

Research Paper

Comparing Autobiographical Brand Images and Neutral Images Regarding False Memory Formation



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Citation Shabani, M., Salehi, J., and Khosrowabadi, R. (2022). Comparing Autobiographical Brand Images and Neutral Images Regarding False Memory Formation. *Basic and Clinical Neuroscience*, 13(4), 489-500. <http://dx.doi.org/10.32598/bcn.2021.2275.2>

<http://dx.doi.org/10.32598/bcn.2021.2275.2>



Article info:

Received: 14 Sep 2020

First Revision: 29 Sep 2020

Accepted: 06 Oct 2020

Available Online: 01 Jul 2022

Keywords:

Brand autobiographical memory, False memory, Deese-Roediger-McDermott paradigm (DRM)

ABSTRACT

Introduction: Consumers' prior experiences form an episodic memory that largely influences their decision-making process. This episodic memory is mainly linked to cognitive and emotional perception and we know that brand image influences our cognitive and emotional perception. Nevertheless, it has not been well described how autobiographical memories of brand images differ from other types of images.

Methods: In this study, we hypothesized that brand pictures have a higher chance to create false memories as compared to neutral ones.

Results: We investigated this hypothesis using the Deese–Roediger–McDermott paradigm with lists of brand pictures from the local market and associated neutral images from the international affective picture system. Thirty graduate students were exposed to image stimuli, followed by a distractor task and a recognition task. After the normality test, reaction times (RT), and false recognition rate of brands and neutral images were statistically compared using a pairwise t-test.

Conclusion: The results showed a significant decrease in reaction time (RT) and an increase in the false recognition rate of brand pictures compared to neutral images. Interestingly, the effect of gender on the creation of false memory by autobiographical brand images was not significant. We hope these findings can pave the way for a better understanding of the false memory mechanism.

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Highlights

- Autobiographical brand images give a higher chance of false memory as compared to neutral images
- Men and women do not differ in the formation of false memory
- Reaction time in false memory is longer than in true memory.
- False positives create more cognitive load.

Plain Language Summary

We see many images around us every day, such as the image of different brands in our daily shopping, which puts us in front of different types of images, many of which are old, these brands become part of our life memories, and their images are aspects of autobiography. Therefore, these brands can form false memories for people. The image stimuli of this study are to investigate whether these images can form false memories or not. The results showed that the images that we see every day in the street of the supermarket and can change our memories.

1. Introduction

The eventual impact of a brand depends on the nature of consumers' experiences with that brand and the extent to which these experiences prevail in creating a clear association in the consumers' minds. Consumers may form a meaningful and personal association between themselves and a given brand and firmly connect with the self-concepts (Moore & Homer, 2008). In this regard, the autobiographical memories associated with a given brand allow consumers to choose the product that they think they know about. Therefore, it is important to investigate whether advertisements can lead to the creation of false memory in consumers. We believe that personal life memories are the epitome of personal events influencing a person's behavior. That is why, factors such as photographs, people's accounts, our goals, and motivations can stimulate these narratives when we reminisce.

Autobiographical memory can be defined as a memory of past personal experiences and is considered a vital foundation of a person's self-concept. Therefore, there has been an increasing focus on identifying methods of retrieving this type of knowledge (Hyman Jr, Gilstrap, Decker, & Wilkinson, 1998). The emotional part of the brand-associated relationships in adulthood is probably set during childhood when such relationships are formed. Subsequently, the consumer's childhood memories of the brand or brand experiences can be a determinative factor in their decision-making. For instance, as they bring to mind those past emotional

attachments, these autobiographical memoir sequences are perceived as veridical records joined by strong visual and, subsequently, graphic remembering of the original experience in themselves; particularly because they suggest that the original emotions are probably crucial components of autobiographical memories (Baumgartner, Sujana, & Bettman, 1992).

