الذاكرة في علم النفس

Memory in Psychology

م.م. زهراء حامد عبيد

ماجستير في اللغة الانكليزية

كلية الحلة الجامعة

Assist. Lec. Zahra' Hamid Obeid

M.Sc.. In English
Hilla University College

(قَدم للنشر في 20/ 12 / 2023 ، وقَبل للنشر في 20 / 2 / 2024)

الملخص

الذاكرة تلعب علينا طوال حياتنا. هل شعرت يومًا بالحرج لأنك لم تتمكن من تذكر اسم شخص معروف كنت تتحدث إليه؟ أو قلقًا وعاجزًا لأن كل ما حفظته جيدًا في اليوم السابق قبل إجراء الامتحان الخاص بك أصبح فجأة غير متوفر؟ إن الذاكرة حقًا هي قدرة بشرية رائعة جدًا، ولكنها مثيرة للاهتمام. فهو يعمل على الحفاظ على إحساسنا بمن نحن، ويحافظ على علاقاتنا الشخصية ويساعدنا في حل المشكلات واتخاذ القرارات. نظرًا لأن الذاكرة أساسية لجميع العمليات المعرفية تقريبًا مثل الإدراك والتفكير وحل المشكلات، فقد حاول علماء النفس فهم الطريقة التي يتم بها حفظ أي معلومات في الذاكرة، والآليات التي يتم من خلالها الاحتفاظ بها على مدى فترة من الزمن، وأسباب فقدانها من الذاكرة. الذاكرة، والتقنيات التي يمكن أن تؤدي إلى تحسين الذاكرة. يمتد تاريخ الأبحاث النفسية حول الذاكرة إلى أكثر من مائة عام. ويعود الفضل في أول استكشاف منهجي للذاكرة إلى هيرمان، وهو عالم نفس ألماني عاش في أواخر القرن التاسع عشر (1885). لقد أجرى العديد من التجارب على نفسه ووجد أننا لا ننسى المادة التي تعلمناها بوتيرة متساوية أو كاملة. في البداية يكون معدل النسيان أسرع ولكنه يستقر في النهاية. وجهة نظر أخرى حول الذاكرة اقترحها فريدريك بارتليت (1932) الذي أكد أن الذاكرة ليست سلبية، ولكنها عملية نشطة. وبمساعدة المواد اللفظية ذات المغزى مثل القصص والنصوص، أثبت أن الذاكرة هي عملية بناءة. أي أن ما نتذكره ونخزنه يخضع للعديد من التغييرات والتعديلات مع مرور الوقت. إذن هناك فرق نوعي بين ما حفظناه في البداية وبين ما نسترجعه أو نتذكره فيما بعد. هناك علماء نفس آخرون أثروا في أبحاث الذاكرة بشكل كبير.

الكلمات المفتاحية : الذاكرة ، العمليات المعرفية ، الأبحاث النفسية .

Abstract

Memory plays on us throughout our lives. Haveyou ever felt embarrassed because you could not remember the name of a knownperson you were talking to? Or anxious and helpless because everything youmemorized well the previous day before taking your examination has suddenly become unavailable?

Memory indeed is a very fascinating yetintriguing human faculty. It functions to preserve our sense of who we are, maintainsour interpersonal relationships and helps us in solving problems and takingdecisions. Since memory is central to almost all cognitive processes such asperception, thinking and problem solving, psychologists have attempted tounderstand the manner in which any information is committed to memory, themechanisms through which it is retained over a period

of time, the reasons why itis lost from memory, and the techniques which can lead to memory improvement.

The history of psychological research on memory spans over hundred years.The first systematic exploration of memory is credited to Hermann, aGerman psychologist of late nineteenth century (1885). He carried out manyexperiments on himself and found that we do not forget the learned material at aneven pace or completely. Initially the rate of forgetting is faster but eventually it stabilizes. Another view on memory was suggested by Frederick Bartlett (1932)who contended that memory is not passive but an active process. With the help of meaningful verbal materials such as stories and texts, he demonstrated that memory is constructive process. That is, what we memories and store undergoes manychanges and modifications over time. So there is a qualitative difference in whatwas initially memorized by us and what we retrieve or recall later. There are otherpsychologists who have influenced memory research in a major way.

