

A Review on Emotionality on Implicit Memory: Effects of Depression and Mood Congruency

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Implicit memory, emotion, depression, mood-congruent memory

Anahtar kelimeler

Örtük bellek, duygu, depresyon, duygudurum tutarlı bellek

Abstract

This study focuses on implicit memory, which refers to unconscious recollection of previously exposed information. It specifically examines the effects of emotionality on implicit memory, with a particular focus on how depression and mood congruency influence memory. Through a comprehensive review of studies, the goal is to shed light on the intricate relationship between these internal and external factors and implicit memory in the context of depression. The study summarizes and evaluates previous research, highlighting inconsistencies and gaps in the literature. Several factors are discussed, including different types of implicit memory tasks, the importance of controlling for explicit contamination, and distinguishing between depression as a disorder and depressed mood. By analyzing findings, this study tries to identify factors contributing to inconsistent results in prior research, providing insights into underlying mechanisms of implicit memory in individuals with depression. While there is evidence supporting the impact of emotionality on implicit memory, the effects of depression and mood congruency are less clear and require further investigation. By examining internal and external factors, this study aims to enhance our understanding of the relationship between emotions, mood, and implicit memory in depression, potentially guiding future interventions and treatment approaches for individuals experiencing depression-related memory impairments.

Örtük Bellekte Duygu Yüğü Üzerine Bir Derleme: Depresyon ve Duygudurum Tutarlılığının Etkileri Öz

Mevcut çalışma, önceden maruz kalınan bilginin bilinçdışı hatırlanmasını ifade eden örtük belleğe odaklanmaktadır. Duygu yükünün örtük bellek üzerindeki etkilerini incelemekte olup, özellikle depresyon ve duygudurum tutarlılığının bellek üzerindeki etkisine odaklanmaktadır. İlgili çalışmaların kapsamlı bir gözden geçirilmesi aracılığıyla, bu içsel ve dışsal faktörler ile depresyon bağlamında örtük bellek arasındaki karmaşık ilişki üzerine ışık tutmak amaçlanmaktadır. Mevcut derleme, konuyla ilgili önceki araştırmaları özetleyip değerlendirerek, literatürdeki tutarsızlıkları ve boşlukları vurgulamaktadır. Farklı türdeki örtük bellek görevlerinin rolü, açık bulaşmanın kontrolünün önemi, depresyonun bir bozukluk olarak ve depresif duygudurum olarak ayrı bir şekilde ele alınmasının gerekliliği gibi birçok faktör tartışılmaktadır. Bu çalışma, bulguları analiz ederek, önceki araştırmalarda tutarsız sonuçlara katkıda bulunan faktörleri belirlemeye, depresyonlu bireylerde örtük belleğin temel mekanizmalarına dair bilgi sunmaya çalışmaktadır. Duygu yükünün örtük bellek üzerindeki etkisini destekleyen kanıtlar olmakla birlikte, depresyon ve duygudurum tutarlılığının etkileri henüz netlik kazanmamış ve daha fazla araştırmaya ihtiyaç duyulmaktadır. İçsel ve dışsal faktörleri inceleyerek, bu çalışma depresyon bağlamında duygular, duygudurum ve örtük bellek arasındaki ilişkinin daha iyi anlaşılmasına katkıda bulunmayı ve depresyonla ilişkili bellek bozuklukları yaşayan bireyler için gelecekteki müdahaleler ve tedavi yaklaşımlarına yol göstermeyi amaçlamaktadır.

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Memory is a fundamental cognitive process utilized in daily life, involving the encoding, storage, and retrieval of gained information. Memory processes can be classified in various ways. This review focuses on explicit and implicit memory, with particular emphasis on the latter. Explicit memory refers to conscious recollections of specific events or knowledge that is encoded intentionally (Levine et al., 2009; Mulligan, 2011). On the other hand, implicit memory is a system that stores unconsciously recollected information that has been previously encoded either intentionally (e.g., learning how to ride a bicycle) or incidentally (e.g., learning a song's lyrics without trying to) (Levine et al., 2009). There are three main types of implicit memory: priming, procedural memory, and classical conditioning (Goldstein, 2010). Priming occurs when a prior stimulus affects the response given to a subsequent test stimulus, which can affect performance either positively (as an increase in the response time or the accuracy) or negatively (as a decrease in the response time or the accuracy). Procedural memory pertains to motor skills, while classical conditioning involves the association of two stimuli.

