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LEARNING AND MEMORY (ÖĞRENME VE HAFIZA)

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In modern psychiatry the two questions which gained importance during last century to understand normal and deviated behavior are how a human being learn and keep the acquired information in brain. Although these two concepts were initially accepted in the area of psychology rather than psychiatry (or in a restricted field of psychiatry like cognitive and behavioral therapy), with the findings of new researches it is now widely accepted that every psychiatrist working with cognitively deteriorated patients like the demented or schizophrenics should know the basic principles of learning and memory.

For the next few issues, we will overview the forms and biological basis of learning and memory. Then we will go further deep into cognitive dysfunctions in psychiatric disorders especially with the evidence of neuroimaging.

The brain is composed of one hundred billion neurons and each neuron is connected to 10 000 other neurons. But mind within the brain is more than neuronal network and network combinations. Neurons have a capability of changing the strength of existing synapses and of making new synapses (Kandel and et al. 2000).

When an input (from outside or inside) is sensed by the system (brain), the selective processing the aspects of these sensations, called filtering leads to the production of perception (Siegel 2000). These perceptions which are further formed in mental representations are themselves subject to further filtering in which only selected few are placed in working memory (Fig. 1). Working memory, where the mental representations handled consciously, has only limited capacity (7(2 items) (we will go into details of working memory in the forthcoming issues) (Smith and Jonides 1998). Representations are then processed and placed within long-term memory where they can be retrieved for future use. There are many types of long-term memory, although an extensive area of brain has been used for every of them, some parts are more specialized for each type (Fig. 1) (Miller and Mayford 1999).

Two types of long-term memory have been distinguished in the normal human beings. Implicit memory (nondeclarative memory) is unconscious memory which involves in training reflexive motor and perceptual skills. With implicit memory, a human being can learn new motor skills and simple reflexive learning including habituation, sensitization, classical and operant conditioning, and priming. Priming helps us to recall previously seen words or objects unconsciously even if only some part of them is available (Kendell and et al. 2000).

Factual knowledge of people, places and things, and what these facts mean, is referred as explicit memory (or declarative memory). Explicit memory can be recalled by conscious effort and can be declared. Explicit memory can be further classified into two: episodic (events and personal experiences) and semantic (facts). Semantic memory is related to objective knowledge like “a minute is sixty seconds” but episodic memory is related to our personal experience like “I was in Istanbul last summer”.

Medial temporal structures hippocampus and parahippocampal structures (parahippocampal cortex, entorhinal cortex, dentate gyrus and subiculum) play a key role in the encoding new information which consolidate later on with already stored labile information. Thus when an information arises from one or more three model association cortices (the prefrontal, limbic and parieto-occipital-temporal cortices), it is processed by hippocampus and parahippocampal structures than send back to related association cortex without disturbing the existing knowledge or events (Miller and Mayford 1999). That piece of information is now associated with other informa-

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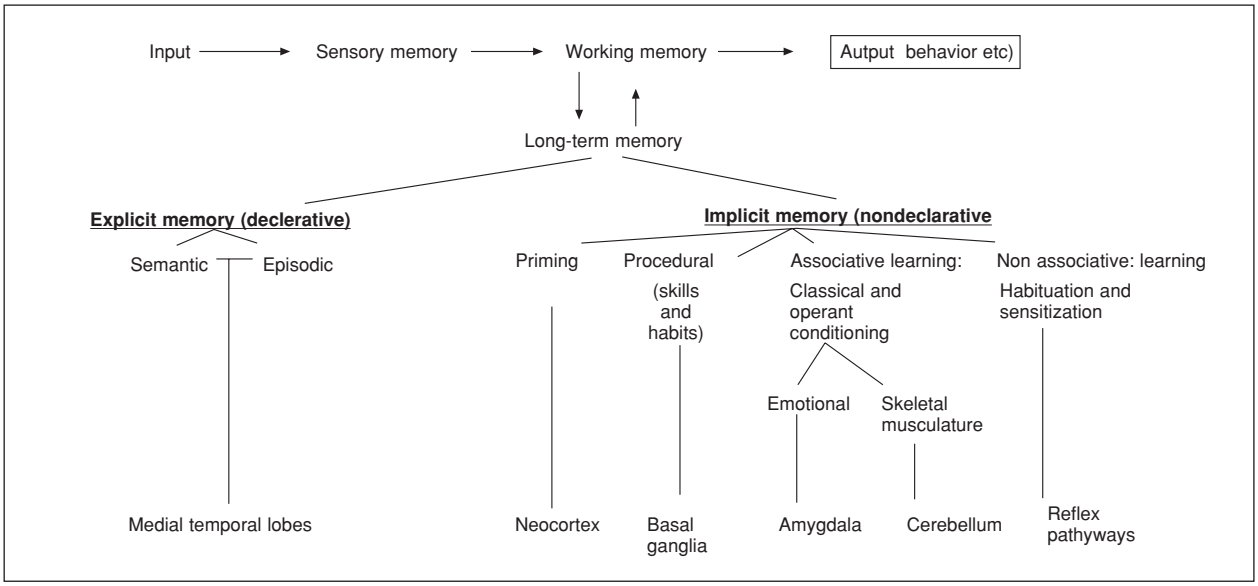
Editörden: Yrd. Doç. Dr. Ali Saffet Gönül, köşesindeki yazısını bu ay İngilizce olarak kaleme aldı. Öğrenme, kaydetme ve hatırlama süreçlerini, kısaca hâfızanın (belleğin) işleme mekanizmalarını anlatacağı ve birkaç sayı sürecek bu yazıları ilgiyle takip edeceğinizi umuyoruz.



tion in the brain. When that piece of information is wanted to be retrieved it is recalled with the associated information. For example when some new information about sharks arrives, it is encoded with the already known facts about sharks in the mind. It is encoded with different categories such as if it is an animal or plant, its' living environment, physical features and behavior patterns. Thus the word "shark" is now associated with all these features previously existing and newly added information. When it is necessary to retrieve back the word "shark", all the associated knowledge can be drawn back.

A number of studies made it clear that the experience of knowledge as a seamless, orderly, and cross-referenced databases is the product of integration of multiple presentations in the brain at many distant anatomical sites, each concerned with only one aspect of the concept that came to mind (Buckner and Koutstaal 1998). For example the posterior parietal cortex is associated with the naming of the objects but left occipitotemporal cortex is associated with object recognition.

KAYNAKLAR

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