The Role of the Ambient and Internal Context in the Process of Memory Functionality Optimization

Laura Viorela Kovacs[1]

Abstract: Purpose of this research is to observe that there is a correlation between the organization/structuring of information during encoding, the environmental context, the internal/emotional state of the subject during encoding, and the optimization / improvement of the memory functionality in the process of updating the information. Considering this premise, the research aims to observe that if the environmental and internal context existing in the encoding process is similar to the one existing in the updating process, there will be a beneficial effect on the efficiency of updating the information, whether presented in an organized, structured manner. The study aims to demonstrate that the data refresh processes can also be influenced by emotional factors, in which emotion may enhance memory performance (eg flash memories or state-dependent learning). The absence of any affectionate or motivational burden always results in superficial and short-term impress.

Keywords: memory, encoding, updating process, environmental context, context internal-emotional, systematization-organization-structuring

1. Introduction

1.1. Defining the Memory Concept

Memory is the cognitive process of memorizing (encoding), storing (retaining) and updating our information and experiences. It does not reduce itself to that. If we present meaningless syllables to some subjects, in their remembrance, they will appeal to the syllabus grouping. If we present them words, they will regroup them after a series of criteria. Therefore, it is not a simple, structured, constructive psychic mechanism, but it can even be creative. The necessary quality of memory

[1] Student, 3nd year, Faculty of Communication and International Relations, specialization Psychology, Danubius University of Galați, Romania, Adress: 3 Galați Blvd. Galati 800654, Romania, Tel.: +40372361102, Fax: +40372361290, Coresponding author: latvio@yahoo.com.

derives from the fact that it is involved in the great behaviors of human life: knowledge and learning, understanding and problem solving, intelligence and creativity, memory ensuring the continuity of the individual's psychic life.

Memory is in close interaction and interdependence with all other processes, attributes and psychic capacities, being the result of the contact of the sense organs with the surrounding reality, which highlights the connection of memory with the sensory mental processes.

Memory does not just mean the accumulation of information, but also the organization and even structuring of it, thereby referring to thinking. We only remember and update what we like, that corresponds to desires, aspirations, which reveals the connection of memory with affective-motivational processes. Memory also involves the presence of a volunteer effort, thus making its connection to the will. Also, personality traits will have an impact on what we memorize or update: an optimist will retain certain aspects of reality in reading a novel, unlike a pessimist (Etco et al., 2007).

Through the mnesic dimension, the psychic system exists as a specific entity, with continuity and stability over time. Memory does not intervene from the outside in structuring and integrating the known psychic processes - perception, thinking, imagination, emotional experiences, etc. - but is part of their very own internal structure. Thus, the memory link is a structural component of the entire mental system, representing the setting and preservation of its past (Golu, 2007).

1.2. The Memory Processes

Regarding the memory processes, researchers agreed on the number, nature, functions and specificities of these processes. Thus, while traditional psychology prefers the terms of memory (or imprinting, fixation, engraving), preservation (or restraint, preservation), updating (or reactivation), modern psychology from a psychocognitive perspective, processing information, resorts to terms such as encoding, storage, and recovery/refresh. To remember information, it must first be mentally fixed, then stored and finally updated.

1. Encoding means translating information into a particular code (material or ideal). Encoding is the first process or the first phase completed by the memory mechanisms in their dynamics. Generally, three types of codes are used - visual, auditory, semantic, meaning there are three types of encoding:

1) visual encoding, which uses the image code;

2) audio encoding, using the sound code (physical and verbal);

3) semantic encoding, which is specific to the sentence code.

Besides these codes, on which traditional psychology has focused more, there are of course many others. Various skills (cycling or swimming) are fixed in a motor code. Other sensory information (olfactory, taste, tactile, thermal, etc.) also uses a number of memory codes, even if they are less well known and researched.

2. Storing is the process of retaining information until it is needed to make it available. Storage time (the time that elapses between the input and output of memory information) is extremely varied. Sometimes it is very short, the stored material wiping almost immediately, sometimes average, there are cases when it covers even the entire life of the individual. The variable storage time has been the basis for distinguishing between different types of memory: short-term memory (working memory), medium-time memory, immediate or operational memory, tactical memory (similar to the average duration) and strategic memory long-lasting memory (its purpose is to make a confrontation, a synthesis between the traces of stimuli and similar experiences previously stored and the new data to be memorized).

