DEVELOPMENT OF TURKISH DRM LISTS AND COMPARING FALSE MEMORY DIFFERENCES ACROSS DISCRETE EMOTIONS

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ABSTRACT

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The DRM paradigm is one of the most commonly used paradigms in false memory literature. This paradigm consists of word lists, and although it has been utilized for a long time, emotion has only recently been integrated into this paradigm. While most of the emotional DRM lists present in the literature have been developed based on the circumplex model, there are different emotion theories. Among these, the discrete emotion theory suggests that despite certain shared characteristics among emotions, they significantly diverge in various other aspects. This particular theory has been studied in both memory and false memory literature, yet a comprehensive examination within the context of the DRM paradigm has been lacking. In the current study, a total of 25 Turkish DRM lists were developed for five discrete emotions: disgust, fear, sadness, anger, and happiness. A total of 71 university students (41F, 30M) aged between 18 and 26 (*M*= 21.38, *SD*= 1.74) participated in the study. The participants were exposed to 15 randomly selected lists of words, with three lists from each emotion category, presented on a computer. Following a distractor task, a recognition task was administered. In the recognition task, there were three types of words: critical lures, semantically related to the studied list of words; old words, originating from the studied lists; and new words, unrelated to the studied lists. The results of the study revealed that sadness and anger-related critical lures produced more false memories than disgust, fear, and happiness-related critical

lures. The recognition task in the study employed a six-point confidence scale. Therefore, the analyses for sensitivity and response bias were conducted within the scope of Signal Detection Theory. These analyses were conducted on hit rates (old responses given to old words) and false alarm rates (old responses given to new words). Since false alarms could be obtained from both critical lures and new words, the analyses were performed considering both as false alarms. When evaluating critical lures as false alarms, no significant difference in sensitivity and response bias across emotions was found. However, when counting new words as false alarms, there were significant differences across emotions in sensitivity and response bias. Specifically, the participants exhibited lower sensitivity scores for fear and happiness compared to other emotions. In terms of response bias, the participants demonstrated a liberal response bias for happiness, and a conservative response bias for disgust, fear, sadness, and anger. Collectively, the results have emphasized the noticeable disparities existing among discrete emotions. This study has not only provided a deeper understanding of the intricate interconnection between emotions and false memory but also contributed to our enhanced grasp of how they interact within the framework of the DRM paradigm.

Keywords: Discrete emotions, DRM paradigm, Signal Detection Theory, Recognition task, False memory

ÖZET

TÜRKÇE DRM LİSTELERİNİN GELİŞTİRİLMESİ VE AYRIK DUYGULARIN SAHTE ANI ÜRETİMİ AÇISINDAN KARŞILAŞTIRILMASI

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Sahte anı literatüründe kullanılan en yaygın paradigmalardan biri DRM paradigmasıdır. Kelime listelerinden oluşan bu paradigma uzun zamandır kullanılsa da duygunun bu paradigmaya dâhil edilmesi daha yakın zamanda olmuştur. Literatürdeki duygusal DRM listelerinin çoğu döngüsel modele göre geliştirilmiş olsa da literatürde farklı duygu teorileri de mevcuttur. Bu teorilerden biri olan ayrık duygular teorisi, her duygunun ortak bazı özellikleri olsa da diğer açılardan birbirlerinden ayrıştıklarını ileri sürmektedir. Bu teori bellek ve sahte anı çalışmalarında çalışılmış olsa da DRM listelerinde kapsamlı bir şekilde çalışılmamıştır. Bu çalışma kapsamında beş ayrık duygu ele alınarak toplamda 25 Türkçe DRM listeleri geliştirilmiştir. Çalışmada ele alınan tiksinti, korku, üzüntü, öfke ve mutluluk duyguları aynı zamanda temel duygular olarak görülmektedir. Çalışmaya 18 – 26 yaş aralığında (*M*= 21.38, *SD*= 1.74) 71 üniversite öğrencisi (41K, 30E) katılmıştır. Çalışmada katılımcılara bilgisayar üzerinden seçkisiz olarak seçilmiş, her duygu grubundan üç liste olmak üzere, 15 listeye ait kelimeler gösterilmiş, ara bir görevin ardından tanıma görevi verilmiştir. Tanıma görevi üç farklı türden kelime içermektedir: çalışılan liste kelimelerinin anlamsal olarak çağrıştırdığı kritik çeldiriciler, listede olup daha önce çalışılmış eski kelimeler ve liste kelimelerinden bağımsız yeni kelimeler. Çalışma sonucunda, üzüntü ve öfke içerikli kritik çeldiricilerin tiksinti, korku ve mutluluk içerikli kritik çeldiricilere kıyasla daha fazla

sahte anı üretimine sebep olduğu bulunmuştur. Çalışmada tanıma görevi 6'lı güven aralığı kullanılarak yapılmıştır. Bunun sonucunda Sinyal Tespit Kuramı kapsamında duyarlılık ve tepki yanlılığı ile ilişkili analizler de yapılmıştır. Bu analizler isabet (eski kelimeye verilen eski tepkisi) ve yanlış alarm (yeni kelimeye verilen eski tepkisi) oranları hesaplanarak yapılmıştır. Çalışmada yanlış alarmlar hem kritik çeldiricilerden hem de yeni kelimelerden elde edilebildiği için, ikisinin de yanlış alarm olarak ele alındığı analizler yapılmıştır. Kritik çeldiricilerin yanlış alarm olarak ele alındığı analizlerde, duygular arasında duyarlılık ve tepki yanlılığı açısından bir fark çıkmamıştır. Ancak yeni kelimeler yanlış alarm olarak ele alındığında, duygular arası ayrışmalar gözlemlenmiştir. Katılımcıların duyarlılığının korku ve mutluluk koşullarında, diğer duygulara kıyasla daha düşük olduğu bulunmuştur. Tepki yanlılığında ise, katılımcıların mutluluk koşulunda liberal, tiksinti, korku, üzüntü ve öfke koşullarında ise muhafazakâr bir tepki yanlılığı gösterdiği bulunmuştur. Özetle, sonuçlar ayrık duygular arasında gözle görülür farklılıklar olduğunu vurgulamaktadır. Bu çalışma, duygular ve sahte anılar arasındaki karmaşık bağlantının daha derin bir şekilde anlaşılmasına katkı sağlamakla beraber aynı zamanda DRM paradigması çerçevesinde nasıl etkileşime girdiklerini daha iyi anlamamıza katkıda bulunmaktadır

Anahtar Kelimeler: Ayrık duygular, DRM paradigması, Sinyal Tespit Kuramı, Tanıma görevi, Sahte anı.

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LIST OF SYMBOLS AND ABBREVIATIONS

BAS	: Backward Association Strength
BDI	: Beck Depression Inventory
DRM	: Desee-Roediger-McDermott
FAS	: Forward Association Strength
ROC	: Receiver Operating Characteristic
SDT	: Signal Detection Theory

CHAPTER I

INTRODUCTION

Do you remember what you were doing last Friday? Or what did you eat two days ago at lunch? And how confident are you that your memories are 100% accurate? Through our lives, we experience and learn lots of things, and our brain stores most of these pieces of information and memories. However, when we attempt to recall these memories, they do not always emerge intact in our consciousness. This phenomenon is known as false memory. False memory occurs when a person remembers a memory from their past with certain details altered or remembers a memory that never actually happened in their life before (Brainerd et al. 2008; Roediger and McDermott 1995).

False memory is a crucial and frequently studied topic in psychology literature, and it is mostly assessed by the Deese-Roediger-McDermott (DRM) paradigm (Deese 1959; Pezdek and Lam 2007; Roediger and McDermott 1995). In this paradigm, a group of semantically related words is shown to the participants, and these words evoke one critical word. Later, old and new words, including the critical words, are shown to the participants, and it was asked whether they have seen these words previously or not (Pezdek and Lam 2007; Roediger and McDermott 1995). People generally tend to give old responses to the critical word and create false alarms (Pezdek and Lam 2007).

Although false memory has been studied for a long time, it is not clear why or under what circumstances we are creating false memories. Among the variables that may affect the formation of false memories, emotions come to the fore as a critical variable. It is known that emotions can create vivid and long-lasting memories; however, these emotional memories are not accurate all the time (Kaplan et al. 2015; Levine and Edelstein 2009; Reisberg and Heuer 2007). In fact, emotions can make people more susceptible to false memories (Kaplan et al. 2015). Recognizing the

influence of emotions on false memories, researchers have started to create DRM lists with emotionally loaded words (Chang et al. 2021; Yüvrük et al. 2019). However, these DRM lists were developed according to the circumplex model.

In addition to the circumplex model, there are other models of emotions in the literature, such as discrete emotion theory. Although no comprehensive DRM lists have been created according to this model, only one study by Bland et al. (2016) used DRM lists with discrete emotions. However, they only included two emotions (fear and anger), and their focus was not on comparing the emotions but rather on examining mood congruency (Bland et al. 2016). Therefore, it is still unknown whether there are differences in false memory rates among discrete emotions. In this thesis study, we have created DRM lists to examine the impact of discrete emotions on false memory.

1.1 FALSE MEMORY

False memory can be defined as either remembering an event that never happened or remembering an event with some parts altered (Roediger and McDermott 1995: 803). The history of false memory dates back to the 1930s. Bartlett (1932) was the first researcher to investigate the false memory in experimental settings (Roediger and McDermott 1995: 803). In his study, he used the method of repeated reproduction, using a folktale named "The War of Ghosts". Although he lacked statistical data, the result of his study demonstrated that people are prone to reproduce the story in a shorter, less accurate, and more culturally appropriate manner (Bartlett 1932). This study showed that humans are not able to remember an event accurately all the time. Our memory and perception are susceptible to the influence of our beliefs, prior experiences, attitudes, motives, and more (Buckhout 1974: 24).

In our daily lives, the occurrence of false memory may not always have significant implications. However, there are some situations where false memory may lead critical consequences (Bookbinder and Brainerd 2016: 1315). One example of such a situation is eyewitness testimony. In his article, Buckhout (1974) highlighted the unreliability of eyewitness testimonies. Numerous factors can affect the accuracy of eyewitness testimony, including inadequate lightning, distance, the existence of a crowd, or fast movements. Additionally, the witness's physical condition (e.g., old age, tiredness, sickness) or psychological state (e.g., stress) can also contribute to

inaccuracies (Buckhout 1974: 225). Another situation where false memory becomes important is the issue of repressed memories. When people experience traumatic events, they often tend to repress these memories due to their painful nature. However, later in life, these memories may resurface and be recovered in their conscious mind (Laney and Loftus 2013: 138). Although these repressed memories could be true, there is a high chance that they may be false memories, especially if they are recovered in therapy. The increased incidence of repressed memories of abuse during therapies in the 1990's suggested that certain techniques (e.g., suggestive probing) employed in the therapy may have contributed to the formation of false beliefs in repressed memories (Laney and Loftus 2013: 138; Loftus 1993: 526).

False memory can be categorized into two types: implanted false memory and spontaneous false memory (Bookbinder and Brainerd 2016: 1316, 1321). Let's consider a scenario where you went out for dinner two weeks ago and had noodles and sushi. If, after two weeks, someone asks you "Did you have ramen and nigiri?" that question is suggestive and increases the probability of false remembering. This serves as an example of implanted memory. But if the person simply asks, "What did you eat?" and you try to remember what you ate without any interference, any inaccuracies in your memory recollection would be classified as spontaneous false memory. Given the two types of false memory, different approaches may be needed to address each type.

1.1.1 Measurements of False Memory

The misinformation paradigm is widely recognized as a fundamental and commonly used procedure in studies on implanted false memory (Bookbinder and Brainerd 2016: 1321). This paradigm was firstly used by Loftus and Palmer (1974) to examine the effect of suggestive questions following an event. In their first experiment, they showed participants videos of traffic accidents and asked some questions about the accident. In the questions about the speed of the cars involved in the accident, they changed the verbs used (e.g., contacted, hit, bumped, collided, and smashed) to investigate how this affects the participants' responses. Their results showed that changes in the verbs significantly affected the mean estimation for the speed (Loftus and Palmer 1974: 586). In their second experiment, the first part was the same, except

that only the verbs “hit” and “smashed” were used, with a control group. In the second part, they were asked if they remembered seeing a broken glass, which was not in the videos. Their results revealed that participants who were questioned using the verb “smashed” were more likely to falsely claim they saw a broken glass compared to participants questioned with the verb “hit” (Loftus and Palmer 1974: 587). In addition to this method, various other methods have been employed to implant false memory into one’s mind. For instance, in the famous “Lost in the mall” study, Loftus and Pickrell (1995) successfully implanted a whole new false childhood memory to their participants’ mind. These studies and others (e.g., Loftus 1975; Loftus et al. 1978) revealed that post-event information, suggestions, and misleading questions can lead to the formation of false memories (for reviews, Frenda et al. 2011; Loftus 1997; Loftus 2005).

As mentioned earlier, in addition to studies on implanted false memory, there are also studies focused on spontaneous false memory. These kinds of false memory research do not involve suggestive techniques; instead, they simply present an item to the participants and ask them to recall or recognize the item. These items can be scripted materials such as sentences or narratives, staged events (live or video recordings), or semantically related word lists, such as the DRM paradigm (Bookbinder and Brainerd 2016: 1321; Yüvrük and Kapucu 2022: 2). The DRM paradigm is one of the most commonly used technique in the spontaneous false memory literature.

1.1.1.1. DRM Paradigm

The DRM paradigm was first developed by Deese (1959) and revealed the occurrence of false recall. However, it was not until 1995 when Roediger and McDermott discovered the study of Deese that it gained recognition. In their first experiment, they replicated Deese’s work and found similar results (Roediger and McDermott 1995: 806). Subsequently, they extended their finding with more lists. Later, Stadler and colleagues (1999) published the norms for 36 DRM lists. These DRM lists consist of 10–15 words that are all semantically related to a critical lure. During the learning phase, participants are only presented with the words in the list but not the critical lure itself. After completing the learning phase, participants are

given either a recall or recognition task. In the recall task, participants tend to recall the critical lure, even if they did not see it. In the recognition task, some of the old words from the list, critical lures, and some new words are shown to the participants, who are then asked to indicate whether they recognized each item or not. Participants often mistakenly recognize the critical lures as old words. To determine the efficacy of lists, researchers analyze the false alarm rate by comparing the rate for critical lures to that for new words. If the false alarm rate is significantly higher for critical lures than new words, it indicates that the lists are functioning as intended. This shows that people do not falsely recall or recognize random words, but rather their false memory stem from the semantic associations between the critical lure and the word list. In this regard, it was also hypothesized that similar findings would be observed in our study (Hypothesis 1a). Moreover, to ascertain participants' competence in distinguishing between old and new words, it also hypothesized that there would be differences between these word types for old responses (Hypothesis 1b).

Since DRM lists are easy to apply and evaluate, they have been used in thousands of studies to assess false memories, and it has been shown that they are a reliable tool (Coane et al. 2021: 1; Gallo 2010: 835). Some of these studies directly used the original lists (e.g., Payne et al. 1996; Storbeck and Clore 2011; Thapar and McDermott 2001), whereas others developed new English lists according to the needs of their study (e.g., Arndt 2010; Bland et al. 2016; Chang et al. 2021; Knott et al. 2018; Shah and Knott 2018). Because semantic association is important in these lists, researchers from different countries have developed DRM lists applicable to their cultures, such as Bosnian (Brennen et al. 2007), Spanish (Cadavid and Beato 2017), French (Dehon et al. 2010), Polish (Ulatowska and Olszewska 2013), and Turkish (Mısırlısoy 2004).

Studies utilizing DRM lists have increased our awareness about constructive nature of memory and have helped us to discover the nature of the false memory (Gallo 2010: 835). For instance, in the first DRM lists studies, data collection occurred immediately after the learning phase. However, as the use of DRM lists became more prevalent, researchers started investigating the effect of retention intervals. In a study by Thapar and McDermott (2001), the effects of retention interval on false recall and recognition were investigated. They found a significant interaction between retention

interval and item type (studied words vs. critical lures) in both recall and recognition tests. The results of recall and recognition revealed that although memory performance declined over time in both word types, the decline was greater for studied words compared to critical items (Thapar and McDermott 2001: 426, 429). Similar results were obtained in other studies (Experiment 1, Payne et al. 1996; Experiment 1, Seamon et al. 2002:). The difference in the study by Seamon and colleagues (2002) is that accurate recall for studied list words significantly decreased after two weeks and two months. However, for critical words, false recall did not decrease after two weeks but only decreased after two months (Seamon et al. 2002: 1058). These findings indicated that falsely remembered information tends to be more resistant to forgetting compared to learned information.

1.1.2 Theories of False Memory

One explanation for false memory comes from the developers of DRM paradigm (Roediger and McDermott 1995). They proposed the Activation/Monitoring Theory, which consists of two processes: activation and monitoring. While activation is generally associated with encoding, and monitoring with retrieval, both processes can occur during both in encoding and retrieval stages (Roediger et al. 2001: 392). According to the theory, during the study session, people not only activate the given information but also related information (Roediger et al. 2001: 393). In the DRM paradigm, this spread activation also activates the critical lure (Gallo and Roediger 2002: 471). Since participants have activated the critical lure during the study phase, they may remember it during the retrieval phase. When participants fail to accurately monitor the source of the critical lure, they may falsely remember it as if they had seen it during the study phase (Gallo and Roediger 2002: 471; Roediger and McDermott 1995: 810).

Another prominent theory in false memory literature is the Fuzzy-Trace Theory. According to this theory, there are two representations of memory as verbatim and gist, which are not dependent to each other (Reyna and Brainerd 1995: 22). When we first encounter information, the surface form of the memory creates verbatim traces, which also includes contextual cues (Brainerd and Reyna 2002: 165; Reyna and Brainerd 1998: 194). During the retrieval process, accessing verbatim traces is fast and

provides surface information, resulting in more accurate memory (Brainerd et al. 2002: 121). On the other hand, gist traces include the episodic output of information, such as meaning, relationships, and patterns (Brainerd and Reyna 2002: 165). Retrieval of gist traces is slower and results in reconstruction of memory, making memory less accurate (Brainerd et al. 2002: 121). In terms of forgetting, this theory suggest that verbatim traces fade away faster than gist traces since the surface information does not remain longer compared to meaning (Brainerd and Reyna 2002: 166). As mentioned earlier, false memory can be categorized into two types. Implanted false memories have verbatim traces, since they explicitly presented to the participants. On the other hand, spontaneous false memories, such as critical lures in the DRM paradigm, do not have verbatim traces (Reyna and Brainerd 1998: 195).