Keyword : **Memory, cognitive processes, psychological research**

Introduction

NATURE OF MEMORY

Memory refers to retaining and recalling information over a period of time, dependingupon the nature of cognitive task you are required to perform. It might be necessary tohold an information for a few seconds. Forexample, you use your memory to retain an unfamiliar telephone number till you have reached the telephone instrument to dial, orfor many years you still remember thetechniques of addition and subtraction which you perhaps learned during your early schooling. Memory is conceptualized as a process consisting of three independent, though interrelated stages. These are**encoding**, **storage**, and **retrieval**.

(Atkinson, R. C. & Shiffrin, R. M p,34-55 , 1968)

Anyinformation received by us necessarily goes through these stages.

(a) ***Encoding***is the first stage which refers to a process by which information is recordedand registered for the first time so that it becomes usable by our memory system. Whenever an external stimulus impinges on our sensory organs, it generates neuralimpulses. These are received in different areas of our brain for further

processing. In encoding, incoming information is received and some meaning is derived. It is thenrepresented in a way so that it can be processed further. (Ibid)

(b) ***Storage***is the second stage of memory. Information which was encoded must also bestored so that it can be put to use later.Storage, therefore, refers to the process through which information is retained and held over a period of time.(Ibid, p 43)

(c) ***Retrieval***is the third stage of memory. Information can be used only when one is able to recover it from her/his memory. Retrievalrefers to bringing the stored information to her/his awareness so that it can be used for performing various cognitive tasks such as problem solving or decision-making. It may be interesting to note that memory failure canoccur at any of these stages. You may fail to recall an information because you did notencode it properly, or the storage was weak so you could not access or retrieve it when required.(Ibid , p 45)

INFORMATION PROCESSING APPROACH :

THE STAGE MODEL

Initially, it was thought that memory is the capacity to store all information that weacquire through learning and experience. Itwas seen as a vast storehouse where all information that we knew was kept so thatwe could retrieve and use it as and when needed. But with the advent of the computer, human memory came to be seen as a systemthat processes information in the same way as a computer does. Both register, store, andmanipulate large amount of information and act on the basis of the outcome of such manipulations. If you have worked on a computer then you would know that it has a temporary memory (random access memoryor RAM) and a permanent memory (e.g., a hard disk). Based on the programmer commands, the computer manipulates the contents of itsmemories and displays the output on the screen. In the same way, human beings tooregister information, store and manipulate

the stored information depending on the task that they need to perform. For example, when you are required to solve a mathematical problem, the memory relating to mathematical operations, such as division or subtraction are carried out, activated and put to use, andreceive the output (the problem solution). Thisanalogy led to the development of the firstmodel of memory, which was proposed by Atkinson and Shiffrin in 1968. It is known as **Stage Model**.

(Baddeley, A. D., & Longman, D. J. (1978) p 66)

Section One

MEMORY SYSTEMS :

SENSORY, SHORT-TERM AND LONG-TERM MEMORIES

According to the Stage Model, there are three memory systems : the **Sensory Memory**, the **Short-term Memory** and the **Long-termMemory**. Each of these systems have different features and perform different functions withrespect to the sensory inputs.

Sensory Memory

The incoming information first enters the *sensory memory*. Sensory memory has a large capacity. However, it is of very short duration, i.e. less than a second. It is a memory systemthat registers information from each of thesenses with reasonable accuracy. Often this system is referred to as sensory memories or sensory registers because information from all he senses are registered here as exact replied of the stimulus. If you have experienced visual after-images (the trail of light that stays afterthe bulb is switched off) or when you hearreverberations of a sound when the

sound has ceased, then you are familiar with iconic (visual) or echoic (auditory) sensory registers. (Ibid)

Short-term Memory

In this type the person perhaps do not attendto all the information that impinge on his /hersenses. Information that is attended to entersthe second memory store called the *short-term* m*emory* (abbreviated as STM), which holdssmall amount of information for a brief period of time (usually for 30 seconds or less).Atkinson and Schifrin propose that information in STM is primarily encoded acoustically, i.e. in terms of sound and unless rehearsed continuously, it may get lost fromthe STM in less than 30 seconds. Note that the STM is fragile but not as fragile as sensoryregisters where the information decaysautomatically in less than a second.

