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Do gender stereotypes give rise to false memories?

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Abstract
False memory is normally examined by the Deese-Roediger-McDermott (DRM) paradigm and it has shown an indirect association with gender stereotypes. In this study, gender effect on the false memory formation along with influence of emotional words stimuli were examined. 60 subjects (30 female) were recruited and they were exposed to 4 lists of 12 words in a DRM paradigm. Effects of gender stereotypes were examined using 2 lists of gender categorized words. In addition, emotional effect of the stimuli was also investigated by 2 lists of negatively-valanced or neutral lures (eg. blood or chair). Subsequently, false memory rates in the male and female participants were statistically compared using a mixed ANOVA model. The results showed a significant differential effect of gender on the false memory formation as well as negative and neutral word stimuli.

Keywords: False memory, Deese-Roediger-McDermott paradigm, gender stereotypes.

1. Introduction and preliminaries

In Recent years, there has been a growing interest toward examining and exploring the nature of falsely remembered information by individuals who actually never were presented with it. Roediger and McDermott (1995) adapted an experimental technique originally developed by Deese (1959), hereafter referred to as the Deese–Roediger–McDermott (DRM) paradigm and this paradigm in turn drew more attention to the subject. Participants in Roediger and McDermott research were presented with lists of

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15 words that were the strongest associates to a missing word in free association norms [1].For example, lets assume this list of words was presented to the participants might be presented with the following list of words, all of which are related to word “sleep” which is not presented: bed, rest, awake, tired, dream, wake, snooze, blanket, doze, slumber, snore, nap, peace, yawn, drowsy. After the presentation of a study list, participants were asked to immediately recall as many of the list words as possible in any order with a warning against guessing. Despite this warning, participants typically recalled the no presented critical words with about the same probability as items that appeared in the middle of the study list. These significant high levels of false recall and recognition have been widely replicated and extended (see Roediger, McDermott [2] for a partial review) [3].

Implicit Associative Response Theory (IAR) of False Memories Elicited by the DRM Paradigm: In theories of association, activation is a fundamental concept. Activation as defined by Anderson (1983) is the transfer of information from long-term memory to short-term memory. In other words, activation is the transfer of information from a latent state to a conscious state. General models of recall, predict that a person incorrectly recalls an event when the concepts activated during the study are associated with non-activated concepts, which are activated through the process of broadcasting the activity takes place. After a while, when one is asked to recall what he or she has studied, all activated concepts will come to mind and one cannot distinguish between right and wrong concepts, this being said to be a failure in coding resources.

Underwood's IAR Theory (1965) is an associative theory for the calculation of false memory. Underwood (1965), like Dies (1959) studied the interventional error in the learning paradigm. He hypothesized that by presenting a list of items for study, researchers can activate items that were strongly related to them, hence calling it a conceptual associative response (IAR). He also found that this activation causes encrypted unmasked items to be encoded in line with the actual read items. In other words, when participants read the words, the most common items related to these words will be activated by them. Underwood (1965) observed that participants mistakenly perceived the word critical more than any other word and this would likely increase the performance of previous associations [4].

In order to study false memories produced by social stereotypes, we adapted the Deese–Roediger–McDermott (DRM) paradigm in the present research. A stereotype is a cognitive representation of the ideas, facts, and images that are associated with a social group [5].

For example, it is undeniable that we have stereotypes of vast number of groups such as genders, nationalities, ethnic groups, occupations, political parties, social clubs, and even families. By using Stereotype concepts, we will use a have suitable and interesting context in which the effects of direct and indirect associations on false memories can be studied. In an associative network model, direct association between two concepts is possible if they are related to another concept without reference. Usually associate generation tasks are used to measure Direct associations are usually measured via associate generation tasks, and they are the basic and essential aspects of memory illusion researches [1](Roediger, & McDermott, 1999). However, two concepts form an indirect association when they are related through a third (mediating) concept. Free-association production probabilities can help us

distinguishing These two types of associations (for discussions, see [6]. For instance, imagine that you are asked to associate freely to the concept lion. Like most of the people, tiger would be one of the first associates you produce, and tiger can be considered as a direct associate for lion. Then if you are presented with tiger as a stimulus and asked to generate associates, you would most probably produce stripes. But in contrast, it is unlikely for you to produce stripes in response to lion. The association between Lion and stripes is indirect and tiger is the mediating concept through which the association is formed.