Advertisement and how it affects memory and forms false memory has been investigated in a large number of studies (Sherman, 2013; Sherman, Follows, Mushroom, Hampson-Jones, & Wright-Bevans, 2015; Sherman & Moran, 2011). For instance, one study proved brand names as a set of stimuli create false memories (Sherman & Moran, 2011). The brand names can be divided into different categories based on the following distinctive aspects. First, brands are uniquely presented to the audience through advertisements via television, print media, billboards, films, etc. Second, advertisements intentionally seek to make brand names and products associated with them appealing and memorable. Third, brands often occur in their categories, potentially reinforcing their category membership and strengthening semantic connections between them. For example in shops, similar items are arranged in clusters of related products. These distinctive features make brands a valuable candidate for "real-life" stimulation to be used in the studies on false memories (Sherman & Moran, 2011). Moreover, research on brand images and their impact on memory can also help improve the effectiveness of successful advertisements.

False memories are mental experiences erroneously taken to be veridical portrayals of past occasions. To understand and study true and false memories, the source monitoring framework can be used as a theoretical approach (Brainerd & Reyna, 2005). Based on this view, attributing mental experiences to memory is based on factors, such as the qualitative features of the mental experiences (Lindsay & Johnson, 2000) and if they exist in supporting memories, knowledge, and beliefs. Memory attributions are made via flexible criteria and factors, such as motives, goals, and the social context influencing them. Therefore, it is possible to mistake vivid or even vague false information that fits the activated schemas for true information. Suggestion effects in eyewitness memory, inadvertent plagiarism, children and adults false accounts of abuse, reports of alien abductions, and ‘memories’ from infancy are some examples of memory distortions that derive from such factors. For example, some studies suggest that repeatedly questioning a person about a fictitious event can lead them to create elaborate descriptions of the event. Encouraging individuals to create images can increase the probability of false memories (D. A. Gallo, Foster, & Johnson, 2009).

Decades of research show that people are susceptible to developing false memories (Nichols & Loftus, 2019). In the last decade, using a list of associated words has been one of the most common methodologies. This procedure, known by the acronym Deese-Roediger-McDermott (DRM), was developed by Roediger and McDermott (Pardilla-Delgado & Payne, 2017) and is based on studies done by Deese in 1959. In DRM, a list of words is presented to the participant to be memorized (study phase) and later recognized (test phase). To do this, standard verbal stimuli (word lists) with either neutral or emotional content (positive and negative) are adopted in such a way that they are familiar (somehow to mislead the person). Organizing stimuli into participant-related collections have been inspired as a method by previous research with words, which creates strong misdiagnosis effects.

These kinds of false memories are believed to be the result of the automatic activation of “gist” information (Devitt & Schacter, 2016). Accordingly, in the study phase, people memorize the desired words either via detailed representation (specific and detailed characteristics of the words, such as pronunciation and spelling), or root and original representations (general and indefinite features, such as meaning). Hence, information is encrypted in two separate ways. When decrypting the information in the test phase, people either retrieve elements of terms leading to recollection/recognition of

target words (true memory) or only retrieve inherent and meaningful elements leading to recollection/recognition of obscure words (false memory) (Sun, 2019).

In the recognition task, participants should distinguish items whose presentations are clearly remembered from items that seem to be merely familiar (i.e., items for which they do not have full memory).

Based on the current models of recognition memory, recognition involves both familiarity and recollection. People with a sense of familiarity seem to respond more quickly, which is defined as a quick decision in the diagnosis stage. Some authors interpret the “remember” and “know” as responses that reflect different processes of recollection and familiarity, respectively (Weinstein & Nash, 2013; Matzen & Benjamin, 2009).

Nowadays, the main focus of different brands is to be seen in a certain way and to be able to grow in the minds of consumers through various advertisements. Many advertisers focus on creating a sense of familiarity in the audience. In other words, they try to make consumers believe that they have already used a certain product and felt satisfied with it. In this study, we seek to understand how autobiographical brand images can be different from neutral images in terms of false memory formation.