Storage dynamics imply fidelity, amplification, and diminution of stored material. Storage fidelity depends on the quality of the encoding, if it is done under proper conditions. The most important mechanism of encoding, which provides it with the quality, is that of linking the information to be retained (the principle of association).

The active rearrangement of data (words, information) allows them to be reminded by categories even if they were presented at random. The phenomenon is called "clustering" - organizing the material by category. The grouping of information during storage is based on a number of criteria, such as:

- familiarity;
- personal relevance;
- shape and sound;
- the degree of resemblance or differentiation.

The positive role of organizing information has two arguments:

1) space economy; organized information, grouped into categories, occupies a smaller space than the unorganized one;

2) facilitating recovery, organization provides the opportunity to recover all the information contained in a unit.

The diminution, degradation and disappearance (deletion) of stored material in the memory is based on the forgetting mechanism.

The three phenomena we have referred to - storage fidelity, enrichment of stored content, and degradation of stored material - concomitantly with their adjacent mechanisms, highlight the active, dynamic character of storage. At the same time, they reveal the significance of the storage process in the memory process chain, the quality of the preservation largely depending on the quality of the next process.

3. Recovery is the process of memory, which consists of revealing the contents encoded and stored for their use according to requests and needs. Some authors consider that the process of "searching" information in memory occurs automatically on a predetermined path. For others, recovery is an active process in which the subject sets recovery pointers. Other authors have conceived recovery as a process carried out in at least two stages: an initial search phase and a decision step based on the close characteristics of the information retrieved (Etco et al., 2007).

Recognition and reproduction are mechanisms of recovery. The difference between recognition and reproduction consists in the fact that recognition is achieved in the presence of the material object (material stimulus, image, etc.), and reproduction is performed in the absence of the stimulus (the stimulus to be updated). (Zlate, 2009) Recognition is relatively simple, involving only perceptual processes, while reproduction is more complex and difficult because it involves the call to thought. Recognition involves overlapping the current model over that in the mind of the subject, while reproducing - confronting and comparing mental models in order to extract the optimal one. They resemble the fact that they have involuntary and voluntary forms (Zlate, 2009).

Both recognition and reproduction have different degrees of precision. Thus, they can be very precise, rigorous, but also vague, imprecise to memorization and preservation. There is a close interaction and interdependence between memory processes. The conditions and contents of the memorization and updating are closely related, however, the latter's dependence on the former must not be absolute (it is not mandatory for an easily memorized material to be as easily and quickly reproduced). Neither their succession (memorization - preservation -

reproduction) deserves to be absolutized (there are cases when a stored material is no longer replicated, being "pushed" into the unconscious tank, not updated or material can be stored, reproduced, but not recognized, the individual not realizing that the material in question was the object of his conscience) (Etco et al., 2007).

The memory processes are made easier or laboriously, faster or slower, with higher or lower energy and time consumption, with high or low efficiency depending on a number of factors. These could be divided into two major categories:

1) the particularities of the material to be memorized;

2) the psychophysiological features of the subject

The first category includes:

The nature of the material, which can be intuitively objectual or abstract, descriptive or explanatory-rational, meaningful or lacking in logical, theoretical or utilitarian sense. Research has shown that an intuitive-sensorial material (object images) is easier to grasp than a symbolic-abstract one (words). Age alters this principle, however, students reproducing abstract words more readily than intuitive images.

Organizing the material (high, medium, low). A material that has a high degree of organization and structuring will be better memorized than another with less organization and structure. The serial organization of the material produces an interesting effect, depending on the position occupied by the serial material. Investigations have shown that the elements at the beginning and end of the series are better memorized than those in the middle. Better detention of elements at the beginning of the series was called primacy effect (MSD), and the end-of-series regency effect (MLD). (Etco et al., 2007)

The question is why the hierarchical organization improves memory? The answer could come from the fact that, through the hierarchical organization, we can divide the vast search process into a smaller sequence: this reduces the situations in which we can stumble through the appearance of the same word several times, as it is happens when we memorize unorganized material (Raaijmakers & Shiffrin, 1981; Gillund & Shiffrin, 1984) (Atkinson, 2002).

The homogeneity of the material produces the following 3 effects: 1) the Robinson effect (1924) - a homogeneous series (only letters, words or geometric figures) is stored faster; 2) the effect of Restorff (1932) - the heterogeneous elements placed

in a larger series of homogeneous elements are retained better than the latter (eg non homogeneous pairs rather than homogeneous); 3) The Underwood effect (1950), the materials with a high degree of homogeneity are retained more heavily compared to those with a lower degree of homogeneity.