1.2 EMOTION

Emotion can be described as a short episode of synchronized response to people, things, or events (external or internal) that are evaluated as significant (Niedenthal and Ric 2017: 3; Smith and Kosslyn 2007: 340). This response can involve subjective experience, motivation, bodily responses (such as facial expression and arousal), evaluation, and appraisal, which are part of mental and physical processes. For example, experiencing anger, sadness, or happiness after a conversation with someone. Emotion refers to the range of reactions to time-limited events (Smith and Kosslyn 2007: 340). Other than these definitions, there are different approaches and models that attempt to explain emotion.

One of the most common models is the circumplex model. This model, proposed by Russell (1980), argues that the best way to represent emotions is to place them in a circle with a two-dimensional bipolar axis. The dimension on the x axis represents the valence, and the y axis represents the arousal (Barrett and Russell 1999). Valence stands for the positivity or negativity (or pleasantness or unpleasantness) of the emotional stimulus or response to a stimulus. Arousal (or activation), on the other hand, represents the intensity (high or low) of emotional situations and our reactions, which cause changes in our body such as increased heart rate or sweating (Kaynak and Aydın 2021: 927; Smith and Kosslyn 2007: 343). In this model, all emotions have different valence and arousal levels and positioned along the circular dimension.

Another model of emotion is the motivational (approach-withdrawal) model. According to this model, organisms are motivated to either approach or withdraw from stimuli (Watson et al. 1999). Negative activation represents withdrawal, and it serves to protect organisms from behaviors that may have unwanted outcomes. Negative emotions such as fear, worry, disgust, and nervousness are related to withdrawal (Watson et al. 1999: 830). Conversely, positive activation stands for approach, and it guides the organism to engage in behaviors that may result in pleasant outcomes. Positive emotions such as happiness and enthusiasm are related to approach behavior (Kapucu et al. 2018: 86; Watson et al. 1999: 830). These two models are classified as dimensional approaches to emotion, whereas the next model approaches emotion on a categorical basis (Smith and Kosslyn 2007: 343).

The last model to be mentioned within the scope of this thesis study is known as basic emotion or discrete emotion model. This theory originates from an evolutionary perspective, building upon Darwin's (1859) work "On the Origin of Species" (Smith and Kosslyn 2007: 341). The theory states that although emotions have some common features, they are distinguished from each other by their unique characteristics (Ekman 1992). For example, disgust, fear, sadness, anger, and contempt are all negative emotions, yet they differ in terms of their physiology, prior events, behavioral reactions, facial expressions (Ekman 1999). In a more recent meta-analysis of 83 studies showed that basic emotions have consistent activation patterns in the brain, and these patterns significantly differ for each emotion (Vytal and Hamann 2010: 2879). It is generally accepted that there are six universal basic emotions: disgust, fear, sadness, anger, happiness (joy), and surprise (Ekman 1992: 170; Smith and Kosslyn 2007: 341; Vytal and Hamann 2010). In the scope of the thesis study, five of these basic emotions were utilized. The selection of these emotions was based on the norm study of Turkish emotional words, which replicated the Affective Norms for English Words (ANEW: Bradley and Lang 1999). This norm study provides arousal and valence values of Turkish emotional words, as well as their discrete emotion categories, which include disgust, fear, sadness, anger, and happiness (Kapucu et al. 2018).

1.2.1 Disgust

Disgust is generally known as a highly arousing negative emotion associated with withdrawal motivation (Harmon-Jones et al. 2016: 5). It predominantly activates the right insula and right inferior frontal gyrus, and its activation of the inferior frontal gyrus and anterior insula differentiates it from other emotions (Vytal and Hamann 2010). One definition of disgust points out that disgusting stimuli have the contagion aspect, indicating that disgusting stimuli have the potential to turn non-disgusting stimuli into disgusting ones (Rozin and Fallon 1987: 23). For example, if someone sneezed on the food you were eating, you would likely experience disgust. You would feel revulsion, push away the food, and become nauseated, which represent feeling, behavioral, and physiological components of disgust, respectively (Rozin et al. 2016). This contamination can easily and sometimes invisibly spread (Chapman et al. 2013: 1101). Since it has a contagion feature, it is hypothesized that disgust has evolutionary importance as a signal for threats of disease around us (Curtis et al. 2004). Disgust has different types as core disgust (e.g., vomit, spoiled food), interpersonal disgust (e.g., avoiding from sick people), sexual disgust, animal-nature reminder disgust (e.g., contact with dead body), and moral disgust (moral violations that make us low as a person, e.g., stealing) (Chapman and Anderson 2012: 64; Rozin et al. 2016). It is also associated with different psychopathologies such as obsessive and compulsive disorder, blood, injury, and injection phobia, and spider phobia (Rozin et al. 2016: 826; Teachman & Smith-Janik 2009: 3).

1.2.2 Fear

Similar to disgust, fear is also recognized as a highly arousing negative emotion associated with withdrawal motivation (Harmon-Jones et al. 2016: 5). Its most significant activation is in the left amygdala (Vytal and Hamann 2010: 2872). Fear is elicited by confrontation with real or imagined threats, and therefore it is highly important in terms of survival (Izguierdo et al. 2016: 696). It can also be part of a phobia. Moreover, fear learning has an important function known as generalization, which helps organisms deal with new stimuli if they are similar to already feared ones (Dunsmoor et al. 2011). Fear serves adaptive purposes within the defense system by assisting with danger perception, restructuring metabolic processes and priorities in

behavior to prepare suitable defensive actions, and improving memory for relevant experiences (LaBar 2016: 767). The defense mechanism triggered by fear requires high energy. After the elicitor of fear disappears, fear response rapidly decreases to reach a homeostatic state (LaBar 2016: 751).

1.2.3 Sadness

Sadness is commonly characterized as a negative emotion with moderate arousal (Smith and Kosslyn 2007: 344). Since it has been generally characterized by inhibition in behaviors and being passive, it includes withdrawal motivation (Karnaze and Levine 2018: 45; Smith and Kosslyn 2007: 344). It generally activates the left medial frontal gyrus and head of the caudate nucleus, and these activations significantly differentiate sadness from other emotions (Vytal and Hamann 2010: 2879). The most common sources of sadness are the perception of loss or failure in achieving goals (Karnaze and Levine 2018: 46; Webb and Pizzagalli 2016: 860). The loss could be a loved person, a job, a position, or a material. The failure in goal could be getting rejected by your dream university. Sadness is mostly accompanied by crying, a behavioral characteristic of sadness (Webb and Pizzagalli 2016: 860). Sad people may display politeness and generosity, and they may be more prone to seeking immediate rewards that could provide temporary mood enhancement but may have undesirable outcomes in the long-term (Karnaze and Levine 2018: 48, 49). Last but not least, sadness goes along with ruminative thoughts and pessimism, and is considered one of the key symptoms of depressive disorders (Karnaze and Levine 2018: 45).

1.2.4 Anger

Anger is known for being a highly arousing negative emotion with approach motivation (Smith and Kosslyn 2007: 344). Activations in the inferior frontal gyrus and parahippocampal gyrus differentiate anger from other emotions (Vytal and Hamann 2010: 2879). Anger arises when a person experiences physical or psychological restrictions or their goals are obstructed (Harmon-Jones and Harmon-Jones 2016: 775). Anger serves to organize and regulate social, interpersonal, and psychological (e.g., self-defense, sense of control) processes, such as self-defense

and maintaining a sense of control, which count as adaptive aspects (Harmon-Jones and Harmon-Jones 2016: 774). However, anger does not always lead to positive outcomes and can be associated with negative consequences, such as violence (Harmon-Jones and Harmon-Jones 2016: 774). Since anger has negative consequences, there are some strategies, both direct and indirect, to reduce these consequences. Direct strategies involve dealing with the source, such as an apology; while indirect strategies focus on managing the emotional experience, such as finding a reason to feel happy (Miron et al. 2008: 326).

1.2.5 Happiness

Unlike the other basic emotions listed above, happiness is a positive emotion associated with approach motivation and changeable arousal (Harmon-Jones et al. 2016: 6). The greatest activation is found in the right superior temporal gyrus (Vytal and Hamann 2010: 2870). Happiness is conceptualized as the presence of life satisfaction and positive affect, as well as a lack of negative affect (Lu 2001: 408; Niedenthal and Ric 2017: 150). It relies on subjective assessment. Happiness is correlated with societally valued qualities and resources, such as good mental and physical health, marriage, and a satisfying job (Lyubomirsky et al. 2005: 803; Niedenthal and Ric 2017: 152). Although correlations do not imply causation, many people may assume that these qualities and resources are the reason why a person is happy. However, a study by Lyubomirsky and colleagues (2005) revealed that happiness is the cause of the positive results it is correlated with. This causation can be explained by different mechanisms. One perspective focuses more on the health side and assumes that being happy increases the reproduction of useful hormones (Niedenthal and Ric 2017: 153). The second perspective highlights the fact that when we are happy, we show our happiness with some signals, like a smile. These signals make other people happy by stimulating the reward center. People like to be around other people who make them happy. Therefore, being happy helps us build healthy relationships and effective teamwork (Niedenthal and Ric 2017: 153). Lastly, happiness signals to us that we are in a safe environment. Feeling safe direct us to explore and learn, leading to increased knowledge and success in our professional lives (Niedenthal and Ric 2017: 153).

1.2.6 Studies with Discrete Emotions

Disgust, fear, sadness, anger, and happiness are among the most extensively studied discrete emotions in the literature. In a study involving 119 people, researchers investigated the elicitation of disgust, sadness, anger, and happiness through visual and olfactory cues (Croy et al. 2011). The results found that the majority of participants (98–99%) named an odor elicitor for disgust and happiness, whereas a smaller percentage of participants named an olfactory cue for anger (52%), and sadness (43%). On the other hand, more than 83% of participants were able to name visual cues for these emotions (Croy et al. 2011: 1332). These results suggest that although people can name fewer olfactory cues compared to visual cues, disgust and happiness are the exceptions to this pattern. Additionally, the results highlight the unique properties that differentiate emotions from each other.

In another study, Aubé and colleagues (2013) investigated the effects of fear, sadness, and happiness on the recognition of music memory under different encoding procedures. When the duration of the emotional music clips was matched, fear and happiness showed significantly better memory performance compared to neutral and sad music. Even when the number of events in the music clips was matched instead of the duration, fear still resulted in better memory performance compared to others. In both conditions, fear sems to be resulted in better memory performance than sadness which was assumed that the reason for the enhanced memory performance of fear was due to its significance for survival (Aubé et al. 2013: 987). Therefore, fear might lead to less false memory than sadness in the current study (Hypothesis 2e).

In a different study, the effects of fear and anger were investigated in both pre-encoding and post-encoding phases (Kapucu et al. 2018). In the pre-encoding condition, participants exhibited higher memory accuracy for anger compared to control condition (calmness), whereas there was no difference between anger and fear. In the post-encoding condition, there was no significant difference between anger, fear, and the control condition (happiness) (Kapucu et al. 2018: 92, 95). Because fear and anger did not differentiate from each other in their memory accuracy, they may be not differentiated in their false memory performance (Hypothesis 2f). In another study by Karaaslan et al. (2019), anger, sad and neutral face stimuli were used. Their results

demonstrated that in within-object binding condition, hit scores were lower in sad stimuli compared to anger and neutral stimuli. These results can be adapted to the false memory as higher false memory rate for sadness compared to anger (Hypothesis 2h).

There is also a growing body of literature that focuses on how disgust enhances memory and attention. These studies generally compared disgust with fear and found that disgust enhanced memory performance compared to fear in different age groups with different sets of stimuli (e.g., Chapman 2018; Chapman et al. 2013; Croucher et al. 2011; Marchewka et al. 2016; Zhang et al. 2019; Schienle et al. 2021). The reason for this comparison is that both disgust and fear are highly arousing negative emotions with withdrawal motivation. Therefore, the difference between them is attributed to their unique characteristics. The study by Marchewka et al. (2016) demonstrated the enhancing effect of disgust not only over fear but also over sadness. Moreover, a study by Boğa et al. (2021) showed that disgust-related stimuli were recognized better than fear and happiness-related stimuli in younger adults. In line with these studies, it can be expected that disgust would result in least amount of false memory compared to other emotions (Hypotheses 2a, 2b, 2c, and 2d). Also, since fear and happiness resulted in similar performance in some studies (Aubé et al. 2013: 984; Boğa et al. 2021: 28), it can be expected to see a similar false memory performance in these emotions (Hypothesis 2g).

1.3 FALSE MEMORY AND EMOTION

It has been noted that false memories can occur in eyewitness testimonies or in repressed memories, which come to light in therapies. Both situations are often highly emotionally charged. In one scenario, people try to recollect details of a crime they witness, while in the other, people recover their traumatic experiences that were repressed for a long time. Although emotional memories are commonly believed to be vividly remembered and long-lasting, they are not always accurate (Kaplan et al. 2015: 1). Therefore, investigating the relationship between emotion and false memory gain importance.

When exploring the relationship between memory and arousal, it has been suggested that the importance of information determines whether emotion enhances memory or not (Kaplan et al. 2015: 2). It has been appeared that as the arousal

increases, attention narrows down to the important parts of the information. Therefore, memory is enhanced for the central parts but impaired for the peripheral details, a phenomenon known as memory-narrowing effect (Kaplan et al. 2015: 2; Kensinger 2009: 4). This effect has been demonstrated in laboratory studies where participants were shown crime videos but could only recall information about the weapon (what is important to them), neglecting details about the perpetrator, which may result in false identification (Kaplan et al. 2015: 2; Loftus et al. 1987). The effect of arousal on false memory has also been observed in a mood induction study conducted by Corson and Verrier (2007). In this study, participants were assigned to one of the five groups: control, happy (positive high arousal), serene (positive low arousal), anger (negative high arousal), and sad (negative low arousal). All participants saw the same ten DRM lists and then received immediate recall (after each list) and recognition (after all lists done) tasks. Results of the recall task revealed that high-arousal groups (happy and anger) falsely recalled more compared to low-arousal groups (serene and sad). The control (low arousal), sad, and serene groups as well as positive and negative valence groups did not differ from each other in terms of their false recall. The recognition data also revealed similar results to the recall data regarding old responses to critical lures, whereas hit rates and old responses for noncritical lures did not differ across mood conditions (Corson and Verrier 2007: 210). Although this study did not find an effect of valence on false memory, there are studies who have found a significant effect of sad mood compared to happy and control groups. Storbeck and Clore (2005; 2011) compared the control, sad and happy mood groups. In their first study, they found that sad mood decreased false recall of critical words (Storbeck and Clore 2005: 787). In their second study, they revealed that this effect occurred only when mood was induced before the learning, but not after (Storbeck and Clore 2011: 984). In another study, Zhang and colleagues (2017) investigated mood-congruency by assigning participants to either positive, negative, or neutral mood conditions, and all participants saw positive, negative, neutral word lists. Results of their study revealed significantly higher false recognition for negative critical lures in all mood conditions and a mood-congruency effect only in negative mood condition (Zhang et al. 2017: 532). In a different study, the effect of mood-congruency was assessed using discrete emotions (fear and anger). Mood-congruency showed itself in the fear condition as significantly

higher false recognition for fear compared to anger and neutral conditions. However, in the anger condition, false recognition was higher for anger compared to the neutral condition (Bland et al. 2016: 614).

Beside these mood studies, there were also different false memory studies that used emotional word lists without any mood induction. Some studies could not find any difference in false alarm rates for critical lures on positive and negative DRM lists (e.g., Dehon et al. 2010: 632, 633; Experiment 1, Palmer and Dodson 2009: 245; Yüvrük et al. 2019). Although these studies did not reveal any difference between positive and negative DRM lists, a norming study by Chang and colleagues (2021) found a significant difference. Specifically, negative lists generated more false recall and recognition compared to positive ones (Chang et al. 2021: 110). Similarly, a higher false recognition rate for negative compared to positive and neutral lures was found in different studies (Brainerd et al. 2010: 148; Knott et al. 2018: 1067). Beside these DRM studies, a higher false memory rate for negative compared to positive stimuli was demonstrated in another memory study (Brainerd et al. 2008: 922). One reason for the difference in these studies might be because they divided emotions according to their valence. However, as mentioned in earlier studies, discrete negative emotions showed different memory performance from one another (Chapman 2018; Chapman et al. 2013; Croucher et al. 2011; Boğa et al. 2021; Karaaslan et al. 2019; Marchewka et al. 2016; Zhang et al. 2019; Schienle et al. 2021). Moreover, a positive emotion (happiness) also showed different memory performance compared to different negative emotions. Because happiness showed worse memory performance than disgust (Boğa et al. 2021) and similar memory performance to fear (Aubé et al. 2013: 984; Boğa et al. 2021: 28) we might expect a better memory performance of happiness compared to sadness and anger (Hypotheses 2i and 2j).

In the realm of memory research, particularly in the domain of emotion and memory employing the recognition memory task, the application of Signal Detection Theory (SDT) analysis holds importance and used in various studies (e.g., Boduroğlu and Kapucu 2019: 53; Dougal and Rotello, 2007: 425; Kaynak and Aydın 2021: 927; Kaynak and Gökçay 2017: 337). In addition to hit and false alarm scores, analyses involving sensitivity (d') scores obtained from SDT have gained prominence. Sensitivity, within this context, serves as a metric of participants' discriminative

ability. When participants are able to discriminate old and new words successfully, they obtain higher d' scores, which refers to higher accuracy. Conversely, when they were not able to differentiate old and new words, their d' scores decrease. In the study by Douglas and Rotello (2017: 425), memory sensitivity did not differ between positive and negative words. In another study, sensitivity was compared between positive and negative words, with an added manipulation of the arousal levels of these words (Kaynak and Gökçay 2017: 340). The findings indicated that young adults displayed similar accuracy level for positive and negative words when the words had high arousal levels. On the other hand, when the words had moderate arousal levels, their accuracy was higher for positive words compared to negative words . Some studies have examined the sensitivity comparison between disgust and fear stimuli. These studies revealed that accuracy was higher for disgust-related stimuli than for fear-related stimuli (e.g., Schienle et al. 2021: 5; Zhang et al. 2019: 5). Similarly, in another study, it was found that memory accuracy was lower for fearful pictures when compared to sad ones (Marchewka et al. 2016: 5). Based on these findings, we formulated two hypotheses: fear will result in lower memory accuracy compared to disgust, as well as in comparison to sadness (Hypotheses 3a and 3b).