2. Materials and Methods

Participants were 30 graduate students (Mean±SD age: 25.16±1.70 years, 15 women, all right-handed) at Shahid Beheshti University, Tehran, Iran. All participants had normal or corrected to normal vision and had no consumption of caffeine, alcohol, or any other drugs in the few hours before the experiment. Inability to obtain a minimum normal score (two standard deviations above or below the average score) in the cognitive tasks, including Raven’s intelligence test, n-back, and DRM was used as an exclusion criterion. Table 1 presents the participants’ demographics and their cognitive scores. The tasks were presented to the participants using a desktop computer with a 32-inch screen placed 1.4 m away from the participant. The n-back test (Chooi & Thompson, 2012) was commercially designed by the Sina institute for behavioral and cognitive research and the DRM task was automatically implemented in the Matlab2014 software.

Stimuli

The DRM method was used to measure false memory (Roediger & McDermott, 1995), which is the most widely used method to check the false rate in short-term

Table 1. Demographics and cognitive scores of the participants

Characteristics	Groups / Mean±SD		Two Sample t-Test	P
	Female	Male	t	
Age (y)	25.00±1.56	25.33±1.88	-0.523	0.603
IQ score	103.87±4.32	108.27±24.63	-0.681	0.501
N-back rate	93.13±3.94	90.07±14.19	0.806	0.432

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IQ: Intelligence Quotient.

memory (D. Gallo, 2013). Roediger and McDermott revived the experimental design developed by Deese because no other reliable laboratory paradigm existed to induce false recall (Pardilla-Delgado & Payne, 2017).

Using the DRM method, we created two tests: one with brand image stimuli and another with neutral images adapted from the international association of physics students (IAPS) (Lang, Bradley, & Cuthbert, 1997). Categories of the brand image stimuli were derived from Sherman's work (Sherman & Moran, 2011). Then, the related brand images were extracted from data provided by Jarf Negar market research company according to the information provided by the company. The brand images had been exposed to the public for five years when we experimented. Famous brands were excluded because the products with the highest and the lowest frequency were excluded from the experiment due to high reputation and low productivity. The company was one of the sponsors of this research and permitted us to use their data in this research.

Experimental procedure

Two similar tests were constructed according to the DRM paradigm, the only difference being the type of images used in each of them. In the first test, neutral images from IAPS were used and in the second test, brand images were implicitly used. Each test consisted of 8 different categories of images and order of the brand image categories that were randomly selected for each participant while we ensured that all the categories were presented. The description of the test is as follows. In the first stage, 20 images of a category were presented to the participants. The images were consecutively displayed one second for each image. After, the participants were asked to count their heartbeat for one minute and report the number they counted to the examiner. This was used to create a distraction. After this step, 20 images were shown one by one, including 10 duplicate images and 10 very similar images that were not included in the original set of images. Following the presentation of each image, the participants answered two questions. First, they had to decide whether

the image they just saw was included in the original set of images that they had previously seen. Second, participants had to determine the level of confidence in their answers by choosing one of the three predetermined choices: I do not know, I know, I doubt. The same procedure was applied to all eight sets of images (Figure 1). Participants rested for 4 min between blocks and 30 min between the two experiments.

This test consists of two stages. The first stage is for participants to view and memorize images. In the study phase, people viewed duplicate images and new images. After each image, people were asked for two years. Question 1: Was the image you saw part of the category of images viewed? The second question examined people's confidence.

Data analysis

In both experiments, the DRM paradigm was used to measure false and true memories. The DRM test measures participants' true and false choices in short-term memory during recall and recognition. If the duplicate stimulus is presented and the participant approves it, the memory is considered true, but if a non-duplicate stimulus is presented and the participant reports having seen it, they have developed a false memory. Following this procedure, we calculated the number of true and false memories. The participants' reaction times (RT) were also calculated while answering the question "Was the observed image among the images you saw in the previous phase?" Then the percentage of true and false memories was calculated by dividing the number of each type of memory by the total number of presented images.

Statistical analysis

In this study, first, we compared true and false memories of neutral and brand images in a group of 30 university students. To study gender differences, true and false memories of neutral and brand images were separately compared in the male and female groups. The normality of the data was checked using the Shapiro-Wilk test

before the t-test. The above-mentioned comparisons were performed for true and false memories and RT and a pairwise t-test were applied for statistical analysis. Subsequently, we compared true and false memories associated with neutral and brand images in the male and female groups using two independent sample t-tests.