Long-term Memory

Materials that survive the capacity and duration limitations of the STM finally enterthe *long-term memory* (abbreviated as LTM) which has a vast capacity. It is a permanent storehouse of all information that may be asrecent as what you ate for breakfast yesterday to as distant as how you celebrated your sixth birthday. It has been shown that once anyinformation enters the long-term memorystore it is never forgotten because it gets encoded semantically, i.e. in terms of themeaning that any information carries. Whatyou experience as forgetting is in fact retrieval failure; for various reasons you cannot retrievethe stored information. You will read about retrieval related forgetting later in this chapter. So far we have only discussed the structural features of the stage model. Questions whichstill remain to be addressed are how does information travel from one store to another and by what mechanisms it continues to stay in any particular memory store. Let us examine the answers to these questions. How does information travel from one store to another? As an

answer to this question, Atkinson and Shiffrin propose the notion of **control processes** which function to monitor the flow of information through various.

working memory

Psychologists have suggested that the short-term memory is not unitary, rather it mayconsist of many components. This multicomponent view of short-term memory was first proposed by Baddeley (1986) who suggested that the short-term memory is not a passive storehouse but rather a work bench that holds a wide variety of memory materials that are constantly handled, manipulated and transformed as people performvarious cognitive tasks. This work bench is called the working memory.

The first component of the working memory is the phonological loop ,holds a limited number of sounds and unless rehearsed they decay within 2 seconds.

The second componentvisuospatial sketchpad stores visual and spatial information and like phonological loop the capacity of the sketchpad too is limited. The third component, which Baddeley calls the Central Executive, organizes information from phonological loop, visuospatial sketchpad as well as from the long-term memory. Like a true executive, it allocates attentional resources to be distributed to various information needed to perform a given cognitive operation and monitors, plans, and memory stores. As suggested earlier, all information which our senses receive are notregistered; if that be the case, imagine the kindof pressure that our memory system will have to cope with. Only that information which is attended to enters the STM from sensoryregisters and in that sense, selective attention, thefirst control process that decides what willtravel from sensory registers to STM. Sense impressions, which do not receive attention, fade away quickly. The STM then sets into motion another control process m**aintenance rehearsal** to retain the

information for as much time as required. As the name suggests, these kinds of rehearsals simply maintain information through repetition and when such repetitions discontinue the information is lost. Anothercontrol process, which operates in STM to expand its capacity, is **Chunking**.

As against maintenance rehearsals, which arecarried through silent or vocal repetition, this rehearsal attempts to connect the 'to beretained information' to the already existing information in long-term memory. For example, the task of remembering the meaning of the word 'humanity' will be easier if the meanings of concepts such as 'compassion','truth' and 'benevolence' are already in place.

LEVELS OF PROCESSING

The levels of processing view was proposedby Craik and Lockhart in 1972. This viewsuggests that the processing of any newinformation relates to the manner in which itis perceived, analyzed, and understood whichin turn determines the extent to which it willeventually be retained. Although this view hasundergone many revisions since then, yet itsbasic idea remains the same.

Craik and Lockhart proposed that it ispossible to analyse the incoming informationat more than one level. One may analyse it interms of its physical or structural features For example, one might attend only to theshape of letters in a word say cat - in spite ofwhether the word is written in capital or smallletters or the colour of the ink in which it iswritten. This is the first and the shallowestlevel of processing. At an intermediate levelone might consider and attend to the phoneticsounds that are attached to the letters andtherefore the structural features aretransformed into at least one meaningful wordsay, a word cat that has three specific letters. Analyzing information at these two levelsproduces memory that is fragile and is likelyto decay rather quickly. However, there is athird and the deepest level at whichinformation

can be processed. In order toensure that the information is retained for alonger period, it is important that it getsanalyzed and understood in terms of itsmeaning. For instance, you may think of catas an animal that has furs, has four legs, atail, and is a mammal. You can also invoke animage of a cat and connect that image withyour experiences. To sum up, analyzing information in terms of its structural andphonetic features amounts to shallowerprocessing while encoding it in terms of themeaning it carries (the semantic encoding) isthe deepest processing level that leads tomemory that resists forgetting considerably.Understanding memory as an outcome ofthe manner in which information is encodedinitially has an important implication forlearning. This view of memory will help you realize that while you are learning a newlesson, you must focus on elaborating themeaning of its contents in as much detail aspossible and must not depend on rote memorization. Attempt this and you will soonrealize that understanding the meaning ofinformation and reflecting on how it relatesto other facts, concepts, and your life.