Response bias (c) is another metric derived from SDT. Response bias reflects participants' bias toward designating a response as either "old" or "new". When participants exhibit a tendency to label items as "old", this results in a negative c value, termed as a liberal response bias. Conversely, when participants have a tendency to say "new", a positive c value is generated, constituting a conservative response bias (Boduroğlu and Kapucu 2019: 60). Existing literature reveals that participants tend to display a liberal response bias for negatively valenced stimuli compared to positively valenced one (e.g., Dougal and Rotello, 2007: 424; Kapucu et al. 2008: 703; Kaynak and Gökçay 2017: 340; Yüvrük and Kapucu 2022). Drawing from these findings, we also hypothesized that negatively valenced words will result in a liberal response bias when compared to happiness (Hypothesis 4a).

1.4 THE AIM AND SIGNIFICANCE OF THE STUDY

The aim of the current study was to develop DRM lists for five discrete emotions (disgust, fear, sadness, anger, and happiness) and investigate how these emotions affect false memory production in the DRM paradigm. To achieve this, five DRM lists were generated for each emotion. Participants were presented with three random lists from each emotion category. Later, a recognition task was administered, and participants were asked to rate their confidence in having studied each word. The presence of higher old responses to the critical lure compared to new words indicates the DRM effect.

False memory is a significant phenomenon in certain settings, such as eyewitness testimonies. One way to assess false memory production in a laboratory setting is through the use of the DRM paradigm. Throughout the literature, numerous studies have demonstrated the effectiveness of DRM and have further expanded its scope by introducing various influential variables. Among these factors, emotion has emerged as a crucial one.

Emotion is elucidated through diverse theoretical frameworks. According to the circumplex model, being commonly used in most false memory studies, emotions vary in two primary dimensions: valence and arousal. In line with this model, emotional DRM lists were developed. The Basic/Discrete emotions theory, on the other hand, categorizes emotions as distinct entities. Although previous studies have demonstrated the varying effects of discrete emotions on memory performance, there has been a dearth of DRM lists developed for these discrete emotions. Consequently, the primary aim of the study was to develop DRM lists for discrete emotions: disgust, fear, sadness, anger, and happiness. Moreover, there is a lack of literature on how discrete emotions specifically affect false memories, especially within the DRM paradigm. Hence, as a secondary aim, false memory rates and how these rates change among emotions were investigated. The third and fourth aims encompassed the comparison of sensitivity and response bias values across emotions. Through these pursuits, this study has documented several key contributions made to the fields of false memory and emotion. The hypotheses of the present study are listed in Table 1.

Table 1. The Hypotheses of The Study

Hypothesis 1: DRM Effect a. Old responses to the critical lures will be significantly higher than old responses to the new words. b. Old responses to the old words will be significantly higher than old responses to the new words.
Hypothesis 2: Differences Among Emotions for False Memory Production a. Disgust will be least likely to generate false memory compared to fear. b. Disgust will be least likely to generate false memory compared to sadness. c. Disgust will be least likely to generate false memory compared to anger. d. Disgust will be least likely to generate false memory compared to happiness. e. Fear will be least likely to generate false memory compared to sadness. f. Fear and anger will result in generating a similar amount of false memory. g. Fear and happiness will result in generating a similar amount of false memory. h. Anger will be least likely to generate false memory compared to sadness. i. Happiness will be least likely to generate false memory compared to sadness. j. Happiness will be least likely to generate false memory compared to anger.
Hypothesis 3: Differences Among Emotions for Sensitivity a. Memory sensitivity for fear will be lower than that of disgust as inferred from the false alarm rates obtained from new words. b. Memory sensitivity for fear will be lower than that of sadness as inferred from the false alarm rates obtained from new words.
Hypothesis 4: Differences Among Emotions for Response Bias a. Negative emotions will result in liberal response bias compared to happiness as inferred from the false alarm rates obtained from new words.

CHAPTER II

METHOD

2.1 PARTICIPANTS

The current study was conducted with university students aged 18 to 26 (*M*= 21.38, *SD*= 1.738). A total of 81 students participated in the study. However, 10 of them were excluded from the study. Nine of them were excluded because they had either a psychological/psychiatric/neurological disorder or used medication because of a psychological/psychiatric/neurological disorder. One student was excluded because of a technical problem. All the following analyses were conducted with the remaining 71 healthy students (41F, 30M). For the estimation of minimum sample size required in the study, a prior power analysis was conducted with G*Power version 3.1.9.7 (Faul et al. 2007). Based on the results, at a significance level of .05, *N*=29 was needed to reach 80% power for detecting a medium effect which is 0.15 (Cohen 1988). Therefore, the current sample of 71 was sufficient for this study. The participants were selected via convenience sampling, mostly from the students of Çankaya University and Social Sciences University of Ankara (Table 2). The demographic characteristics of the participants is given in Table 3.

Table 2. The Number of Participants from Different Universities

	Total	1st grade	2nd grade	3rd grade	4th grade	Master
Social Sciences University of Ankara	58					
Preparation school	7					
Psychology		8	32	2		9
Çankaya University	11					
Psychology			3	2	3	
Translation and Interpreting Studies (EN-TR)				2	1	
Other Universities	2					
Psychology		1	1			

Table 3. The Demographic Characteristics of the Participants

	n/percent	Range	M(*SD*)
Number of participants	71		
Age		18 – 26	21.38(*1.784*)
Gender			
Female	40/56,33%		
Male	31743,66%		
Hand Choice			
Right	65/91,55%		
Left	6/8,45%		
Marital Status			
Single	71/100%		

2.2 MATERIALS

2.2.1 Demographic Information Form

At the beginning of the study, after obtaining informed consent, a demographic information form was given to the participants. In this form, information related to age, gender, education, and health were collected from the participants (Appendix A). Furthermore, participants' dominant hands were asked to use the mouse with their preferred hands for the study. If participants had a psychological, psychiatric, or neurological disorder or took medication for one of these conditions, they were removed from the study.

2.2.2 Beck Depression Inventory (BDI)

The inventory was developed by Beck et al. (1961) as a measurement tool for the behavioral appearance of depression. It consists of 21 items, and each item is rated on a four-point scale (0-3). The possible scores from this inventory range from 0 to 63. The severity of depression was divided four as none or minimal (<10), mild to moderate (10-18), moderate to severe (19-29), and severe (30-63) (Beck et al. 1988). In the current study, no participants were eliminated according to their BDI scores. Higher scores indicate more severe depression symptoms. Turkish adaptation of the inventory established by Hisli (1989). In the Turkish version of BDI, internal consistency reliability was found .74 and validity was found .50. The BDI is shown in Appendix B. In the current study, the participants' scores were between 0 to 36 (M=12.25, SD=7.625).

2.2.3 DRM Lists

2.2.3.1 Choosing the Critical Lures

In the extent of this study, five critical emotional words for each discrete emotion category (disgust, fear, sadness, anger, and happiness) were selected from the emotional word lists of Kapucu and colleagues (2021) and word norms of Tekcan and Göz (2005). The valence and arousal values, as well as the discrete emotion category of the words, were obtained from the lists of Kapucu and colleagues (2021). Imagination, concreteness, frequency, and association set width were obtained from the study of Tekcan and Göz (2005). In the selection part of the words, the lists of Kapucu and colleagues (2021) and Tekcan and Göz (2005) were compared. Firstly, the same words from each list were determined. Second, the words with less than ten associative words were eliminated since our lists should have consisted of 10 words. Last, from all emotion categories, five words that were supposed to represent the emotion well were chosen as critical words. These words should have been close to each other in the extent of their imaginability and concreteness. All values for the emotion categories were presented in Table 4.

Table 4. Values of Emotion Categories

Emotion	Valence	Arousal	Imagination	Concreteness	Frequency	Association set width
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
Disgust	2.79(1.1)	5.55(0.85)	5.43(0.72)	6.36(0.44)	61.4(32.21)	14.4(1.52)
Fear	3.36(1.25)	6.3(0.66)	3.62(0.51)	3.5(1.52)	95(57.47)	15.8(2.68)
Sadness	2.18(0.61)	6.25(0.25)	4.81(1.11)	4.62(1.74)	99.2(79.50)	13.2(1.92)
Anger	3(1.33)	5.75(0.84)	4.74(0.89)	4.98(0.79)	151.6(123.73)	15.4(3.21)
Happiness	7.51(1.04)	7.08(0.28)	4.89(1.2)	3.57(1.67)	277.6(427.39)	16(1.87)

2.2.3.2 Creating the Word Lists

In this phase, associative words for each critical word were determined from Tekcan and Göz's (2005) list. If more than one word had the same associative word, the common word remained in the list of the word with which it is most highly associated. When the rank of the associative word was similar for both critical words, the associative word was kept in the list of critical words, which has a smaller number of associative words. In this phase, some critical words were changed because of some similar words. The lists that created and used in the current study are presented in Appendix C.

2.2.3.3 Choosing the Non-Critical Words

For each emotion, two words and their two associates were chosen for the non-critical words. If the associates of these words were the same as those in the lists, the next associative word was chosen.

To sum up, in the extent of this study, five lists were created for five different emotions (disgust, fear, sadness, anger, and happiness). Therefore, 25 critical words were chosen, and 25 lists were developed. However, participants studied three lists for each emotion category to avoid cognitive load. Each list contained ten words associated with the critical word. Also, for each emotion, six non-critical words were chosen. These non-critical words were shown to participants in the recognition phase.

2.2.4 Distraction Task

The distractor task was given to the participants between the learning and recognition phases. On the computer screen, two numbers appeared side by side. Participants were required to decide whether those two numbers were the same or not by pressing the "F" or "K" buttons on the keyboard. There were 50 pairs of numbers, and the result of this task was not used in the further analysis.

2.2.5 Recognition Task

In the last part of the study, participants took the recognition task. This task consisted of 90 words. 45 of 90 words were old words. Each participant saw the old words from the lists that they studied. The second, fifth, and eighth words of each

studied list were chosen. 15 of 90 words were the critical words. Participants saw the critical word of their studied list. Lastly, 30 of 90 words were the non-critical words. These words were the same for each participant, and there were six words for each emotion category. The words were displayed on the computer screen in a random order. While the word was on the screen, there was also a six-point slider (Figure 1). The participants were told to make decisions about the word on the slider using the mouse.

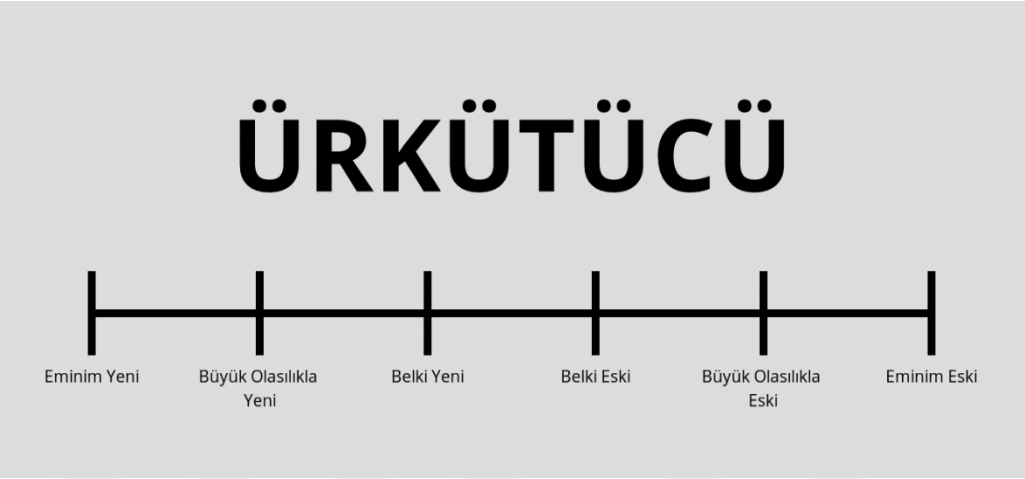

Figure 1. Recognition Task with Six-point Slider

2.3 RESEARCH DESIGN

In the study, the research design was 5x3 within-group factorial ANOVA. The emotion variable had five levels as disgust, fear, sadness, anger, and happiness. The word type variable had three levels as critical words (critical lures), old words, and non-critical new words. All emotion categories were consisted of all types of words.

Old words from five emotion categories were seen by participants in the learning phase. In the recognition phase, all types of words from all emotion categories were seen by participants. The dependent variables recorded in the recognition phase were “old” and “new” responses given by participants. Participants also decided how much they were confident about their responses. The research design of the study is shown in Table 5.

Table 5. The Experimental Design of the Study

	Critical words	**Old words**	**Non-critical new word**
Disgust	5	50	6
Fear	5	50	6
Sadness	5	50	6
Anger	5	50	6
Happiness	5	50	6

2.4 PROCEDURE

The study was approved by the Ethical Committee of Çankaya University (10/08/2021, issue: 46, Appendix D). First, the participants read and signed the informed consent (Appendix E). Second, the participants took the demographic information form and Beck Depression Inventory consecutively. If participants had no medical condition, they continued the study. Then, participants got on the computer for the experiment. All experiment procedures were displayed to the participants using PsychoPy (2022.1.2) software (Peirce et al. 2019). The background was in "Gainsboro" color, and the letters were black. Letters were in the middle of the screen, and the letter height was 0.12 in the learning phase and recognition task, 0.13 in the distraction task. For each participant, three lists out of five were chosen randomly for each emotion category. A total of 15 word lists (150 words) was shown in the learning session of the experiment. The order of the word lists for each emotion, as well as the order of emotion categories, was randomized. On the other hand, because the order of the words in the list was chosen according to their association with the critical lure, each word in the list was displayed in the same order. During the learning session, the participants were told to learn the words that appeared on the screen as much as possible (see Appendix F for the instructions given to the participants). Each word appeared on the screen for 1500 ms. and there was a 750 ms. delay between each word. After the learning phase, a distraction task was given, followed by a recognition task. In the recognition task, each word (90 words) appeared for an unlimited time in random order. So, the recognition task was a self-paced task for the participants. The participants decided that the word they saw was an "old" or a "new" word. They were also told to decide how much they were confident about their answers. They gave their confidence ratings on a six-point slider (1: Absolutely New, 2: Most Probably New, 3: Maybe New, 4: Maybe Old, 5: Most Probably Old, and 6: Absolutely Old). The slider was in (0, -0.2) position, and the letter height was 0.02. For this rating, if the participant

gave an “old” response for an old word, these answers counted as a hit response. If the participant gave an “old” response to a new word, these answers counted as false alarms. Participants’ false alarms scores for critical lures were considered false memory.

CHAPTER III

RESULTS

In this section, the results of the analysis are reported. The main purpose of the study was to assess if the DRM paradigm worked and how it changed across different emotions. In a classical DRM paradigm, the rate of "old" responses is essential, and there should be a significant difference between new words and critical lures, as well as between new words and old words in terms of old responses. Accordingly, a 5 (emotion: disgust, fear, sadness, anger, and happiness) x 3 (word type: critical lures, old words, and new words) two-way repeated measures ANOVA analysis was conducted. Subsequently, a number of paired sample t-tests were conducted to investigate the interaction between emotion and word types.

The analyses of the Signal Detection Theory (Macmillan and Creelman 2005) were also applied to investigate memory performance of participants. Sensitivity refers to the participants' ability to differentiate between old and new words. Response bias, on the other hand, shows that if participants respond in a certain pattern. One-way repeated measures ANOVA analyses were executed, with sensitivity and response bias values added as dependent variables. Moreover, Receiver Operating Characteristic (ROC) curves were generated according to the Signal Detection Theory. These curves provide information about the participants' memory accuracy, extracted from their responses on the confidence ratings.

3.1 DATA PROCESSING AND DATA CLEANING

All analyses were conducted using Statistical Package for Social Sciences (SPSS) for Windows, Version 25. In the detection of outliers, z scores are calculated.

Values higher than 3.29 or lower than -3.29 were considered outliers (Field 2018: 339). In the study, no outlier was detected; therefore, all analyses were conducted with 81 participants. An independent samples t-test was conducted to compare old responses for critical lures, old words, and new words between males and females. There was no significant effect of gender on any word type; thus, gender was not included as a variable in the analysis. A test of normality was conducted to see if the sample was normally distributed. The assumption of normality was violated in our sample. However, according to the central limit theorem, the normality assumption becomes less important in large samples because, nonetheless, the distribution of the sample tends to normal (Field 2018: 346). Therefore, in larger samples (higher than 30), normality is less critical (Field 2018: 346; Pallant 2007: 286). In large samples, outliers are more important (Field 2018: 331). Since no outliers were identified in the sample, applying parametric tests to the data was deemed appropriate.

3.2 EFFECTIVENESS OF THE DEVELOPED DRM LISTS

The effectiveness of the lists we developed was measured by the frequency with which participants generated false memories for the critical lures of the list. To assess this, the rate of the participants' old response for the critical lures were calculated (see Table 6).

Table 6. Effectiveness of the DRM Lists

Disgust		Fear		Sadness		Anger		Happiness	
C.L.	Eff.	C.L.	Eff.	C.L.	Eff.	C.L.	Eff.	C.L.	Eff.
Böcek	63%	Korkunç	60%	Hastane	81%	Trafik	63%	Anne	55%
İshal	44%	Şok	26%	Cenaze	79%	Patron	51%	Dostluk	67%
Pire	57%	Katil	81%	Esir	55%	Gürültü	79%	Gülüş	28%
Ter	36%	Kaçak	47%	Açlık	91%	Kavga	91%	Tatil	74%
Toz	33%	Tehlikeli	81%	Dert	77%	Suçlu	93%	Özgür	71%

C.L.: Critical Lure, *Eff.*: Effectiveness

3.3 RESULTS OF ANOVA REGARDING THE EFFECTS OF EMOTION AND WORD TYPE ON OLD RESPONSES

In the study, the main effects of emotion, word type, and the interaction effect between these two variables on "old response" were examined. Since the participants gave their responses on a 6-point scale (1 = Absolutely new, 6 = Absolutely old), the responses of 4, 5, and 6 considered as "old response". To explore the main and

interaction effects, a 5 (emotion: disgust, fear, sadness, anger, and happiness) x 3 (word type: critical lures, old words, and new words) two-way repeated measures ANOVA analysis was conducted. The sphericity assumption was met for word type but not for emotion and the interaction between emotion and word type. Therefore, the Greenhouse-Geisser correction was applied for emotion and interaction. The main effect of emotion ($F(3.41, 238.59) = 9.91$, $p = .00$, $\eta_p^2 = .12$) and word type ($F(2, 140) = 397.11$, $p = .00$, $\eta_p^2 = .85$), as well as the interaction of emotion and word type ($F(5.74, 401.55) = 14.52$, $p = .00$, $\eta_p^2 = .17$) were found to be significant (Figure 2).

