

## The Impact of Semantic Content of the Words on False Memories

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### **Abstract**

*Starting from the false memories paradigm proposed by Deese in 1959 and revised by Roediger and McDermott (1995), this paper studies the relationship between the semantic content of the words and the percentage of false memories. The 45 Romanian participants ( $M_{age} = 31.60$ ;  $SD = 9.23$ ) included in this study were given consecutively two lists of words: the first one comprised 14 words belonging to the same semantic area, while the second one comprised the initial words plus 8 distractor words that were either semantically associated with the ones from the first list (the experimental condition), either semantically different from it (control condition). Their task was to identify the words on the second list that were also part of the initial list.*

*The obtained results did not support the main hypothesis of this study according to which there was expected to result a significant positive correlation between semantic association of the words and the false memories occurrence ( $\chi^2 = .27$ ,  $p > .05$ ). Therefore, further research that takes into account the limitations of the present study, is recommended in order to examine more thoroughly this issue.*

**Keywords:** *false memories, semantic association, individual differences*

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## I. INTRODUCTION

Whether we talk about events that never took place or about events that people remember quite differently than the way they happened, the false memories elicited a great interest among the psychologists. This interest increased especially early in the 1990, when during the court trials from USA, many reported memories in those cases of abuse were questionable. Some researchers showed that certain therapeutic techniques could cause false memories occurrence. Therefore, the apparent recovery of the memories could be actually the creation of these memories (Lindsay & Read, 1995; Loftus, 1993).

Identifying the way these false memories occurs, the factors which determine the false memories and especially those factors which prevent and reduce the occurrence of the false memories are of paramount importance for the justice area, regarding the eyewitnesses' testimonials and the deposition of the victims of the abuse. At the same time, all these aspects mentioned above could contribute to the improvement of the people's daily life.

Bartlett was known as the first one who conducted, in 1932, the first experimental research concerning the false memories (as cited in Roediger & McDermott, 1995). Also, he was the one who distinguished between the reproductive memory and the reconstructive memory. Reproductive memory refers to accurate production of material from memory, whereas reconstructive memory emphasizes the active filling in missing elements while remembering. Therefore, the later one determines the occurrence of the errors. Remembering stories or real life events (which are richer in meaning) gives rise to reconstructive processes, while remembering word lists gives rise to reproductive memory, which is more accurate.

One of the experiments that revealed the fact that we encounter significant levels of false memories during our life is Deese's from 1959 (Bruce & Winograd, 1998). During the experiment, subjects were presented a word list which included words semantically associated (e.g. "candy", "sugar", "taste" and so on). Then, the subjects had been asked to recall the words from a list which included a critical lure (e.g. "sweet"). Following the experiment, Deese discovered that the participants frequently included the critical lure on the list of the recalled words.

A false memory could be defined either as a recall of one word that never has been seen/heard by the subject or as a recall of an event that never took place or just took place differently. Different types of false memories were studied during experiments and the most interesting paradigms are considered Deese-Roediger McDermont (Roediger & McDermont, 1995) and Kassim & Kiekel (1996). The first one, which replicated Deese's experiment and even extended this by adding the false recognition, shows the mechanism of the false memories

formation in case of the words, and the second one shows the mechanism of false memories formations in case of participating in the events.

The first type of false memories refers to the explicit memory of some words included in a list containing words semantically related. The participants have to recall or recognize later words that were not on the list presented initially. These new added words were semantically similar with those initially presented. According to this paradigm, when the participants study a word list, they often say later that within the second list they recognized also one word that had never been presented to them. This word is named critical lure. All the words from the list were associated with this critical lure. When the subjects had been asked if they “know” (they are confident that they had been told that word, but they don’t remember exactly the presentation) or if they „remember” (they are sure about the fact that the respective word had been presented to them and they remember something about the presentation, they had a vivid recollection), most of the time, participants pretended that they remember the word. In this scenario, the participants remember a word that they think they heard previously, when in fact this word had never been presented to them.