3. Results

Table 2 presents the results of the pairwise t-test between false and true memories for biographical brand images and IAPS neutral images in the male and female groups. Based on the results shown in Table 2, autobiographical brand images in the female group create more false memories compared to neutral images ($t=16.1680, P=0.005$). While, true memories for autobiographical brand images were lower than the true memories for IAPS images ($t=16.168, P=0.005$). Also, true and false memories for the brand and IAPS images were compared in the male group and the following results were obtained. False memory was significantly higher for autobiographical brand images ($t=20.1800, P=0.005$) and true memory was significantly higher for IAPS neutral images ($t=23.129, P=0.005$). Compared to false memories, true memories were higher in the two groups for neutral and brand images. Moreover, more true memories existed for neutral images compared to brand images. Table 2 and Figure 2 present the recognition results for the brand and IAPS images in each group (male versus female groups). Table 2 examines the comparison of male and female groups in the formation of false and true memory in two categories of brand images and IAPS images. Figure 2 examines

the comparison of male and female groups in the formation of false and true memory in two categories of brand images and IAPS images.

In the next section, we present the RT for true and false memories in the male and female groups. Table 3 and Figure 3 present the results of the dependent t-test between the mean RT of false memory and true memory for autobiographical brand images and IAPS neutral images. Based on the results, the RT for the false memories of autobiographical brand images was significantly faster than RTs of false memories of IAPS neutral images in males ($t=2.12, P=0.05$) and female groups ($t=2.02, P=0.09$). Table 3 presents the comparison of RT in false and true memory in the category of brand images and IAPS in two groups. Figure 3 shows the comparison of reaction time in false and true memory in the category of brand images and IAPS in two groups

According to the results presented in Table 3, the average reaction time for the false memory was longer in all participants who had false memories for the autobiographical brand images compared to IAPS neutral images. No significant difference was observed in the male and female groups but the trends were similar. Also, no significant difference was observed for true memory recognition.

Figure 3 presents the average and standard deviation of the participants' RT to recognize the false and true memories of the brand or IAPS neutral images.

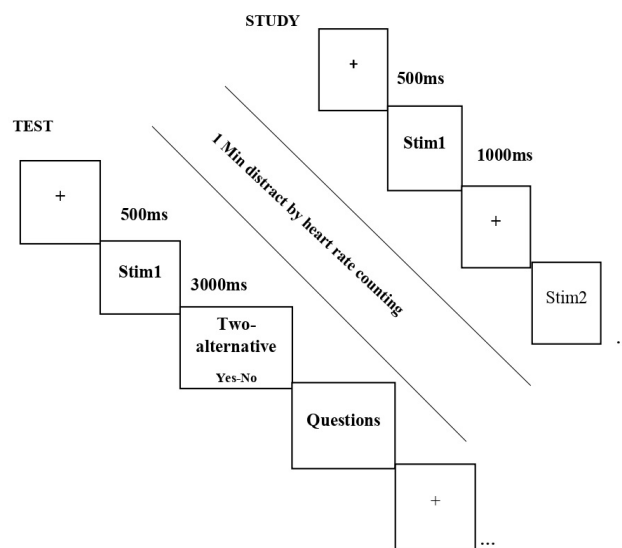


Figure 1. Procedure of the Deese-Roediger-McDermott (DRM) task

Table 2. Comparison of neutral and brand images for false memory formation

Image Type	Variables	Mean±SD		Pairwise t-test Neutral vs Brand	
		IAPS Neutral Images	Brand Images	t	P
False	Female (n=10)	0.01±0.016	0.239±0.051	-16.168	0.005
	Male (n=13)	0.020±0.013	0.256±0.038	-20.180	0.005
	All participants (n=23)	0.018±0.015	0.243±0.044	-27.003	0.005
True	Female (n=15)	0.985±0.015	0.760±0.051	16.168	0.005
	Male (n=15)	0.979±0.012	0.755±0.033	20.189	0.005
	All participants (n=30)	0.982±0.014	0.756±0.044	27.003	0.005