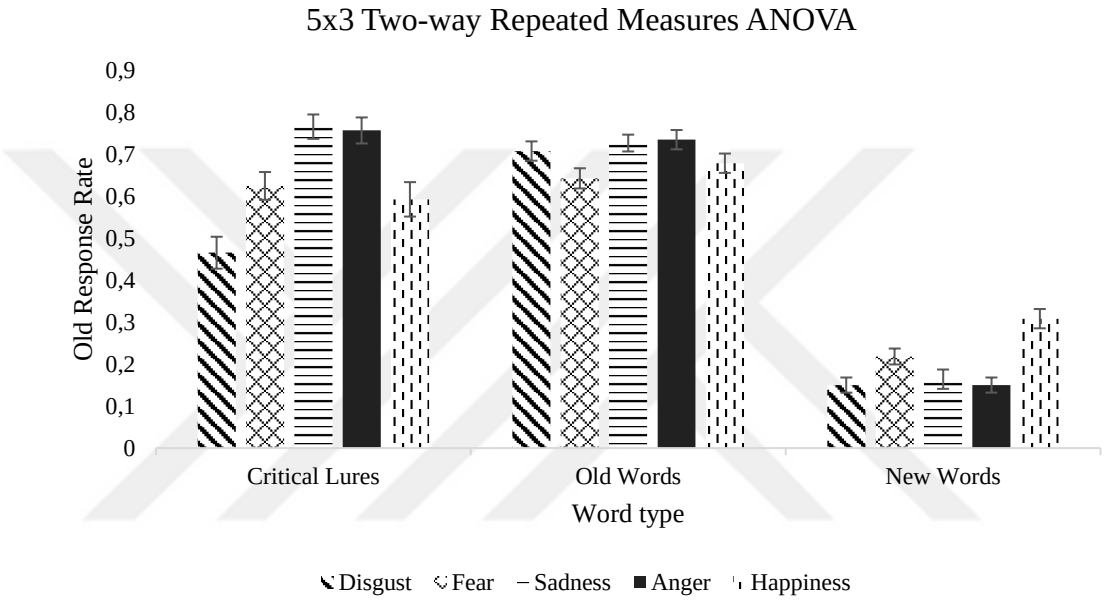

Figure 2. The Interaction of Emotion and Word Type on Old Responses

3.3.1. The Main Effect of Emotion on Old Responses

Pairwise comparison revealed that old responses toward the disgust-related words ($M = .44$, $SE = .02$) were significantly lower compared to sadness ($M = .55$, $SE = .02$), anger ($M = .55$, $SE = .02$), and happiness ($M = .53$, $SE = .02$). Participants gave significantly more old responses to sadness-related words compared to fear ($M = .5$, $SE = .02$). Old responses toward sadness, anger, and happiness did not significantly differ from each other. All the effects are illustrated in Figure 3.

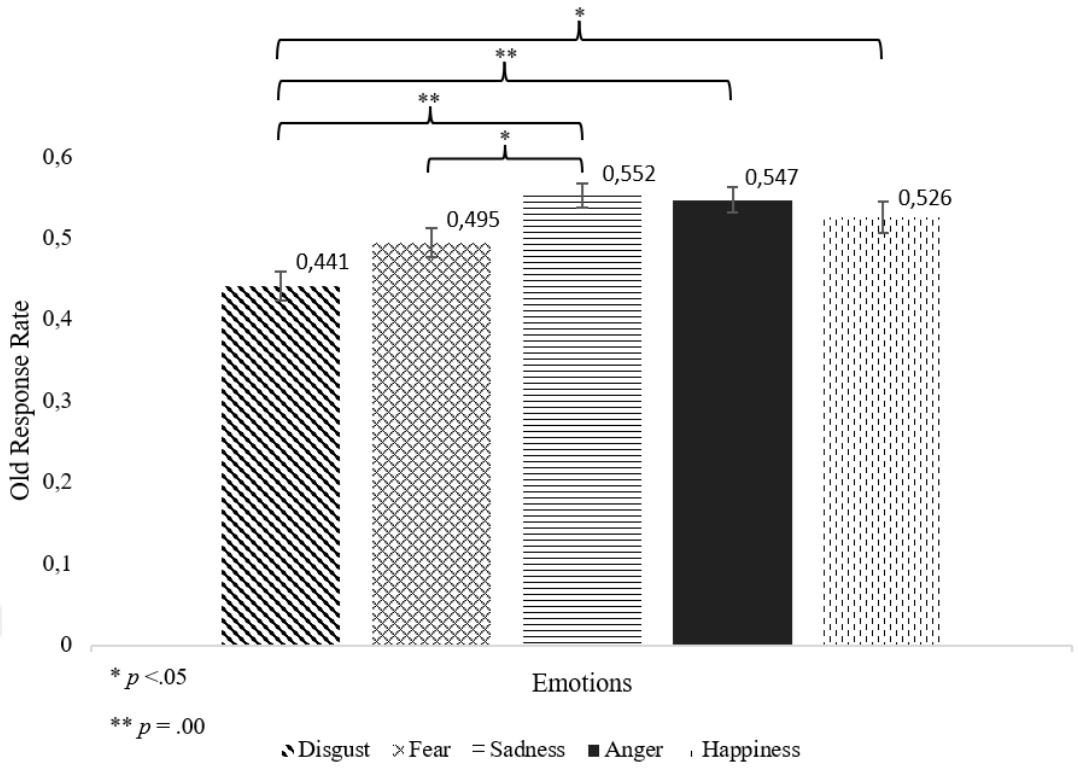

Figure 3. The Main Effect of Emotion on Old Responses

3.3.2 The Main Effect of Word Type on Old Responses

Pairwise comparison revealed that participants gave significantly higher old responses to the critical lures compared to new words (*MD* = .44, *SE* = .02). This result supported Hypothesis 1a. Moreover, they gave significantly more old responses to old words (*M* = .70, *SE* = .02) compared to critical lures (*M* = .64, *SE* = .02) and new words (*M* = .20, *SE* = .01) (Figure 4). The significant difference between old words and new words supported Hypothesis 1b. The significant difference between old and new words showed that participants correctly recognized the old words as instructed. Furthermore, the significant difference between critical lures and new words demonstrated the effectiveness of the lists as participants thought they had seen the critical lures.

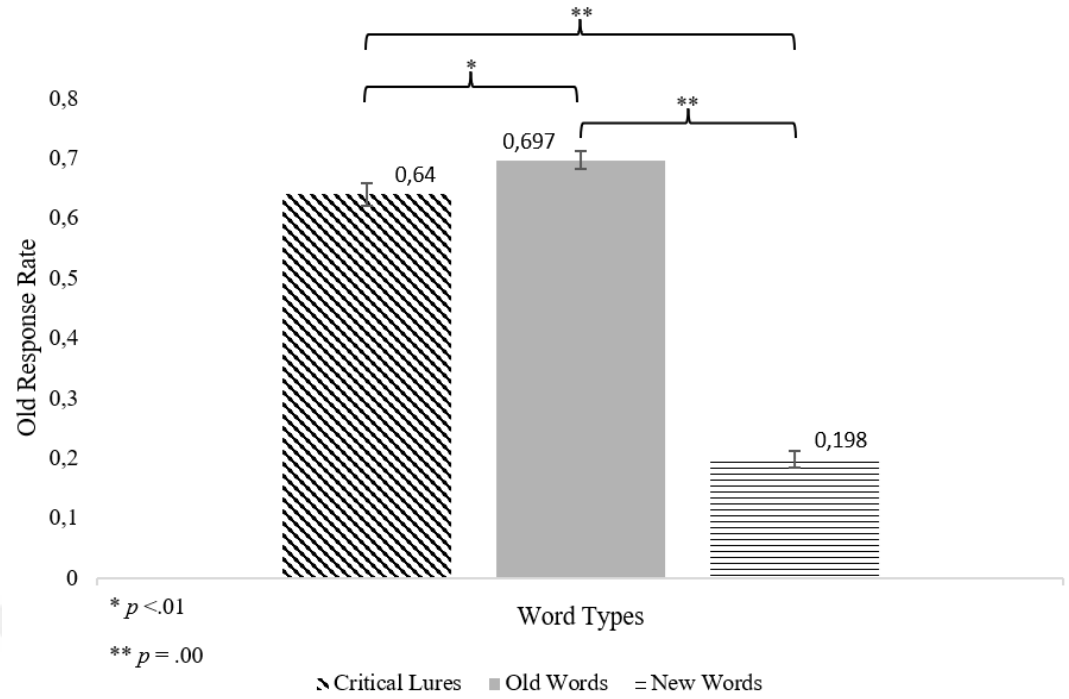

Figure 4. The Main Effect of Word Type on Old Responses

3.3.3 Results of Paired-Samples T-Tests for Investigating the Interaction Between Emotion and Word Type on Old Responses

ANOVA analysis revealed a significant interaction effect of emotion and word type on old responses. Thereafter, paired-samples t-tests were conducted to examine the interaction between emotion and word type. For each word type, three separate analyses were conducted. First, for just critical lures, possible comparisons across emotions were made. Second, for just old words, possible comparisons across emotions were conducted. Lastly, for just new words, possible comparisons across emotions were performed. For each analysis, Holm's sequential Bonferroni procedure was applied to account for multiple comparisons. After the correction, the significance values were set at .005, .006, .006, .007, .008, .01, .013, .017, .025, and .05, respectively.

For each emotion, five separate analyses were executed. First, possible comparisons across different word types for disgust were performed. Second, possible comparisons across different word types for fear were conducted. Then, possible comparisons across different word types for sadness were executed. Later, possible comparisons across different word types for anger were conducted. And finally,

possible comparisons across different word types for happiness were performed. Again, for each analysis, Holm's sequential Bonferroni procedure was applied to account for multiple comparisons. After the correction, the significance values were set at .017, .025, and .05 respectively.

3.3.3.1 Possible Comparisons Across Emotions for Critical Lures

All emotions were compared to each other for participants' old responses to critical lure word type. These comparisons were conducted to test our hypothesis 2. Old responses to critical lures were counted as false memory. A high old response to the critical lures indicated the presence of false memory. There were significant differences between disgust (M = .46, SD = .32) and fear (M = .62, SD = .28), $t(70)$ = -3.61, $p < .001$; disgust and sadness (M = .77, SD = .25), $t(70)$ = -6.92, p = .00; disgust and anger (M = .76, SD = .26), $t(70)$ = -6.98, p = .00. These results supported our hypothesis 2a, 2b, and 2c, respectively. Moreover, there were significant differences between fear and sadness, $t(70)$ = -3.69, p = .000; sadness and happiness (M = .59, SD = .34), $t(70)$ = 4.06, p = .00; and anger and happiness, $t(70)$ = 3.32, $p < .001$, which were in line with our hypotheses 2e, 2i, and 2j, respectively. There was a significant difference between fear and anger, $t(70)$ = -2.82, $p < .013$ (Figure 5). This difference rejected our hypothesis 2f. Hypothesis 2d was also rejected due to the non-significant difference between disgust and happiness. Hypothesis 2g was supported with non-significant difference between fear and happiness. Lastly, sad and anger did not significantly differentiate from each other, resulting the rejection of our hypothesis 2h. Most false memories were generated for sadness and anger.

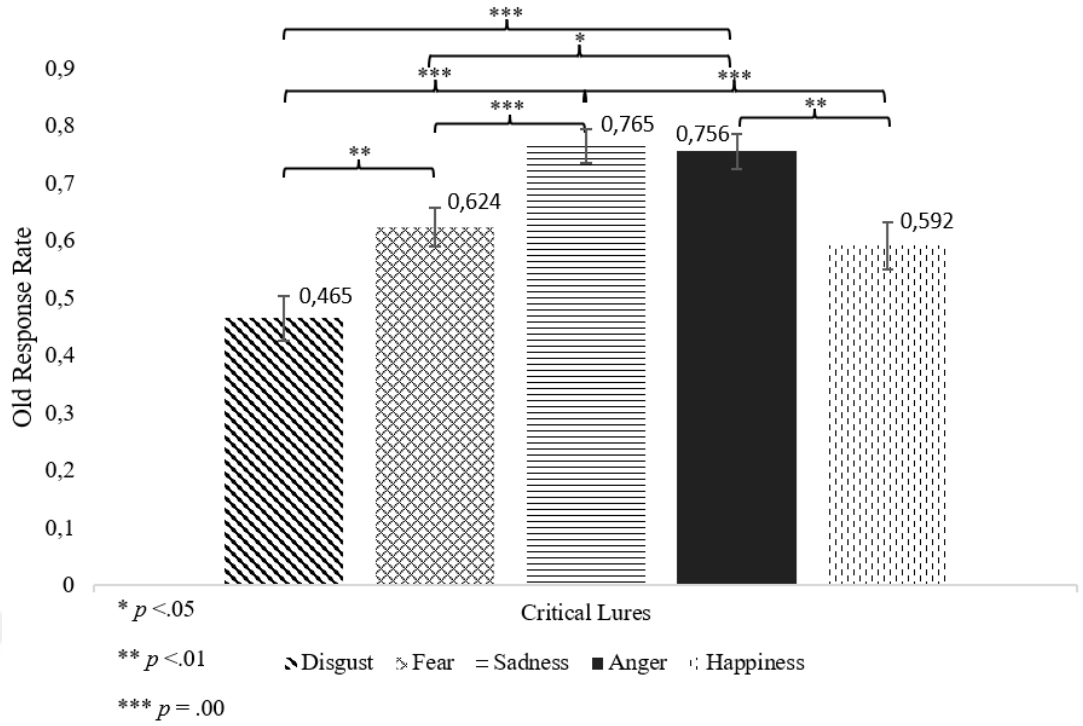

Figure 5. Possible Comparisons Across Emotions for Critical Lures

3.3.3.2 Possible Comparisons Across Emotions for Old Words

All emotions were compared to each other for participants' old responses given to old word type. Old responses to old words were counted as hits, indicating successfully remembering the old words. There were significant differences between fear (M = .64, SD = .20) and sadness (M = .73, SD = .16), $t(70)$ = -3.22, p < .005; and fear and anger (M = .73, SD = .19), $t(70)$ = -3.17, p < .005. The differences between other emotions remained non-significant (Figure 6).

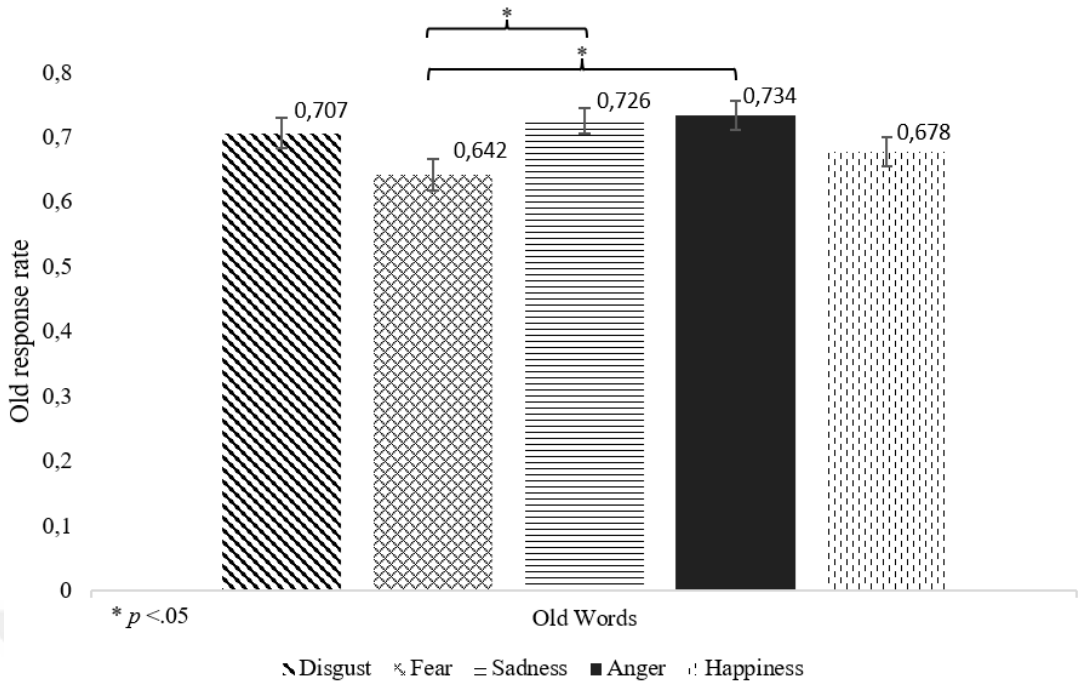

Figure 6. Possible Comparisons Across Emotions for Old Words

3.3.3.3 Possible Comparisons Across Emotions for New Words

All emotions were compared to each other for participants' old responses given to new word type. Old responses to new words were counted as false alarm, indicating false memories of seeing those words. Disgust (M = .15, SD = .15), $t(70)$ = -6.13, p = .00; fear (M = .22, SD = .16), $t(70)$ = -3.81, p = .00; sadness (M = .16, SD = .20), $t(70)$ = -5.26, p = .00; and anger (M = .15, SD = .15), $t(70)$ = -6.6, p = .00 significantly differentiated from happiness (M = .31, SD = .19). There was also a significant difference between disgust and fear, $t(70)$ = -3.51, p < .001, and between fear and anger, $t(70)$ = 3.46, p < .001 (Figure 7). The significances between disgust and sadness; disgust and anger; fear and sadness; and sadness and anger were not statistically significant. The results have suggested that participants made the most mistakes in remembering happiness.