False memories captured the attention of the psychologists, who studied many facets of this subject. Considering the experiments on false memories and their outcomes, we can summarize the main elements that influence the false memories, differentiating them on three levels:

- (1) On the individual (participant) level;
- (2) On the procedure level;
- (3) On the word level.

On the individual level, previous studies have shown that older adults exhibit lower levels of veridical recall and recognition of recently studied information than do younger adults. Norman and Schacter (1997) and Tun, Wingfield, Rosen & Blanchard (1998) reported that older adults are more susceptible to false recall and false recognition than younger adults. Results of the experiment run by Kensinger and Schacter (1999) showed that young adults are able to acquire increasing amounts of item specific information across a number of trials, and to use that information to suppress some of their false recollections responses, whereas elderly adults did not show any reduction in false recall across trials. Another issue that could be highlighted on the individual level, is the influence of sleep in reducing the false memories. The findings of Fenn et al. (2009) show that false memories can be reduced following sleep, and the benefits of sleep include increased accuracy in episodic memories. They revealed that there are some possible mechanisms through which sleep might enhance the ability to avoid false memories: some item-specific details associated with studied items could be consolidated during the sleep; sleep could strengthen sensory representation and could provide an interval with less mental activity,

therefore the mental accuracy could be increased. On the individual level, researchers found another aspect with influence on false memories and that is working memory capacity. Watson et al. (2005) found that individuals with high working memory capacity recalled fewer critical lure in the warning condition (when they have been told about possibility of false memories occurrence).

On the procedure level, studies revealed a number of factors that have an impact of false memories. Warning participants prior to the presentation of the list has been shown to reduce false recalls. Gallo, Roberts & Seamon (1997) showed that the forewarned subjects reduced their false alarm rate for critical lures. Because in the forewarned condition, the subjects were specifically told that the study list were designed to “mislead” them, this condition gave the subjects the chance to create strategies to reduce or eliminate the false recognition effect. Another factor that has been shown to reduce false recalls is that of multiple study–test trials (Mc Dermott, 1996). In addition, other factors are considered to influence the false memories and we can mention here the presentation duration: the rate of false recall tends to increase with fast presentation durations and decreases with slower presentation durations (McDermott & Watson, 2001). Combining warnings and multiple study-test trials conducted in obtaining significantly better results – almost complete elimination of false recalls in younger adults (Watson, McDermott & Balota, 2004).

On the words level, a study of Madigan and Neuse (2004) including two recognition experiments confirmed that false memories were significantly less frequent for words of lengths that never occurred in a studied list than for words of lengths that did occur in the study list.

Also, a number of studies showed that distinctiveness reduced false memories occurrence. The literature concerning memory presented the distinctiveness effect, according to which an item is well remembered when certain of his features are distinctive in comparison with other items. For example, some studies revealed the fact that after studying a list of words orthographically associated with a nonpresented lure word, the subjects were less likely to have a false memory about the lure word if this was an emotional one (e.g., “rape” after studying “cape”, “nape”, “tape”, ...) than if it was neutral (e.g., “hook” after “book”, “look”, “cook”) (Pesta, Murphy & Sanders, 2001; Kensinger & Corkin, 2004).

Moreover, it is stated that emotional contents are remembered better than non-emotional contents. There are some studies showing that this aspect is valid both at quantitative level, indicating that emotional contents are recalled or recognized better than neutral contents (Buchanan & Adolphs, 2002) and at qualitative level, indicating that memory is richer in details for emotional than for nonemotional contents (Doerksen & Shimamura, 2001; Kensinger & Corkin, 2003a).

Considering the results of above mentioned previous studies, the present paper is aimed at examining the relationship between the semantic content and the rate of false memories, and starts with the hypothesis that the percentage of recollection error would be greater if the distractor words were semantically related with the ones that needed to be recognized, than if there was no semantically association between the initial and the distractor words.