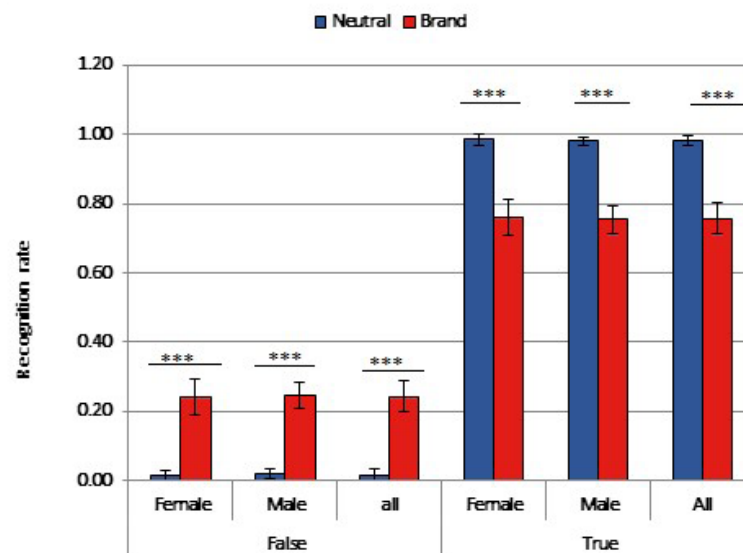
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In the next stage of our analysis, we investigated the effect of gender on the formation of false memories of neutral and brand images. As presented in Table 4 and Figure 4, no significant result was observed for the male and female groups. Table 4 presents the effect of gender at RT in true and false memory in the category of brand images and IAPS. Figure 4 shows the effect of gender at RT in true and false memory in the category of brand images and IAPS. Moreover, no difference was observed between male and female groups in their RT to recognize false and true memories either for neutral or brand images (Table 5 and Figure 5). Figure 5 shows the effect of gender on the RT to recognize false/true memories for the brand and the IAPS neutral images.

4. Discussion

Research on memory has been common research interest in psychology and consumer behavior. Although, the distinction between different memory systems and their behavioral implications is sufficiently not emphasized in consumer behavior research. In this study, we investigated the effect of self-brand biographies on false memory formation. The results showed that brand images can create a more false memory of autobiographical brand images than neutral images.

The capability of brand names to create false memory and deceive our memory has been indicated in previous studies (Sherman & Moran, 2011). Sherman and Moran also examined the effect of brand names on false memory formation based on the DRM paradigm



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Figure 2. Comparison of recognition rates of false/true memories for the brand and the IAPS neutral images

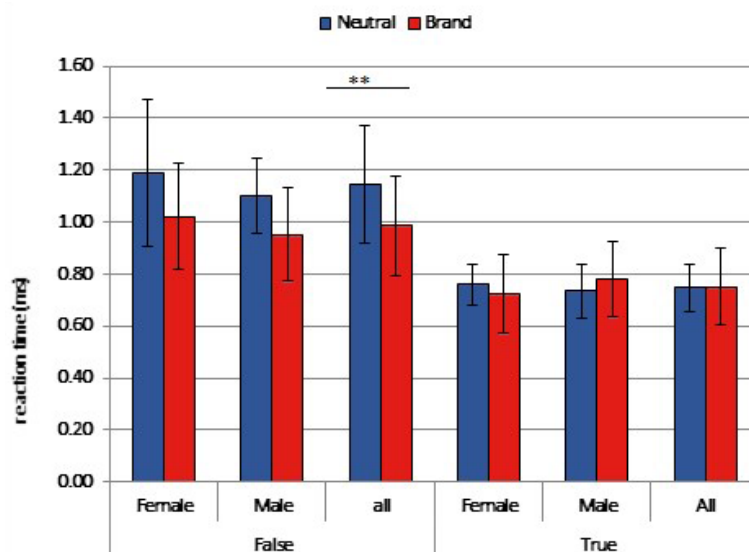
Table 3. Comparison of Reaction Times (RTs) to recognize false/true memories for the brand and neutral images