Social stereotypes contain an abundance of indirect associations. For example, it is unlikely for nurse to be associated with librarian. Yet, nurse and librarian does share a common link to the concept of feminine roles and through this link, they can be indirectly associated.

Can the DRM paradigm produce false memories based on indirect (stereotype) associations? Investigating indirect associations tests a potential limiting condition on the false memory effect. It is predictable that the presentation of lion can lead to production of false memories of the direct associate "tiger"; but what about stripes? Is it possible for a perceiver to have a false memory for stripes after seeing lion? In addition, investigation the formation of false memories based on indirect associates helps to the search for a theoretical interpretation of the process(es) responsible for the false memory effect.

An important underlying issue is the involvement of implicit (automatic) associative processes versus explicit (controlled) guessing strategies (see Roediger et al., 1998, for a review of competing theoretical interpretations). Roediger and McDermott (1995) argued that false memory for critical, associated words occurs as a result of spreading activation through an associative network. Due to the links between sleep and each of the presented words, bed, rest, and awake, the strong associate sleep becomes activated upon presentation of the other words. Later, when the participants attempt to remember the words they saw earlier, the activation of sleep at time of study misleads them to recall or recognize it as an "old" word.

Emotional memories are vivid and lasting but not necessarily accurate. Under some conditions, emotion even increases people's susceptibility to false memories. This review addresses when and why emotion leaves people vulnerable to misremembering events. Recent research suggests that pregoal emotions—those experienced before goal attainment or failure (e.g., hope, fear)—narrow the scope of people's attention to information that is central to their goals. This narrow focus can impair memory for peripheral details, leaving people vulnerable to misinformation concerning those details. In contrast, post goal emotions—those experienced after goal attainment or failure (e.g., happiness, sadness)—broaden the scope of attention leaving people more resistant to misinformation. Implications for legal contexts, such as emotion-related errors in eyewitness testimony, are discussed [7]

This research considered the role of emotions and specifically examined the effect of emotional word lists and participants' moods on false memories in the DRM paradigm. In one type of research, researchers have used emotionally laden word lists to test participants in the absence of mood induction. These studies aimed to investigate the effect of emotional content. In this research, our

purpose is to examine whether false memory can be created by gender stereotypes in the Deese-Roediger-McDermott paradigm [7]. We also seek to investigate the effect of emotional word burden on false memory formation in two groups

Materials and methods

Participants and Apparatus

Participants were 30 college students (age M ± SD: 25.16 ± 1.70 years, 15 male) from the Zanjan University. All participants had a normal or corrected-to-normal vision. Being in 18-30 years age range, having no consumption of caffeine, alcohol, and other drugs in the few past hours were considered as inclusion criteria. The tasks were presented to the participants using a desktop computer with a screen of 22 inches from 60 cm.

DRM method was used to measure false memory [8] The words used in the lists DRM were extracted from a similar Persian article in the field [9].

Procedure

Subjects participated individually in this experiment. They first signed the participant consent questionnaire. Subjects were placed in front of a computer in a test environment (the subjects were unaware of the purpose of the experiment. After the test, the objective of the test was explained to them). The procedure of displaying the lists was in this way: a list consisted of 12 words was presented to each participant. Then they were asked to tough their own wrist and count their pulse for one minute in order to avoid memorizing previously displayed content. After that, the Subjects were assigned to the subjects after which a list of words related to those words was presented to the subjects. This procedure continued until all 4 lists were displayed. [10]. Our word lists included a male list, a female list, a black negative list, and a neutral word list for the window. These words were extracted from Comparison of working memory capacity of obsessive-compulsive patients with control group article. [11] and List of sex stereotypes extracted from False memories article based on indirect associations of gender stereotypes of occupations. [12]

Results

Table 1 shows the mean proportions of correct and false recall of stereotype (men and women listed) items by men and women. Mean correct and false recall scores were analyzed in separate 2 (gender) x 2 (list type) mixed ANOVAs.

