The Impacts of Advertising and Promotion in Light of the Activity of: Sensory Receptors, Brain Regions and Appetitive and Defensive Motivational Systems

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Abstract

Purpose: This study shows the neural basis which lies behind the success of advertising and promotion processes, represented in the degree of activation of audiences' sensory receptors, in addition to the connectivity of their brain regions. It directs attention to the effect of these processes on their appetitive and defensive motivational systems as well.

Methodology: This experimental qualitative study is built upon three consecutive experiments and primary data collected through in-depth interviews. It is explanatory in nature, including three interconnected studies.

Findings: Sensory receptors are triggered by advertising and promotional messages. Their activation degree relies on the elements used in these messages, in terms of their strength of influence and diversity. The neural associations between brain regions allow the flow of these messages from the information processing areas to the behavior guidance areas, passing through the emotion areas in the brain. Advertising and promotional messages stimulate one of the systems at the expense of the other, namely appetitive, and defensive systems.

Keywords

Advertising and promotional messages, sensory receptors, brain regions, appetitive and defensive systems

1.1 Introduction

It is still difficult to unravel the real motives behind customers' buying behaviors of various products and services (Sevic et al., 2022). Since behavior is the outcome of large scale neurodynamical processes and continuous changes in the activation level of brain areas (Duch, 2007). Although the effect of tailored nutrition campaigns on the decrease in the consumption of unhealthy meals is recognized, little is known about the neural processes causing this behavioral change

(Casado-Aranda et al., 2022). This research demonstrates the impacts of different sensory receptors and brain regions on the behaviors toward advertising and promotional messages. Noticeably, senses have gained researchers' attention in the fields of advertising and promotion, they result from the activity of sensory receptors, which have been disregarded. Sensory receptors occur in eyes, nose, mouth, ears and body organs, the human body recognizes the world through its sensory system (Marzvanyan & Alhawaj, 2019). The weak activity of sensory receptors leads to insensitivity to advertising and promotional messages and suppression of any response to them. The role of neural links between the various brain regions in the transmission of these messages between them is of interest to this research. There is a dearth of studies on the direct correlations between the brain regions involved in creating the neural associations and the brain regions that become activated when being exposed to external stimulators, such as music (Rose, 2020). The prominent role of repetitive advertising and promotional messages in stimulating motivational systems, thus purchasing behaviors is investigated by this research. The research problem is apparent in unstudied core issues by previous research, which are:

The role of sensory receptors in receiving and processing advertising and promotional messages, in addition to their sensitivity, which is affected by repetition in two contradictory ways, namely enhancement and suppression. Rehearsal leads to a

better remembering capability, by increasing the sense of stimuli (Zhou & Brown, 2015). The activation level of brain regions and the presence of robust neural associations between them determine viewers' responses to advertising and promotional messages. It is significant considering the neurotransmitters communicating between amygdala and cortical regions (Martin et al., 2009). The impacts of advertising and promotional messages on the appetitive and defensive systems. The connection of hypnosis, suggestibility and mass hysteria terms to the fields of advertising and promotion. To solve this problem, the following questions are answered by this research:

(1) Does exposure to repetitive associated stimuli influence memory?

(2) Does exposure to associated stimuli influence emotion through memory as a mediator?

(3) Does exposure to associated stimuli influence emotion through perception as a mediator?

(4) Does exposure to associated stimuli influence behavior through emotion as mediator?

1.2 Theoretical Background

1.2.1 Role of Sensory Receptors in Advertising and Promotion

Incorporating sensory receptors in advertising and promotional research is significant. Although these receptors transfer advertising and promotional messages to the brain regions responsible for showing responses, only viewers' senses have seized the minds of researchers. Using scents papers strips in magazine ads for perfume to activate olfactory sense (Labenz et al., 2018). According to neurological research, sensory receptors allow the human body to best react to internal and external events, they begin with receptor potentials, causing a release of a neurotransmitter that provokes its corresponding nerve to send the received information to the human brain, these receptors transmit as nerve signals and the place where the nerve fiber terminates in the central nervous system determines the way we perceive a stimulus (Marzvanyan & Alhawaj, 2019).

Employing multiple sensory elements increases customers 'purchasing intentions, which is different from the process of single-sense advertising (Elder & Krishna, 2010). Sensory cues affect customers' perceptions of food and their response to it (Silaban et al., 2023). Thus, the visual appearance of food affects the perception and expectations of taste (Hoegg & Alba, 2007). Moreover, the background music and sounds during eating influence consumption and taste judgment (Spence & Shankar,

2010). Additional sensory cues contribute to customer satisfaction, by affecting memory and emotions (Silaban et al., 2023). Despite the above, the role of activated sensory receptors, and interconnected brain regions regarding the impacts of advertising and promotional processes were completely neglected. In confirmation of the previous idea about the importance of including sensory receptors, we find that the product texture, relying on mechanoreceptors, conveys a message to the customer about the product quality. Tactile mechanoreceptors allow touch, which is essential for human beings' survival and development (Iheanacho & Vellipuram, 2019). Tactile perception, such as the mouthfeel of food and its texture affects taste perception (De Araujo & Rolls, 2004). Scented products and packages are received through olfactory receptors, turning them into electrical signals to transfer them to the brain central nervous system for processing. Olfactory receptors mediate the interaction process between the external world and olfactory brain; thus, odors activate one or various olfactory receptors (Korsching, 2004). Furthermore, taste receptors play a leading role in receiving taste information. Taste buds on the tongue besides the oropharynx help us to discern what we eat (Lee & Owyang, 2017), they consist of a group of taste cells that create a pore where stimuli can invade the brain subsequently (Marzvanyan & Alhawaj, 2019). Advertisements stimulate photoreceptors, by using attractive visual scenes and

celebrities. Retinal is a light receptor (Marzvanyan & Alhawaj, 2019), it is the layer of photoreceptors cells and Glial cells within the eyes, transmitting the photons in form of electrical signals along the neuronal pathways to the brain to discriminate visual images (Nguyen et al., 2021). Additionally, mechanoreceptors are stimulated by songs and music included in advertisements. Mechanoreceptor cells in the form of hair cells existing in the inner ear detect sound and head movement (Gillespie & Müller, 2009). Occasionally, some products are manufactured to be difficult to open, causing injury and pain receptors' stimulation. Nociceptors or pain receptors, consist of a group of sensory neurons with nerve endings, widely distributed in deep tissues including joints, muscles, and most visceral organs (Bavencoffe et al., 2014), representing a subset of sensory neurons mediating pain and densely innervate peripheral tissues including the skin, gastrointestinal and respiratory tract besides joints (Pinho-Ribeiro et al., 2017). Temperature adjustment is associated with service promotion, as the extreme hot and cold temperatures within a service environment activate thermoreceptors. Thermoreceptors are separated into receptors that detect warmth and cold (Torebjörk & Schmelz, 2005). In addition, spraying strong aromas or pesticides during customers' presence causes negative publicity. Chemoreceptors are specialized sensory receptors transforming chemical substances into certain

biological signals (Kumar & Prabhakar, 2012), causing physiological response (Depetris-Chauvin et al., 2015).

