's disease. The presence of neuritic plaques and neurofibrillary tangles, particularly in the medial–temporal regions of the brain, is thought to be linked to severe memory impairments in Alzheimer's disease. These changes, together with neuronal death and neurotransmitter depletion in other cortical and subcortical locations, particularly the hippocampus and other medial–temporal lobe structures, contribute to the disease's breadth

In contrast to amnesia, dementia's memory deficit affects both short-term' and 'long-term' memory and is part of a wider cluster of abnormalities impacting a wide range of cognitive and emotional functions, including impairments in semantic and procedural memory, as well as episodic memory. Demented patients may exhibit anosognosia, or a lack of awareness of their deficiencies, as they go through their illness.

Numerous studies have attempted to tackle this fascinating working memory using various means such as decoding its existence at the neuronal level and/or proposing different theoretical models in terms of neuronal activity or brain activation patterns, following such cognitive conceptualization of working memory developed more than four decades ago [7]. For example, from a cognitive neuroscientific perspective, verbal and visual-spatial working memories were studied separately, with the contrast between the two types demonstrated through investigations of patients with overt difficulty in short-term storage for certain verbal or visual activities. Following this, connections or dissociations with various working memory systems (such as phonological loops and visuospatial sketchpad) were created. Broca's and Wernicke's regions are activated by linguistic and acoustic information, whereas visuospatial information is represented in the right hemisphere. The fronto-parietal network, which includes the dorsolateral prefrontal cortex (DLPFC), the anterior cingulate cortex (ACC), and the parietal cortex (PAR), has been identified as the working memory neural network in numerous investigations. More specifically, the DLPFC has been implicated in tasks requiring executive control, such as information integration for decision-making, maintenance and manipulation/retrieval of stored information, or tasks relating to taxing loads (such as capacity limit). Meanwhile, the ACC has been demonstrated to operate as a "attention controller" that assesses the requirement for sensory or perceptual processing modification and adaptation based on task demands, while the PAR has been referred to be the "workspace" for sensory or perceptual processing [8]. It should be noted, however, that current neuroscientific understanding of working memory assumes that, like other cognitive systems, working memory requires the functional integration of the entire brain, and that clearly delineating its roles into multiple components with only a few regions serving as specific buffers is impractical. Nonetheless, seeing the multicomponent working memory model in the brain provides insight into working memory's functional segmentation.

Further research has recently discovered that, in addition to the typically recognised cortical components engaged in verbal working memory, the subcortical layer's basal ganglia also plays a role .Throughout task encoding, the caudate and thalamus were engaged, and the medial thalamus was activated during the maintenance phase, whereas activity in the fronto-parietal network, which comprises the DLPFC and the parietal lobules, was only observed during retrieval. These findings support the idea that during verbal working memory tasks, the basal ganglia enhances attention on a goal while inhibiting irrelevant distractor, which is especially important during the encoding phase.

Because there are so many components of working memory that are yet unknown, as well as its increasing complexity, the cognitive neuroscience foundation of working memory necessitates ongoing research before an entire explanation can be compiled. From the psychological conceptualization of working memory attempted in the multicomponent working memory model (to the neural representations of working memory in the brain, particularly in the frontal regions, one important conclusion drawn from this review of the literatures is that working memory as a psychological construct or a neuroscientific mechanism cannot be investigated as an isolated event [9].

CONCLUSION

In summary, the current paper provides a psychological and neuroscientific description of working memory, including theoretical models of working memory, as well as neural patterns and brain regions involved in working memory in healthy and diseased brains. Working memory is thought to be the foundation for many other cognitive functions in humans, and knowing working memory mechanisms would be the first step toward understanding other parts of human cognition like perceptual or emotional processing.

Following that, it would be reasonable to investigate the relationships between working memory and other cognitive systems.

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