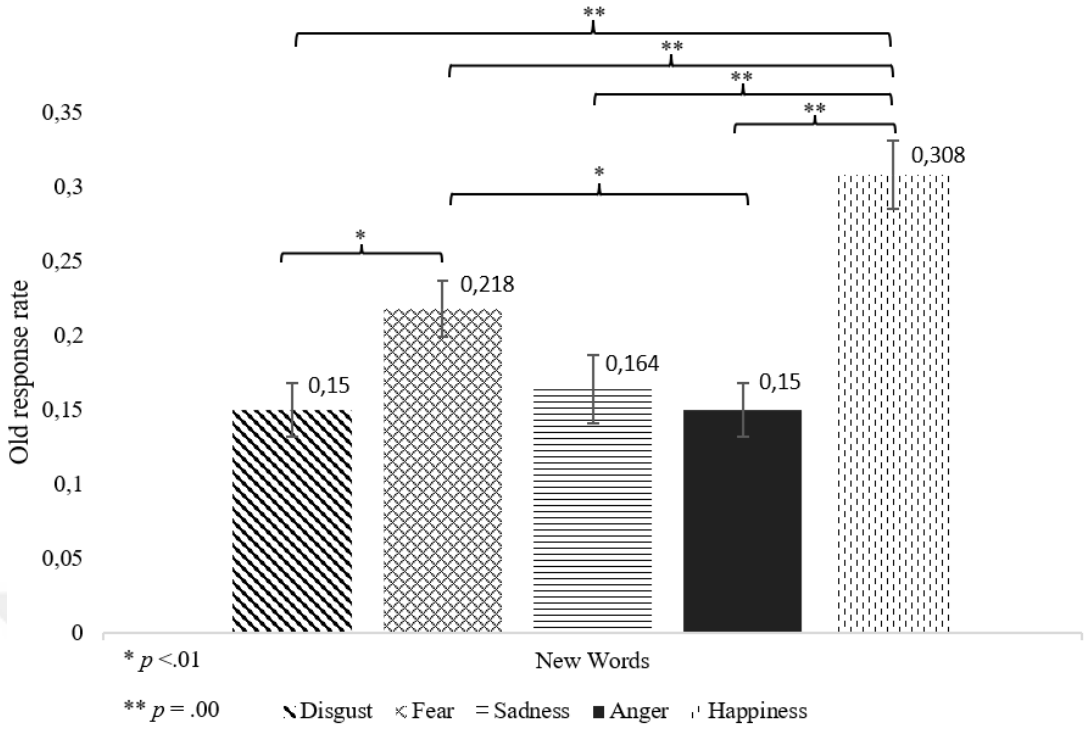

Figure 7. Possible Comparisons Across Emotions for New Words

3.3.3.4 Possible Comparisons Across Different Word Types for Disgust

Participant's old responses to all word types for disgust were compared to each other. There were significant differences between critical lures (M = .46, SD = .32) and old words (M = .71, SD = .19), $t(70)$ = -5.83, p = .00; critical lures and new words (M = .15, SD = .15), $t(70)$ = 8.43, p = .00; and old words and new words, $t(70)$ = 19.6, p = .00 (Figure 8).

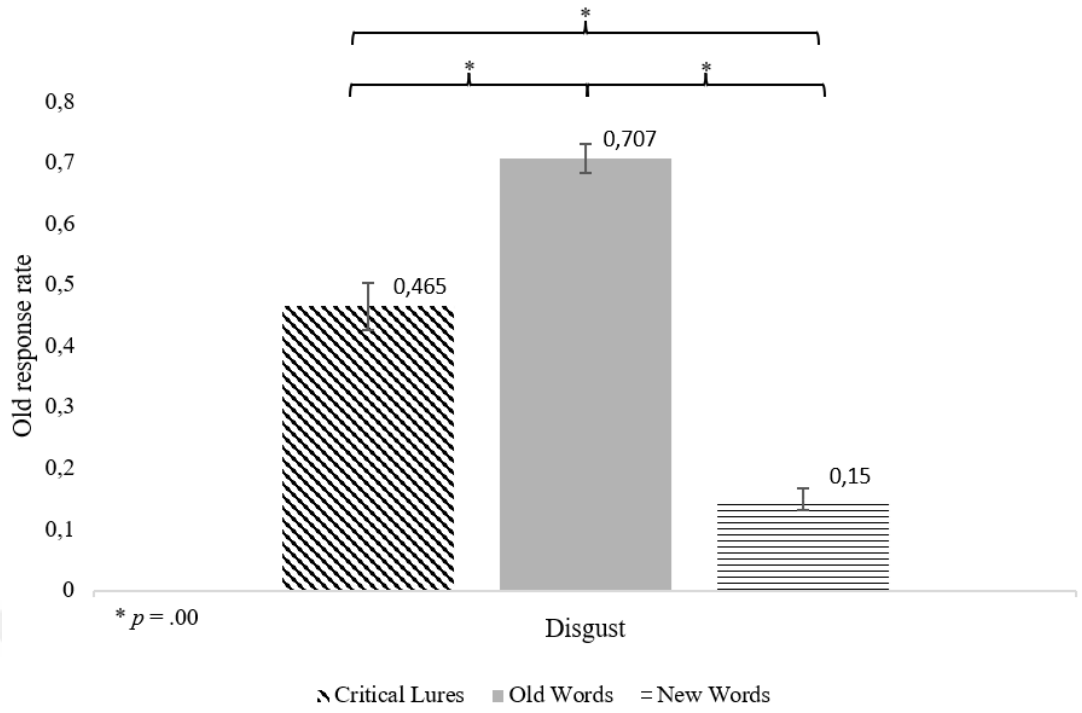

Figure 8. Possible Comparisons Across Different Word Types for Disgust

3.3.3.5 Possible Comparisons Across Different Word Types for Fear

Participant's old responses to all word types for fear were compared to each other. Significant differences were also found between critical lures (M = .62, SD = .28) and new words (M = .22, SD = .16), $t(70) = 11.87$, p = .00; and old words (M = .64, SD = .20) and new words, $t(70) = 14.15$, p = .00 (Figure 9). Participant could not be able to detect that they did not see the critical lures in the learning phase.

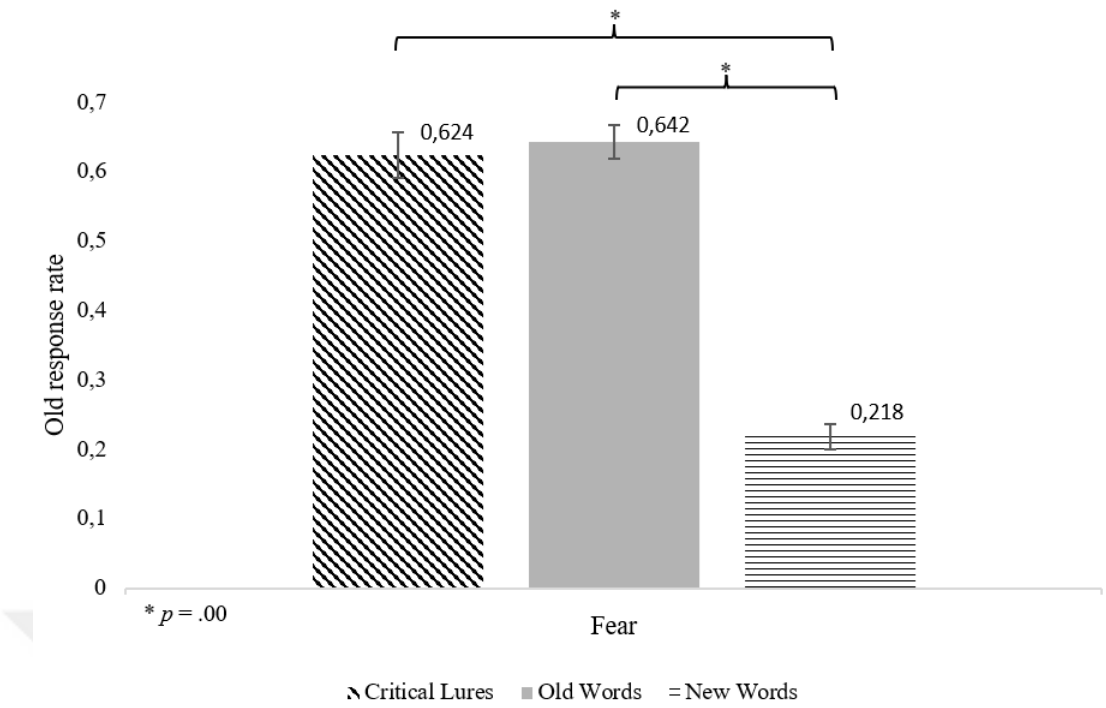

Figure 9. Possible Comparisons Across Different Word Types for Fear

3.3.3.6 Possible Comparisons Across Different Word Types for Sadness

Participant's old responses to all word types for sadness were compared to each other. Significant differences were found between critical lures (M = .77, SD = .25) and new words (M = .16, SD = .20), $t(70) = 15.44$, p = .00; and old words (M = .73, SD = .16) and new words, $t(70) = 18.53$, p = .00 (Figure 10). Again, critical lures were perceived as old words by participants.

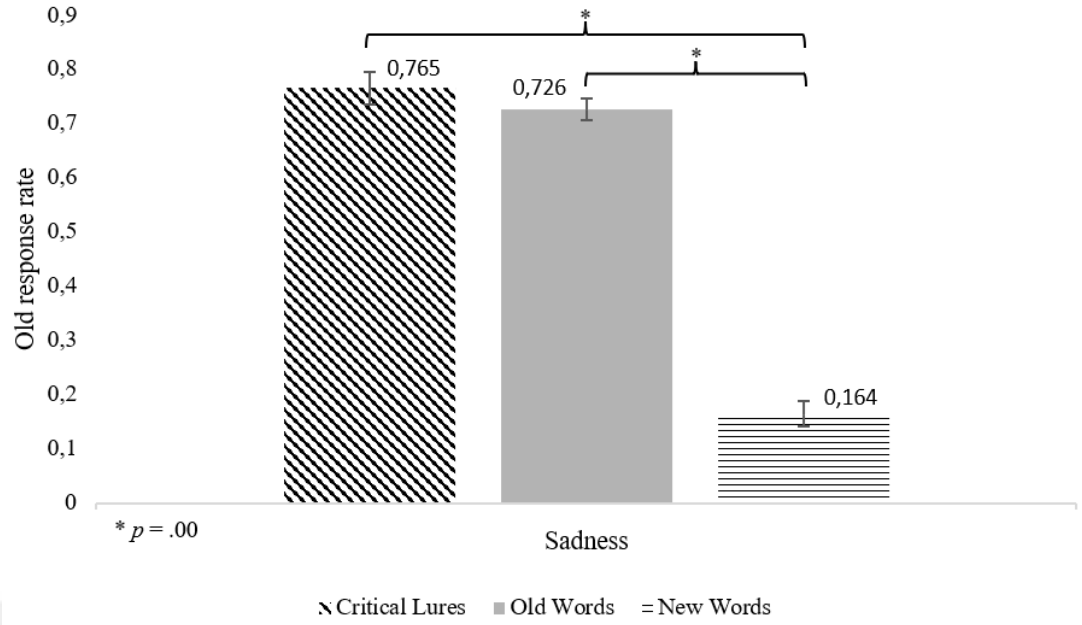

Figure 10. Possible Comparisons Across Different Word Types for Sadness

3.3.3.7 Possible Comparisons Across Different Word Types for Anger

Participant's old responses to all word types for anger were compared to each other. Significant differences were found between critical lures (M = .76, SD = .26) and new words (M = .15, SD = .15), $t(70) = 18.56$, p = .00; and old words (M = .73, SD = .19) and new words, $t(70) = 22.4$, p = .00 (Figure 11). The participants rated critical lures as old words.

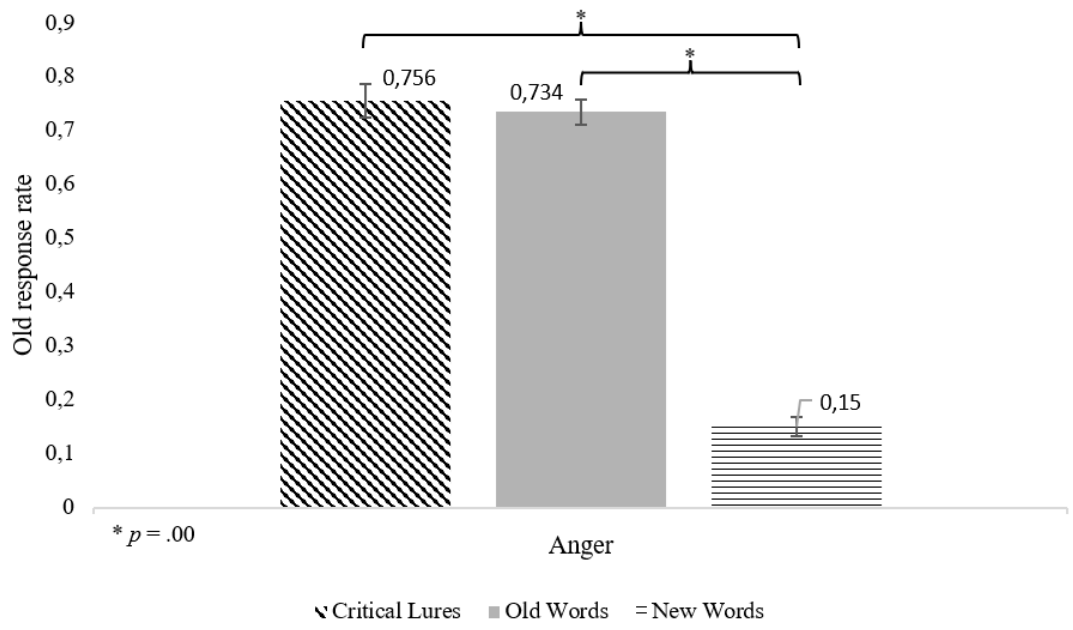

Figure 11. Possible Comparisons Across Different Word Types for Anger

3.3.3.8 Possible Comparisons Across Different Word Types for Happiness

Participant's old responses to all word types for happiness were compared to each other. There were significant differences between critical lures (M = .59, SD = .34) and new words (M = .31, SD = .19), $t(70) = 6.14$, p = .00; old words (M = .68, SD = .19) and new words, $t(70) = 11.49$, p = .00; and critical lures and old words $t(70) = -2.14$, $p < .05$ (Figure 12).

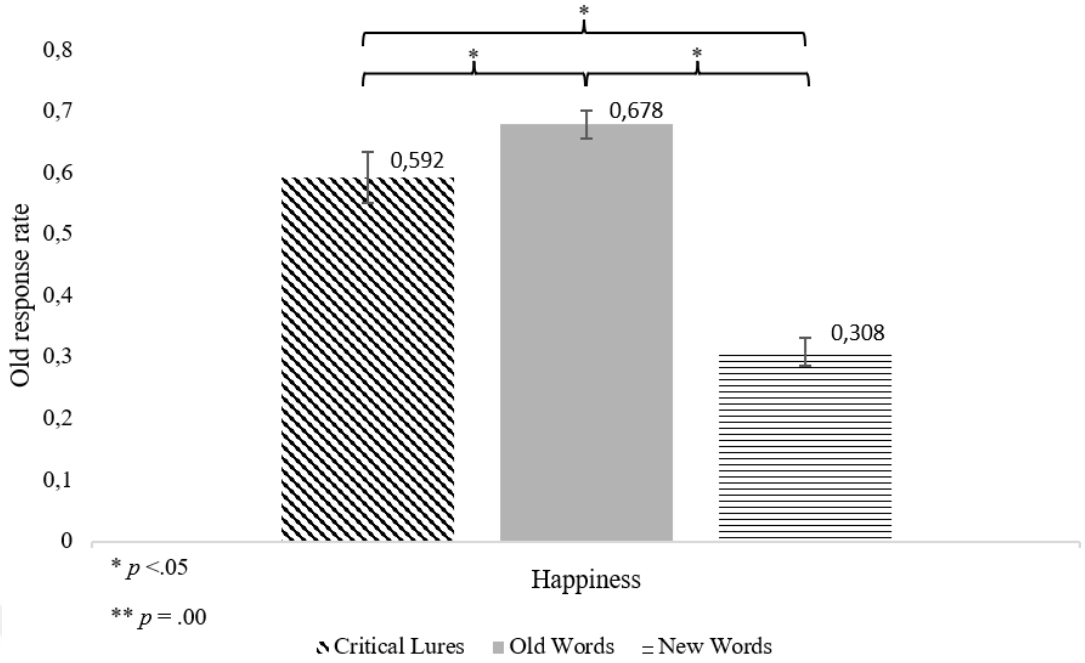

Figure 12. Possible Comparisons Across Different Word Types for Happiness

3.4 DRAWING ROC CURVES

In the ROC curves, the false alarm rates (saying old to new words) are shown on the x axis, and the hit rates (saying old to old words) are illustrated along the y axis (Macmillan and Creelman 2005: 10). Curves positioned in proximity to the upper left corner of the graph indicate higher memory accuracy. In the study, we collected false alarm rates from both critical lures and new words. Therefore, two distinct ROC curves were drawn: one corresponding to critical lures (Figure 13a) and the other is for new words (Figure 13b). Both curves included all emotion categories.

The curve for critical lures appeared more flattened than the curve for new words. This can be interpreted as the occurrence of DRM effect regardless of emotion. Since the curve for new words was notably closer to the upper left corner, the accuracy for new words was higher than the accuracy for critical lures. When focusing on the new words, accuracy was appeared to be higher in disgust, sadness, and anger compared to fear and happiness.