1.2.2 Connectivity of Brain Regions and their Activation by Advertising and Promotion

The connectivity of brain regions allows the transmission of advertising and promotional messages between the various regions. Although, this fact has been mentioned in neuroscience, it was neglected in advertising and promotional research. Accordingly, it is addressed in this study. Previous neuroscience studies emphasized the connection between different brain regions and hippocampus across time (Zhan et al., 2018). They showed the interaction between the hippocampus and neocortical regions when retrieving stimuli that were learned even once (Buckner & Wheeler, 2001; Simons & Spiers, 2003). Recent studies propose the existence of neural associations between the inferior parietal lobule and other brain regions, such as the temporal and frontal cortices (Baldo et al., 2006). The hippocampus is significant in forming neural associations (Du et al., 2019). Thus, emotional context improves memory, by increasing the activation level of hippocampus and its connectivity to amygdala (Takashima et al., 2016). Considering the neurotransmitters communicating between amygdala and cortical regions is significant (Martin et al., 2009). Parietal, occipital, temporal and frontal lobes lead to viewers' responses to advertising and promotional materials. Most of association areas

are in parietal, temporal, and frontal lobes (Rose, 2020). The parietal cortex integrates information from various sensory sources (Reep et al., 1994). The occipital lobe processes visual stimuli (Rehman & Al Khalili, 2019). Temporal lobe includes hippocampal formation and the amygdala (Kiernan, 2012). Amygdala processes stimuli, initiating the appropriate emotional and behavioral responses (Martin et al., 2009). Frontal lobe forms behavioral and motor skills (Scott & Schoenberg, 2010).

1. 2.3 Strengthening Neural Associations between Advertisement and Product through Repetition

Recently, researchers showed little interest regarding the importance of repeating advertising and promotional materials. Moreover, the neurological component linking the repetition process with the ability to recall the product, thus showing interest in it was not determined. The effect of advertisement repetition was and still is a controversial issue (Longman, 1997). Redundant exposures to the same advertisement can decrease its effectiveness (Calder & Sternthal, 1980). Nothing is common between the circumstances surrounding viewers when watching the advertisement, in terms of timing, place, event and the circumstances surrounding them during exposure to product. Here comes the role of conditional neural association linking both circumstances, creating emotions toward the product. Purchase intention captivated scholars' attention who believed that it should be antecedent to purchase behavior (Khaleeli,

2020). However, not all purchases result from former intentions or real needs, but rather they may be affected by an advertisement. 95% of thinking process and therefore purchase decisions are formed at the subconscious mind (Sevic et al., 2022).

Repetition strengthens the product's neural associations and increases receptors' sensitivity to the advertisement and the activation level of brain areas, especially when using diverse advertising elements. Relatedly, its direct impact on memory power cannot be overlooked. The activation level in the hippocampus increases when individuals retrieve the repeated items (Kim, 2018). Participants' attitudes toward the displayed characters become more positive the more times the characters had been seen by them during the exposure phase (Haddock & Maio, 2008), as the interaction between hippocampus and other regions related to a certain stimulus increases in repetition learning. (Zhan et al., 2018). Behavioral studies showed that after participants learned words and word pairs six or three times, their item and associative recognition performance has increased (Zhan et al., 2018). Since repetition improves the relational associations between specific items, if the associated pairs are recalled, those relational associations are maintained, predicting sustained hippocampal activation across time (e.g., Yang et al., 2016, cited in Zhan et al., 2018). Repeated exposure to a stimulus increases the signal-to-noise ratio of neural responses (Eldar et

al., 2013). Repetition enhances attention to the product, thus the sensitivity to it. Attention improves neuronal responses, by increasing sensitivity to stimuli (Reynolds et al., 2000). Repetition is significant for famous brands to maintain strong positioning in customers' minds. Since neural networks dynamically appear and disappear throughout our lives (Demarin & Morovic, 2014, p.209). Brain associations change over time (Rose, 2020). Human behavior changes when the recent neuro-associations become stronger, thus being able to replace the old ones (Robbins, 1991).

1.2.4 Responses of Appetitive and Defensive Systems to Advertising and Promotional Messages

Undoubtedly, advertising affects consumers' purchasing decisions (Martins et al, 2019). This research emphasizes that advertising and promotion materials activate one of the two systems at the expense of the other, namely appetitive, and defensive motivational systems. Both systems regulate emotions toward stimuli whether they promote or threaten physical survival (Lang et al., 1997). The appetitive system is activated in situations promoting sustenance, such as getting rewards, eating, drinking, etc., while the defensive system is activated in life threatening and protective situations, such as illness, attack, injury, etc. (Lang & Bradley, 2013). Pictures, real events, and other stimuli vary according to their degree of threat and thus, to the extent to which they activate defensive motivation (Bradley

et al., 2001). While, pleasant images activate the appetitive system, leading to inhibition of defensive reflexes (Bradley et al., 2001). This paper shows how commercials captivate viewers; thus, their appetitive system is activated at the expense of their defensive system, causing them sometimes to engage in unfavorable behaviors. This issue has not been investigated by previous research.