Data volume. It has been found that the number of rehearsals required to store a material is even greater as the material is larger.

The second category includes the psychophysiological features of the subject:

- degree of involvement in activity;
- -subject status (fatigue, health);
- the way of learning;
- motivation;
- his attitudes and inclinations;
- the optimal repetition (under-learning creates the "illusion of learning", and over-learning leads to the installation of the inhibition of protection, to the saturation state and the avoidance need.) So if 10 rehearsals were required for the storage of the material, the additional ones should not exceed 5).

Research has shown that we hold 10% of what we read, 20% of what we hear, 30% of what we see, 50% of what we see and hear at the same time. So, the more complex the cognitive actions, the memory productivity also increases (Etco et al., 2007)

1.3. How to Optimize the Memory Functionality

Optimization of the memory functionality can be achieved by using special processes, called mnemotechnical processes.

1) Intensifying the interaction between the subject and the material to be memorized, the appeal to various methods of processing it, such as: a) drawing up the text plan; b) its fractionation into parts; c) detachment of the essential points; d) establishing similarities and differences.

2) Establishing some landmarks, support points, mnemoschemes raises the potential of memory: emphasis in text, pictographic writing, associations, abstracts, graphic schemes and so on.

3) **Systematization of knowledge from the stock and those to be assimilated**. They will be easier and longer to be retained if they are linked to each other,

hierarchically and integrated into the notional system, if they are segmented into meaningful units, if they are organized on a unitary and coherent plan.

4) Visualization, use of various visual methods: figures, graphs, tables, arrows, boxes etc.

5) The LOCI method (Lat.: belonging to the place), the use of the image to fix on what we want to memorize on an imagined route. The subject imagines a certain route with places that gradually progress: the street, the park in front of the block, the staircase, the door of the apartment, the vestibule, the living room, the kitchen, the bathroom, the bedroom, etc. It is necessary to store chains of words or events and not singular units, so we develop a history or a story in which the information to be memorized as characters.

6) Acronyms and phrases: for example, the ROGVAIV acronym makes it easier to remember the spectrum colors. Students in American schools, to remember the value of π, evoke the phrase Pie I wish I could remember pi - 3,141592 (Negura & Losii, 2010).

An essential role in determining the preservation time of what we have previously memorized also has emotional-affective and motivational factors. There is a direct proportional dependence between the echo or resonance of the material given in our affective-motivational sphere and the degree of survival of keeping it in memory.

By virtue of the action of the Ego defense mechanisms, information and experiences with positive affective-motivational resonance are fixed more strongly than those with negative resonance. The absence of any affectionate or motivational burden always results in superficial and short-term fixation (Golu, 2007).

2. Objectives and Hypotheses

Objective

The objective of this survey is to observe that there is a correlation between the organization/structuring of information during encoding, the environmental context, the internal/emotional state of the subject during the encoding process and the optimization/improvement of the memory functionality in the process of updating the information.

Hypotheses

1. The presentation of systematized information in the encoding process increases the efficiency of updating information

2. If the environmental and internal context of encoding information is similar to the one in which information will be updated, then the chances of an effective updating increase, regardless of whether the information is organized/systematized or not.

3. Methods

Participants

The lot/sample of participants was made up of 12 persons aged between 20 and 66 with a different educational level (5 persons with secondary education with a baccalaureate diploma and 7 persons with higher education) without visual disturbances (optical deficiencies corrected to 5 people) and without hearing disorder (hearing impairment corrected for 1 person).

Instruments

Four tests were used containing images of very diverse objects/beings/phenomena:

- Test 1 includes 30 images of random/incidental objects and beings with a high degree of generality, without a hierarchical organization or a systematized logical structure. The pictures are the following: key, bird, keyboard, hat, trophy, flower pot, phone, books, camera, pyramid, sofa, cup, backpack, smiley face, watch, chess pawn, toothbrush, castle, map , lamp, locomotive, belt, glass, bracelet, diamond, screwdriver, window, back, mirror, curtain.
- Test 2 includes 30 images of random / incidental objects and beings with a high degree of generality, without a hierarchical organization or a systematized logical structure. The pictures represent the following: child, dress, plate, painting, door, heart, mountain, umbrella, hourglass, cross, scissor, fish, fish, snowman, car, padlock, key ring, hexagon, remote control, bell, mustache, syringe, pen, baton, garbage bin, bank.
- Test 3 includes 30 images of objects / beings / phenomena of high specificity and organized, structured in the nature category: tree, cat, butterfly, cascade, moon, mushroom, sunflower, snowflake, desert, spider

web, lightning, volcano, clouds, leaf, bear, rainbow, tornado, terra image, sea horse, wheat stalk, ladybug, wheat stalk, sun, squirrel, lake, star sky, humming bird, boreal aurora, cave / grotto, crayfish...

