

Word-list Recall in Youngsters and Older Adults

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Abstract

A word-list recall is an experiment that examines the effect of age on the change in memory. The ability to understand or use language is more or less dependent on the memory capacity. Any person may know what s/he wants to say but may not be able to say it if the memory does not help. We use some form of memory in all aspects of language processing. Whatever we have in our mind is stored whether for seconds, hours, or years. By short-term memory, a person can remember different things for a period of seconds or minutes only. By rehearsal, the duration and the quantity of storage will increase. Therefore, rehearsal transforms the short-term memory into the long-term memory. This experiment, which examines the number of words recalled by different age groups after presenting a word list, reveals that the younger a person the more are the words he or she recalls. The experiment also reveals that semantically related words have greater chance to be remembered when they are compared with unrelated words.

Keywords: aging, short-term memory, long-term memory, semantically related words, word list recall.

1. Introduction

Language learning and language use is impossible without the brain. The role that brain plays in developing language ability is undeniable. Among the creatures, human being is the only one who has the ability to acquire and process insufficient data and produce an infinite variety of language. Hunt (as cited in [1], [2]) describes the innate ability of human in producing language as below:

Since the language children produce cannot be accounted for based on the language they receive from their environment, theorists have hypothesized that children are born with a genetic predisposition to acquire language with what Chomsky has termed a language acquisition device (LAD).

Another amazing aspect of brain is the memory capacity that it has. Griffith (in [3]) has claimed that the memory capacity of human brain is approximately one trillion bits of information in his life span.

The remembrance or recall ability of brain is also worth mentioning. We are not forced to search the whole memory in order to find particular information. The selective search ability rather than whole search is present in human mind only. There are different factors that can affect recall of what we memorize. One of the important influencing factors is the meaningfulness of learning. If the new material relates to the existed knowledge of the learner's cognitive structure the recall of that material will be easier. As another effective factor, we can mention the role of shocking matters in recall. The striking events result in better recall. Other important considerations include content, the learner's ability, and the quantity and difficulty level of the task involved ([5], 1981).

The activities of brain are not limited to the above-mentioned ones. Many other activities occur either consciously or subconsciously. Among the enumerated capabilities of brain, recall or remembrance is the brain ability under discussion in this article. As it was mentioned in previous paragraph, recall of the materials is affected by different factors. Aging as an effective factor is at

the center of attention in this article. The article tries to show that becoming older affects the degree of recall. Mental abilities are indirect and invisible. By designing some specific tests, we are able to elicit some behaviors. The elicited behaviors are perceived as indicators of underlying abilities of mind. Thus, the experiment tries to show the possible relationship between short-term memory loss and age by a word-list recall test. Here on the other hand, the researchers try to see whether the semantically related words have greater chance to be remembered later.

1.1. Aging

Aging is a term that refers to the changes that occur during the life of living creatures. Human being as a creature can change in different dimensions. Physical, social, and psychological changes are observable in the people's life span. As the result of aging, some abilities in human develop and some others decline. Knowledge of world and wisdom progress as a person grows up. Recalling ability on the other hand is the dimension that declines through the pass of time:

As people grow older, they often complain about difficulty with recalling names, and they perpetually attribute this deficiency to growing old. But the more plausible explanation for this problem is that a sixty-year-old knows considerably more people and more facts than a sixteen-year-old, and since access to LTM is capacity limited, it is more logical to assume that the more you have to remember, the easier it is to forget (Scovel, 1998, p. 85) [9].

There is an increasing possibility of declines in cognitive functions of brain as healthy people age. Although the change in brain function is inevitable, the speed of aging differs in different people. Some people face aging when they are at earlier ages and this aging happens with faster rate than others do. Bad eating habits, alcohol use, lack of exercise, and stress besides changes in hormones can be enumerated as the factors that increase the rate of cognitive decline. Aging seems to have an indirect relationship with the success in performing tasks that require attention and controlled processing of information i.e., people in early ages perform greater in tasks that rely on attention and information processing. Some kinds of learning such as mastering correct pronunciation that require motor skills will also become more difficult as a person becomes older. These alterations in cognitive abilities are due to changes that occur in brain's volume, the number of synapses, the number of receptors, the levels of neurotransmitters, and many other brain related factors.

Many different types of memory have been identified in humans, such as episodic, semantic, strategic, working, source spatial, and non-declarative. Rapp et al. (2003) [7] studies show memory functions, which associated with the medial temporal lobe, are especially vulnerable to age-related decline.

