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## COMPARATIVE STUDY OF THE IMPACT OF FACTORS INCREASING RETRIEVAL IN LONG-TERM MEMORY ON RECALL AND RECOGNITION

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### ABSTRACT

*The present research's purpose was comparative study of the impact of factors increasing retrieval in long-term memory on recall and recognition in students in three assignments including mathematics, experimental science and social studies. Experimental and expanded post-test with control group was used. 90 fifth grade female students of Bafq city in educational year 2016-2017 as subject in form of three experimental and three control groups were randomly selected and replaced. Semantic extension, position texture and information organization methods were taught to experimental groups and the subjects were immediately assessed by the common retrieval post-test. The effect of teaching semantic extension, position contexts and information organization strategies on recall and recognition was evaluated. Dependent variables' measurement tool was a test executed by teachers of mathematics, experimental science and social studies. The results of t-test and Wilcoxon showed that the teaching the factors increasing retrieval in each three field of homework of mathematics, experimental science and social studies influence the recall and recognition. There were a significance difference between experimental and control group in each discipline. Accordingly, we conclude that teaching factors increasing retrieval to learners at the time has a significant impact on recall and recognition and this effect in retrieval is more than learning.*

**Keywords:** Cognitive Memory, Recognition, Recall, Memory Retrieval Factors.

### INTRODUCTION

Memory is one of the cognitive actions of the human brain that has emerged in recent decades as an area for interdisciplinary research in a variety of disciplines including psychology, neuroscience, psychoanalysis, electronics, computers, etc. Each of these disciplines has studied one angle of the memory issues. According to psychology and other areas related to memory, researchers in educational science and psychometric memory also seek to retrieve learners' information in quizzes. There is a lot of information in memory that we do not know about the quality of a lot of them and we will not remember anything if they ask us anything about them, remember this information in the right position or evidence of their presence in their memory, but we may remember this information at appropriate times or have some evidence of their presence in our memory. There are some examples of these exam questions for learner that this question itself sometimes motivate a part of the memory related to that question's response and activates the test content. Memory is a process that refers to the dynamic mechanisms associated with storing, storing, and retention, information retrieval and past experiences (Begorcoland et

al, 2003 quoted from Sternberg, 2016). Memory is one of the cognitive actions that play an important role in individual activities (Eysenck and keane, 2005). Memory consists of processes for obtaining, recording, or storing data and finally data retrieval and it can be categorized in different ways. Tulving introduces four type of long-term memory including procedural memory, perceptual memory, episodic memory and semantic memory (Achak et al, 2015). Semantic memory is a person's inference of his experiences and includes his knowledge of concepts, rules, principles and skills. Therefore, semantic memory is a concept that is stored in the form of propositions, networks and schemas (Balota, 1999).

Paying attention to and interested in learning strategies are the natural consequences of a change or transformation in the orientation of behavioral theories to cognitive theories. These theories seek to explain complex cognitive processes such as comprehension, retrieval, and cognitive strategies. These theories emphasize how learning is done, how input information is processed, and how information is encoded, stored and retrieved in memory (Sternberg, 2016, translated by Kharrazi & Hejazi, 2008). Learning and memory require a series of stages. The stage during which the presentation of the subject of learning takes place is known as "encoding". Encoding is the first stage of learning. So, encoding of some information is stored in memory system. Therefore, the second stage of learning is storage. The third and last stage is retrieval. At this stage, the information stored in the memory system is recovered or retrieved. Evaluating the structure without studying the process or studying the retrieval without reviewing the encoding and storage is impossible. The memory system is activated and used only when the process acts in intrinsically passive structures of the memory system, (Zarrin Bakhsh et al., 2013).