Image Type	Variables	Mean±SD		Pairwise t-Test Neutral vs Brand	
		IAPS Neutral Images	Brand Images	t	P
False	Female (n=10)	1.187±0.282	1.022±0.201	2.122	0.054
	Male (n=13)	1.102±0.145	0.951±0.179	2.021	0.098
	All participants (n=23)	1.144±0.224	0.987±0.191	2.711	0.011
True	Female (n=15)	0.761±0.078	0.722±0.152	-0.049	0.961
	Male (n=15)	0.736±0.103	0.781±0.146	-0.676	0.51
	All participants (n=30)	0.749±0.091	0.752±0.149	-0.088	0.931

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(Moran, Sherman, Bychkov, & Ron, 2011). A study performed by Sherman et al. provided the first empirical evidence that commercial brands create false memory for other competing brands through advertising. Their study included two phases, in the first phase of the experiment, subjects watched various brand images, such as chocolate; and in the second phase, they watched a television program that was accompanied by advertisements. False memories were created for brands that existed in the ads. Subsequently, participants were tested a week after they watched the ads. The results showed that over time, the amount of true memory decreased, and more false memory was formed for the participants (Sherman et al., 2015), (Ost et al., 2013), (Budson et al., 2006).

Memory gaps or errors refer to inaccurate recall or complete loss of information in the memory system for a particular detail or event. Memory errors may also include remembering things that never happened or remembering them differently than they did. These errors or gaps can occur for various reasons, including emotional involvement in the situation, expectations, and environmental changes. As the gap between memory encoding and retrieval increases, more forgetting occurs, and the possibility of memory errors increases. All theories of false memory have several common concepts that have been stated differently. Common concepts include constructive processes of reconstruction, item-specific versus communication processing, the extension of activation, and monitoring (Brainerd & Reyna, 2005). In simpler terms, when viewing brand images, communication networks are formed between different sources (a network between closely re-



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Figure 3. Comparison of Reaction Times (RTs) to recognize false/true memories for the brand and the IAPS neutral images

Table 4. Effect of gender on the recognition rates of false/true memories for the brand and the IAPS neutral images

Image Type	Variables	Mean±SD				Pairwise t-test Female vs Male	
		IAPS Neutral Images		Brand Images		t	P
Neutral	False	0.015	0.015	0.020	0.012	-0.994	0.329
	True	0.985	0.015	0.979	0.012	0.994	0.329
Brand	False	0.239	0.051	0.246	0.038	-0.4250	0.6740
	True	0.760	0.051	0.753	0.038	0.4250	0.674

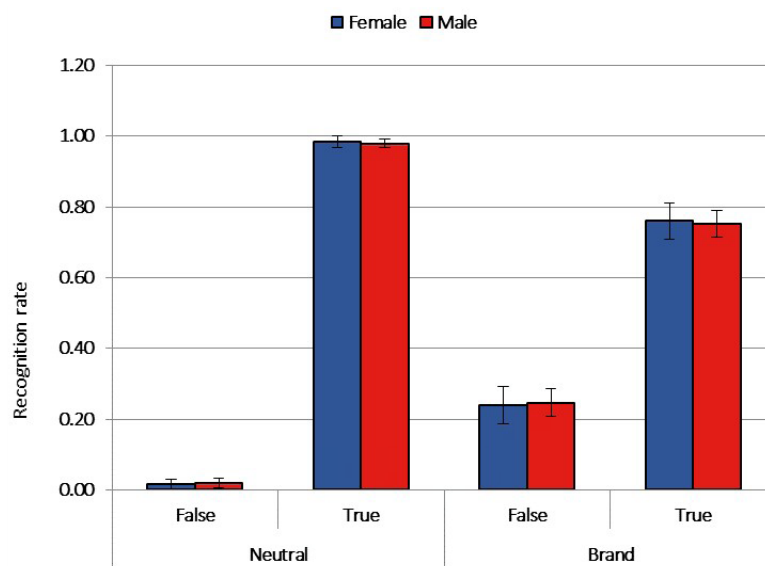
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lated brands), and by activating the network, items that were not previously presented can be remembered (D. A. Gallo, Roberts, & Seamon, 1997). This is most effective when recalling items that are autobiographical, contrary to our common belief that knowing more about a case makes it easier to remember. In some cases, this trust can lead to false memory formation (Shaw, 2018; Brewin & Andrews, 2017; Hyman Jr et al., 1998).