1.2.5 Suggestibility, Hypnosis and Mass Hysteria Terms are not Limited to the Medical Field

Food advertisers send suggestive messages to audiences to feel that eating certain types of food will make them happier and healthier. Suggestibility term refers to the communication process resulting in the acceptance with conviction of the communicated suggestive messages, even if there are no suitable grounds for accepting them (McDougall, 2001). It indicates the individual differences in responding to suggestive messages under some comparable circumstances, while suggestion is an influential way of communication (Hilgard, 1991). Some advertisements promote products by instilling feelings of fear within viewers, as happened during covid period. Suggestive messages may cause mass hysteria, by diffusing fear among people in society. Feeling of insecurity boosts suggestibility (Sevic et al., 2022). The term hysteria refers to uncontrollable emotional excess that can be temporary (Basavarajappa et al., C., 2020). Mass hysteria refers to collective phenomena ranging

from the spread of delusional ideas among individuals to the adoption of some peculiar behaviors and rituals (Lee, 2022). It is subjectivity under siege, as the subjects become under forces of affect leaving them with no chance to resist a specific ritual or behavior (Lara, et al., 2017, P.34). Advertising and promotional processes begin with hypnotic processes allowing the viewers to accept the suggestive messages. Hypnosis guides the individual's attention toward a suggested direction (Mende, 2009). Hypnotic techniques convince the receiver's unconscious mind through activating mechanisms that have the emotional power to re-organize and de-organize the receiver's behavior (Cavallaro, 1996).

1.3 Research Hypotheses

H1: Repetitive exposure to associated stimuli has a significant impact on memory.

H2: Exposure to associated stimuli has a significant impact on emotion through memory as a mediator.

H3a: Exposure to associated stimuli has a significant impact on emotion through perception as a mediator.

H3b: Exposure to associated stimuli has a significant impact on behavior through emotion as a mediator.

1.4 Research Model

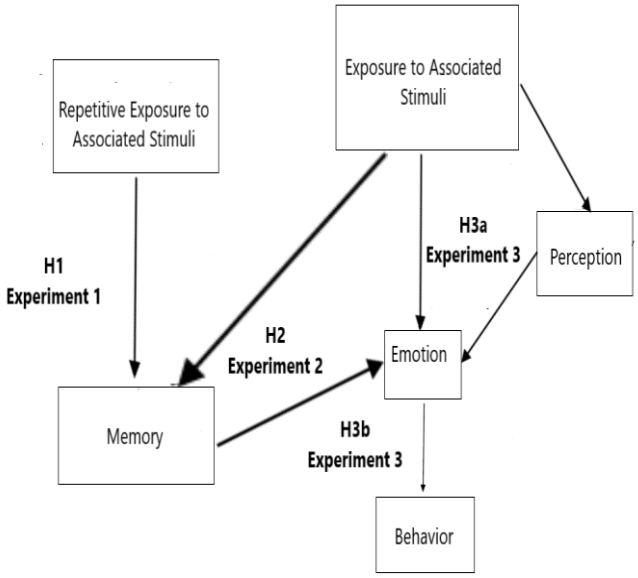

Figure 1.1

1.5 Research Objectives

(1) Investigating the relationship between repetitive exposure to associated stimuli and memory.

(2) Investigating the relationship between exposure to associated stimuli and emotion through memory as a mediator.

(3) Investigating the relationship between exposure to associated stimuli and emotion through perception as a mediator.

(4) Investigating the relationship between exposure to associated stimuli and behavior through emotion as a mediator.

1.6 Research Design and Methods

This experimental qualitative research includes three simulation experiments, representing three consecutive studies. It is empirical explanatory in nature, based on primary data collected via in-depth interviews. Many studies have adopted a qualitative experimental approach, such as (Brantlinger et al., 2005; Lahmiri & Bekiros, 2019; Naber, 2015). This approach shows the nuanced differences in emotional and behavioral responses. An experiment can often be conducted relying only on qualitative data (Robinson & Mendelson, 2012). This research is phenomenological. Phenomenological research recognizes individuals' perceptions of actual experiences (Delve & Limpaecher, 2022) and understands more about a specific phenomenon (Bliss, 2016). This study employed posttest-only control group experimental design, including experimental and control conditions. The treatments are introduced in test area only and the effect of the independent variables was measured after introducing the treatments in both conditions. The participants in control and experimental groups were heterogeneous in terms of gender, age, etc. In post-test-only control group design, subjects are randomized to a treatment without measuring the response before the intervention of this treatment, thus in some studies only the post-measurements need to be taken, the variability within diverse groups could be quite large in these types of experimental designs (Wludyka, 2011).

1.6.1 Experimental Model Designs and Procedures

Experiment (1), is known as Implicit Association Test (IAT)-Memory Recall Test. The control group were exposed to groups of paired images only once, whereas the experimental group were exposed to them three times. The participants had to memorize the two associated images for each pair of images, by relating them to each other somehow. So that, they can retrieve the missing images when showing the associated ones. The name of each image was presented to the participants. The groups of paired images were arranged in three rows. Each row included three rectangles; each rectangle contained a pair of images. The total number of images is eighteen. Three minutes were given to both groups. Previous research conducted by Helm & Growns, 2023 emphasized that 5 seconds can be sufficient to memorize a single image. Which led to giving this timing for each image and a double timing, namely 10 seconds for the two images within each rectangle. The presentation was repeated three times for experimental group. Nyberg, L., NILSSON and Olofsson, 1994 repeated exposure to words three times to stimulate memory. Another page was shown then to both groups, containing the missing images in each row. Then, the participants of both groups were provided with pieces of paper to list the missing images within five minutes. The papers were collected to determine how many images each participant could remember. The five-minutes period was perceived as sufficient time to retrieve the missing

images. The same period for nearly a similar number of stimuli was used in a previous study conducted by Helm & Growns, 2023 to retrieve images of people's faces. The number of images in the experiment in this study is 18, while there were 20 in the previously mentioned one. Each participant in both groups was asked individually three questions, and a separate question for each group. Question 4 for experimental group and 5 for control group. (Interview Questions exist in the supplementary file).