The analysis of false recall in stereotypes list produced not significant main effects of gender, F(0.122), MSE=0.022, p=0.727, and list type, F=0.003, MSE=0.001, p=0.955, There was a significant interaction between gender and list type, F=34.387, MSE=6.230, p=4.49e-08, Planned comparisons showed that women falsely recalled more stereotypes list critical lures than men, t(2.50)=, p=0.01., there was a significant gender difference in the false recall of Lists of gender stereotypes critical lures, t(-7.26)=., p=0.00. Women also falsely recalled more Lists of gender stereotypes lures than women lures,

t(16.16)=, p=0.00., levels of false recall of stereotypes list lures did differ significantly for men, t=-13.23, p=0.00 related intrusions were low and significantly affected by gender or list type.

Table 1: Investigation of Gender Imagery (In-group comparison)

		False word from female list		False word from male list		t-test	
		mean	std	mean	std	t-statistics	p-value
goal false recall	woman	0.93	0.25	0.67	0.48	2.50	0.01
	man	0.07	0.25	1.00	0.00	-5.38	0.00
related false recall	woman	0.60	1.50	3.53	1.54	-7.26	0.00
	man	0.20	0.76	0.40	0.56	-1.29	0.21
true memory	woman	5.93	1.86	5.60	1.19	0.81	0.43
	man	6.60	2.16	6.10	1.64	1.40	0.17
unrelated words	woman	0.50	0.63	0.13	0.43	2.48	0.19
	man	0.30	0.60	0.13	0.43	1.31	0.20

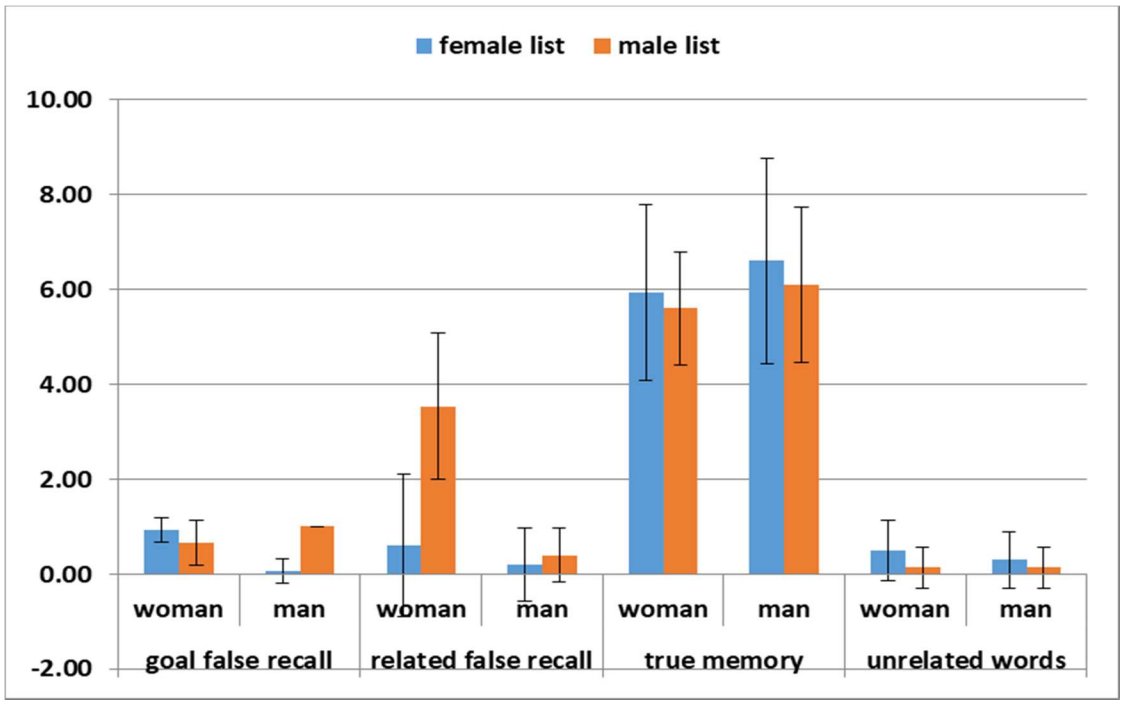

Figure 1: Investigating Gender Imagery (In-group comparison)