Various theories have been presented about the structure and process of memory by the researchers. One of the perspectives that are important in this regard is the view of the processing levels proposed by Lockhart & Craik (1990). They have assumed that the attention and perceptual processes of learning time determine what information is stored in long-term memory. There are various levels of processing that include the in-depth physical analysis of a stimulus to deep and semantic analysis. They define depth as the semantic derived from the stimulus (Eisenck and Kane, 2013; Zare, 2009). We can refer to following theories as other ones in this regard as: primary and secondary memory theory of William James (Hart, 1965), Sensory, short and long-term memory theory of Atkinson and Schiffrin (1968), Craik and Lockhart's processing depth pattern (1972), Barkley's work memory pattern (1990 and 1995, quoted by Sternberg, 2016). There are also some critiques to these theories. One of the important criticisms is the neglecting the type of processing during the study and the type of processing during the test. Tulving (1975) established a comprehensive principle that is known as the specialized encoding to overcome these criticisms, accordingly, if the symptoms of the test position are identical with the learning position signs, memory performance will be higher. Most learners do not use additional examples effectively without special training support (Renkel, 1997) and learners themselves are not able to create and produce exploratory extensions or question designs (question extension) (King, 1999, quoted by Ding, 2009). Similarly, Schumacher (1991) showed that the grades of students who used different extensions went up in some courses and dropped in some lessons. So, as you can observe, researches on the effectiveness of memory extension strategies have led to different results and according to Eisenck and Kane (2013), the nature and degree of precision of semantic expression requires further discussion. Hence, achieving a more coherent result requires further research in this regard. In this study, strategies



for memory retrieval as an independent variable on reminding and recognition are used to explore the application of positioning text and semantic extensions and organizing the actual learners' information in schools. One of the most important goals of education is the ability of a person to create and apply organized knowledge consciously to facilitate problem solving and to add to the possibility of progress. Recent research has shown that the memorizing a large, complex and relatively unusual set of information largely depends on individual success in finding an organizer framework when learning those materials (Tulving, 1972).

Two memory tests which have been more considered by authors are recall and recognition. A lot of research has shown that individuals' performance in recognition tests is better than reminder tests (for example, Hemphreys et al., 2010; Schulz et al., 2011; Achak et al., 2015). One explanation regarding the best function of the recognition is two-process theory (Eysenck and Keane, 2005). Accordingly, the recall includes two retrieval and recognition stages, while recognition consists of only one stage. Creek and Tulving, 1975: quoted from Karami Nuri, 2014 observed that in memory tests, the qualitative nature of the assignment and the type of cognitive operations applied to the materials is more important than some factors such as voluntary learning, the amount of effort employed, the complexity of the desired task, the amount of time spent, the amount of repetition and practice. Therefore, learning mental and mental activity in the memory process is important. In this regard, teaching and training that make the minds of learners to process more profoundly and semantically will be more effective (Slavin, 2006).

The use of appropriate teaching and assessment methods can improve learner performance. One of the things that are required to be addressed in this field is the cognitive processes of learners among which memory is the most important of them. If we can succeed in improving the information retrieval of learners' memory by some ways in order to improve their performance during the test, we will have a great step towards improving the quality of the training. Many researches have been conducted on memory and some useful results and ideas have been presented. However, despite the theoretical controversies surrounding memory explanation, the answers to some of the questions are still unclear. An experiment was done in this study in order to study the effect of increasing retrieval factors on recall and recognizing of students which aims to answer the question of do the factors increasing the retrieval in long-term memory affect the recall and recognition of 5th grade students in Bafgh? The research's hypotheses were developed to answer these questions and with respect to the mentioned variables. The purpose of present research was comparative study of the effects of factors increasing retrieval in long-term memory on recall and recognition.



## **MATERIAL AND METHODS**

This is a descriptive study and experimental type of research in which an extended post-test design with control group has been used which study the effect of factors increasing retrieval in long-term memory on recall and recognition and inferential methods have been also used. The statistical population of this study included all fifth grade female students in Bafgh city who were studying in schools in the year of 2016-2017 in the schools of this city. The sample was selected randomly from this community. A total of 90 students participated in this study. In this way that, 17 Shahrivar Female Primary School was firstly selected among all the female primary school. Among this school's students, 15 students were randomly selected as the control group and 15 were selected as the experimental group. Then, the pre-test and workshops were implemented

and in the final post-test was done for each group. These workshops were done according to variables of some factors of increasing retrieval including semantic extension, information organization, and position texture. Regarding semantic extension variable, student is firstly required to imagine the circles that he sees around himself and then they should measure the accessible and tangible circles such as geometric shapes and then perimeter of the circle was introduced and some examples and exercises were solved in this field, and their problems were resolved, and then they were asked to solve the exercises settle others' problems and teach the learned issues and topics to weaker students in order to better topic understanding.

Regarding organization, one chapter from Science lesson of Fifth grade elementary school was selected and taught it in an organized way to experimental group as tree diagram. To control some of the disturbing variables, the subjects were selected in the same way in term of gender, academic level and grade. Also, teachers of each group were selected equally in order to control the effect of teacher's training.