Previous experiences via memory can significantly affect consumers' decisions. Memory is an active constructive process in which information is acquired, stored, and then retrieved to be used in decision making. Autobiographical memory deals with personal events and has been found to have a profound impact on human behavior. Therefore, considering that brand choice is based on the consumers' memory of it, further investigation on the impact of autobiographical brands on consumers' memory is required.

Many studies demonstrated that the main reason for the effectiveness of advertising is to create a semantic connection between different types of memories (Van Reijmersdal, 2009). This distinction between autobiographical and semantic memories is particularly relevant to decision-making models. Brand-related knowledge is usually influenced by semantic memories. Moreover, the emotional and personal connection of each individual to themselves is related to their biographical memories.

Brand-related autobiographical memory may provide a better explanation for behavioral decision theory. Currently, it is mainly focused on the cognitive aspects of decision making and has not paid much attention to the emotional dimensions which cause a contrast between actual choices and predictions from rational models. According to the perspective of memory-based decisions, semantic memories are the root of decisions and autobiographical memories include emotional dimensions and self-relevance to the



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Figure 4. Effect of gender on the Reaction Time (RT) rates of false/true memories for the brand and the IAPS neutral images

Table 5. Effect of gender on the Reaction Times (RT) to recognize false/true memories for the brand and the IAPS neutral images

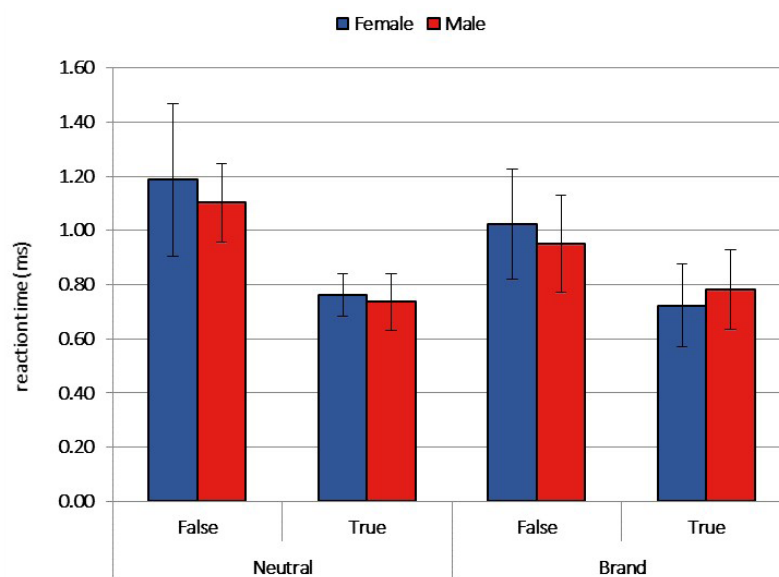
Participants	Image category	Mean±SD		Pairwise t-Test Neutral vs Brand	
		Female	Male	t	P
Neutral	False	1.18±0.28	1.10±0.14	1.04	0.30
	True	0.76±0.07	0.73±0.10	1.45	0.74
Brand	False	1.02±0.20	0.95±0.17	1.01	0.31
	True	0.72±0.15	0.78±0.14	-1.07	0.29

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decision-making process (Ratnayake, Broderick, & Mitchell, 2010). Therefore, the semantic relationship among the brand autobiographical memories causes memory errors and creates false memory for the case.