Table 2: Investigation of Gender Imagery (Intergroup comparison)

		woman		man		t-test	
		mean	std	mean	std	t-statistics	p-value
goal false recall	female list	0.66	0.25	0.93	0.25	-13.23	0.00
	male list	0.93	0.25	0.66	0.47	-13.23	0.00
related false recall	female list	0.60	1.50	0.20	0.76	1.30	0.20
	male list	3.53	1.54	0.40	0.56	10.42	0.00
true memory	female list	5.93	1.85	6.60	2.16	-1.28	0.21
	male list	5.60	1.19	6.10	1.64	58.00	0.18
unrelated words	female list	0.30	0.60	0.50	0.62	-1.26	0.21
	male list	0.13	0.43	0.13	0.08	0.00	1.00

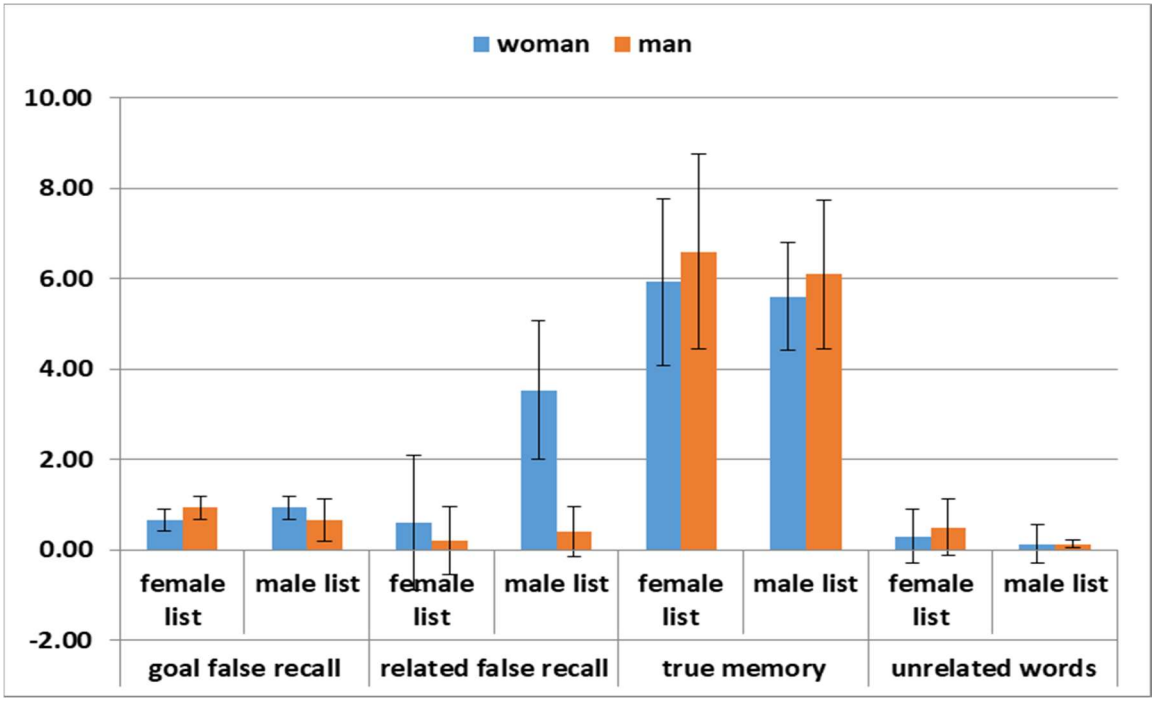

Figure 2: Investigating Gender Imagery (Intergroup comparison)

Table 3 shows the mean proportions of correct and false recall of negative and neutral items by men and women. Mean correct and false recall scores were analyzed in separate 2 (gender) x 2 (list type) mixed ANOVAs. The analysis of correct recall showed a was significant main effect of gender F(=5.734, MSE=5.734., p=1.28e-08, The main effect of list type also showed that participants recalled more neutral than negative words, F=1.878, MSE=0.286, p=0.017, The interaction between gender and list type was statistically significant, F=32.595, MSE=4.969, p=9.15e-08.