- Test 4 includes 30 images of objects with a high degree of specificity, organized and structured in the food category: oatmeal, melon, bread, apple, ham, egg, lemon, fries, cake, carrot, walnuts, candy , cereals, sandwich, pasta, pretzels, coffee beans, green lettuce, fish, pizza, banana, avocado, mushrooms, cheese, corn, pineapple, chocolate, red, olive, almonds.

A film featuring images from a forest (summertime), including specific sounds (spring drift, bird song, leaf rust, etc.) was used.

Procedure:

The test was conducted in 2 different days, and the procedure consisted of applying the four tests and viewing and hearing the film in the following way:

- 1st day – Tests 1 and 3 were applied in 2 stages:

Stage I - Persons interviewed were asked to view the images in test 1 for 1 minute and then for 1 minute to mention the images stored on a sheet of paper.

Stage II- Interviewees were asked to view the images in Test 3 for 1 minute and then for one minute to mention the images stored on a sheet of paper.

- 2nd day – tests 2, 4 were applied and the movie-view-hearing variable was inserted. The testing consisted of 3 steps:

Stage I - The interviewed people viewed / heard the movie for 5 minutes.

Stage II- The interviewees were asked to view the images in Test 2 for 1 minute and then for 1 minute to list the images stored on a sheet of paper. Throughout this stage the sound background was provided by the previously viewed movie. Also, during image refresh, people were encouraged to view the images in the movie that continued to run through the test.

Stage III - Interviewees were asked to view the images in Test 4 for 1 minute and then for 1 minute to list the images stored on a sheet of paper. Throughout this stage the sound background was provided by the previously viewed movie. Also, during the update of the images, people were encouraged to view the images in the movie that continued throughout the test.

4. Results

In order to analyze the results obtained during the 2 days of testing, the statistical analysis was used as a result of applying the four tests (2 general - Test (T) 1 and T 2 and 2 specific - T 3 and T 4) obtained the following:

1st day –T1 and T3 were applied

Test 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7	2	16,7	16,7	16,7
	8	2	16,7	16,7	33,3
	9	3	25,0	25,0	58,3
	10	2	16,7	16,7	75,0
	11	2	16,7	16,7	91,7
	12	1	8,3	8,3	100,0
	Total	12	100,0	100,0	

At T1, the most common score in the reproduction distribution - the highest frequency, was 9, representing 25%, with more than 8% more than the other updates (7, 8, 10, 11). The best update - 12, according to the analysis, had the lowest frequency, namely 8.3%

Test 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9	2	16,7	16,7	16,7
	10	3	25,0	25,0	41,7
	11	1	8,3	8,3	50,0
	12	4	33,3	33,3	83,3
	14	1	8,3	8,3	91,7
	15	1	8,3	8,3	100,0
	Total	12	100,0	100,0	

At the T3 specific test, the most common score in the reproduction distribution - the highest frequency, had the score of 12, representing 33.3%, the next highest score being the 10th score by 25%.

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Test 1 - Test 3	-2,083	1,505	,434	-3,040	-1,127	-4,795	11	,001

Also, by comparison, applying paired samples on T1 and T3, the difference is significant (Sig 2-tailed = 0,001), ie less than 0,05.

2nd day – T2 and T4 were applied and the film variable was inserted

Test 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	8	1	8,3	8,3	8,3
	9	2	16,7	16,7	25,0
	10	2	16,7	16,7	41,7
	11	1	8,3	8,3	50,0
	12	1	8,3	8,3	58,3
	13	3	25,0	25,0	83,3
	14	2	16,7	16,7	100,0
	Total	12	100,0	100,0	

At T2, the most common score in the reproduction distribution - the highest frequency - was 13, representing 25%, with more than 8% more than the following updates (9, 10, 14). What is interesting to note from the first day when general T1 was applied but without the variable film is that the best updating is 14 with a frequency of 8% higher, ie 16.7%, unlike the day before the best update had, according to the analysis, the lowest frequency of 8.3%.