Implicit and explicit memory differentiate from each other in the manner of processing mode, with perceptual and conceptual processing being the two types of processing modes in the literature (Vakil et al., 2018). In perceptual processing, the sensory and physical features of the stimuli are essential. Therefore, this type of processing relies on preliminary stages in which these features are analyzed (Vakil et al., 2018). On the other hand, conceptual processing is concerned with semantic features and the meaning of the stimuli. So, conceptual processing type demands a high level of processing and focuses on these critical features. In the general view, implicit memory tasks are perceptual, whereas explicit memory tasks are conceptual (Roediger & McDermott, 1992), however there are exceptions. The distinction between conceptual and perceptual tasks is related to what participants focus on. For instance, there are conceptual implicit memory tasks (e.g., category production) and perceptual explicit memory tasks (e.g., pictorial cued recall). In explicit memory tasks, participants receive intentional retrieval instructions, while in the implicit memory tasks, retrieval instructions given to the participants are incidental, in which no reference to the encoding phase is given (Ramponi et al., 2010). In other words, this distinction can be seen in the studies where previously presented stimuli are required to be remembered consciously in explicit memory tasks, but not in implicit memory tasks (Gaddy & Ingram, 2014). The characteristics of the presented stimuli can vary and affect memory performance in different tasks for implicit and explicit memory systems. Emotion is one such characteristic considered in this review.

Emotion has been defined as physical and mental processes, including facets of subjective experience, motivation, appraisal and evaluation, and bodily responses (e.g., facial expression or arousal) (Smith & Kosslyn, 2014). Emotional content can have a positive impact on memory performance, both in terms of quantity and quality (Kapucu, 2020). Even though emotion is evoked spontaneously in daily life, memory studies involving emotional stimuli in laboratory settings have gained attention, particularly in exploring the effects of emotions on memory processes (e.g., Sayar & Cangöz, 2013). These studies commonly utilize the circumplex model, which categorizes emotion based on two distinct dimensions: valence and arousal (Russell, 1980). Valence refers to whether an emotion is positive or negative, and arousal indicates the intensity of the emotion (Russell, 1980). For instance, a picture of flowers can be considered a stimulus that is positively valenced and has low level of arousal. In contrast, a picture of a crying baby can be regarded as a negatively valenced stimulus with high level of arousal. Studies on emotion and memory mostly focus on the valence dimension (Danion et al., 1995; Denny & Hunt, 1992) and compare the effects of positively and negatively

valenced stimuli to neutral stimuli on memory performance. Hence, the current review mainly emphasizes studies on explicit and implicit memory performance related to emotions.

Studies have found an enhancement effect of emotional stimuli on explicit memory performance for both negative (e.g., Dewhurst & Parry, 2000; Kensinger & Corkin, 2003) and positive (e.g., Bohanek et al., 2005) stimuli. Studies on emotion and implicit memory have also shown the effect of emotionality in both non-clinical (Collins & Cooke, 2005) and clinical groups (Denny & Hunt, 1992). In particular, depression patients are one of the commonly studied clinical samples to investigate the effect of emotion on implicit memory (e.g., Danion et al., 1995; Watkins, 2002). According to cognitive theories of depression, several factors can affect the course of depression, such as one's representations of oneself and how one retrieves an event (Gotlib & Joormann, 2010). As indicated by Beck et al. (1979), patients with depression create consistently negative-biased representations of their own self (e.g., worthlessness, failure). Once one of these representations is activated, others are also activated in an automatic manner (Liu et al., 2023). These negative-biased activations could lead to deficits in implicit memory, which occurs automatically. Hence, this review also tries to explore the relationship between emotion and implicit memory in depression. Moreover, there are studies focused on the implicit memory performance of depressed participants within the context of the mood congruency phenomenon (Ruiz-Caballero & González, 1997; Watkins et al., 1992; Wisco, 2009).