Table 3: Emotional load assessment (intra-group comparison)

		negative word		neutral word		t-test	
		mean	std	mean	std	t-statistics	p-value
goal false recall	woman	0.93	0.25	0.33	0.18	16.16	0.00
	man	0.50	0.51	0.90	0.31	-3.53	0.00
related false recall	woman	3.20	1.58	0.33	0.18	10.71	0.00
	man	0.40	0.67	0.33	0.71	0.36	0.72
true memory	woman	5.40	1.33	4.83	1.44	1.73	0.09
	man	4.83	1.64	4.73	1.87	0.21	0.84
unrelated words	woman	2.46	1.41	0.13	0.35	8.56	0.00
	man	0.23	0.43	0.30	0.59	-0.49	0.62

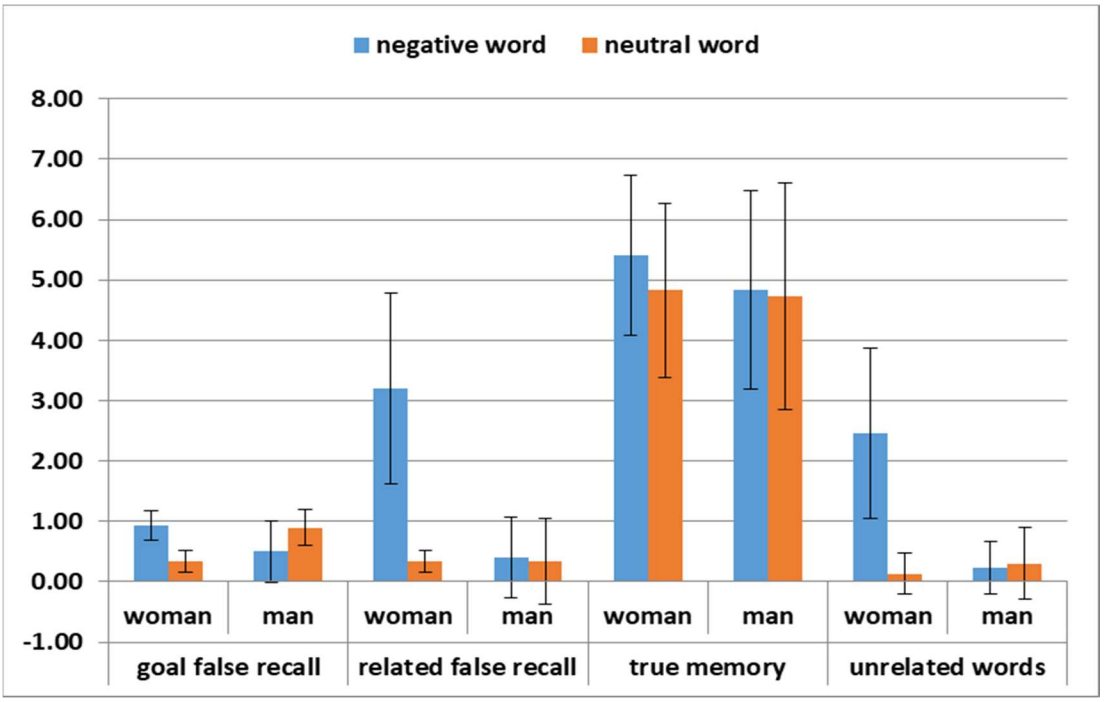

Figure 3: Emotional load assessment (intra-group comparison)

Table 4: Emotional load assessment (intergroup comparison)

		woman		Man		t-test	
		mean	std	mean	Std	t-statistics	p-value
goal false recall	negative word	0.93	0.25	0.50	0.50	4.18	0.00
	neutral word	0.03	0.18	0.90	0.31	-13.15	0.00
related false recall	negative word	3.20	1.58	0.40	0.67	8.91	0.00
	neutral word	0.03	0.18	0.33	0.71	-2.24	0.03
true memory	negative word	5.40	1.33	4.83	1.64	1.47	0.15
	neutral word	4.83	1.44	4.73	1.87	0.23	0.82
unrelated words	negative word	2.46	1.41	0.23	0.43	8.31	0.00
	neutral word	0.13	0.35	0.63	0.81	-3.11	0.00