1.2. Memory

According to the first definition of Merriam Webster dictionary memory is the power or process of reproducing or recalling what has been learned and retained specially through associative mechanisms. The value of learning correlates directly with the amount of learned information that is stored in memory and the proportion of that material that the individual can recall ([1], p. 39). Learning is considered equal to the storing, retaining, and recalling information. Information is not learned unless it is stored in the brain, retained, and remembered later in proper situations. Therefore, memory plays a significant role in learning process. The models of memory can be studied under two categories: short-term memory and long-term memory [8].

1.2.1 Short-term Memory

Short-term memory also called working memory is our very limited ability to remember new information without storing in long-term memory ([9], p. 130). There are different definitions presented by different learning theorists. Anderson (as cited in Chastain, 1988) defines memory as "a capacity for keeping a limited amount of information in a special active state". Short-term

memory is usually called working memory because it holds the information in our immediate consciousness at any given time. Short-term memory is limited and this limitation can be discussed from two different aspects: Limitation in quantity of stored information and the limitation in the period of time that materials can be held in memory. It is believed that the capacity of short-term memory is not more than seven discrete items. This small quantity of information can be processed in short-term memory only. The length of material retention on the other hand depends on several factors. Information organized in small quantities, practiced, learned at the beginning or end of lists, and studied recently, is remembered longer ([1], p. 40). Short-term memory receives information from the environment and prepares it for storing in long-term memory. By paying conscious attention to what is held in short-term memory, human can send the information to long-term memory. The acts of rehearsal and elaboration are necessary to prepare information for storage in long-term memory. Without rehearsal, information will not be kept in short-term memory. Elaboration is also another cognitive process that helps better remembrance. In this process, information is chunked into meaningful units and in this way, it can be related to previously stored information in long-term memory. Lefrançois ([4], p. 61) elaborates on memory components as below:

Sensory information first enters sensory memory. Only those items that are paid attention to enter short-term memory and the rest are discarded or forgotten. The information that gets into short-term memory is available as a name or a word as long as it is rehearsed. Some of the information then is coded for long-term storage and is stored as concepts or meanings.

1.2.2 Long-term Memory

Long-term memory is the memory as we normally think of it; whether it is of an event from childhood or of the name of a person we have just met (Scovel, 1998, P. 127).

Long-term memory is in contrast with short-term memory in two ways: the capacity of storage and the period of time that materials are held. Long-term memory can keep a large amount of information for a long period. As it was mentioned earlier, information transfers from short-term memory to long-term memory. The process of transference is called encoding. To elaborate on encoding it is better to provide an example. Suppose that you know a word and you can recall its shape, its meaning, and its pronunciation. Remembering the word by its meaning can be called semantic encoding. We make association between the information we gain from environment to retain them in long-term memory and recall them later. The associations we make between varieties of information in our memories can be discussed by considering schemata, script, elaboration, and categorization. Schemata are the related units of information organized by our brain. Anderson (as cited in [1] defines a schema as " large, complex units of knowledge that organize much of what we know about general categories of objects, classes of events, and types of people." Scripts are related to schema and play significant roles in remembering things. Schemata that reflect typical sequences of actions are often referred to as scripts (Chastain, 1988, p. 42). As an example for scripts we can mention the order of events when going to a restaurant. Another cognitive process that helps better remembrance is elaboration. This process is considered as a basic technique for recalling materials. When you elaborate on something, you actually associate it with more meanings and mental images. For example, you will be able to remember the address of somewhere better if you associate it with images of that area such as the color of walls, the types of trees surrounding there, and the name of a famous shop beside that specific place. Grouping and relating materials that is called organization also help better recall.

1.3 Semantically Related Words vs. Semantically Similar Words

Usually we see in different texts that semantic relatedness and semantic similarity are used interchangeably. It is necessary to make a distinction between these two terms. Some believe that concepts such as antonymy; a type of sense relation expressing the meaning of oppositions, and

meronymy; what denotes a constituent part of, or a member of something, are not included in semantic similarity while semantic relatedness includes these two concepts:

Semantic relatedness indicates how much two concepts are semantically distant in a network or taxonomy by using all relations between them (i.e. hyponymy/hypernymy, antonymy, meronymy and any kind of functional relations including is-made-of, is-an-attribute-of, etc.). When limited to hyponymy/hyperonymy (i.e. is a) relations, the measure quantifies semantic similarity instead [6].

2. Method

2.1. Participants

Two age groups were investigated in this study. Forty subjects participated in this study in two different age groups. One group included twenty subjects who were under age 20 and the other group included twenty people who were over age 50.