However, as shown in the table below (paired samples applied for general tests T1 and T2), the difference is significant (Sig 2-tailed = 0.000), i.e. less than 0.05.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1	-2,083	1,165	,336	-2,823	-1,343	-6,197	11	,000

Continuing the statistical analysis on day 2 with T4, the following results:

Test 4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11	1	8,3	8,3	8,3
	12	3	25,0	25,0	33,3
	14	5	41,7	41,7	75,0
	15	2	16,7	16,7	91,7
	17	1	8,3	8,3	100,0
	Total	12	100,0	100,0	

At T4, the highest share in the reproduction distribution - the highest frequency, had the score 14, representing 41.7%, with more than 16% more than the next update (12) and 8 % more than the best percentage obtained by applying T3 specific on the first day when there was no movie variable.

Also, by statistically analyzing T4 compared to T3, it is noted that the minimum and maximum number of re-updating from 9 to 11 and from 15 to 17 have been improved.

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Test 3 - Test 4	-2,333	1,670	,482	-3,394	-1,272	-4,841	11	,001

Applying also the analysis paired samples test for T3 and T4, to see whether the film variable significantly influenced the result of the experiment, Sig 2-tailed = 0.001, this is less than 0.05, i.e. the difference is significant. Therefore, the hypothesis is confirmed that "if the environmental and internal context of encoding information is similar to the one in which the information will be updated, then the

chances of an effective updating increase, regardless of whether the information is organized/systematized or not"

The analysis of the data obtained during the 2 days of testing shows an increase in the number of updates due to the introduction of the variable that consisted of video viewing/listening. Also, there is a significant increase in the general test in an environmentally controlled context by the film variable.

5. Conclusions

Starting from the assumptions made at the beginning of the article and analyzing the results obtained after the tests, the following were found:

- presentation during the encoding step of structured/systematized information increases the efficiency in the information update/reproduction stage;
- the appropriate environmental context can lead to the induction of positive emotional states, the increase of attention, the facilitation of the voluntary effort, with beneficial influences in all three stages of the mnesic process: coding, storing, updating information;
- the discussions with the interviewed people, following the tests, concluded that people (in the context of viewing and hearing the film) tried a classification (without being suggested) on their own. Therefore, the environment and internal context facilitated the process of updating - reproduction - confrontation and mental comparison (personal reorganization) with the existing models in order to extract the optimal model (Zlate, 2009); However, as a personal criticism that I bring to the study, the intention of classifying the interviewed persons may also result from the familiarity of the images presented for memorization (the clustering phenomenon, the updating of the images to be recalled by categories even if they were presented randomly);
- Memory is largely dependent on the state of learning (state-dependent learning) (Atkinson et al., 2002);
- Memory improves if the internal state during the updating step corresponds to the state during encoding (Eich, 1980) (Atkinson et al., 2002);

- as a critical critique of the experiment, I mention that the selected sample is too small to achieve a significant result. A larger number of interviewees could change the results.

Bibliography

Atkinson, R.L.; Atkinson, R.C.; Smith, E.E.; Bem, D.J. & Nolen-Hoeksema, S. (2002). *Introducere în psihologie/ Introduction to Psychology*. 11th Ed. Bucharest: Editura Tehnică, pp. 364, 366, 388.

Cosmovici, A. (1996). *Psihologie general/ General Psychology.* Iași: Polirom, pp. 146-151.

Ețco, C.; Fornea, Iu; Davidescu, E.; Tintiuc, T.; Daniliuc, N. & Cărăruș M. (2007). *Psihologia generală*. Suport de curs/ *General Psychology*, Course. Chișinău, pp. 64-67, 71-73.

Golu, M. (2007). *Fundamentele psihologiei*/ *The fundamentals of Psychology*. Volume I, 5th Ed. Bucharest: Editura Fundației România de Mâine, pp. 536, 546.

Negură, I. & Losîi, E. (2010). *Psihologia generala/ General Psychology*.. Chișinău, pp. 121-122.

Zlate, M. (2009). *Fundamentele psihologiei/ The fundamentals of Psychology*. 4th Ed. Iași: Polirom, p. 168.