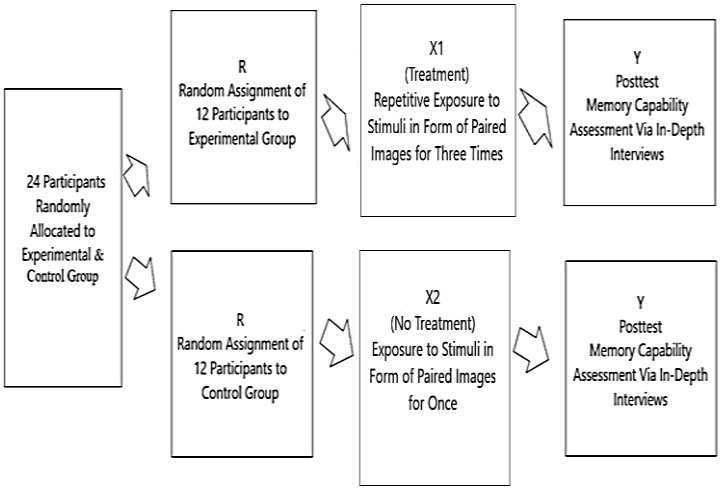

Figure 1.2

Experiment (2), is known as Visual-Olfactory Test-Emotional Recall Test. A strong and beautiful scent was sprayed inside the place where the experiment took place. The

experimental group watched two short silent movies accompanied by music, including tragic stories, while the control group smelled the scent without watching the movies. This experiment investigates whether spraying the same scent again will lead to positive or negative emotions for both groups and the first images coming to their minds when smelling it. The first and second movies took approximately 8 and 4 minutes, respectively. A laptop was used to show movies, and its screen was enlarged to make the vision clearer. The researchers postponed the interviews with both groups until finishing the last experiment to enable the experimental group to form a strong neural association between the scent and movies in their long-term memory. The delayed judgments of learning are more accurate than the immediate judgments of learning (Rhodes & Tauber, 2011). This delay increases the accuracy of the participants' judgments, by giving them insights into their own long-term memory of the stimulus before making their own judgments (Helm & Growns, 2023). Five questions were directed to the experimental group and four questions to the control group. The fourth question was for the experimental group only. (Interview questions exist in the supplementary file).

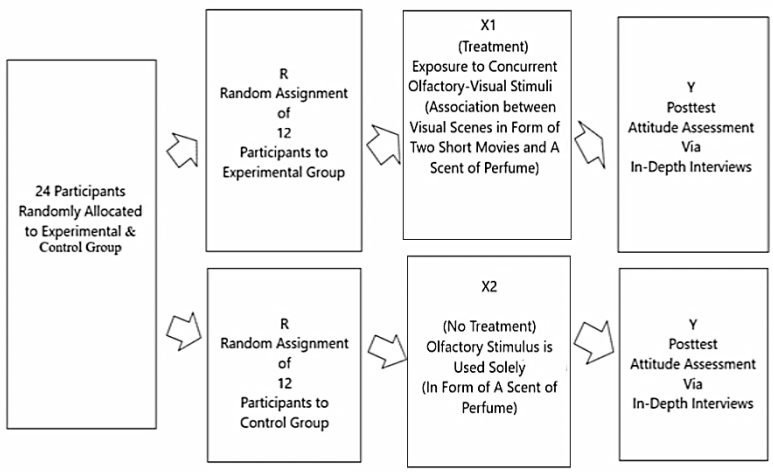

Figure 1.3

Experiment (3) is known as Perceptual-Emotional Recall Test. It shows the strong impact of advertising and promotional materials on viewers' motivational systems: appetitive and defensive systems. In addition to emphasizing the notion of the neural association between advertising content and viewer's perception of the product, etc. A cake was brought and distributed into several dishes equal to the number of participants of both groups, then the dishes were presented to them. The experimental group was exposed to twenty disgusting images of cakes, shown in a video sequentially in a large size. Masarwa et al., 2020 showed that image size has a considerable effect on images' incidental memory, as the physical image dimensions influence image memorability. The video duration was 1 minute and 40 seconds. The images were arranged gradually in terms of

their impact degree, from the least to the most influential. The control group did not see any images. Then both groups were invited to eat the cake. Two shared questions were asked for both groups, four questions for experimental group and two questions for the control group (Interview questions exist in the supplementary file).

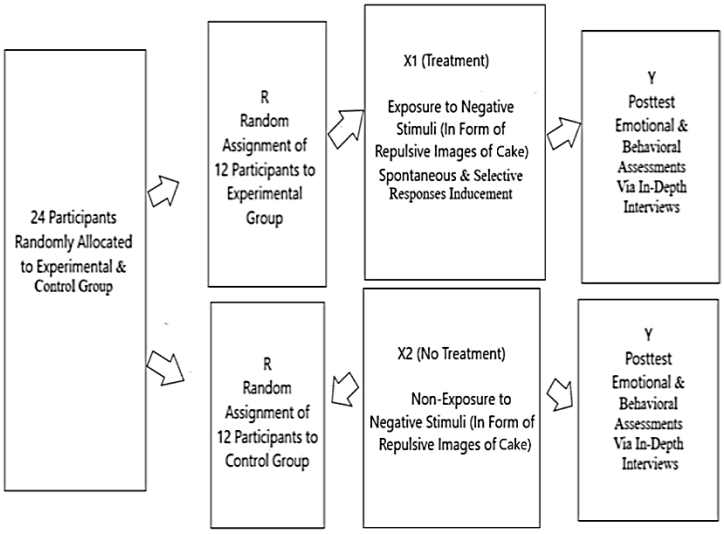

Figure 1.5

1.6.2 Data Collection and Analysis Techniques

This study employed independent measures-experimental design (between groups). Since different participants were assigned to both groups, group A (experimental condition) and group B (control condition) for each experiment. A purposive sampling technique was adopted to select participants with specific qualities, the first of which is that they are over eighteen

years old and that they tend to eat sweets. The number of participants is 24, assigned equally and randomly to experimental and control groups, relying on a lottery technique. 16 women and 8 men. Consent was obtained from participants in the experiments. An experimental study conducted by li et al., 2023 and a quasi-experimental study conducted by Saleh et al., 2021 assigned 12 participants for data collection. Cross sectional data was used. Face-to-face structured interviews were held with both groups, consisting of open-ended questions. The participants were informed of the possibility of their withdrawal whenever they wanted. They were encouraged to take sufficient time when narrating their own experiences. The previous procedures are part of interview protocols mentioned in previous studies, such as Jacob & Furgerson (2012). The interviews took about 30 minutes to 45 minutes. Collected data was transcribed word to word in Arabic language and translated then accurately in English language. Data was analyzed qualitatively through a thematic analysis technique, leading to forming initial codes, which were merged into various themes and then subthemes were provided, as more detailed information. A combination of deductive and inductive coding approaches was relied upon. Themes were identified through pre-existing information, and theories, in addition to the data extracted from the interviews. Qualitative analysis can be based on both inductive and deductive approaches (Armat et al., 2018).