TYPES OF LONG-TERM MEMORY

The short-termmemory is now seen as consisting of more thanone component (working memory). In the sameway it is suggested that long-term memory toois not unitary because it contains a widevariety of information. In view of this,contemporary formulations envisage longtermmemory as consisting of various types.For instance, one major classification withinthe LTM is that of **Declarative** and **Procedural**(sometimes called nondeclarative) memories.All information pertaining to facts, names,dates, such as a rickshaw has three wheels orthat India became independent on August 151947 or a frog is an amphibian or you andyour friend share the same name, are part ofdeclarative memory. Procedural memory, onthe other hand, refers to memories relating toprocedures for accomplishing various tasksand skills such as how to ride a bicycle, howto make tea or play

basketball. Facts retainedin the declarative memory are amenable toverbal descriptions while contents ofprocedural memory cannot be describedeasily. For example, when asked you candescribe how the game of cricket is played butif someone asks you how do you ride a bicycle,you may find it difficult to narrate.Tulving has proposed yet anotherclassification and has suggested that thedeclarative memory can either be **Episodic** or**Semantic**.**Episodic memory** contains biographicaldetails of our lives. Memories relating to ourpersonal life experiences constitute theepisodic memory and it is for this reason thatits contents are generally emotional in nature.How did you feel when you stood first in yourclass? Or how angry was your friend and whatdid s/he say when you did not fulfill a promise? Althoughsuch experiences are hard to forget, yet it isequally true that many events take placecontinuously in our lives and that we do notremember all of them. Besides, there arepainful and unpleasant experiences which arenot remembered in as much detail as pleasantlife experiences.The study of memory is a fascinating field andresearchers have reported many new phenomena.The following phenomena show the complex anddynamic nature of human memory.

Flashbulb Memories : These are memories ofevents that are very arousing or surprising. Suchmemories are very detailed. They are like a phototaken with an advanced model camera. You canpush the button, and after one minute you have arecreation of the scene. You can look at thephotograph whenever you want. Flashbulbmemories are like images frozen in memory andtied to particular places, dates, and times.Perhaps, people put in greater effort in theformation of these memories, and highlightingdetails might lead to deeper levels of processingas well as offer more cues for retrieval.

Autobiographical Memory : These are personalmemories. They are not distributed evenlythroughout our lives. Some periods in our livesproduce more memories than

others. For instance,no memories are reported pertaining to earlychildhood particularly during the first 4 to 5 years.This is called **childhood amnesia**. There is adramatic increase in the frequency of memoriesjust after early adulthood, i.e. in the twenties.Perhaps emotionality, novelty, and importance ofLong-term Memory Classificationevents contribute to it. During old age, the most recentyears of life are likely to be well remembered. However,before this, around 30 years of age, decline in certainkinds of memory starts.

Implicit Memory : Recent studies have indicated that many of the memories remain outside the conscious awareness of a person. Implicit memory is a kind of memory that a person is not aware of. It is a memory that is retrieved automatically. Oneinteresting example of implicit memory comes from the experience of typing. If someone knows typing that means s/he also knows the particular letters on the keyboard. But many typists cannot correctly label blank keys in a drawing of a keyboard. Implicit memories lie outside the boundaries of awareness. In other words, we are not conscious of the fact that a memory or record of a given experience exists.

Nevertheless, implicit memories do influence our behaviour. This kind of memory was found in patients suffering from brain injuries. They were presented a list of common words. A few minutes later the patientwas asked to recall words from the list. No memory was shown for the words. However, if s/he was prompted to say a word that begins with these letters and two letters are given, the patient was able to recall words. Implicit memories are also observed in people with normal memories.

Semantic memory, on the other hand, is the memory of general awareness and knowledge. All concepts, ideas and rules of logic are stored in semantic memory. For instance, it is because of semantic memory that we remember the meaning of say ‘nonviolence’ or remember that 2+6=8 or the STD code of New Delhi is 011 or that the word ‘elaphant’ is misspelt. Unlike episodic memorythis kind of memory is

not dated; you perhapswill not be able to tell when you learnt the meaning of non-violence or on which date you came to know that Bangalore is the capital of Karnataka. Since the contents of semantic memory relate to facts and ideas of general awareness and knowledge, it is affect-neutral and not susceptible to forgetting.