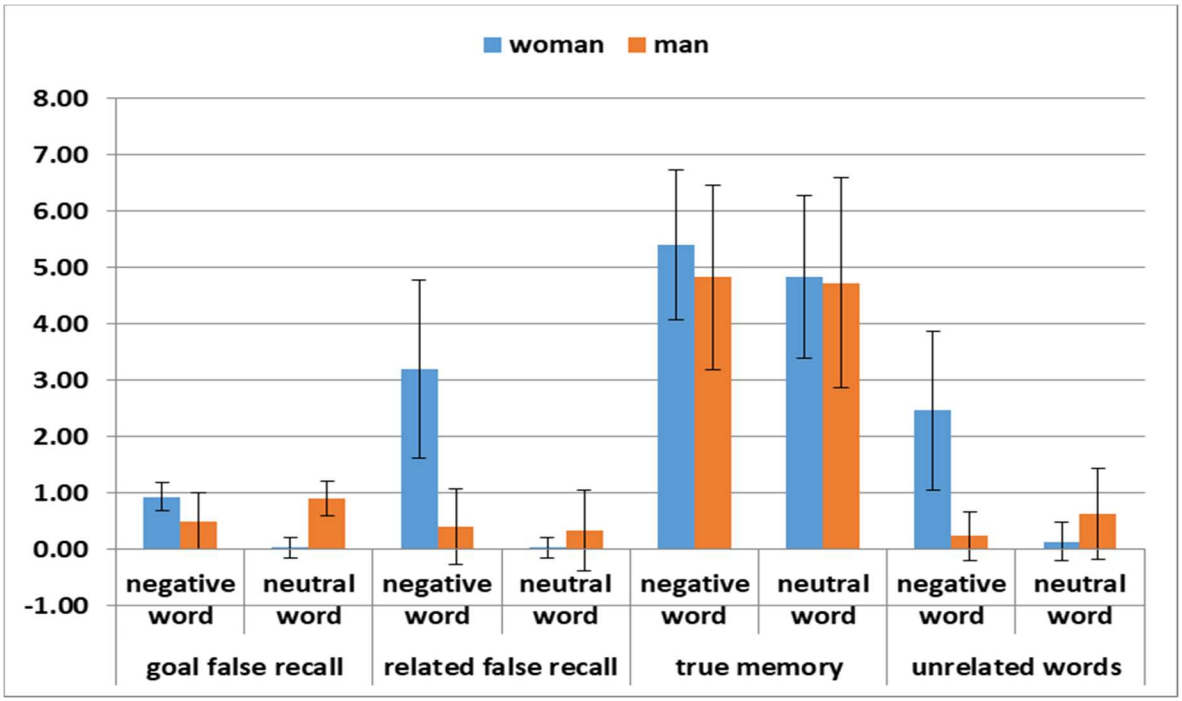

Figure 4: Emotional load assessment (intergroup comparison)

Discussion.

experiment reported that they were unaware of the gender theme of the studied list, suggesting that the false memories were due to implicit associative processes. Although we could replicate an

increase in the false recognition of stereotypically gender-congruent occupations, the analyses of the responses and the participants' egalitarian attitudes against the gender role helped us detecting a gender-congruent effect. Moreover, analyses of the responses indicated that participants' attitudes toward gender roles potentially moderate the degree that they form occupational gender stereotypes. Implications of the results for basic/applied research on the interactions between stereotype and memory are discussed.

This study examined whether false memories, as revealed by the Deese-Roediger-McDermott (DRM) paradigm, can arise from indirect stereotype associations, as proposed by Lenton, Blair, and Hastie (2001). We found significant indications of stereotype-evoked false memories. The participants in our experiment reported that they were unaware of the gender theme of the studied list, suggesting that the false memories were due to implicit associative processes. Although we could not replicate an increase in the false recognition of stereotypically gender-congruent occupations, we detected a gender-congruent effect partially by the analyses of the "Remember" responses and the participants' egalitarian attitudes against the gender role. Moreover, analyses of the "Know" responses indicated that participants' attitudes toward gender roles potentially moderate the degree that they form occupational gender stereotypes. Implications of the results for basic/applied research on the interactions between stereotype and memory are discussed