2.2. Instruments

The fundamental purpose of the study was to compare the recall ability of younger people with that of the older adults. It was also aimed to find whether semantically related words have greater chance to be recalled. Therefore, a list of fifteen Farsi words was selected from high frequency words used in everyday life. Selecting difficult words with ambiguous meanings was avoided in order to reduce the danger of word knowledge bias. This list was prepared in order to be presented to subject for the aim of measuring their recall ability, so it is called a word-list for recall. The experimenters ordered the words in a way that somewhere at the end of the list two semantically related words were shown immediately after each other without any other word between them to see whether their relatedness can affect recall procedures of participants.

2.3. Data Collection Procedures

In order to compare the short-term memory differences in two age groups twenty people below 20 and twenty people above 50 were included in this study. The word list that consisted of fifteen highly frequent words was shown to the participants in a special way. Typed words were presented by PowerPoint program to the subjects. Each word was typed separately from others on a separate slide and the whole list was presented in 45 seconds. The duration of time chosen for presenting each word was 3 seconds. After the presentation of words, the participants were asked to write down whatever they remembered from the words they had seen. The participants were asked to hand in their papers after one minute. The study was aimed to tap short-term memory of participants, therefore the subjects were asked to write down whatever they remembered immediately after the presentation of word-list. If they were asked to write the words later, there would be danger of long-term memory interference.

2.4. Data Analysis

The participants in both age groups were provided with 15 words in a speed of 3 seconds for each word. In order to determine if the mean of the number of words recalled by young participants is different from that of the older adults, independent sample t-test is used. The level of α is considered 0.05 in this study. The p-value is calculated in order to see whether the difference between two age groups is significance. If the p-value is less than 0.05, the difference will be considered significant enough to say that the different group's short-term memories perform differently.

It is also assumed that the related words have greater chance to be recalled. In order to test the assumption, the study tries to find the number of participants who have recalled the related words and see whether their remembrance has any priority over others. If more than half of the participants recalled the related words, we would consider a recall priority for them over other words.

3. Results and Discussions

Table 1 shows the descriptive results obtained from the word-list recall task performed by participants. Two groups were compared with each other in the study: youngsters and older adults.

Table 1. Group Statistics

Group number	N	Mean	Std. Deviation	Std. Error Mean
1	20	6.85	1.631	.365
2	20	5.15	1.899	.425

It is obvious that first group which includes youngsters has the greater mean than the second group- older adults- under investigation do. Therefore, the older adults averaged fewer recall of the words than the youngsters did. To see whether the difference is significant p-value should be considered.

The researcher tries to prove the assumption that youngsters perform better in tasks related to short-term memory when they are compared with older adults.

It is assumed that aging affects short-term memory negatively. To determine whether performance of two groups is different in the word list recall task an independent sample t-test was chosen as statistical procedure. Table 2 elaborates on the results of the independent sample t-test. Before everything, we should consider the statistical significance for the Levene's test to assure that our variances are different. As the statistical significance for the Levene's test in this case is 0.495 and greater than 0.05, we assume that the variances are different and we can use the obtained results shown on the top line with confidence. The output obtained from SPSS shows that there is a significant difference between two groups under study. The difference was ($t(38) = 3.03$, $p = 0.004$). As it is obvious p-value is less than the selected α , which is 0.05, and this shows that the difference between the performance of youngsters and older adults in recall task is great.

Table 2. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
number	Equal variances assumed	.474	.495	3.037	38	.004	1.700	.560	.567	2.833
	Equal variances not assumed			3.037	37.151	.004	1.700	.560	.566	2.834

The other prediction of the researchers was that participants are mentally more sensitive to the semantically related words and they keep the related words in mind appropriately by making association between them; therefore these related words have greater chance to be recalled. Counting the number of participants who had written both related words in their papers as a result of recall revealed that 23 out of 40 participants had remembered these two words and had written them beside each other. It can show that related words are remembered better than other words and people can find their relation as an element, which helps better recall. Our paper used, among other, the works [10] and [11].

4. Conclusion

The present study intended to investigate any possible relationship between aging and short-term memory ability of people. The findings indicate that the older the human being the worse his or her short-term memory ability. This finding is the result of an investigation on the ability of

different age groups in immediate recalling of a word-list. Another finding of this research was that the more the words are semantically related the less they are forgotten. This finding approves the belief that chunking, which is the placing of material into related classes, helps remembrance of materials. This implicates that people should make associations between what they receive from environment as input and connect these received materials with what they have learned before in order to become capable of recalling them.

5. References

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6. Appendix

Word list

cancer
vase
spoon
sock
watch
celery
invasion
body
glue
chair
monitor
glass
fridge
cheese
bank