Methods of Memory Measurement

There are many ways in which memory is measured experimentally. Since there are many kinds of memories, any method appropriate for studying one type of memory may not be suited for studying another. The major methods which are used for memory measurement are being presented here

a) Free Recall and Recognition (for measuring facts/episodes related memory) : In free recall method, participants are presented with some words which they are asked to memorize and after some time they are asked to recall them in any order. The more they are able to recall, the better their memory is. In recognition, instead of being asked to generate items, participants see the items that they had memorized along with distracter items (those that they had not seen) and their task is to recognize which one of those they had learnt. The greater the number of recognition of 'old items', better is the memory .

b) Sentence Verification Task (for measuring semantic memory) : As you have already read, Methods of Memory Measurement semantic memory is not amenable to any forgetting because it embodies general knowledge that we all possess. In sentence verification task, the participants are asked to indicate whether the given sentences are true or false. Faster the participants respond, better retained is the information needed to verify those sentences.

c) Priming (for measuring information we cannot report verbally) : We store many kinds ofinformation that we can't report verbally – for instance, information necessary to ride a bicycle or play a sitar. Besides, we also store information that we are not aware of, which is described as implicit memory. In priming method, participants are shown a list of words, such as garden, playground, house, etc. and then they are shown parts of these words like gar, pla, ho, along with parts of other words they had not seen. Participants complete parts of seen words more quickly than parts of words they had not seen. When asked, they are often unaware of this and report that they have only guessed.

Section Two

Knowledgerepresentation and organization in Psychology

In this section we will take a look at the organizational structure that the contents of long-term memory acquire over a period of time. Since long-term memory holds a very large amount of information which is put to use with amazing efficiency, it would be very useful to know how our memory system organizes its contents so that the right information is available at the right moment.

It is important to note at this point that many ideas relating to organization of the content of long-term memory have resulted fromexperiments that have employed semantic retrieval tasks. You will perhaps agree that there cannot be any error in recalling the contents of semantic memory. For anyone who knows that birds fly will not make a mistake in answering a question — Do birds fly? The answer will be in affirmative. But people may take variable lengths of time in answering

questions, which require semantic judgments. While responding to question 'Do birds fly?' a person will take not more than a second but answering a question 'Are birds animals'? may take longer. Depending upon how much time people take in responding to questions such as these, the nature of organization in longterm memory has been inferred. The most important unit of representationof knowledge in long-term memory is a concept. **Concepts** are mental categories for objects and events, which are similar to each otherin one or in more than one way. Concepts once formed get organized in categories — a category itself is a concept but it also functions to organize similarities among other concepts based on common features. For example, the word mango is a categorybecause different varieties of mangoes can be subsumed within it and it is also a conceptwithin the category of fruit. Concepts may also There are many ways in which memory ismeasured experimentally. Since there are manykinds of memories, any method appropriate forstudying one type of memory may not be suitedfor studying another.

Memory as contractive processes

If you were to carefully examine the initial explorations about memory processes, you will perhaps conclude that memory primarily consists of reproduction of stored materials. This view was held by Ebbinghaus and his followers who emphasized the quantity of information that can be stored in the memory and judged its accuracy by matching the contents of storage and reproduction. If the reproduced version of the stored material showed any deviation, it was seen as an error and a case of memory failure. This storage metaphor of memory implied that the memory was a passive occurrence of learnt material that has been transported to its long-term storehouse. This position was challenged by Bartlett in the early thirties who contended that memory is an active process and all thatwe have stored undergoes continuous change and modification. What we memorize is influenced by the meaning we assign to the