## **II. METHOD**

### **1. Participants**

50 persons participated to this study: half of them ( $M_{age} = 28$ ;  $SD = 4.56$ ) composed the control group; the other half ( $M_{age} = 34.48$ ;  $SD = 10.97$ ), the experimental group. The two groups were formed depending on the nature of the distractor words that were used, as described in the next two sections of this paper. The answers of 5 participants from the control group were eliminated, because they did not follow correctly the testing procedure. Therefore, the results from these 5 participants were not included in the statistical analysis.

Taking into account the fact that the material consisted of a list of words and that the semantic aspect was very important, the eligible criterion was that the participants to be native Romanian speakers. The recruitment procedure was based on nonprobability sampling, respectively all participants were volunteers.

### **2. Materials**

In order to run this experiment, we created 3 lists of words, starting from the models existing in the experiments of Deese (as cited in Bruce & Winograd, 1998) and Roediger & McDermott (1995).

The first list included 14 words semantically associated: clinic, gown, medicines, surgeon, ambulance, illness, bandage, admission, stretcher, pain, perfusion, hospital, doctor, office. This list was given to both research groups.

The second list was designed for the control group and included the initial 14 words plus other 8 words semantically unrelated to the ones from the first list: equipment, phone, light, sheet, building, pen, car, tools. The complete list was as follows: clinic, equipment, gown, medicines, phone, surgeon, light, ambulance, illness, bandage, admission, sheet, stretcher, building, office, pen, pain, perfusion, hospital, car, doctor, tools. The new words were mixed with the old ones; we have not considered a specific order of the words.

The third list was destined to the experimental group and comprised the initial 14 words on which there were added 8 more words semantically associated with the former ones: dispensary, anesthesiologist, discharge, cancer, wadding, syringe, ward, resident. These words

were placed in the same position as the distractor words from the third list, as follows: clinic, dispensary, gown, medicines, anesthesiologist, surgeon, discharge, ambulance, illness, bandage, cancer, admission, wadding, stretcher, office, resident, pain, perfusion, hospital, ward, doctor, syringe.

We consider it is worth mentioning that because of the translation from the present article, the above mentioned words might not reflect exactly the same meaning as in the experiment we ran in the Romanian language.

### **3. Procedure**

The participants were tested individually or in groups of 3-4 persons. Before starting the experiment, the subjects were informed about the conditions of this experiment. Those subjects tested in groups were told that they would be seated at a certain distance, in order to avoid any temptation of looking to the neighbors' answer. Also, the subjects were told that at the beginning they will be given a word list and they have to read it carefully within 20 seconds. Then, that they have to hand in to the examiner this first list and they will be given the second one, which contained more words than the initial list. They had to mark only those words which they remember from the previous list. The time limit for this second task was 3 minutes.

The second list contained a very short instructing regarding the way in which the participants should proceed further. They were also given this information verbally, that is they had to carefully read the words and mark only those words that they saw on the initial list. In the end of the list, they have been asked the age and gender, mentioning that this data is necessary for the aggregation of the results.

## **III. RESULTS**

The participants' answers for each word were coded using the label "correct" (if the word was identified correctly as being or not being part of the initial list) or the label "wrong" if the memory was false, namely if one said that the word was included in the initial list when actually it wasn't or vice versa.

The significance of the differences between the control group and the experimental one regarding the percentage of false memories was tested using the z test for two independent proportions, by applying the chi-squared test.

The data were synthesized by calculating the frequencies of correct and false memories for each sample. There were emphasized three types of false and correct frequencies, taking into account the complete list of words (initial plus distractor words), as well as each of the two

partial lists derived from separating the initial words from the distractor ones. In order to apply the z test, the cases were weighted in SPSS by each of these three frequency variables.

Table 1. False and correct memories – the number and percentage of responses within each group for initial, distractor and total words.