Findings and Discussion

Study 1, H1: Repetitive exposure to associated stimuli has a significant impact on memory

From the qualitative data, 18 codes were extracted, 7 themes and 17 sub-themes. The male participants who saw the images repetitively remembered the missing images much more efficiently than those who saw them once. The same for women participants. Which proves that repeatedly viewing the advertisements and promotional materials helps in recalling the promoted items, reflecting on audiences' behaviors. Since the brain is the entrance to feeling, which is the basic driver of human behavior. There is a convergence in the level of memory strength between women and men in both groups. For experimental group, most female participants confirmed the easiness of remembering the missing images. Two participants belonging to elderly and young adulthood categories perceived it as a tiring process, which emphasizes that age is not always an indicator of memory strength. A woman emphasized that the level of difficulty was moderate. "*Yes, I remembered the images very quickly." A4, Female, Housewife, old age.* All the male participants emphasized the easiness of remembering the hidden images. *"Yes, it was quite easy to remember the images." B5, Male, Accountant, Middle adulthood.* All female participants assured that the simultaneous presence of the two images within

each rectangle helped them very greatly to recall the concealed images. Many of them worked to find direct relationships between the associated images in their minds, which facilitated the remembering process. Except for one participant who was unable to remember most images. *"Certainly, every visible image in each rectangle helped me remember the missing image, as I formed relationships between each image and its pair in each rectangle." A4, Female, Housewife, old age. "I did not try to find relations between the images, perhaps this is what did not make me remember them." A7, Female, Accountant, young adulthood.* All men emphasized that the association between each pair of images helped them to remember the missing images. Furthermore, some of them created meaningful relationships between them, which had a significant impact on their memory. *"Sure, the association between images in each rectangle was a key factor in my ability to remember the missing images." B5, Male, Accountant, Middle adulthood.* Results proved that the visual link between the images, in addition to the links emerging from giving meanings linking every two images in the same rectangle led to remembering the missing ones. Regarding the retrieval of images if both images within each rectangle were hidden, the answers of all participants ranged between difficulty and impossibility; indicating the strength of the neural effect of associative learning *"I think that the disappearance of both images within each rectangle will make remembering any of them*

exceedingly difficult." A3, Female, Engineer, Young adulthood. As proof of the above, when sequential songs are placed on a playlist, with their repeated hearing, the individual becomes capable of recognizing the next song easily by hearing the song preceding it. The results emphasized the significance of repeating images in remembering them. *"Of course, seeing the images several times enabled me to memorize and retrieve them easily afterwards." A4, Female, Housewife, old age. "Repeating the display of images gave me a good opportunity to link the images to each other in my mind." B2, Male, IT Manager, Middle adulthood.*

Regarding control group, all participants of both genders confirmed the difficulty of remembering the missing images. Two women and a man perceived the level of difficulty as moderate *"No, it was difficult to remember the missing images." A5, Female, Housewife, Middle adulthood. 'No, it was not easy at all, there are many images that I could not remember, I had to exert much effort to remember some of them." B1, Male, Professor, Old age. "It was moderate in terms of difficulty." A12, Female, Accountant, Old age.* All of them asserted that the association between images considerably affected their memory. Some of them acknowledged that this association helped them form meaningful relationships between each pair of images. *"Yes, having images linked together helped me remember the missing ones." A6, Female, Housewife, Young adulthood.* They

emphasized that concealing both images within each rectangle would not enable them to remember the missing ones. *"Certainly, not having either image appear in the rectangle would have made the remembering process extremely hard." A5, Female, Housewife, Middle adulthood.* They thought that if they had been allowed to see the images several times, their ability to remember the missing ones would have been better. *"I remembered the images well, even though I had only seen them once, but it took me long time to do that, thus I believe that if I had seen them several times, it probably would not have taken me that long." A4, Female, Accountant, Old age. "Absolutely, I think that repeatedly seeing the images may have helped me better remember the ones that I failed to remember after seeing them only once." A6, Female, Housewife, Young adulthood.* The diversity of age groups among the participants, which included elderly, middle aged and young people, did not lead to any difference in their ability to evoke the images after viewing them only once. They all acknowledged the difficulty of this process, the same thing in terms of gender. Consequently, watching advertising and promotional content repeatedly helps in recalling the promoted item, thus increasing the desire to acquire it. Viewing the advertisement only once may not be sufficient to form strong neural associations of the product in customers' minds. According to results, repeating the advertising and promotional content three times is effective and does not provoke

viewers. The repetition process, in addition to the use of integrated attractive advertising and promotional elements, lead to storing the promoted item in long-term memory, making it difficult to be replaced by an emerging one. Visual memory recalls the scenes of commercials, whereas working memory is the gateway to long term memory. Photoreceptors play a significant role in the viewer's ability to receive visual information whether repeatedly or once. Repeated exposure to advertising and promotional content increases receptors' sensitivity and the activation degree of brain areas, including temporal, parietal, occipital, and frontal lobes, responsible for storing and retrieving information, processing sensory and visual information, and organizing human responses respectively. Based on the above, the hypothesis for this experiment has been proven.