stimulus material and once it is committed to our memory system, it cannot remain in isolation from other cognitive processes. In essence, therefore, Bartlett saw memoryas a constructive and not a reproductive process. Using meaningful materials such as texts, folk tales, fables, etc. Bartlett attempted to understand the manner in which content of any specific memory gets affected by a person's knowledge, goals, motivation, preferences and various other psychological processes. He conducted simple experiments in which reading of such stimulus materialswas followed by fifteen minutes break and then the participants of his experiment recalled whatthey had read. Bartlett used the method of serial reproduction in which the participantsof his experiments recalled the memory materials repeatedly at varying time intervals. While engaging in serial reproduction of learned material his participants committed a wide variety of 'errors' which Bartlett considered useful in understanding the process of memory construction. His participants altered the texts to make them more consistent with their knowledge, glossed over the unnecessary details, elaborated the main theme and transformed the material tolook more coherent and rational. In order to explain such findings, Bartlett invoked the term schema, which according to him 'was an active organization of past reactions and past experiences'. Schemas refer to an organization of past experiences and knowledge, which influence the way in whichincoming information is interpreted, stored, and later retrieved. Memory, therefore, becomes an active process of construction where information is encoded and stored in terms of a person's understanding and within her/his previous knowledge and expectations.

Nature and cusses of Forgetting

Each one of us has experienced forgetting and its consequences almost routinely. Why do weforget? Is it because the information we commit to our long-term memory

is somehow lost? Is it because we did not memorize it well enough? Is it because we did not encode the information correctly or is it because during storage, it got distorted or misplaced? Many theories have been forwarded to explain forgetting and now you will read about those that seem plausible and have received considerable attention. The first systematic attempt to understand the nature of forgetting was made by HermannEbbinghaus, who memorized lists of nonsensesyllables.

Conclusion

Memory is seen as consisting of three interrelated processes of encoding, storage and retrieval.While encoding is registering the incoming information in a way that it becomes compatibleto the memory system, storage and retrieval refers to holding the information over a periodof time and bringing the information back to one's awareness, respectively.

The Stage Model of Memory compares memory processes with the working of a computerand suggests that incoming information is processed through three distinct stages of sensorymemory, short-term memory and long-term memory.Levels of processing view of memory contends that the information can be encoded at any of the three levels, namely, the structural, the phonetic and the semantic. If an informationis analyzed and encoded semantically, which is the deepest level of processing, then itleads to better retention.

Long-term memory has been classified in many ways. One major classification is that ofdeclarative and procedural memory and another is that of episodic and semantic memory. Contents of long-term memory get represented in terms of concepts, categories and imagesand are organized hierarchically.

Forgetting refers to loss of stored information over a period of time. After a material is learnt,there is a sharp drop in its memory and then the decline is very gradual. Forgetting has been explained as resulting from trace decay and interference. It may alsobe caused due to absence of appropriate cues at the time of retrieval.

Memory is not only a reproductive but also a constructive process. What we store undergoeschange and modification within one's past knowledge and schema.

Mnemonics are strategies for improving memory. While some mnemonics use images, otheremphasizeorganization of the learnt material.