Group		Initial Words		Distractor Words		Total Words	
		Correct	False	Correct	False	Correct	False
Control	Count	223	57	155	5	378	85
	Percentage	79.6%	20.4%	96.9%	3.1%	81.6%	18.4%
Experimental	Count	270	80	186	14	456	94
	Percentage	77.1%	22.9%	93%	7%	82.9%	17.1%

Table 2. The percentage of participants who incorrectly recalled each word, depending on group.

Initial Words	Percentage Within Group		Distractor Words	Percentage Within Group	
	Control	Experimental		Control	Experimental
Clinic	5%	12%	Equipment <sup>A</sup> / Dispensary <sup>B</sup>	0%	12%
Gown	5%	0%	Phone <sup>A</sup> / Anesthesiologist <sup>B</sup>	5%	16%
Medicines	10%	12%	Light <sup>A</sup> / Discharge <sup>B</sup>	0%	0%
Surgeon	10%	32%	Building <sup>A</sup> / Cancer <sup>B</sup>	0%	0%
Ambulance	10%	20%	Pen <sup>A</sup> / Wadding <sup>B</sup>	5%	0%
Illness	40%	28%	Car <sup>A</sup> / Syringe <sup>B</sup>	0%	8%
Bandage	10%	8%	Tools <sup>A</sup> / Ward <sup>B</sup>	10%	20%
Admission	55%	56%	Sheet <sup>A</sup> / Resident <sup>B</sup>	5%	0%
Stretcher	10%	20%			
Office	30%	32%			
Pain	20%	16%			
Perfusion	20%	16%			
Hospital	25%	20%			
Doctor	35%	48%			

Note. A = distractor word semantically related to initial list; B = distractor word semantically unrelated to initial list

The results regarding the recollection of words depending on whether the second list did or did not include any words semantically associated with the initial list, did not sustain our hypotheses. The chi-square tests indicated that there was not a significant association between

the nature of the distractor words and the percentage of false memories regarding the initial words ( $\chi^2 = .57, p > .05$ ), distractor words ( $\chi^2 = 2.67, p > .05$ ), and complete list ( $\chi^2 = .27, p > .05$ ).

#### **IV. DISCUSSION**

The results of this research did not support our hypothesis according to which it was expected a higher percentage of false memories when the distractor words were semantically associated with the initial ones, as opposed to the condition in which the distractor words were not semantically related to them. Thus, the outcomes of this study were different from the ones reported by other authors (e.g., Roediger & McDermott, 1995).

A possible explanation could be the fact that the second list included an insufficient number of additional words and that they were given to the participants immediately after the first one. Therefore the memories could have been too “fresh”, enhancing the chances of the participants to give correct answers. Besides, as an additional argument for this potential issue, it is also important to take into account the fact that the majority of them were aged between 26 and 31 years, which means that they probably had a good general capacity of information retrieval.

Another possible explanation for the between-groups similarities regarding the percentage of error recollection could be the fact that the distractor words could have had some emotional impact at the subjective level considering that they referred to the field of medical practice, and thus were indirectly connected with one’s health condition. This presupposition could be supported by the studies that, despite some controversies, brought some evidence for the fact that emotional contents were associated with a better recollection performance than non-emotional contents (e.g., Kensinger & Corkin, 2003b)

Also, it is important to highlight the fact that the two lists of words were created without being grounded in norms/studies on semantic association of the words, as well as the fact that the validity of the results presented in this paper is limited by the small number of participants.

Therefore, starting from our findings, it could be useful to proceed further with another study that will involve a larger number of participants. At the same time, it is worth to consider choosing different lists of words, with a different length, and also drawn according to the results revealed by other studies regarding the semantic associations that involve different independent variables (such as the emotional impact of the words).

Taking into account the fact that the subject of false memories is important in case of the recollection of both words and images, and, to a greater extent, also in case of the events

recollection (e.g., in justice area, in case of witnesses testimonials), we consider that the present paper could offer a starting point for a future study on a broader scale.

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