Study 1 Discussion

According to results, the repeated exposure of the experimental group to groups of paired images helped them remember the missing images, which did not happen with the control group members who viewed them once. This is consistent with neurological and psychological research. The repetitive exposure to an event enhances the episodic memory, with vivid and detailed information remaining (Yang et al., 2016). Semantic memory is formed when the knowledge is learned multiple times, whether in the same or different contexts (Elward & Vargha-Khadem, 2018). According to processing fluency theories, when

we experience a stimulus for the second time, it is processed much easier than novel stimuli (Palumbo et al., 2021). Vuokko, 2014 emphasized that multiple exposures to advertisements increase consumers' awareness of the advertising messages and facilitate their processing. Most participants in the control group confirmed that being exposed to the images for once was not enough but rather it was better to see them repeatedly. The visual association between the paired images had a significant role in remembering the missing ones according to results. Most participants from both groups succeeded in forming meaningful mental associations between the paired images, thus they could remember the missing ones. They also emphasized that if the associated images did not exist, they would not remember any of the missing images or at least, the process would be exceedingly difficult. Thus, the conditional neural association is a crucial factor along with the repetition factor in the ability of audiences to recall advertising and promotional messages. This is slightly different from what has been inferred in previous advertising studies. As it was shown that individuals establish associations during processing information, by linking new received information to experiences or objects stored in memory (Schacter, 2014, cited in Schmidt, S., & Eisend, 2015). In fact, advertising leads to forming associations between the information sent, which may be linked to the endorser and other elements and the promoted item. Thus, this study differs from

previous studies in this regard in several factors: First, it is an experimental qualitative study, based on an implicit association test. Second, it emphasizes the importance of employing multiple advertising elements capable of creating strong neural associations between the advertisement and product in viewers' minds to facilitate recalling the advertising content. We cannot disregard the significance of advertising content in determining the activation degree of memory area, this process is called hippocampal activation. In addition to the importance of the neural associations established between memory areas and feeling and behavior areas. Photoreceptors played a leading role in the success of recalling the missing images, as the repetition process increased their activity. According to results, repeating advertising, and promotional messages three times can be highly effective. The participants did not complain regarding the number of repetitions, and they showed no feeling of boredom. According to Krugman (2013), three exposures are enough because, (four, five, etc. are repeats of the third exposure effect (Schmidt & Eisend, 2015).

Study 2, H2: Exposure to associated stimuli has a significant impact on emotion through memory as a mediator

20 codes, 9 themes and 23 sub-themes were extracted from data (Exist in the supplementary file). For experimental group, all participants of both genders recognized the used scent during the experiment after spraying it again., except for a

woman., *"Yes, that is the scent that was sprayed on the first time." A1, Female, Engineer, old age. "This odor existed when we were watching the movies." B8, Male, Film Editor, young adulthood. "This is a different scent from the one used during the experiment." A11, Female, Psychotherapist, Young adulthood.* As soon as they smelled that scent again, they remembered the movies they had seen with their painful scenes., except for one woman who admitted that she remembered nothing. *"When I smelled that scent, I remembered the movies' scenes I had watched." A4, Female, Housewife, old age. "When I smelled that scent, I remembered the experiment which included tragic movies." B5, Male, Accountant, Middle adulthood. "Nothing, I did not remember anything." A11, Female, Psychotherapist, Young adulthood.* This shows the effect of linking the scent and the scenes included in the two movies, as smelling the scent again activated the brain regions responsible for recalling these scenes and this is exactly what happens in advertisements. By using a scented product package, the product becomes distinct in customers' minds compared to others, making it one of their preferences. The feelings of most participants toward this scent were negative despite its beauty, while others were neutral. *"My feelings were extremely negative because of movies I watched which I remembered as soon as I smelled that scent again, however the scent itself is amazing." B5, Male, Accountant, Middle adulthood. "It smelled nice; however, it reminded me of*

the tragic scenes which I have seen in both movies, as for my emotions I cannot describe precisely, maybe they are neutral." A1, Female, Engineer, old age. The reason for these negative emotions is the mental associations with the painful movies they saw. This shows the impact of stimuli on emotions through memory, especially if these stimuli provoke several sensory receptors concurrently. Some participants had neutral feelings, as the sensitivity of people and the strength of their memory differ. Some individuals need to be exposed to repetitive messages over successive periods to be affected. Although the scent was beautiful and should have stimulated the participants' appetitive system, their emotions toward it turned negative and thus the defensive system was the one that was most active. All participants of both genders confirmed that smelling that scent again made them recall the movies' scenes. *"Yes, it reminds me strongly of the movies I watched." A9, Female, Student, Young adulthood.* This refers to the importance of using various advertising and promotional elements, thus affecting multiple sensory receptors concurrently. Six participants refused to buy the used perfume, if it was available, five women and a man, as it would make them remember the painful movies' scenes. The most of those who refused were women, which is logical given the strength of their emotions toward painful situations. Three participants were hesitant, and the rest agreed. When seeing advertising and promotional works repeatedly, the influence

becomes stronger, reaching the psyche and body. Photoreceptors, olfactory receptors, and mechanoreceptors played a leading role in that experiment. Sensory receptors feed brain regions with information and depending on the degree of their sensitivity, the density and nature of the stored information becomes. Parietal, temporal, occipital, and frontal lobes were activated by the messages.

For control group, most participants of both genders failed to distinguish the sprayed scent. Only four of them succeeded in recognizing it. *"No, I cannot, for me it is just a beautiful scent." A11, Female, housewife, young adulthood.* Because they did not watch movies like the experimental group, there is no neural association that has been formed. Thus, they did not recall any mental images. *"I did not remember any images." B7, Male, Accountant, Old Age.* All of them had positive emotions toward the scent, as they did not associate it with any sad scenes in their minds *"Positive feeling, this scent is adorable." B2, Male, Lawyer, Young adulthood.* All participants of both genders showed their desire to buy the perfume if it is available. This indicates the stability of their behavior toward the scent. Neither the sensory receptors nor the brain regions mentioned in that experiment were activated in the control group with the same degree of strength, as happened in the experimental group. Because of the absence of the strong negative auditory and visual stimuli to which the participants of the experimental group were

exposed to. *"Sure, I will buy it because I liked its smell." A5, Female, Housewife, Middle adulthood.* Advertising and promotional materials have a strong suggestive effect on viewers, changing their attitudes and behaviors. In educational ads, painful scenes are employed to convince viewers to abandon harmful behaviors. The hypothesis of that experiment has been proven.