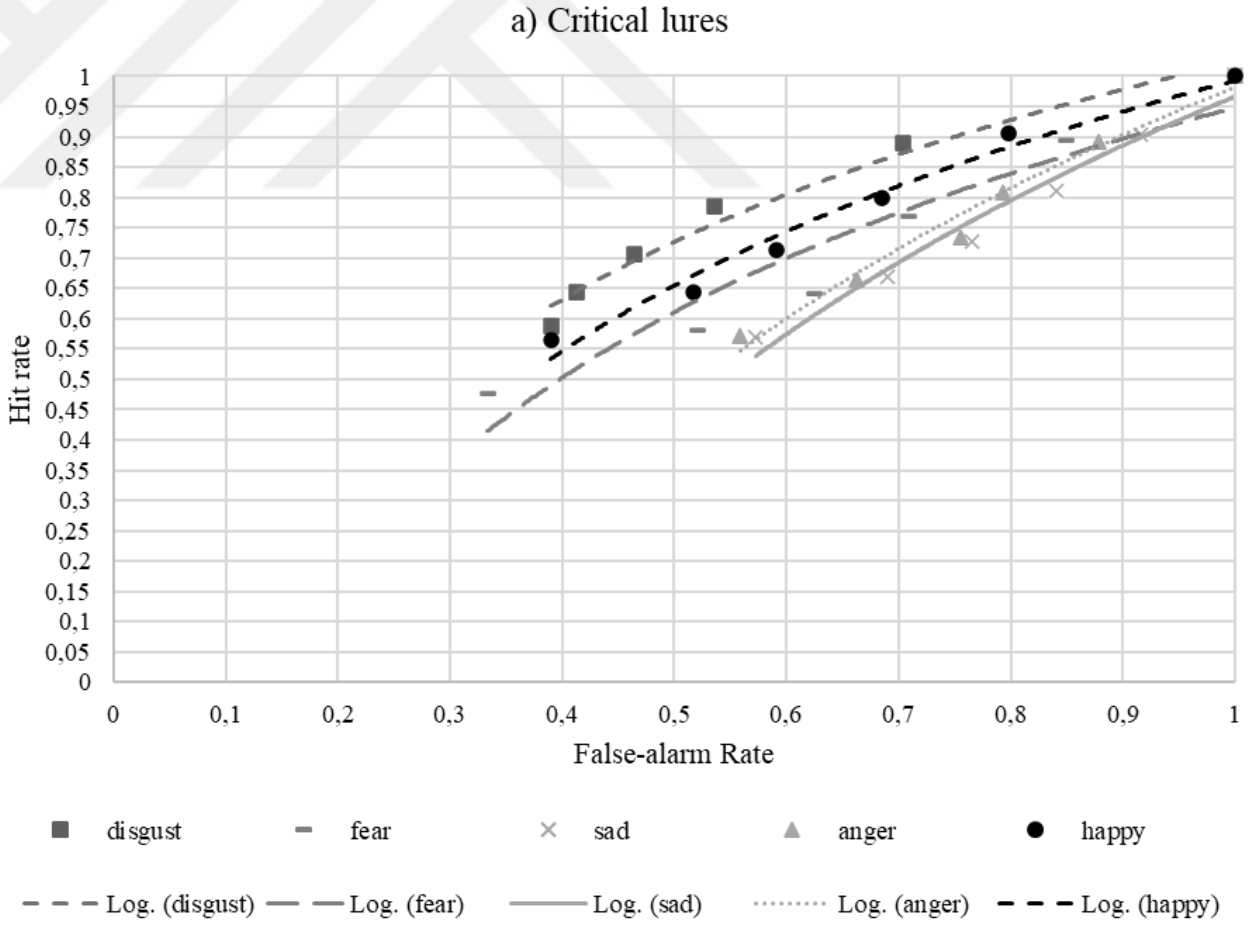

Figure 13. Roc Curves for Critical Lures and New Words in All Emotions

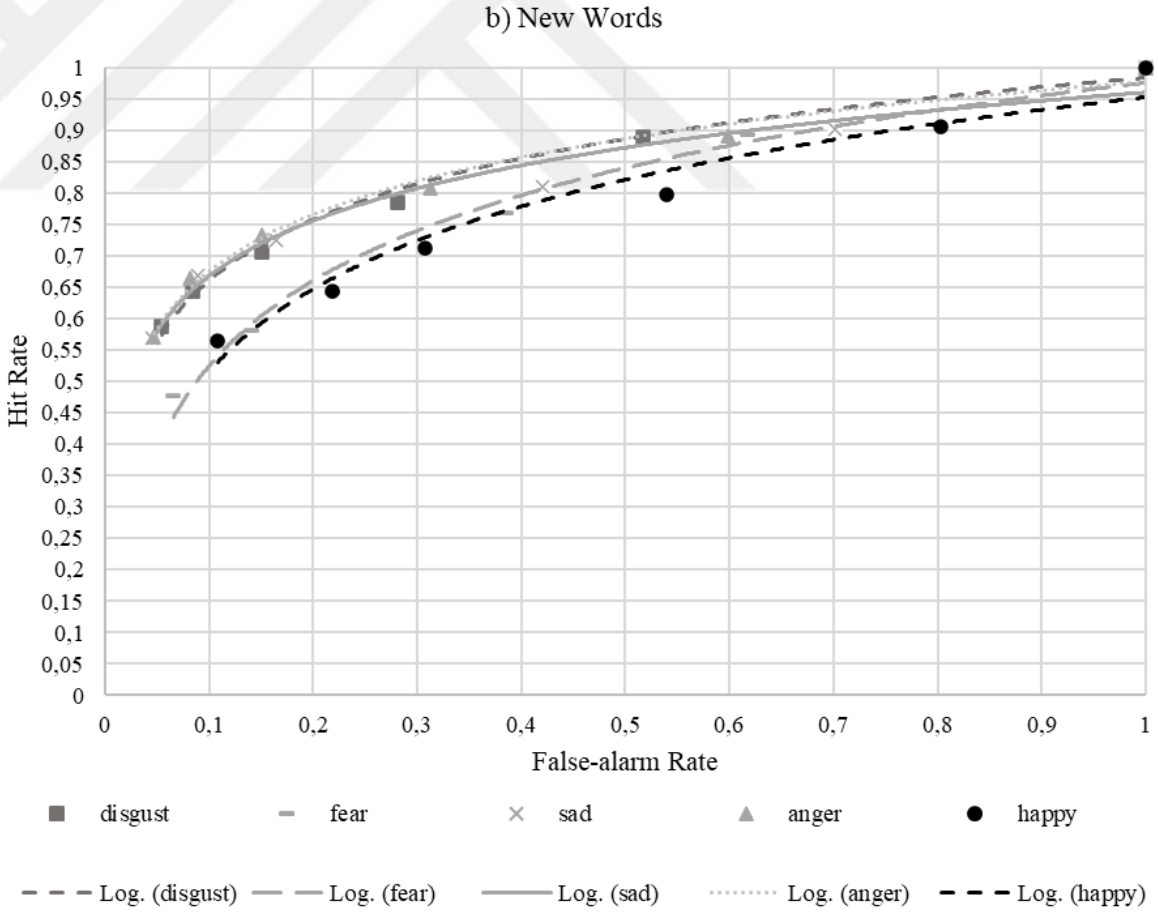

Figure 13 Continued

3.5 SENSITIVITY AND RESPONSE BIAS AS FUNCTIONS OF EMOTION

Sensitivity (d') and response bias (c) are variables obtained from hit and false alarm rates. Sensitivity refers to the discrimination ability of a person. Higher sensitivity indicates a better performance to discriminate between old and new words (Macmillan and Creelman 2005: 3, 8). The formula to calculate sensitivity is as follows:

d' = z(Hit rates) – z(False alarm rates)

Response bias, on the other hand, refers to a tendency to respond in a particular trend. If participants consistently respond as "old" regardless of the type of word, this results in a lower c value and signifies a liberal response bias. Conversely, a tendency to predominantly respond to words as "new" leads to a higher c value, indicating a conservative response bias (Boduroğlu and Kapucu 2019: 60; Macmillan and Creelman 2005: 29). The formula to compute response bias is as follows:

c = -1/2 * [z(Hit rates) + z(False alarm rates)]

Sensitivity and response bias were included as dependent variables in the following analyses. Since there was only one IV (emotion) and it is a within-subject variable, one-way repeated measures ANOVA analyses are conducted on d' and c values separately for old words vs. critical lure discrimination and old words vs. new words discrimination. The assumption of sphericity was not violated in either analysis.

3.5.1 Result of One-Way ANOVA for Sensitivity

Two one-way ANOVA analyses were conducted to observe how sensitivity varied across emotions. In the first analysis, the dependent variable was d', which was obtained when old responses to critical lures were counted as false alarm. The result of this analysis showed that the main effect of emotion did not have a significant effect on sensitivity (Figure 14a).

In the second analysis, the dependent variable was d', which was obtained when old responses to new words were counted as false alarm. This analysis revealed a significant main effect of emotion on sensitivity, ($F(4, 276) = 10.50$, $p = .00$, $\eta_p^2 = .13$). Pairwise comparison revealed that sensitivity score for disgust ($M = 1.6$, $SE = .09$) was significantly higher than that for fear ($M = 1.22$, $SE = .09$) and happiness ($M = 1.2$, $SE = .1$). Additionally, the sensitivity scores for sadness ($M = 1.6$, $SE = .09$) and

anger (M = 1.7, SE = .08) were also significantly higher than those for fear and happiness (Figure 14b). These results revealed that the discrimination ability of the participants was higher for disgust, sadness, and anger. Participants' discrimination ability was lower for fear compared to disgust and sadness, which supported our hypotheses 3a and 3b, respectively.

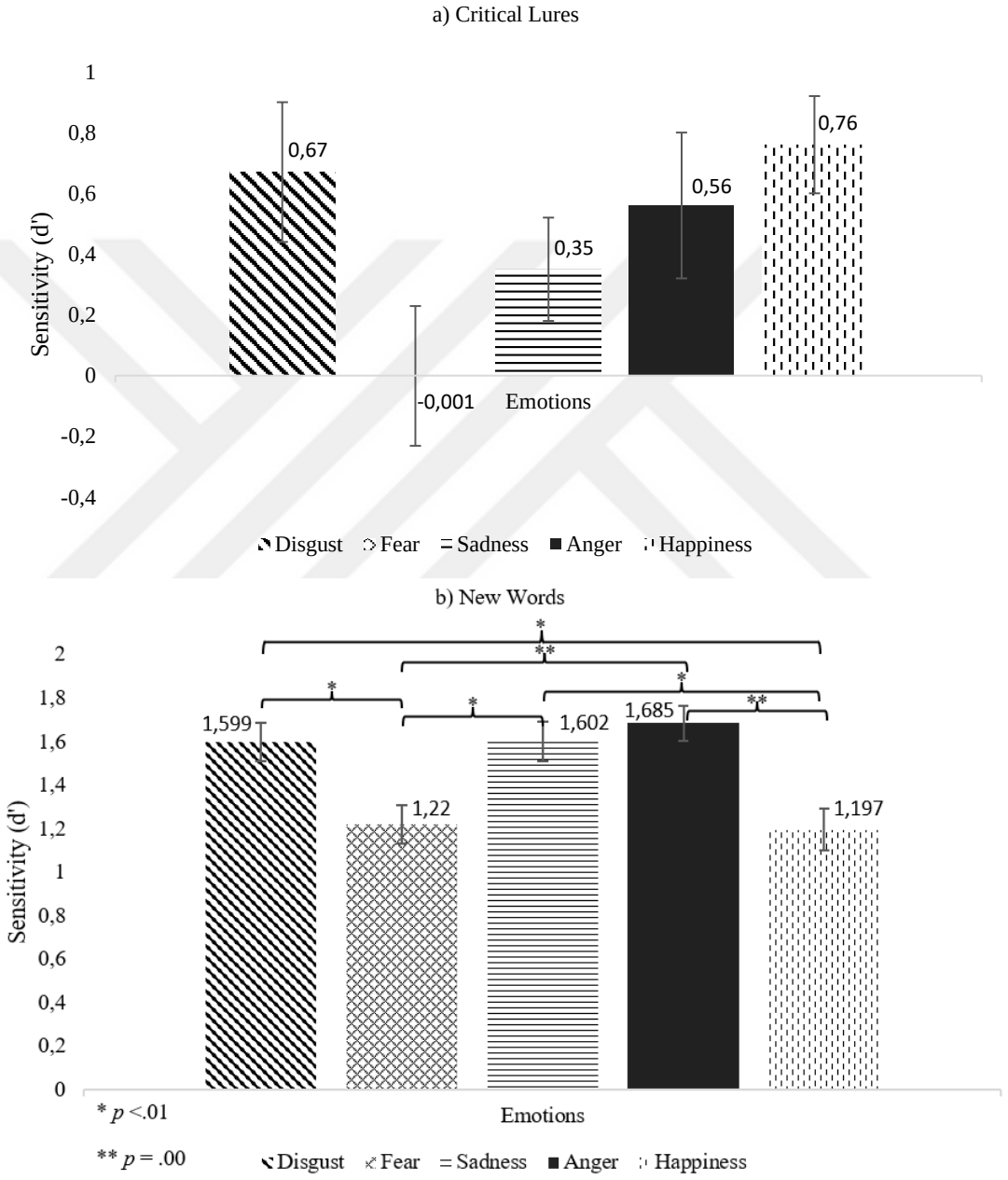

Figure 14. Sensitivity in All Emotion Types for Critical Lures and New Words

3.5.2 Results of One-Way ANOVA for Response Bias

Two one-way ANOVA analyses were conducted to observe how response bias varied across emotions. In the first analysis, the dependent variable was c, which was obtained when old responses to critical lures were counted as false alarm. This analysis did not yield a significant main effect of emotion on response bias (Figure 15a).

In the second analysis, the dependent variable was c, which was obtained when old responses to new words were counted as false alarm. In this analysis, there was a significant main effect of emotion on response bias, ($F(4, 276) = 6.73$, $p = .00$, $\eta_p^2 = .09$). Pairwise comparison revealed that the response bias for happiness ($M = -.07$, $SE = .05$) was significantly lower than that for disgust ($M = .17$, $SE = .04$), fear ($M = .19$, $SE = .05$), sadness ($M = .14$, $SE = .05$), and anger ($M = .13$, $SE = .05$) (Figure 15b). These results have revealed that participants showed a liberal response bias for happiness and a conservative response bias for the other emotions, which contradicted our hypothesis. As a result, our hypothesis 4a did not supported.

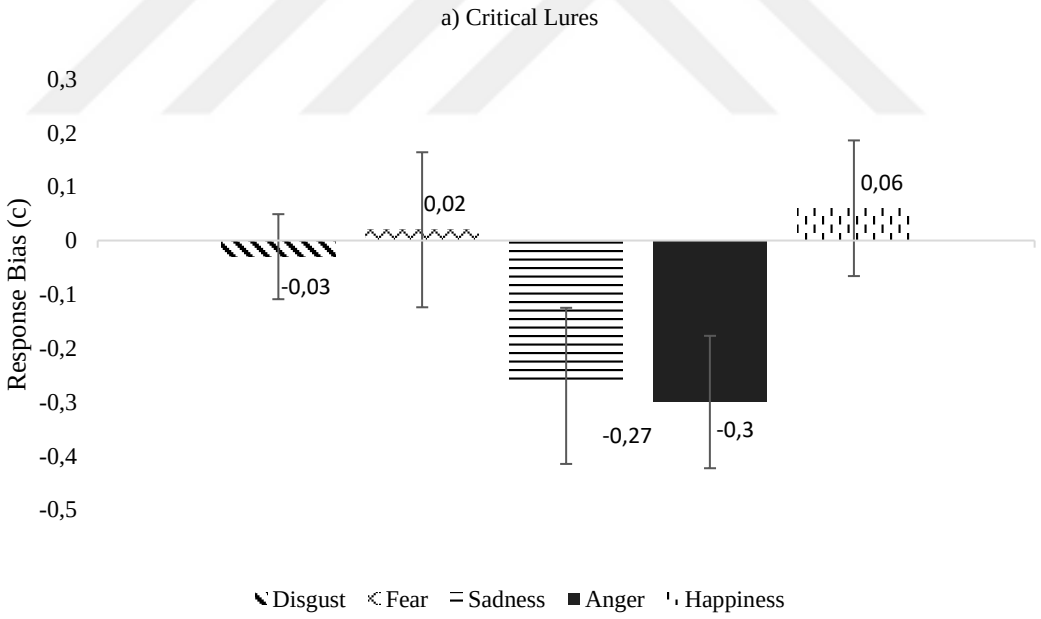

Figure 15. Response Bias in All Emotion Types for Critical Lures and New Words

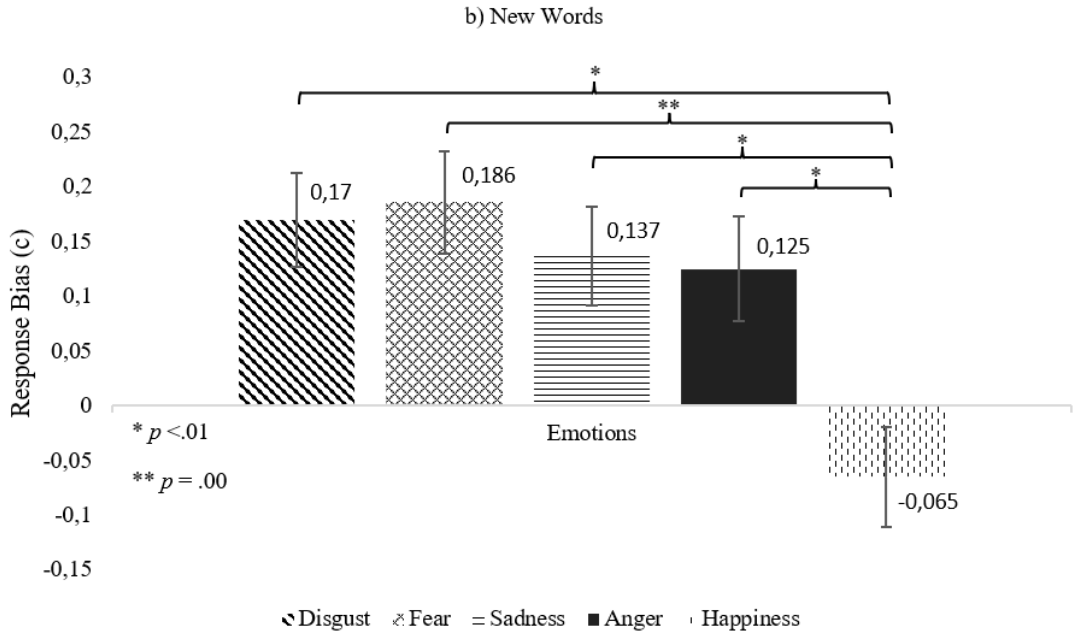

Figure 15 Continued

CHAPTER IV

DISCUSSION

The first aim of the study was to develop Turkish DRM lists for disgust, fear, sadness, anger, and happiness. For this purpose, five DRM lists were developed for each discrete emotion. In a classical DRM paradigm, participants recognize old words and critical lures more than new words. A DRM procedure with the developed DRM lists was administered to the participants. Later, ANOVA analysis was conducted to test our first hypothesis. Besides the first hypothesis, we also investigated how emotions affected false memory performance. Under our second hypothesis, we formed ten hypotheses regarding the relationship between each emotion with one another. To test these hypotheses, paired samples t-tests were applied. In this chapter, the results of the analyzes were discussed. First, the findings regarding the DRM paradigm and the effectiveness of the newly developed DRM lists for discrete emotions were evaluated. Second, five discrete emotions were compared and discussed in terms of their false memory production. Third, how sensitivity and response bias varied across emotions were discussed. Lastly, the limitations, suggestions for further research, and conclusion were presented in this chapter.

4.1 EVALUATION OF DRM PARADIGM AND EFFECTIVENESS OF DRM LISTS

In the DRM paradigm, the probability of false recognition of critical lures is significantly higher than the probability of false recognition of unrelated new words. Although both groups consist of words that were not shown previously, they result in different recognition performances. This paradigm shows that people are prone to

falsely remembering words that are semantically related to words they have seen previously. This effect has been demonstrated by many study (e.g., Cadavid and Beato 2017; Roediger and McDermott 1995; Thapar and McDermott 2001; Yüvrük et al. 2019).