In terms of data analysis, descriptive statistics including tables, charts, mean, standard deviations and rankings were used to describe the data. The research hypotheses also used inferential methods such as Wilcoxon test, a nonparametric test to compare the mean of two dependent populations. SPSS software that is very powerful software for analyzing psychological data was used to test the hypothesis tests.

Library and rate method have been used in this research to collect information. The library method includes the use of books, journals, publications and specialized articles on libraries and the Internet. The materials were prepared by adopting the relevant dissertations and the dear professor's comments. These questions were presented in two ways: an explanatory and multiple choices and each of these questions were used to evaluate memory recall and recognition. The amount of reminder and level of recall was measured by using explanatory questions and level of recognition was measured by multiple-choices one. Content validity was used to determine the validity of the research tool and the Cronbach's alpha for this questionnaire was 0.86, which is an acceptable value.

## FINDINGS

The total number of subjects was 90 girls in the fifth year of elementary school, including 30 girls in mathematics, 30 ones in the experimental sciences and 30 in social science studies and in each group, 15 students were assigned in the experimental group and 15 ones in the control group. The number of subjects was the same in all groups, and there was no drop in them due to the short duration of the test.

***The first main hypothesis:*** Retrieval factors in long-term memory influence learning of fifth grade female student in Bafq city.

According to the normality of the pre-test and post-test variables, we can use the-paired-t test which is a parametric test in order to examine the hypothesis. The null hypothesis and the opposite of this test are as follows. The-paired-t test results are as follows.

**Table 1: descriptive indexes of reminder paired-t test**

Variables	Number	Mean	Standard deviation
Pre-test	30	10.24	1.37
Post-test	30	13.14	2.036

According to possible significance values and comparing it with error level which has been considered equal to 0.05, it is observed that null hypothesis is rejected because possible significance values is less than 0.05. Null hypothesis rejection means that there is a significance difference between average score of pre ad post-test groups. Therefore, according to the results related to descriptive statistic, we can conclude that memory retrieval factors have a significant effect on reminding students in content.

**Table 2: the results of reminder paired-t test**

Variable	Degree of freedom	t- statistic	Significance possibility
Level of recall	-4.714	2	0.000

**The second main hypothesis:** Retrieval factors in long-term memory influence recognition of female fifth grade student in Bafq city.

According to possible significance values and comparing it with error level which has been considered equal to 0.05, it is observed that null hypothesis is rejected because possible significance values is less than 0.05. Null hypothesis rejection means that there is a significance difference between average score of pre ad post-test groups. Therefore, according to the results related to descriptive statistic, we can conclude that memory retrieval factors have a significant effect on recognition the content in students and so, the main hypothesis is confirmed.

**Table 3: The results of descriptive indexes of paired-t test-recognition**

Variables	Number	Mean	Standard deviation
Pre-test	30	11.3	1.17
Post-test	30	13.73	2.2

**Table 4: the results of paired-t test –recognition**

Variable	Degree of freedom	t- statistic	Significance possibility
Level of recognition	-6.491	29	0.000

## DISCUSSION

In explaining the results of the hypothesis based on the results of the Wilcoxon test, we can state that there is a significant difference between the mean scores of the group in the pre-test and post-test which means that the fourth sub-hypothesis of the research is confirmed. Therefore, it can be said that semantic extension in long-term memory generally affects the recognition of the contents of the fifth grade students of the elementary school of Bafgh and since the value of statistic ( $z=-3.75$ ) in semantic-recognition extension is more than the value of statistic ( $z=-0.33$ ) in semantic-recall extension and we can conclude that the effect of semantic extension of the content on the recognition of students is more than the effect of semantic extensions on student recall. This effect is likely to be due to the greater correspondence of the semantic extension to the content of the mathematical lesson. For this reason, it can be argued that semantic extension learning is appropriate for comprehensible and analytical content. But this effect is not the same in different natures, but the type of subjects' assignments plays a decisive role in increasing the performance of the subjects' memory.