Study 2 Discussion

Activating various sensory receptors simultaneously through the watched movies and sprayed scent, including olfactory, auditory, and visual receptors affected the memory of all participants of experimental group and the emotions of most of them. Multisensory experiences refer to events including various sensory elements crafted by someone, to form final impressions (Velasco & Obrist, 2020), such as a sunflower, its color, smell, and texture should be considered in a specific event (Vi et al., 2017). The strong activity of sensory receptors enhanced participants' ability to recall the movies' scenes, thus most of them refused to buy the perfume. Referring to the suppression of appetitive system in favor of the defensive system. Because of using moderately painful movies, the emotions of a small number of participants toward that scent remained non-negative. People used to see what is more tragic in media and real life, and participants only once saw these movies, which decreased their impact on less sensitive ones. The more repetitions, the stronger

the impact of advertisements and promotions. It is called a mere exposure effect, suggesting that the information resulting from repetition strongly influences the cognition-emotion interaction (Palumbo et al., 2021).

Study 3, H3a: Exposure to associated stimuli has a significant impact on emotion through perception as a mediator.

H3b: Exposure to associated stimuli has a significant impact on behavior through emotion as a mediator.

21 Codes, 9 themes and 25 sub-themes were extracted from the qualitative data. For the experimental group, their feelings ranged from feeling bad to disgust and nausea toward the presented cake. Since individuals' sensitivity to various stimuli differs according to their sensory receptors' sensitivity. Both genders confirmed their negative feelings because of the disgusting images of cake they saw, except for a man who emphasized that his feelings were still positive, due to his craving for cakes and his lack of influence by the images *"I feel disgusted and nauseous." A1, Female, Engineer, old age. "I feel pretty disgusted." A6, Female, Accountant, young adulthood. "My feeling is good." B8, Male, Film Editor, young adulthood. "The images of cake I saw, especially the ones in the form of insects had a very strong effect on me." A4, Female, Housewife, old age.* The negative feelings of female participants were

stronger than male participants, which is logical given women's hypersensitivity to negative stimuli. Based on the results, the strong suggestive role of advertising and promotional messages appears through their impacts on the viewers' receptors, especially the visual ones, and the memory and emotions' areas. Additionally, the results showed the psychosomatic impact of negative elements included in advertising and promotional materials, as their effects can reach the body. This is what happens in educational and awareness-raising advertisements. All participants of both genders admitted that they were unable to eat the cake, while seeing the cake images, except for a male participant. A woman could not eat the cake, even after some time had passed since seeing these images. *"This is impossible, I am still affected even after time." A6, Female, Accountant, young adulthood. "Of course not, how can I eat it, while I am seeing those disgusting images." B2, Male, IT Manager, Middle adulthood.* Five participants emphasized their ability to eat the cake after some time had passed, three men and two women, while six refused, five women and a man. One woman was reluctant to accept or refuse. The largest number of men are those who accepted eating the cake after some time had passed compared to women. Regarding the immediate behavior, all participants of both genders, except one, avoided eating the cake, but the delayed behavior was different, as some of those initially rejected eating the cake, agreed then to eat it. Since their negative

feelings faded because of the passing of time. The impact of images depends on individuals' sensitivity and their memory strength. The results also showed the importance of repeating the advertising and promotional content at regular intervals to have a long-lasting effect on audiences. Most participants of both genders emphasized the change of their appetite toward the cake, even some of those who agreed to eat it, except for two male participants. *"Certainly, because the images looked real to me, even though I knew they were just images of cakes and not real animals or insects, however my mind could not see the difference, so my appetite changed negatively." A4, Female, Housewife, old age., "Sure, the images I saw had a strong effect on my craving for cakes, even though they were images of real cakes." B10, Male, Student, Young Adulthood. "Yes, a little bit, because while eating it, I was remembering the disgusting images that I saw, especially the ones in the form of insects, they were very distasteful." A1, Female, Engineer, old age.* All participants of both genders confirmed their inability to eat the cake if it looked like the shown images, except for two male participants. *"No impossible, especially the ones that were in the form of insects. A1, Female, Engineer, old age. "Perhaps, some of them, such as the ones in the form of animals, but for the rest, definitely not." B2, Male, IT Manager, Middle adulthood*. The participants' appetite changed toward the cake, due to the power of imagination, as the mind is affected by imaginative events

similarly to real ones. Participants' defensive system was activated, leading them to avoid eating the cake.

For the control group, all participants of both genders felt good about the cake, as they did not see disgusting images like the experimental group did. Thus, no negative associations were formed between the cake and the images. *"Of course, I feel good, I want to eat it." B2, Male, Lawyer, Young adulthood*. They justified their positive feelings toward that cake that they love desserts, and the cake looks tasty. *"Because it seems like a delicious dessert." A6, Female, Housewife, Young adulthood.* All participants showed a desire to eat it, as their appetite is still incredibly positive. *"My appetite is incredibly good, of course." A4, Female, Accountant, Old age. "Undoubtedly, I would love to eat it." B3, Male, Accountant, Old age.* The experimental group were psychosomatically affected, thus many of them refused to eat it, unlike the control group whose feelings remained positive. The suggestive messages included in advertising and promotional content can lead to psychosomatic impact by activating various sensory receptors. Such as photoreceptors and taste receptors, as both have formed participants' conscious and retrospective experiences, leading to their perceptions of the cake. In addition to different brain regions, such as, parietal, occipital, and frontal lobes. Temporal lobe, including amygdala and hippocampus played an intermediary role between the aforementioned brain regions. It retrieved images and formed emotions, leading to final

behaviors. The experiment's hypothesis has been proven through results.

Study 3 Discussion

In the third experiment and despite the reliance only on the role of photoreceptors and not as in the previous experiment, the impact on the psyche of experimental group was stronger than in the previous experiment. Because this experiment influenced the participants' appetite in a negative and direct way. Moreover, their negative feelings toward the images shown reflected on their feelings toward the cake itself. Since the mind cannot distinguish a lot between what is real and imaginary. Mental imagery excites the same brain regions activated when facing real events (Bensafi et al., 2003), causing physiological changes within individuals (Achterberg, 1985). These results are consistent with what was mentioned before that the brand memory affects consumer's preferences more than the product's taste (Patrizia et al., 2019). Although the photoreceptors had the upper hand in affecting the participants' feelings, the taste receptors played a key role in the approval of a few of them to eat the cake after some time had passed. Especially knowing that positive retrospective experiences affect feelings if they remain in memory for a long period of time. Additionally, the images gradually disappeared from participants' memory, reducing the impact of images on their appetite, especially after the photoreceptors became less sensitive over time. Because of