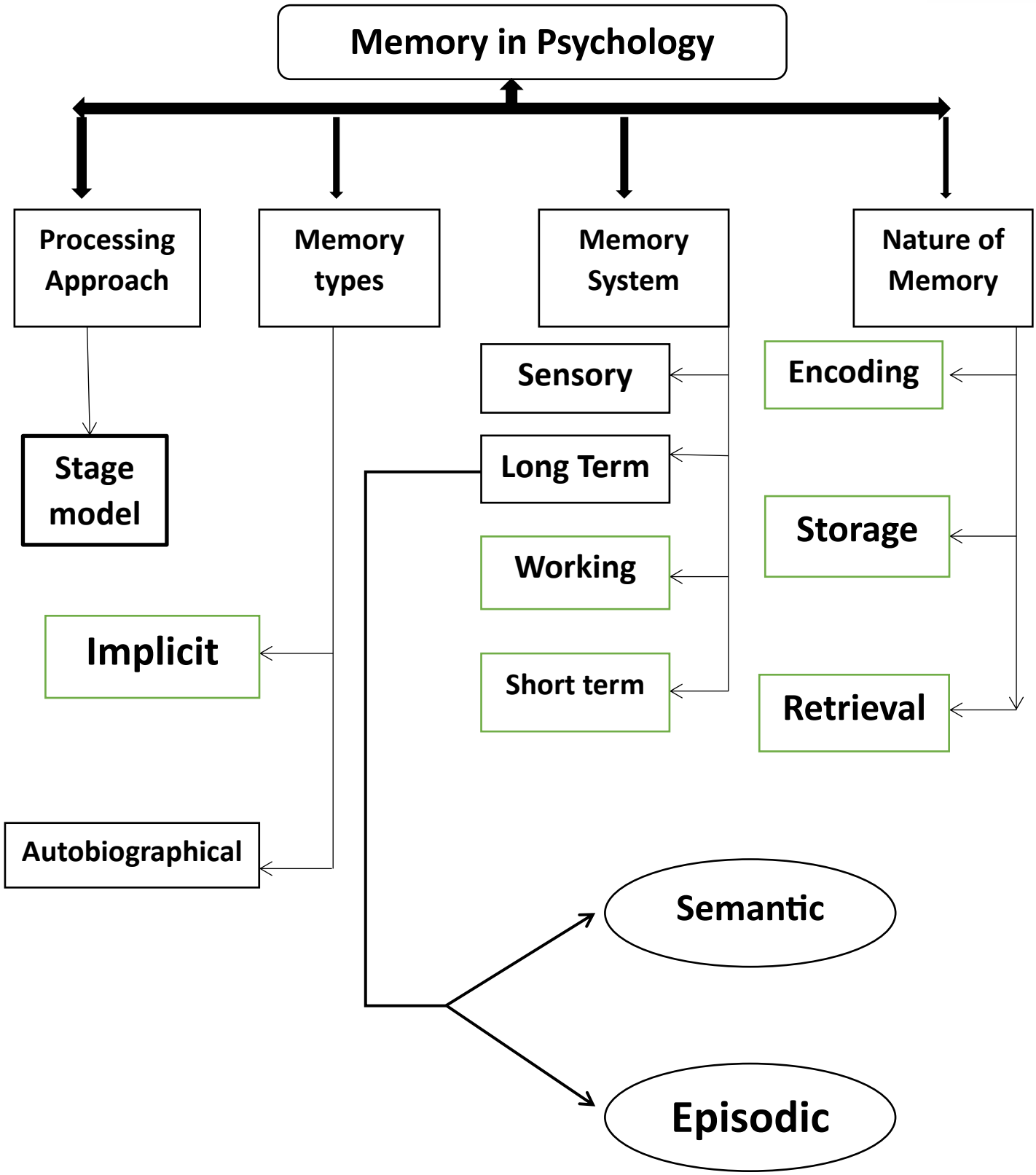

Table 1 , The main principle of memory in psychology

References

-Atkinson, R. C. & Shiffrin, R. M. (1968). Human memory: A proposed system and itscontrol processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learningand motivation (pp. 89-195). New York, NY: Academic Press.

-Baddeley, A. D., & Longman, D. J. (1978). The influence of length and frequency of training sessions on the rate of learning to type. Ergonomics, 21, 627-635.

-Bahrick, H. P. (1984). Semantic memory content in permastore: Fifty years of learningand memory. Journal of Experimental Psychology: General, 113, 1-127.

-Brown, J. (1958). Some tests of the decay theory of immediate memory. Quarterly Journalof Experimental Psychology, 10, 12-21.

-Carrier, M., &Pashler, H. (1992). The influence of retrieval on retention. Memory andCognition, 20, 632-642.

- Cepeda, N. J., Vul, E., Rohrer, D., Wixted, J. T., &Pashler, H. (2008). Spacing effects inlearning. Psychological Science, 19, 1095-1102.

-Chase, K., & Ericsson, W. G. (1982). Exceptional memory. American Scientist, 70, 607-615.

-Chase, W. G., & Simon, H. A. (1973). The mind's eye in chess. In W. G. Chase (Ed.),Visual information processing. New York: Academic Press.

-Conrad, R. (1964). Acoustic confusions in immediate memory. British Journal of Psychology, 55, 75-84.

-Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memoryresearch. Journal of Verbal Learning and Verbal Behavior, 11, 671-684.

-Einstein, G. O., & McDaniel, M. A. (2005). Prospective memory: Multiple retrieval processes.

- Current Directions in Psychological Science, 14, 286-290.

-Gates, A. I. (1917). Recitation as a factor in memorizing. Archives of Psychology, 6(40).

-Godden, D. R., & Baddeley, A. D. (1975). Context-dependent memory in two naturalenvironments: On land and underwater. British Journal of Psychology, 66, 325-331.

-Jacoby, L. L. (1983). Remembering the data: Analyzing interactive processes in reading.Journal of Verbal Learning and Verbal Behavior, 22, 485-508.