In the current study, a total of 25 Turkish DRM lists were developed. Analysis of the study revealed that these lists effectively induced the production of false memories. Participants recognized critical lures as old words compared to new words, thereby supporting our hypothesis 1a. Moreover, they accurately recognized old words as old compared to new words, thereby confirming hypothesis 1b, which suggested that they were successfully able to differentiate old and new words. These effects have been observed when all emotions were considered together, as well as when all emotions were evaluated separately.

False recognition of critical lures varied between 26% to 93%, and the mean level of false recognition was 63,32%. These results were not very different from the literature. For instance, in the study by Stadler et al. (1999: 497), the mean level of false recognition was found to be 66%. Roediger and McDermott (1995: 810) found 72% false recognition in their second experiment. Lastly, in the study of Yüvrük et al. (2019: 261), 66% false recognition was produced in positive lists, 65% in negative lists, and 58% in neutral lists. The study of Yüvrük et al. (2019) was also conducted on a Turkish sample, and there were some critical lures that overlapped with the current study. Some of the lists produced the same number of false recognitions, such as the critical lure “Esir”, which produced 55% false recognition in both studies. Some critical lures, such as “Tatil” and “İshal”, produced a closed false recognition rate. However, false recognition rates were different from each other in some lures. For instance, “Gürültü” produced 91% false recognition in the study of Yüvrük et al. (2019), whereas it produced 79% false recognition in the current study. One reason for this discrepancy might be differences in list items. Although some critical lures were the same, others were different. Differences in other critical lures affected list items because some lures shared the same associative words.

4.2 EVALUATION OF DIFFERENCES AMONG EMOTIONS IN FALSE MEMORY PRODUCTION, HIT AND FALSE ALARM SCORES

The current study examined the false memory production of five discrete emotions: disgust, fear, sadness, anger, and happiness. When evaluating these emotions according to the circumplex and motivational models, certain similarities emerged. Disgust, fear, sadness, and anger are categorized as negative emotions, whereas happiness is classified as a positive emotion (Harmon-Jones et al. 2016:5, 6; Smith and Kosslyn 2007: 344). Additionally, disgust, fear, and sadness displayed withdrawal motivational tendencies, while anger and happiness exhibited approach motivational tendencies (Harmon-Jones et al. 2016:5, 6; Smith and Kosslyn 2007: 344). Despite the numerous similarities among disgust, fear, and sadness, they significantly differed in false memory rates in this study. Disgust showed the lowest false memory generation, followed by fear and sadness. Sadness and anger yielded similar amounts of false memory, despite their distinct motivational tendencies. These differences among emotions highlighted that their dissimilarities in false memory rates might stem from their unique characteristics rather than their motivations or valence.

One possible explanation for the difference among discrete emotions could be their distinct activations in the brain. Although there are some shared brain areas that activate across all emotions, they are not entirely identical. Vytal and Hamann's (2010: 2870) meta-analysis revealed that disgust, fear, sadness, anger, and happiness activated different regions in the brain with different patterns. Disgust showed the largest activation in the right insula and right inferior frontal gyrus, whereas fear predominantly activated the left amygdala. Sadness was found to be associated with the left medial frontal gyrus, anger with the left inferior frontal gyrus, and happiness with the right superior temporal gyrus. Since the current study did not involve neuroimaging in, the neural activations of the participants remained unknown. However, previously reported findings have demonstrated that emotions indeed have diverse effects on the brain. Therefore, the disparity in false memory performance among emotions might arise from this variation in brain activation patterns.

In previous studies, it has been demonstrated that disgust has an enhancement effect on memory, especially when compared to fear (e.g., Chapman 2018; Chapman et al. 2013; Schienle et al. 2021), sadness (e.g., Marchewka et al. 2016), and happiness

(e.g., Boğa et al. 2021). In our study, we hypothesized that this enhancement effect would lead to the least amount of false memory compared to other four emotions (Hypotheses 2a, 2b, 2c, and 2d). Our results indeed showed that the enhancement effect of disgust was evident in false memory compared to other negative emotions. The critical lures related to disgust elicited significantly fewer false memory compared to fear, sadness, and anger as hypotheses 2a, 2b, and 2c predicted. Possible explanations have been proposed for the enhancement effect of disgust. For instance, disgust is an emotion that signals disease and pathogen-related stimuli, making disgust-related stimuli more noticeable and enhancing memory performance (Boğa et al. 2021: 22). Additionally, disgust is part of the behavioral immune system, which aids in detecting and avoiding pathogens before encountering them (Schaller and Park 2011: 99). This aspect of the behavior immune system could contribute to the enhancement effect of disgust because its primary function is to protect us from disease. However, in terms of false memory production, the performance of disgust did not differentiate from happiness, which rejected our hypothesis 2d. A previous study showed that disgust was better recognized than happiness, however, they did not specifically focus on false memory production (Boğa et al. 2021: 28). Moreover, their stimuli and procedure were different from those used in our current study. These might explain why we did not find a significant difference between these emotions in false memory production. Furthermore, in a previous study, participants were asked to name olfactory and visual elicitors for some basic emotions including disgust, sadness, anger, and happiness (Croy et al. 2011: 1332). Their results revealed that a higher percentage of the participants named disgust and happiness-related elicitors for both odor and visual stimuli. Even though the scope of that study differed from ours, we may infer that there might be a shared characteristic between disgust and happiness that sets them apart from other emotions. The ability of the participants to name more elicitors for these two emotions could be related to their prevalence our environment. This similarity between disgust and happiness could be the reason why we did not find a difference in their false memory rates.

Within the existing literature, fear and happiness have showed similar memory performance in different tasks (Aubé et al. 2013: 984; Boğa et al. 2021: 28), even though they have nothing in common in terms of valence or motivational tendencies.

Their similarity also revealed itself in false memory production, aligning with our hypothesis 2g. Because these studies did not specifically focus on relationship between fear and happiness, there has been a lack in the discussion of this similarity. Moreover, in studies related to valence, there has been a discrepancy between positively and negatively valenced stimuli. While some of them found no difference between positive and negative DRM lists (e.g., Dehon et al. 2010: 632, 633; Experiment 1, Palmer and Dodson 2009: 245; Yüvrük et al. 2019), others found differences (e.g., Brainerd et al. 2010: 148; Chang et al 2021: 110; Knott et al. 2018, 1067). This leads us to postulate that this inconsistency could be attributed to the application of the circumplex model. Previous studies dichotomized emotions into negative and positive categories, without adhering to the distinctions outlined by the discrete emotion theory. As a result, we formulated hypotheses indicating that happiness would yield fewer false memory than both sadness and anger (hypotheses 2i and 2j), which were supported. Our results revealed that fear also resulted in fewer false memory compared to sadness (supporting our hypothesis 2e) and anger (rejecting our hypothesis 2f). In summary, fear and happiness displayed a similar pattern of false memory production when compared them with sadness and anger. Yet, the underlying reasons for this pattern remain uncertain- whether attributed to the similarity between fear and happiness or the similarity between sadness and anger.

According to the Activation/Monitoring theory, the words presented in DRM lists have induced spreading activation, which can also active the critical lure. Monitoring errors in recognition task can lead to false memory production (Gallo and Roediger 2002: 471; Roediger and McDermott 1995: 810). Roediger et al. (2001: 393) pointed that although all lists activate related words, lists with higher backward associated strength (BAS) exhibit a greater likelihood of generating false recall. While we did not assess the BAS of the lists in our study, the higher false memory rates observed for sadness and anger could potentially be attributed to BAS. Furthermore, adhering to this theory, another explanation for the higher false memory rates for sadness and anger may be due to the effect of emotions. These two emotions may have an increasing effect on spreading activation or a detrimental effect on source monitoring.

Some of our initial hypotheses did not align with the findings of our study. For instance, we hypothesized that anger would generate fewer false memory compared to sadness (Hypothesis 2h) because hit score of sadness was lower than anger in a prior study (Karaaslan et al. 2019). Moreover, in another study (Kapucu et al. 2018), memory accuracy was similar between fear and anger, leading us to hypothesize that these two emotions would demonstrate similar false memory production (Hypothesis 2f). A plausible explanation for this inconsistency may be that we assessed how emotions affected false memory production; however, existing literature have typically compared discrete emotions either in mood studies or by measuring memory accuracy. Our approach involved drawing inferences from those studies and assuming that emotions associated with higher accuracy would also result in lower false memories.

For example, in a study, disgust demonstrated better memory performance compared to sadness and fear (Marchewka et al. 2016: 5). Surprisingly, both disgust and fear were found to generate more false alarm rates than sadness. This result contradicts our findings, as we observed that both disgust and fear generated less false memory than sadness. One reason for this inconsistency might be that the previous study used pictures, while we used words as stimuli. Additionally, they employed a 30-minute break before the test phase, whereas in our study, there was only a 2-minute break. Previous research has shown that the time interval between encoding and retrieval can affect memory performance (Experiment 1, Payne et al. 1996; Experiment 1Seamon et al. 2002; Thapar and McDermott 2001: 426, 429). This difference in the time interval might be another contributing factor to our contradictory findings.

The main focus of the present study was on false memory production, primarily obtained from participants' old responses given to critical lures. However, in the study, there were also old and new words that contributed to the formulation of hit and false alarm scores. Upon analyzing the hit scores, fear seemed to produce fewer hit scores compared to other emotions, although this distinction reached statistical significance only when contrasted with sadness and anger. Previous studies have found that disgust has an enhancement effect on memory, especially when compared to fear (e.g., Chapman 2018; Chapman et al. 2013; Croucher et al. 2011; Marchewka et al. 2016;

Schienle et al. 2021). In our findings, hit scores were higher for disgust than for fear; however, this difference did not reach the significance level. When false alarm rates were examined, it became apparent that participants' false alarm rates were significantly higher for happiness-related new words compared to other emotions. Also, fear-related words generated more false alarm rates than anger and disgust-related words. This result contradicted a previous study that found no difference between false alarm rates of disgust and fear (Schienle et al. 2021: 5). Nonetheless, it is worth noting that, Schienle et al. (2021) used pictures instead of words in their study, which could account for the discrepancies between the findings of the two studies.

Furthermore, the study also delved into exploring how participants' old responses varied for each word type across each emotion. For fear, sadness, and anger, participants were not able to differentiate old words from critical lures. In contrast, this trend was not observed in disgust and happiness-related words. In disgust and happiness, all word types displayed significantly differentiation from each other. This finding may also show the similarity between disgust and happiness.

4.3 EVALUATION OF SENSITIVITY AND RESPONSE BIAS RESULTS

In the current study, the analyses of sensitivity and response bias were conducted. In the analysis of these variables, hit and false alarm scores were obtained. Alongside false alarm scores, which refers to categorizing a new word as "old", there were also false memory scores that encompassed designating a critical lure as "old". Therefore, we calculated sensitivity and response bias for both critical lures and new words. In the analyses of sensitivity and response bias, which took into account the old responses given to critical lures, there were no difference across different emotions. However, differences among emotions were found in the analyses of sensitivity and response bias when old responses given to new words were counted as false alarms.

Our hypotheses regarding sensitivity were that sensitivity would be lower in fear compared to both disgust (hypothesis 3a) and sadness (hypothesis 3b), findings that were in line with our predictions. These results were in line with some previous studies (e.g., Marchewka et al. 2016: 5; Schienle et al. 2021: 5; Zhang et al. 2019: 5). Yet, the analysis yielded outcomes that exceeded our initial hypotheses. Specifically, there was no difference between fear and happiness, with both these emotions

exhibiting lower sensitivity scores compared to disgust, sadness, and anger. Additionally, participants showed similar accuracy for disgust, sadness, and anger. These results stand in contrast to earlier studies. For example, Douglas and Rotello (2017: 425) found similar memory sensitivity between positive and negative words, a similarity was also found by Kaynak and Gökçay (2017: 340) when words had high arousal level. On the other hand, they found higher accuracy for moderately arousing positive words compared to negative ones (Kaynak and Gökçay 2017: 340). This finding also conflicted with our results since in our study accuracy for happiness was lower. In another study, sensitivity of participants did not change across anger, fear (Experiment 1), and happiness (Experiment 2), which also did not align with our results (Kapucu et al. 2018: 92, 95). However, it is worth noting that their procedure was different; in their study, they used mood induction before or after the learning phase. Therefore, the difference between that study and ours may be due to the differences in the procedures.

Our hypothesis concerning response bias was that participants would show a liberal response bias for all negative emotions compared to happiness (hypothesis 4a), an alignment with existing literature (e.g., Dougal and Rotello, 2007: 424; Kapucu et al. 2008: 703; Kaynak and Gökçay 2017: 340; Yüvrük and Kapucu 2022). However, our results revealed a contrary pattern. Instead, participants showed a liberal response bias toward happiness and a conservative response bias toward all negative emotions. A review by Kaynak and Aydın (2021: 930) pointed out that there were also studies in the literature who found a higher liberal response bias for positive stimuli (e.g., Comblain et al. 2004; Grider and Malmber 2008). From another perspective, Levine and Pizarro (2006: 41) noted that negative moods tend to induce a more conservative stance in individuals' memory processes and judgments.

4.4 LIMITATIONS, SUGGESTIONS FOR FUTURE STUDIES, AND CONCLUSION

The DRM paradigm is widely used in false memory research, aiming to induce false memories through semantically associated word lists. While emotional Turkish DRM lists have been developed (Yüvrük et al. 2019), these lists were not developed according to the specific discrete emotions. Therefore, the main aim of this study was

to develop Turkish DRM lists for discrete emotions. We successfully developed a total of 25 lists for disgust, fear, sadness, anger, and happiness. Furthermore, the production of false memory varied across emotions. Specifically, sadness and anger generated the highest amount of false memory compared to disgust, fear, and happiness. These differences in the effects of discrete emotions underscore the importance of considering emotions based on the discrete emotion theory in future studies on emotion and memory.

The present study has several limitations. One major source of limitation was due to the lack of BAS. Prior research by Roediger et al. (2001) has shown that the BAS is the most influential factor that determine false recall. However, in all previous studies (e.g., Brennen et al. 2007; Deese 1959; Dehon et al. 2010; Roediger and McDermott 1995; Yüvrük et al. 2019), lists were developed according to forward associative strength (FAS). The lists items were words that participants named when asked about the critical lure. Yet, as prior evidence suggests, BAS holds greater importance. Participants are asked to provide the first word that come to their mind when reading each word from the list to assess BAS. If they named the critical lures, it indicated that the list has backward association. To evaluate whether BAS also plays an important role in false recognition, future studies should address this aspect.

Another limitation of the study was that we did not compare these emotions with neutral DRM lists. Neutral DRM lists were previously developed for a Turkish sample in another study (Yüvrük et al. 2019). As a result, we did not develop neutral lists for our study. However, we could have used those lists in our study to conduct a comparison. Some studies revealed differences between emotional word lists and neutral ones in terms of false recognition (e.g., Dehon et al. 2010: 631; Knott et al. 2018: 1067). Therefore, in a future study, the inclusion of neutral lists could be beneficial to observe how discrete emotions vary from neutral lists.

Lastly, in our study, we administered a recognition task immediately after a short distractor task. Therefore, there was no interval between the learning and recognition phases. However, studies in the literature have shown that retention intervals can have a significant impact on memory performance. Previous studies have demonstrated that retention intervals have varied effects depending on the studied words and critical lures (Experiment 1, Payne et al. 1996; Experiment 1, Seamon et al.

2002; Thapar and McDermott 2001). Consequently, in light of these studies, in future research, retention intervals could be incorporated to examine how emotional critical lures are affected by the retention interval and how this effect changes across emotions. In addition to these limitations, attention should also be considered in future studies. Memory and attention are known to be interdependent to each other: what we attend to during encoding can affect our memory, and what we remember from the past can affect our current attentional focus (Chun and Turk-Browne 2007: 177). Therefore, investigating how these discrete emotions impact our attention and subsequently influence memory would be valuable.

Future research should also consider the potential effects of age differences more carefully. Previous false memory studies have revealed differences in false memory production across different age groups (e.g., Brainerd et al. 2008: 355; Brainerd et al. 2010: 150). Besides to false memory studies, some emotion studies that utilized discrete emotions have also shown different results among different age groups. For instance, in a study by Boğa et al. (2021: 30), the advantage of disgust diminished in older adults. Another study demonstrated that children's susceptibility to misleading questions varied with different emotions (Levine et al. 2008: 692). These studies have demonstrated that discrete emotions can have different effects on different age groups. In a future study, it would be worthwhile to investigate how aging affects false memory production in discrete emotions. In summary, to enrich our comprehension of these findings, future research should delve into these lists while considering additional variables such as age, retention interval, and attention. The detected differences and similarities in false memory production rates among emotions have proposed that there is still much to uncover regarding the nature of emotion's influence. To achieve this, future studies should delve into the effects of discrete emotions on false memory using alternative paradigms and methodologies.

Despite the study's limitations, this is the first report of Turkish DRM lists for five discrete emotions, with a specific focus on distinguishing false memory production between discrete emotions. Through this research, we investigated how false memory production was affected by discrete emotions. Furthermore, we conducted a comprehensive comparison of five discrete emotions, scrutinizing their hit and false alarm rates within a singular study. Notably, to our knowledge, this is the

first study that compared sensitivity and response bias scores across five discrete emotions. Thus, the present study has made significant contributions in enhancing our understanding of both false memory and the intricate realm of emotions. In conclusion, it has become evident that discrete emotions do wield a notable impact on the generation of false memories.

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APPENDICES

APPENDIX A: DEMOGRAPHICAL INFORMATION FORM

Demografik Bilgi Toplama Formu

Uygulama Tarihi:...../...../.....

Kişisel Bilgiler:

Cinsiyeti: Kadın ( ) Erkek ( )

Doğum Tarihi:...../...../.....

Yaşı: .....

Medeni Hali: Evli ( ) Bekar ( ) Dul ( ) Boşanmış ( )

El Tercihi: Sağ ( ) Sol ( )

Üniversite kaçıncı sınıf:

Okumakta olduğu bölüm:

Son 6 Ay İçinde Geçirdiği Önemli Rahatsızlıklar (özellikle Psikiyatrik, Nörolojik veya Psikolojik):

Son 6 Aydır Kullanmakta Olduğu İlaç: Var ( ) Yok ( )

Varsa ilacın/ilaçların adı: .....

Varsa ilacın/ilaçların kullanım süresi: .....