sensory receptors' adaptation, the rate of action potentials decreases in return (Marzvanyan, A., & Alhawaj, 2019). Thus, repeating advertising and promotional messages is significant, especially for people who are less sensitive or whose memory is not strong enough. The largest proportion of participants, despite their love for cakes, their feelings toward the presented one turned negative after mentally linking it to the images shown. Therefore, they refused to eat it. This is robust evidence that the neural associations to objects are variable, thus can be easily replaced. Human behavior dramatically changes by pleasure or pain, and when the recent neuro-associations become stronger than the old ones and able to replace them (Robbins, 1991). Associations in brain change over time (Rose, 2020). Neural networks are not fixed, they are appearing and disappearing throughout our lives in a dynamic way, relying on experiences (Demarin & Morovic, 2014, p.209). The same for a promoted product, as it is easy to replace its neural associations in customers' minds with newly established ones dedicated to another product. Thus, brands should continue their advertising campaigns, even the popular ones. This is consistent with a previous study, which proved that repetition process inhibits the recall of non-advertised objects, while enhancing the memory of the advertised objects (Jin et al., 2008). However, this previous study lacks an analysis of the causes behind this phenomenon, unlike this study. Nittono and Watari (2017) investigated the

impact of tasting a food sample, such as chocolate or baked cake or reading a leaflet on consumers' perceptions (Alsharif et al., 2023). Their findings showed that tasting a brand sample elicited a higher late positive potential (LPP) than reading a leaflet, meaning that it has highly affected their perceptions, thus, making a brand more salient compared to others in the same food category (Alsharif et al., 2023). This takes us to the fact that the sensitivity of some receptors compared to others, such as the one responsible for taste compared to vision activates certain brain regions to a greater degree than those less sensitive receptors. Thus, its impact becomes stronger on feelings and behaviors. Visual and gustatory stimuli considered in previous citation do not affect consumers similarly. Since the gustatory stimulus strongly affects the individual's appetite unlike the visual stimulus, whose influence on the appetitive system is much weaker. Psychological and psychosomatic impacts have been ignored in advertising and promotional research, while focusing only on emotional impact. According to psychological studies, psychological harm leads to deeper and longer effects on individuals compared to emotional harm (Mckinnon, 2008). Abusive behavior causes emotional or psychological harm (Kairys & Johnson, 2002). People often respond physically to deeply influential stimuli (Mayer, 2000). It is important to show the relatedness of suggestibility, hypnosis, and mass hysteria terms to advertising and promotion. Since advertising and

promotional messages stimulate the individuals' receptors, their brain regions, increasing their susceptibility to suggestion. When individuals take a collective stance on these messages, we reach the mass hysteria phenomenon, as happened in this experiment.

1.7 General Discussion

According to findings, sensory receptors play an intermediary role in the relationship between advertising and promotional messages and the various brain regions, causing the emergence of senses and behavioral responses. An increased number of studies showed the impact of advertising campaigns on individuals' behaviors, the way they perceive, feel, process the advertising messages, and take their purchasing decisions (Alsharif et al., 2023). However, the neural mechanism of purchasing behaviors affected by advertising messages lacks clarity in these studies. Because of neglecting the role of sensory receptors in shaping this behavior, in addition to the neural connectivity of various brain regions, as a condition for the flow of messages. It was previously mentioned that music affects customers' selection of various products (Hsu & Chen, 2019). However, the role of auditory receptors in this regard was neglected. The same happened with another study, which proved that advertisements, including gender voice (female, male) activate the brain areas responsible for attention process (Casado-Aranda et al., 2018). Without mentioning the role of auditory receptors in stimulating the attention brain area. The success of

advertising campaign is measured by how viewers assess and respond to advertising elements, whether it succeeded in attracting their attention and acquiring a first impression, whether its sent message is clear, whether the advertisement is credible and whether it can delivers the brand image and its value, whether it is original and ultimately, the arrangement of elements, images, colors, text and video formats are tested (Mihajlović et al., 2023). Although the various advertising elements were included in the previous citation, the question is what the effects of these elements are and on what their strength is based. The impact of advertising and promotional materials on audiences' psyche relies on two conditions: The intensity of feelings caused by these materials and the frequent exposure to them. The participants' negative emotions were much higher in the third experiment than the second one. Since their appetitive system was highly stimulated. The impact of images in the third experiment extended to the body and not just the psyche. Thus, some participants suffered from temporary loss of appetite, while others had nausea. Both strong retrieval cues and elaborative coding lead to successful long-term memory (Baddeley & Eysenck, 2009). In addition to the effect of visual stimuli. Since memory power for visual stimuli is incredible (Brady et al., 2013). They are often stored in long term memory (cited in Brady et al., 2019). Sad messages have a significant impact on individuals (Alsharif et al., 2023). Promotional work aiming to

keep individuals away from harmful behaviors should send painful messages, making their defensive system have power over their appetitive system. Positive messages target the individual's appetitive system, activated in certain events, such as getting rewards, eating, etc. (Lang & Bradley, 2013).

1.9 Implications and Future Research

1) This study proved the role of sensory receptors in processing advertising and promotional messages. Since senses are the outcome of their activity. Future research in the services marketing field could study the impact of servicescape elements on customers' sensory receptors.

2) It showed the role of the connectivity of brain regions in the impact of advertising and promotional messages, in addition to the significance of repeating these messages. The contradictory impact of repetition on memory and emotion can be investigated in future research, considering the difference between repetition enhancement and repetition suppression, as excessive repetition can lead to adaptation and possibly negative outcomes. According to the findings, repeating these messages three times can be sufficient. Advertisements are important for well-known brands as they are for lesser-known ones.

3) It emphasized that hypnosis, suggestibility, and mass hysteria are linked with advertising and promotion.

4) It confirmed that advertising and promotional materials could activate one of the systems at the expense of the other, namely

appetitive, and defensive systems. Additionally, it considered the psychological and psychosomatic impact alongside the emotional impact regarding advertising and promotion.

1.10 Conclusion

Many advertising practices play on the subconscious mind, from here the idea of neural manipulation presented in this research is confirmed. This manipulation can be in the individuals' favor; by keeping them away from harmful behaviors and it may push them to adopt irresponsible ones.

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