

Memory and Physiological Basis of Gender Variations

Preeti Gupta¹, Amit Kant Singh¹, Santosh Kumar Sant¹, Kirti Jaiswal¹, Anamika Singh¹, ANG Hyder¹, Nand Kishor Gupta², Sunita Mittal³, Neeru Garg³, Satendri Devi³, Nidhi Jain³

Abstract

Memory is our ability to encode, store, retain and subsequently recall information and past experiences in the human brain. In order to process and store memory, first it has to be 'fed' with bits and pieces of information, most of which are sourced from auditory and visual bodily facilities. Memory is of two types: short term memory and long term memory. Hippocampus is responsible for immediate memory and for selecting the experiences which need to be transferred to the long term memory.

Keywords: Memory; Short term Memory; Long Term Memory; Hippocampus.

Introduction

Memory is our ability to encode, store, retain and subsequently recall information and past experiences in the human brain [1]. In order to process and store memory, first it has to be 'fed' with bits and pieces of information, most of which are sourced from auditory and visual bodily facilities [2]. Memory is of two types: short term memory and long term memory. Hippocampus is responsible for immediate memory and for selecting the experiences which need to be transferred to the long- term memory [3].

Short term and Long term Memory

Short term memory can be defined as an initial memory buffer that allows us to hold a few units of information for a short period of time while we determine their importance [4]. Short term memory is limited in capacity which could vary in time from seconds to minutes and readily available to conscious awareness. Because of the limited capacity of short term memory, it may work better to rapidly combine the related pieces of information into larger units based on similarities, differences or other patterns

this combining process is called chunking and it is important to make short term memory work more effectively [5].

The fundamental difference between short term and long term memory is that, short term memory involves merely modulation of synaptic transmission by modification of pre-existing proteins. On the other hand, long term memory involves formation of new synaptic connection and synthesis of new protein. The link between short term memory and long term memory, at least in some cases, is cyclic AMP, which can induce only modification of existing proteins in a short time, but if elevation of cyclic AMP is persistent, it can phosphorylate transcriptional regulator proteins, and thereby influence synthesis of new proteins [3].

Short memory is an example of how the brain processes information differently when it is either received through visual stimuli or through auditory stimuli, which are both sensory processes [6]. What we hear and see enters our consciousness and are either accepted or disregarded. Thus accepted information is processed in the brain and stored as memory. Disregarded information is soon forgotten. There are also certain factors that affect auditory and visual memory such as hearing and visual

Author's Affiliations: ¹Department of Physiology, ²Department of Anatomy, UP RIMS & R, Saifai, Etawah, 206130, India. ³Department of Physiology, SGRRIM & HS, Dehradun, India.

Corresponding Author: Nidhi Jain, Professor, Department of Physiology, SGRRIM & HS, Dehradun, India.
E-mail: 5124lovely@gmail.com

impairments, emotional and physical conditions. To ensure that the brain is effective in processing information, it is important that it has the capability to hold specific pieces of data and information and view it as a whole. It must do this by arranging the information into a particular order. Once this order is established, the brain can then form associations between certain elements, piece them together and form a complete memory out of the auditory and visual memories it processes [2].

Short term memory is formed by both auditory and visual information but cortex can process more auditory than visual information at one time, especially when broken into manageable "chunks" thus in the short term memory, auditory information plays a more important role than visual information. Although we usually remember only about seven items in the short term, we can remember longer strings of information, such as telephone or social security numbers, by breaking them into chunks. The way that different sensations are recorded in the brain makes the most difference in how short term memories are formed. Visual data, sensed by the eyes, must be processed by the visual cortex before it is stored in memory and auditory data sensed by the ears and processed by the auditory cortex. Short term memories form largely in the prefrontal cerebral cortex, an area of the brain that continues to process information such as image and speech [7].

Gender and Memory

On the basis of various theories to determine which gender has better short term memory or better capacity to retain recent events; many conclusions are being contemplated. Intellectually, genders seem to be fairly equal; however, cognitive abilities differ greatly among males and females. Because thought processes occur in the brain, it is not surprising that males and females could differ how they process information. The men have better short term memory for certain instances such as logical manoeuvres like direction, electronic circuitry, mathematical reasoning and navigation etc [8].

Women, on average, excel on tests that measure recall of words and on tests that challenge the person to find words that begin with a specific letter or fulfil some other constraint. They also tend to be better than men at rapidly identifying matching items and performing certain precision manual tasks, such as placing pegs in designated holes on a board. Whereas women perform better than men in both verbal memory and verbal fluency we find a large difference in memory [9].

References

1. <http://en.wikipedia.org/wiki/Memory>
2. Matt W. Remembering with eyes and ears auditory versus visual memory. http://www.easybib.com/Research/IndexDec_25_2007.
3. Bijlani RL, Manjunatha S. Physiology of speech, learning, and memory. In: Understanding medical physiology, 4TH ed. Jaypee publication; India: 2011; 702-38.
4. KloetDER, VregdenhIE, OitzIMS, Joel M. Brain corticosteroid receptor balance in health and disease. *J Endocrine Review* 1998; 19: 2696-301.
5. Üster S. The Role of Brain Based Gender Differences on the Vocabulary Learning and Consolidation Skills and Strategies. *J Graduate School of Social Sciences*, 2008; 1-169.
6. Hilton E. Differences in visual and auditory short term memory. *J Undergraduate Research* 2001; 4.
7. Levenberg L. Difference Between Short Term Auditory and Visual Memory. http://www.ehow.com/info_8568100_difference-term-auditory-visual-memory.html.
8. NirmalA. Does gender affect short term memory. <http://www.buzzle.com/article/> accessed july21 2009.
9. Kimura D. Sex difference in the brain. *J Scientific American*, 2002; 32-7.