On the other hand, Examining RT of false and true memory in our study showed that false memory has a longer reaction time than true memory. RT is defined as the time elapsed between stimulus input and response output that provides a powerful way to relate physical events to mental events, and the underlying cognitive process, such as perception, attention, and memory (Lopes & Garcia, 2014). The increase of RTs for false memories does not depend on the presence of the test stimulus (positive response) or its absence (negative response). It is evidence of a comprehensive serial information retrieval process stored in the short-term memory, where each item stored in memory is checked, even when a target item has already been found (Coane, McBride, Raulerson, & Jordan, 2007).

It should be mentioned that RT is not considered in false memory research. For instance, a review article byh Coane et al. in 2007 examined the RT of false memories. They searched the PsycINFO database for the terms “reaction time”, “false memory” and “short-term memory” from 1950 to 2014 and indicated that the only article that combined the three keywords was Coen, McBride, Raulerson, and Jordan’s paper (Coane et al., 2007). They also reported that RT is mainly ignored in false memory research. Nevertheless, some studies considered RT and recognition rate. For instance, H. L. Roediger and K. B. McDermott found that cases with strong semantic relevance to the DRM lists (false memory) were often misidentified as cases with poor relevance to the lists. Also, the RT in rejecting false memory was shorter than the RT in rejecting cases with weak sources. These results can be interpreted from the perspective of source activation/monitoring theories (Roediger & McDermott, 1995). Cases with stronger



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Figure 5. Effect of gender on the Reaction Time (RT) to recognize false/true memories for the brand and the IAPS neutral images

semantic associations seem to require a re-listing. This reflects a demand for more cognitive resources and is reflected by increased RT (Coane et al., 2007).

Looking at the results of our study, we also investigated the effect of gender. The findings indicated that no gender difference was observed in false memory formation. These findings are consistent with the study by Seamon et al. They also found no effect on the false memory paradigm by examining the effect of gender on 50 male and 50 female subjects (Seamon, Guerry, Marsh, & Tracy, 2002). Moreover, studies have indicated that despite the hypothesis that participant based on their associated gender is more likely to form false memory about items on the masculine/ feminine lists, no gender differences in false memory formation have been observed (Bauste & Ferraro, 2004). Also, studies show that individual differences in the false sensitivity are not always large, even for variables that have previously shown differences, such as creative imagination (Foley & Johnson, 1985). It seems that no distinguishing feature exists between the two genders for the formation of false memory. And men and women suffer equally from false memory (Devitt & Schacter, 2016), and even those with much superior memory are susceptible to forming false memory (Pattihis, Frenda, & Loftus, 2018). Nevertheless, findings are not consistent and studies show the gender effect on false memory formation. For instance, women have more false memory for negative word list recall than men but no gender difference in recalling neutral lists (Dewhurst, Anderson, & Knott, 2012).

The current research may improve theoretical knowledge about advertising and memory formation of autobiographical brand images while emphasizing the importance of self-related memory on decision-making behavior.

5. Conclusion

Today, marketers try to create a sense of familiarity for the consumers with their products. Therefore, understanding the effect of brand images on memory recall and their impact on decision-making behavior can greatly help the experts in the field of advertisement and consumer science. That could be a reason to use false memory paradigms as an instrumental to better understand the mechanism of memory encoding and recall. In this study, we found that brand images with an autobiographical memory attached to them give a higher chance of false memory formation compared to neutral images. To examine more deeply the underlying mechanism of false memory formation, further studies are suggested using neuroimaging techniques,

such as electroencephalography (EEG) and functional magnetic resonance imaging (fMRI).

Ethical Considerations

Compliance with ethical guidelines

This research has done all the points related to ethical considerations and has been evaluated by the Shahid Beheshti University Ethics Committee (Code: IR.SBU.LCBS.97/1021).

Funding

This article was extracted from the thesis of the first author, a senior student at Shahid Beheshti University's Cognitive Science Research Institute.

Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

We thank Jarf Negar Bazaar for providing biographical image data for our brands. We also thank Mr. Pouya Es-haghi for his assistance with the research process.

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