Introduction

When I was taking beginning Spanish, at the commencement of my first year, overall it would take about an hour to memorize around forty vocabulary words. As the year went on a similar list of forty words could be mastered in less and less time. By the end of the year, I could memorize and recall from memory all forty words by studying for less than fifteen or twenty minutes.

The question then arises, what went on throughout the year? Was I just naturally smarter, or did something happen? As with any activity the simple observation can be made: the more practice one has, the better their performance will be. Aside from vocabulary is the brain able to better retain information if it must retain more information? If so, can retained information from one source or medium equate to enhanced memorization in another medium? For example, if I had spent a solid hour a day actively memorizing Spanish vocabulary words, would I also be able to better recall the music for an instrument, or have to spend less time memorizing equations for math, or even less time memorizing a script for drama.

Perhaps a good place to start is by defining what exactly is meant by memory. Memory is the mental faculty of retaining and recalling information. Information can be something as dry and boring as Spanish vocabulary or even biology definitions. However, information could also be an activity requiring the recall or a skill such as driving a car, running, swimming, playing baseball, or pretty much anything. There are three basic types of memory. Episodic memory recalling specific events that happened while you were present, Procedural memory remembering a skill involving how to do things, and Semantic Memory recalling generalized knowledge that does not include remembering any specific event but more plain knowledge. For our intents and purposes we will treat memorization mostly on a more narrow and small scale definition using semantic memory as only activities in which a person is actively memorizing. In other words, activities where a person is specifically focused on the task of committing something to memory, and not passively taking in information.

**"**Until recently, the fundamental processes involved in such higher mental functions defied description in the mechanistic terms of science. Indeed, for the greater part of this century, neurobiologists often denied that such functions were accessible to scientific analysis or declared that they belonged strictly to the domain of psychology and philosophy. Within the past two decades, however, neuroscientists have made great advances in the understanding the relation between cognitive processes and the anatomic organization of the brain. As a consequence, even global mental attributes such as thought and [memory] can now be meaningfully studied in the laboratory**."**

-Patricia S. Goldman-Rakic

The actual physiological process of memory is a coordinated activation of neurons in various structures of the brain. In the past, it was thought that memory could be traced to a single structure in the brain, however present research can show that there are multiple components constructed around a distributed network of neurons. In other words, there is a physical structure in the brain for the purpose of memory, however it is not clearly centralized or in one location, but rather spread throughout many structures of the brain.

To a large degree, memorization deals with the physiological aspects of taking in information and recall. However, they physiological side of memory focuses on the function of cells, organs, as well as the nature of physical and chemical changes. The purpose of memorization is to be able to store information and be able to recall it. This function is accomplished through neurons. Neurons are the fundamental units of the nervous system, which allow for this storage and retrieval. Each neuron has the typical cell elements, including an outer membrane and mitochondria. Each neuron has fibers extending away from the cell body. These fibers are called axons and dendrites. Axons carry information away from the cell body, sending it to other neurons. Dendrites receive signals from other axons and carry information to the cell body. So, an axon delivering its signal to the dendrites of a second cell, will cause the second cell to relay its signal down to a third cell, and so on. These communication patterns allow the brain to conduct extremely complex information processing. A single neuron may influence anywhere from 1,000 to 100,000 other neurons.

The collective activity of the brains many neurons can be measured by electrodes attached to the skin or skull. The resulting recordings are called electroencephalograms, or EGGs. Although EGGs can show second-to-second changes in brain activity, their one major disadvantage is that they cannot indicate the precise source of the activity. Positron Emission tomography (a.k.a. PET scanning) can enable the brain to be monitored. This technique relies on the fact that actively firing neurons must increase their oxygen and glucose composition. By marking blood, oxygen or glucose with harmless radioactive substances, areas of increased activity can be detected.

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