of the target material on false memories. For example, Brainerd, Silveira, Rohenkohl, and Reyna (2008) found that critical lures associated with negative word lists leads to higher false recognition rates than those associated with positive or neutral word lists. In another category of research, researchers have induced a particular mood in participants and then used traditional, non-emotional, DRM word lists to test them. these studies aimed to examine the effect of emotional state on false memories. For instance, Storbeck and Clore (2005) induced positive or negative moods in participants by playing music for them and then asked them to learn word lists consisting of neutral words. Their results suggested that participants in a positive mood falsely recalled the critical lures more often than did participants in a negative mood [11].

At the first glimpse, it might be difficult to accept both the data reported by Brainerd et al. (2008) and by Storbeck and Clore (2005) [12]. Brainerd et al. (2008) suggests that negative word lists cause higher leves of false memory while on the other hand, Storbeck and Clore (2005) concluded that a negative mood reduces the level of false memory. However, It is important to note that in each of these studies, the authors only manipulated one aspect of emotions when they investigated their effect on false memories and this makes the comparison difficult. In most of the studies designed to answer this question, researchers have tested participants with depression—a naturally occurring mood manipulation

([13], [14], [15]). The primary finding in these studies is this: negative or depression-relevant word lists in compare with positive or neutral word lists cause higher levels of false memory in participants who suffer from, suggesting that memory errors escalate when one's mood and the emotional valence of the word lists match.

The nature of the word lists that have been used to test participants can be considered as One possible explanation for these mixed results. In most of the studies, all of the words on the

particular lists did not reflect the target emotion (Brainerd,Holliday, Reyna, Yang, & Toglia, 2010; Knott & Thorley,2014; [16], 2009; Ruci et al., 2009). For example, the negative emotional word lists used in Knott and Thorley (2014) were taken from Dewhurst, [17], and in this list, the word "truth" is an associate of the critical lure "lie", "together" is an associate of the critical lure "alone", and "tissue" is an associate of the critical lure "cry". These list words – "truth", "together" and "tissue"– do not have a negative emotional valence. Other researchers have referred to the Affective Norms for English Words (ANEW, Bradley & Lang, 1999) and Nelson, McEvoy, and Schreiber's (2004) free association norms to identify the values for valence, arousal, and backward association strength (BAS) for list words and critical lures. Although the well-designed database has contributed to many significant studies, not every word that has been used on word lists in DRM research can be found on the existing database and previous researchers have not collected their own data for the missing words on the lists [18]. Where researchers have collected their own data for the word lists that they constructed [13] they only collected data to establish BAS values without also collecting data to determine the arousal and valence of words on the lists. Since valence and arousal both could have effect on false memories [19], it is essential to hold one constant in order to examine the effect of the other. No single study has both arousal and BAS, equated in the different emotionally laden list words and critical lures.

The present study investigated gender differences in associative memory illusions by presenting lists of associates of negative and neutral critical lures to male and female participants. Consistent with previous research [20]&; [21], [22]; [23] there was gender difference in the false recall of neutral critical lures. In contrast, a significant gender difference was found in the false recall of negative critical lures, whereby women falsely recalled more negative lures than men. This gender difference was present both in overall levels of false recall and in recall accuracy. Previous studies have shown that women typically recall more emotional information than men [24]; [25]; [26]. The present findings show that, under some conditions, women's memory for negative emotional information may be less accurate than that of men.

Bloise and Johnson (2007) suggested that women are more likely than men to discover and reflect on connections within the study material, thereby forming richer associative connections that serve as retrieval cues in subsequent recall tests. Although this account was presented to explain why they found a gender difference in the recall but not in recognition memory, it can be extended to explain the gender difference in false recall found in the current study. According to the activation-monitoring account of associative memory illusions (Roediger et al., 2001), such errors occur when participants generate associates of the words presented in the study lists. The present findings suggest that women reflect on associations within negatively-valenced lists to a greater degree than men and are thereby more likely to generate the negative critical lures [27].

Application and limitations

Limited sample size and number of the lists were constraints of this study. Moreover, further analysis on the critical age for gender stereotypes formation is suggested for the future works.

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