According to the results of the Wilcoxon test, it can be stated that there is a significant difference between the mean scores of the group in the pre-test and post-test which means that the second sub-hypothesis of the research is confirmed. Therefore, it can be said that position texture



generally affects the membrane of the contents of the fifth grade students of the elementary school of Bafgh and since the value of statistic ( $z=-2.263$ ) in position texture-recall is more than the value of statistic ( $z=-1.978$ ) in position texture-recognition and we can conclude that the effect of position texture of on the recall of students is more than the effect of position texture on student recognition. These results were consistent with the results of study of Godden and Baddeley indicating that recall is affected by position texture (Quoted by Eisenck and Kane 2013). The research's results of the Frantz and Alonso (2001), suggest that the sub-texture in which the information is learned can be combined with the learned material, thus the retrieval of the main context of learning has a beneficial effect on the next recall. In the research, Mekon (2002) found out that some types of bilateral relationships in which textual information is enhanced improves recall-based memory and recognition memory along with better memory recall reveal the source for contents. According to Jacobi (1996) and Hey (1998), we can conclude that if position texture of test and study is the same, the recall performance will be better. According to Baddeley theory (1982), recall is affected by position texture. These findings are consistent with the research conducted by Miles Shiring & Eva (2008) in order to study the effect of texture on long-term memory and it was specified that texture made the recall better. According to specialized encoding principle, it can be said that if texture signs is available, memory resource will be improved. The signs restore the conditions of encoding and increase the access to all encoded data including unclear processed texture details (implicit) (Mayers & Broder, 2002). In addition, the information stored in memory represents a combination of information about learning time and texture. Textural interference is a mechanism that can lead to proper interpretation and perception ( Craik, 2002). According to the results of the Wilcoxon test; we can state that there is a significant difference between the mean scores of the group in the pre-test and post-test, which means that the sixth sub-hypothesis of the research is confirmed. Therefore, it can be said that memory organizing generally affects the recognition of the contents of the fifth grade students of the elementary school of Bafgh and since the value of statistic ( $z=-4.345$ ) in organizing-recognition extension is more than the value of statistic ( $z=-2.946$ ) in organizing-recall extension and we can conclude that the effect of information organization on the recognition of students is more than the effect of information organization on student recall. Recent research has shown that the memorizing a large, complex, and relatively unusual set of information largely depends on individual success in finding an organizer framework when learning those materials (Tulving, 1972). Organized information can be better remembered than non-organization information (Eisenck & Kane, 2013). The performance of the groups in the task related to the organized information is significantly better and more than the unorganized information which indicates that the information organization variable plays an important role in improving long-term memory. According to Minsky, a framework is a pattern consisting of a series of key elements and the relationships between them that summarize abstractly what we're reminded about one thing. Organizing a framework is a specific type of memory that is used for retrieval and storage of different type of data. One of the important education's outcomes is the acquisition of many frameworks that can be used by individuals to organize information so that they can think about the complexities of advanced societies. Other important outcome of education is the ability of the person to create and apply organized knowledge to vigilantly facilitate the problem and add to the possibility of progress.



The purpose of this study was investigating the relationship between factors increasing the retrieval (including position texture, semantic extension and information organization) in long-term memory with the recall and recognition of fifth grade female students of Bafgh city. The results of this study showed that strategies of semantic extensions and information organization in recognition are stronger than the recall and position texture strategy in recall is stronger compared with recognition. Since the obtained results related to the recognition are stronger than recall, it suggests that the performance of students in the recognition tests has been better than the reminder, which is consistent with many studies that have shown that the performance of individuals in recognition tests is better than recall ones (for example, Humphreys *et al.*, 2010; Achak *et al.*, 2015). One of the explanations regarding better performance of recognition is two-process theory (Watkins & Kardiner, 1979 & Rabinowitz, Mandler & Peterson, 1977) accordingly; recall consists of two processes including retrieval and recognition, while recognition is just one stage. Creek and Tulving in 1975 (quoted by Karami Nuri, 2014) observed that in memory tests, the qualitative nature of the assignment, and the type of cognitive operations applied on the materials is important instead of some factors such as voluntary learning, the amount of effort used, the complexity of the desired task, the amount of time spent, the amount of repetition and practice, so, learner's mental and psychological activity in memory process is important. Given that these issues, teaching and training which make the minds of learners to process more profoundly and semantically will be more effective (Slavin, 2006). It can also be said that the recognition tests (multi-choice) are the best response measurement tools or the best type of closed-response tests. The questions of these tests can measure different educational goals and match with the content of the majority of lesson subject (Schank and Towle, 2000). Also, given that multiple-choice questions are flexible and have a variety of applications, they have been so far used in most standardized tests whose main advantages are mentioned below:

1-Flexibility 2- the ability to sampling large content and goals 3- correct the responses with ease 4- prefer to other objective tests by teachers and students 5- provide an opportunity to diagnose student learning problems. Regarding these results, it can be said that these findings have important educational implications in psychology and education, since, as previously mentioned, recall and recognizing are very important on various personal, familial and social fields and also the academic performance of the students, so it is important to know the factors and variables associated with it. This research examines the role of the variable affecting it that is the factors increasing retrieval including position text, semantic extension and information organization) in memory. Although these variables have so far been measured in a variety of researches, but so far, none of the researches have studied the relationship between retrieval strategies with recall and recognition, therefore, this research can be a source of future research.

According to obtained results in distribution t table, we can state that there is a significant difference between average scores of group in pre-test and post-test indicating that the second hypothesis of research is confirmed. Therefore, we can say that memory retrieval factors generally influence lesson content recognition of students at fifth grade of elementary school of Bafq city and since the value of statistic ( $t=-6.491$ ) in memory retrieval-recognition is more than the value of statistic ( $t=-4.714$ ) in memory retrieval-recall, we conclude that memory retrieval factors have more impact on students' recognition as compared with retrieval factors' effects on students' recall. These results are consistent with the results of some researches regarding the



manner of impact of applied cognitive strategies and they have generally shown that the learners who apply correct strategies that are consistent with learning tasks will achieve more success in their learning activities. Atare Khameneh (2008) has shown that the teaching the learning and studying strategies has an effect on increasing the motivation of progress. Garner (1990) showed that strategic or strategic behavior increases learning. Eisenck and Kane (2013) argued that memory traits that are distinct or unique are more easily retrieved than those that are similar to each other (Ghasemian and Zare, 2012). Morris, Bransford, and Frank (1977) argued that only stored information is remembered that are fit and relevant to the memory test (Ghasemian and Zare, 2012). Sternberg concluded that if the number of females in short memory is high, the retrieval will be taken place more slowly.

In explaining the role of factors increasing the memory retrieval, we can say that the factors that increase memory retrieval include location, semantic extension, and organization in order to achieve goals. Memory retrieval is not merely a reconstructive phenomenon which uses various strategies (such as bookmark search, inference) to retrieve our main memory works from our experiences and then reconstruct the original experience as the basis for recovery (in order to be familiar with Artificial intelligence of reconstructive memory pattern (Craik, 1983). But also in real-life situations, constructive memory, so that the previous experience affects how things are reminded and what we really remember (Crowder and Green, 2000; Best, 2003). Retrieval is performed efficiently when there is a coordination between the encoding condition and the current recall condition and if there is no coordination, a deficiency will be occurred for retrieval. Consequently, there is less possibility of recalling the target material (quoted by Eysenck and Kane, 2005, translated by (Ghasemian and Zare, 2012)). The present study is consistent with special encoding theory of Tulving (Weisman and Tulving, 1976), according to which the recall issue is encoded according to the context studied. Also, the research findings are consistent with the appropriate transmission processing theory (Gallo Roediger and Gallicie, 2002) in which memory performance depends on the processes used in time of learning and information retrieval.

## CONCLUSION

According to research's results, it can be stated that these findings have important educational implications in psychology and education, because as already mentioned, recall and recognizing are very important in the various fields of individual, family and social, as well as in the academic performance of students, so it is important to know the factors and variables associated with it. This research examined the role of the variable affecting it, that is, the factors increasing retrieval (which includes position texture, semantic extension and information organization) in memory. Although these variables have so far been measured in a variety of researches, but so far, none of the researches have studied the relationship between retrieval strategies with recall and recognition, therefore, this research can be a source of future research.