APPENDIX B: TURKISH VERSION OF BECK DEPRESSION INVENTORY

Aşağıda, gruplar halinde bazı cümleler verilmiştir. Her madde, bir, çeşit ruh durumunu anlatmaktadır. Son bir hafta içindeki (şu an dahil) kendi ruh durumunuzu göz önünde bulundurarak, 4 seçenekten size en uygun bulduğunuz ifadeyi daire içine alınız.

1.

(a) Kendimi üzgün hissetmiyorum

(b) Kendimi üzgün hissediyorum.

(c) Her zaman için üzgünüm ve kendimi bu duygudan kurtaramıyorum.

(d) Öylesine üzgün ve mutsuzum ki dayanamıyorum.

2.

(a) Gelecekten umutsuz değilim.

(b) Geleceğe biraz umutsuz bakıyorum.

(c) Gelecekten beklediğim hiçbir şey yok.

(d) Benim için bir gelecek yok ve bu durum düzelmeyecek.

3.

(a) Kendimi başarısız görmüyorum.

(b) Çevremdeki birçok kişiden daha fazla başarısızlıklarım oldu sayılır.

(c) Geriye dönüp baktığımda, çok fazla başarısızlığımın olduğunu görüyorum.

(d) Kendimi tümüyle başarısız bir insan olarak görüyorum.

4.

(a) Her şeyden eskisi kadar zevk alabiliyorum.

(b) Her şeyden eskisi kadar zevk alamıyorum.

(c) Artık hiçbir şeyden gerçek bir zevk alamıyorum.

(d) Bana zevk veren hiçbir şey yok. Her şey çok sıkıcı.

5.

(a) Kendimi suçlu hissetmiyorum.

(b) Arada bir kendimi suçlu hissettiğim oluyor.

(c) Kendimi çoğunlukla suçlu hissediyorum.

(d) Kendimi her an için suçlu hissediyorum.

6.

(a) Cezalandırıldığımı düşünmüyorum.

(b) Bazı şeyler için cezalandırılabileceğimi hissediyorum.

(c) Cezalandırılmayı bekliyorum.

(d) Cezalandırıldığımı hissediyorum.

7.

(a) Kendimden hoşnutum.

(b) Kendimden pek hoşnut değilim.

(c) Kendimden hiç hoşlanmıyorum.

(d) Kendimden nefret ediyorum.

8.

(a) Kendimi diğer insanlardan daha kötü görmüyorum.

(b) Kendimi zayıflıklarım ve hatalarım için eleştiriyorum.

(c) Kendimi hatalarım için çoğu zaman suçluyorum.

(d) Her kötü olayda kendimi suçluyorum.

9.

(a) Kendimi öldürmek gibi düşüncelerim yok.

(b) Bazen kendimi öldürmeyi düşünüyorum, fakat bunu yapmam.

(c) Kendimi öldürebilmeyi isterdim.

(d) Bir fırsatını bulsam kendimi öldürürdüm.

10.

(a) Her zamankinden daha fazla ağladığımı sanmıyorum.

(b) Eskisine göre şu sıralarda daha fazla ağlıyorum.

(c) Şu sıralarda her an ağlıyorum.

(d) Eskiden ağlayabilirdim, ama şu sıralarda istesem de ağlayamıyorum.

11.

(a) Her zamankinden daha sinirli değilim.

(b) Her zamankinden daha kolayca sinirleniyor ve kızıyorum.

(c) Çoğu zaman sinirliyim.

(d) Eskiden sinirlendiğim şeylere bile artık sinirlenemiyorum.

12.

(a) Diğer insanlara karşı ilgimi kaybetmedim.

(b) Eskisine göre insanlarla daha az ilgiliyim.

(c) Diğer insanlara karşı ilgimin çoğunu kaybettim.

(d) Diğer insanlara karşı hiç ilgim kalmadı.

13.

(a) Kararlarımı eskisi kadar kolay ve rahat verebiliyorum.

(b) Şu sıralarda kararlarımı vermeyi erteliyorum.

(c) Kararlarımı vermekte oldukça güçlük çekiyorum.

(d) Artık hiç karar veremiyorum.

14.

(a) Dış görünüşümün eskisinden daha kötü olduğunu sanmıyorum.

(b) Yaşlandığımı ve çekiciliğimi kaybettiğimi düşünüyor ve üzülüyorum.

(c) Dış görünüşümde artık değiştirilmesi mümkün olmayan olumsuz değişiklikler olduğunu hissediyorum.

(d) Çok çirkin olduğumu düşünüyorum.

15.

(a) Eskisi kadar iyi çalışabiliyorum.

(b) Bir işe başlayabilmek için eskisine göre kendimi daha fazla zorlamam gerekiyor.

(c) Hangi iş olursa olsun, yapabilmek için kendimi çok zorluyorum.

(d) Hiçbir iş yapamıyorum.

16.

(a) Eskisi kadar rahat uyuyabiliyorum.

(b) Şu sıralarda eskisi kadar rahat uyuyamıyorum.

(c) Eskisine göre 1 veya 2 saat erken uyanıyor ve tekrar uyumakta zorluk çekiyorum.

(d) Eskisine göre çok erken uyanıyor ve tekrar uyuyamıyorum.

17.

(a) Eskisine kıyasla daha çabuk yorulduğumu sanmıyorum.

(b) Eskisinden daha çabuk yoruluyorum.

(c) Şu sıralarda neredeyse her şey beni yoruyor.

(d) Öyle yorgunum ki hiçbir şey yapamıyorum.

18.

(a) İştahım eskisinden pek farklı değil.

(b) İştahım eskisi kadar iyi değil.

(c) Şu sıralarda iştahım epey kötü.

(d) Artık hiç iştahım yok.

19.

(a) Son zamanlarda pek fazla kilo kaybettiğimi sanmıyorum.

(b) Son zamanlarda istemediğim halde üç kilodan fazla kaybettim.

(c) Son zamanlarda istemediğim halde beş kilodan fazla kaybettim.

(d) Son zamanlarda istemediğim halde yedi kilodan fazla kaybettim.

Daha az yiyerek kilo vermeye çalışıyorum.
□Evet □Hayır

20.

(a) Sağlığım beni pek endişelendirmiyor.

(b) Son zamanlarda ağrı, sızı, mide bozukluğu, kabızlık gibi sorunlarım var.

(c) Ağrı, sızı gibi bu sıkıntılarım beni epey endişelendirdiği için başka şeyleri düşünmek zor geliyor.

(d) Bu tür sıkıntılar beni öylesine endişelendiriyor ki, artık başka hiçbir şey düşünemiyorum.

21.

(a) Son zamanlarda cinsel yaşantımda dikkatimi çeken bir şey yok.

(b) Eskisine oranla cinsel konularla daha az ilgileniyorum.

(c) Şu sıralarda cinsellikle pek ilgili değilim.

(d) Artık, cinsellikle hiçbir ilgim kalmadı.

APPENDIX C: DEVELOPED DRM LISTS

Emotions	C. L.*	DRM Word Lists									
Disgust	Böcek	İğrenç	İlaç	Börtü	Siyah	Karafatma	Örümcek	Çiçek	Doğa	Kara	Hayvan
	İshal	Tuvalet	Hastalık	Su	Kabız	Karın	Ağrı	Kahve	Bağırsak	Çocuk	Halsizlik
	Pire	Bit	Deve	Kaşıntı	Yorgan	Kaşınmak	Küçük	Battaniye	Kedi	Kene	Köpek
	Ter	Koku	Sıcak	Yorgunluk	Islak	Pis	Spor	Banyo	Emek	İdrar	Koşmak
	Toz	Kir	Duman	Pislik	Temizlik	Toprak	Bulut	Zerre	Bez	Alerjik	Ev
Fear	Korkunç	Film	Ürkütücü	Kötü	Hayalet	Karanlık	Dehşet	Canavar	Kabus	Yaratık	Şeytan
	Şok	Elektrik	Haber	Sürpriz	Şaşkınlık	Market	Hayret	Ani	Etki	Kriz	Olay
	Katil	Cinayet	Bıçak	Silah	Kan	Cani	Kurban	Kiralık	Maske	Tabanca	Vahşet
	Kaçak	Firar	Asker	Dizi	Gelin	Hırsız	Adam	Eroin	Kanun	Kovalamak	Mal
	Tehlike	Alarm	İkaz	Uyarı	Görev	Felaket	Kaçmak	Ateş	Cesaret	Çan	Kırmızı
Sadness	Hastane	Hasta	Doktor	Hemşire	Beyaz	Sedye	Serum	Steril	Yaralı	Yatak	Ziyaret
	Cenaze	Ölüm	Tabut	Üzüntü	Tören	Ölü	Yas	Yeşil	Ağlama	Ceset	Düğün
	Esir	Savaş	Köle	Tutsak	Esaret	Zincir	Kamp	Kırbaç	Aşık	Hapis	Kelepçe
	Açlık	Yemek	Sefalet	Ekmek	Fakirlik	Tokluk	Grev	Gurultu	Kıtlık	Oruç	Yiyecek
	Dert	Tasa	Sıkıntı	Sorun	Keder	Derman	Çare	Çile	Gam	Hüzün	Okul

	Trafik	Araba	Lamba	Sıkışıklık	Işık	Kargaşa	Kaza	Geç kalma	Otobüs	Stres	Yoğunluk
	Patron	İş	Otorite	Emir	Para	İşçi	İşveren	Sekreter	Güç	Müdür	Acımasız
Anger	Gürültü	Ses	Baş ağrısı	Patırtı	Rahatsızlık	Kalabalık	Kirlilik	Şehir	Kaos	Sessizlik	Şamata
	Kavga	Dövüş	Şiddet	Bağırmak	Yumruk	Huzursuzluk	Sinir	Gerginlik	Küsme	Öfke	Sopa
	Suçlu	Hapishane	Ceza	Mahkum	Sanık	Mahkeme	Masum	Polis	Hakim	Suçsuz	Cezaevi
	Anne	Baba	Sevgi	Şefkat	Can	Kucak	Bebek	Ana	Özlem	Kadın	Mutluluk
Happiness	Dostluk	Arkadaşlık	Arkadaş	Güven	Kardeşlik	Sadakat	Beraberlik	Paylaşım	Sır	Yakınlık	Bağ
	Gülüş	Diş	Kahkaha	Tebessüm	Espri	Gamze	Neşe	Güzellik	Komik	Sevinç	Samimiyet
	Tatil	Deniz	Yaz	Dinlenme	Eğlence	Güneş	Havuz	Keyif	Rahatlık	Boşluk	Heyecan
	Özgür	Bağımsız	Hürriyet	Kuş	Serbest	Yaşam	Gökyüzü	İrade	Rahat	Uçmak	At

New Words

Disgust	Rezalet	Utanç	Berbat	Yağcılık	Yalaka	Dalkavuk
Fear	Şüphe	Kuşku	Kaygı	Sonsuz	Uzay	Ebedi
Sadness	Terslik	Aksilik	Düzlük	Yalan	Yanlış	Doğru
Anger	Bencil	Egoist	İnsan	İhmal	Sorumsuz	Hata
Happiness	İyilik	Kötülük	Yardım	Övgü	Başarı	Gurur

*C.L.: Critical Lure

APPENDIX E: INFORMED CONSENT

Bilgilendirilmiş Onam Formu

Çankaya Üniversitesi Sosyal Bilimler Enstitüsü Psikoloji Anabilim Dalı Bilişsel Psikoloji Yüksek Lisans programında yürütülen bu araştırma, Dr. Öğretim Üyesi Hande Kaynak danışmanlığında, Bilişsel Psikoloji Yüksek Lisans öğrencisi Betül Beyza Cengil'in tez çalışmasının bir gereği olarak yapılmaktadır. Tez çalışması için, üniversitesi öğrencisi genç yetişkin bireylere ihtiyaç duyulmaktadır. Araştırma kapsamında, yürütülecek uygulamaların tamamı Betül Beyza Cengil tarafından yapılacaktır.

Bu tez çalışmasının amacı genç yetişkinlerde bellek süreçlerinin incelenmesidir. Uygulamalar katılımcının ve araştırmacının uygun oldukları bir zaman içerisinde gerçekleşecektir. Görüşmeler tek oturumda gerçekleştirilecek olup oturumun yaklaşık süresi 15 dakika olacaktır. Uygulama boyunca bilgisayar ekranında katılımcıdan bazı görevler yapmaları istenecektir. Katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü rahatsızlık hisseden katılımcılar, cevaplama işini yarıda bırakabilirler. Böyle bir durumda katılımcıların çalışmayı uygulayan kişiye, çalışmayı tamamlayamayacaklarını söylemeleri yeterli olacaktır. Gerçekleştirilen görüşme sonunda uygulanan test ve ölçeklerin puanlanıp, bu puanlama doğrultusunda katılımcıya, uygulamanın bitiminde açıklama ve bilgilendirme yapılacaktır. Çalışma hakkında daha fazla bilgi almak için Psk. Betül Beyza Cengil (E-posta: c2097001@student.cankaya.edu.tr) ya da Dr. Hande Kaynak (E-posta: handek@cankaya.edu.tr) ile iletişim kurulabilir.

Görüşme sırasında katılımcının izni doğrultusunda yazılı kayıtları alınacaktır. Daha sonra bu kayıtlar, katılımcının kimlik bilgileri gizli tutularak bilimsel nitelikli çalışmalarda ve eğitim amaçlı olarak kullanılabilir. Bu amaçların dışında bu kayıtlar kullanılmayacak ve başkaları ile paylaşılmayacaktır.
(Katılımcının Beyanı)

Sayın Betül Beyza Cengil (psikolog) ve Dr. Hande Kaynak (danışman) tarafından Çankaya Üniversitesi Sosyal Bilimler Enstitüsü Psikoloji Anabilim Dalı Bilişsel Psikoloji Yüksek Lisans programında yürütülen araştırma ile ilgili bilgiler bana aktarıldı. Bu bilgilendirmenin ardından bu araştırma faaliyetine katılımcı olarak davet edildim.

Eğer bu araştırma faaliyetine katılırsam bana ait bilgilerin gizliliğine büyük bir özen ve saygıyla yaklaşılacağına inanıyorum. Toplanan her türlü verinin eğitim ve bilimsel amaçlarla kullanımı sırasında kişisel bilgilerimin ihtimamla korunacağı konusunda bana yeterli güven verildi.
Bu görüşme süresince yapılacak harcamalarla ilgili herhangi bir parasal sorumluluk altına girmiyorum. Ayrıca herhangi bir tazminat talebim olmayacaktır.

Bana yapılan tüm açıklamaları ayrıntılarıyla anlamış durumdayım. Kendi başıma belli bir düşünme süresi sonunda:

1-Yapılan görüşme kapsamında kendime ilişkin katıldığım her türlü çalışmanın ya da değerlendirmenin araştırma ve eğitim amaçlı olarak kullanılabileceğini biliyorum ve onaylıyorum.

2-Yapılan görüşme, değerlendirme ve faaliyetlere ilişkin yazılı kayıtların araştırma ve eğitim amaçlı olarak kullanılabileceğini biliyorum ve onaylıyorum.
Bu konuda yapılan daveti gönüllülük çerçevesinde kabul ediyorum.

Katılımcı
Adı, soyadı:

Mail Adresi:

İmza

Katılımcı ile görüşen araştırmacı

Adı soyadı, unvanı:

Mail Adresi:

İmza:

APPENDIX F: INSTRUCTIONS

Learning Task Instructions

Birazdan ekrana tek tek kelimeler gelmeye başlayacak. Her kelime 1,5 saniye boyunca ekranda kalacak, ardından bir sonraki kelimeye geçilecektir. Kelimenin ekranda kaldığı süre boyunca, kelimeyi öğrenmeye çalışınız. Bu dikkat gerektiren bir çalışma olacaktır. Hazır olduğunuzda "boşluk" tuşuna basıp kelimeleri öğrenmeye başlayabilirsiniz.

Distraction Task Instructions

Birazdan ekranda sayı çiftleri göreceksiniz. Sizden istenen, ekranda göreceğiniz iki sayı birbirinin aynısı mı yoksa birbirlerinden farklı mı buna karar vermek. Herhangi bir süre kısıtlaması bulunmamaktadır. Eğer iki sayı da aynı ise klavyede "Aynı" yazan tuşa, değilse "Farklı" yazan tuşa basınız. Aşağıda örnek bulunmaktadır, hazır olduğunuzda boşluk tuşuna basarak başlayabilirsiniz.

50	50	Bu sayıların "Aynı" olduğu durum
26	83	Bu sayıların "Farklı" olduğu durum

Recognition Task Instructions

İlk aşamada olduğu gibi, ekrana birazdan tek tek kelimeler gelecek. Bu kelimelerden bazısı, ilk aşamada gördüğünüz eski kelimeler, bazısı ise ilk aşamada görmediğiniz yeni kelimeler olacak. Sizden beklenen, ardı ardına gelecek bu kelimelerin eski kelime mi yoksa yeni kelime mi olduğuna olabildiğince hızlı bir şekilde karar vermenizdir. Ancak bu eski-yeni kararını verirken aynı zamanda bu kararınızdan ne kadar emin olduğunuzu belirtmenizi istiyorum. Bunun için, kararınıza denk gelen dikey çiziğe mouse ile tıklamanız yeterlidir.

Eğer ekranda gördüğünüz kelimenin, ilk aşamada görmediğiniz, yani yeni bir kelime olduğunu düşünüyorsanız ve bu kararınızdan kesinlikle eminseniz o zaman "Eminim Yeni" seçeneğini işaretlemeniz gerekmektedir. Eğer kelimenin yeni bir kelime olduğunu düşünüyor ve bu kararınızdan kesinlikle olmasa da büyük oranda eminseniz, o zaman "Büyük Olasılıkla Yeni" seçeneğini işaretlemeniz gerekmektedir.

Eğer kelimenin yeni bir kelime olduğunu düşünüyor ancak pek de emin olamıyorsanız o zaman “Belki Yeni” seçeneğini işaretlemelisiniz.

Eğer ekranda gördüğünüz kelimenin, ilk aşamada gördüğünüz eski bir kelime olduğunu düşünüyor ancak pek de emin olamıyorsanız o zaman “Belki Eski” seçeneğini işaretlemeniz gerekmektedir. Eğer kelimenin eski bir kelime olduğunu düşünüyor ve bu kararınızdan kesinlikle olmasa da büyük oranda eminseniz, o zaman “Büyük Olasılıkla Eski” seçeneğini işaretlemeniz gerekmektedir. Eğer ekranda gördüğünüz kelimenin, eski bir kelime olduğunu düşünüyor ve bu kararınızdan kesinlikle eminseniz o zaman “Eminim Eski” seçeneğini işaretlemelisiniz.