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## References



- Achak A, Zare H, Sarmadi M & farajollahi M, 2015, effect of Wall type and processing level of questions in recognition tests and recall on student memory function, educational science, a research in school learning, pages 2009-2019.
- Atkinson. R. c. & Shiffrin. R (1968) Human memory: a proposal system and its control processes. Psychology of thinking and motivation. Vol2. Advances in research thory. New York. Academic press
- Baddeley. A (1982) Your memory: A users' guide. New York: Macmillan
- Balota, D. A., Cortese, M. J., Duchek, J. M., Adams, D., Roediger, H. L., McDermott, K. B., et al. (1999). Veridical and false memories in healthy older adults and in dementia and Alzheimer's types. *Cognitive Neuropsychology*, 16, 361-384.
- Best, J. (2003). Memory mnemonics. In L. Nadel (Ed.), *Mncyclopedia of cognitive science*, Vol. 2, PP. 1081-1084. London, England: Nature Publishing Group.
- Craik, F. I. M. (1983); "On the transfer of information from temporary to permanent memory". *philosophical Transactions of the Royal Society, Series, B* 302, 341-359.
- Craik, F. I. M. (2002);" levels of processing past, present and future". *memory*,10 (5-6),305-318.
- Crowder, R. G., & Green, R. L. (2000). Serial Learning: Cognition and behavior. In E. Tulving & F. I. M. criak (Eds.), *The Oxford handbook of memory* (PP. 125-136). New York: Oxford University Press.
- Ding, N. (2009). Visualizing the sequential process of knowledge elaboration in computer-supported collaborative problem solving. *Computers & Education*, 52: 509-519.
- Eisenck M., Kane M, 2013, *Cognitive Psychology of Memory*, Zare H, Nahravanian P, Abdullah Zadeh H, First edition, Tehran: Aijiz, 344.
- Eysenck Michael.w, keane mark.t (2005) *cognitive psychology. A student's handbook*. 5nd edition. U.S.A. New York. Psychology press.
- Garner, R. (1990). When children and adults do not use learning strategies: Toward a theory of settings. *Review of Educational Research*, 60, 517-530.
- Ghasemian F, Zare H.2012, impact of internal and external texture on free recall and recognition, *new psychological research*, 25, 82-63
- Hart, J. T., Jr. (1965);" Recall, recognition and the memory –monitoring process". Unpublished doctoral dissertation, Stanford University.
- Humphreys, Michael S& Maguire, Angela M& McFarlane, Kimberley A& Burt, Jennifer S& Bolland, Scott W& Murray, Krista L& Murray, Krista& Dunn, Ryan (2010) Using Maintenance Rehearsal to Explore Recognition Memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. VL-36. PP- 147-159.



- Karami Nuri R, 2014, Memory and Learning Psychology: with a cognitive approach. Sixth edition, Tehran: Semat, 341
- King, A. (1999). Discourse patterns for mediating peer learning. In A. O'Donnell & A. King). Proactive (Eds.), Cognitive perspectives on peer learning (pp. 87–115). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lockhart. R. S & Craik, F.I.M(1990) levels of processing: A retrospective commentary on a framework for memory research. Canadian journal of psychology.44. 87-112.
- Maliki B, Zare H, Shaghghi F, 2011, the impact of extension and expansion strategies training on the retrieval of semantic memory, new findings in psychology, 21, 5-17
- Mayer, R.E. (1996). learners as information Processors: Legacies and limitations of educational Psychology 's second metaphor. Educational Psychologist, 32, 1-19.
- Renkl, A. (1997). Learning from worked-out example s: A study on individual differences. Cognitive Science, 21: 1-29.
- Schank, R. C., & Towle, B. (2000). Artificial intelligence. In R. J. Sternberg (Ed.,) Handbook of intelligence (PP. 341-356). New York: Cambridge University Press.
- Schulz, K. M. Pearson, Jennifer N. Neeley, Eric. Berger, Ralph. Leonard, Sherry. Adams, Catherine E. Stevens, Karen E. (2011) Maternal stress during pregnancy causes sex-specific alterations in offspring memory, performance, social interactions, indices of anxiety, and body mass. Phys iology & Behavior. 104, 340- 347.
- Slavin, R.E. (2006). Educational Psychology: Theory and practice (8th ed.). New York: Pearson.
- Sternberg R, 2016, Cognitive Psychology, Kharrazi, Hejazi, 8th edition, Tehran: Semat, 800
- Tulving (1974) Cue-dependent forgetting. American scientist. 62, 74-82
- Tulving, E. (1972);” Episodic and semantic memory”. In E. Tulving & W. Donaldson (Eds), Organization of memory. London: Academic Press.
- Wiseman. S & Tulving. E (1976) encoding specificity: relations between recall superiority and recognition failure. Journal of experimental psychology: human learning and memory. v2. pp349-361
- Zarrin Bakhsh B, Zare H, Mahdavian A, 2013, The effect of emotion tool styles on memory bias in recall and recognizing, psychology, 65, 66-53.