Memory researchers have shown great interest in the topic of emotion, and one of the most intriguing findings is that people tend to remember stimuli with emotional content that is relevant to their current mood (Gaddy & Ingram, 2014). This phenomenon, known as "mood-congruent memory," proposes that if the emotionality of the stimulus to be remembered is congruent with the participant's current mood, it is more likely to be recalled or recognized in memory tasks (Bower, 1981; Gaddy & Ingram, 2014). For instance, when participants are in a negative mood state, they are more likely to recall negative information than positive ones. This concept is particularly relevant to depression, which is characterized by a persistent sad, irritable, or empty mood (American Psychiatric Association - APA, 2022), making mood-congruent memory effect a robust factor in depression (Paulewicz et al., 2015).

In the current study, the aim is to examine the internal and external factors, specifically emotions and mood, that affect implicit memory performance in individuals with depression by thoroughly reviewing studies that investigate these relationships. This review addresses three main points. First, it explores the relationship between implicit memory and emotion. Second, it examines studies that have investigated the performance of depressed individuals in relation to implicit memory performance, while also considering the influence of emotion and the phenomenon of mood congruency on their implicit memory performance. Last, the review synthesizes all the findings to determine factors underpinning discrepant findings on the topic.

Implicit Memory and Emotion

Implicit memory encompasses various types of memory such as conditioning, priming, and motor skills (Levine et al., 2009). Despite the fact that implicit memory involves recollection of information without conscious awareness, information with emotional content found its tangible representations in implicit memory. Emotion influences current judgments, feelings, and physiological responses, even in the absence of conscious memory of emotional events; so implicit memory consists of representations of emotions (Levine et al., 2009). Research has demonstrated that individuals process emotional stimuli although they perceive these stimuli unconsciously (Tsuchiya & Adolphs, 2007; Yang et al., 2011). This section of the of the current review provides a comprehensive perspective on the effect of emotion on implicit memory and distinguishes it from explicit memory.

There are discrepant findings about the effect of emotion on memory performance for explicit and implicit memory. In explicit memory tasks, there are clearer findings indicating that emotional stimuli generally enhance memory performance (Kapucu, 2020; Kensinger & Schacter, 2016). Researchers suggested that the availability of representations of emotional stimuli in memory retrieval processes may explain this effect (Ramponi et al., 2010). However, this availability may be due to the presence of episodic context, which is not present in implicit memory tasks, where the enhancement effect of emotion on memory is not seen (Ramponi et al., 2010). On the other hand, some studies have found that emotional stimuli can enhance memory performance in implicit memory tasks, such as priming (e.g., Kensinger & Schacter, 2016). Therefore, in such studies, emotional stimuli have an advantage over nonemotional stimuli in both conceptual and perceptual priming tasks in terms of causing an enhancement effect on memory (e.g., Burton et al., 2004; Collins & Cooke, 2005; Kensinger & Schacter, 2016). Some studies support the notion that emotional material does not affect implicit memory, but it affects explicit memory (e.g., Ramponi et al., 2010; Roediger & McDermott, 1992), whereas some other studies point out that implicit memory is affected by emotional material (e.g., Burton et al., 2004; Sayar & Cangöz, 2013; Watkins et al., 1996). For instance, Burton et al. (2004) has examined the differences in affectivity between explicit and implicit memory performance and found that implicit memory was affected by emotional stimuli. In their research, participants were required to read the passages that had both affective and neutral content aloud as quickly as possible to test implicit memory performance. So, the participants were able to understand the passages, and their reading speed was recorded. On the other hand, explicit memory was measured through multiple-choice questions about the passages at the end of testing. Results revealed that participants' overall reading speed was faster for passages with neutral content than affective content. After implicit memory testing, participants' explicit memory performance was found to be better for passages with affective content. In general, participants were more attentive to passages with emotional content than to those with neutral content. As a result, they spent more time reading these passages and performed better on explicit memory tasks related to those passages. Overall, some studies suggest that emotional material affects explicit memory but not implicit memory, while others indicate that both types of memory can be influenced by emotional material.

Ramponi et al. (2010) found contrasting results to Burton et al. (2004) by showing that emotional content did not affect implicit memory. The study examined the effect of emotion on memory enhancement using both explicit (i.e., associate-cued recall) and implicit memory (i.e., free association) tasks. A crucial aspect of this study was that both memory tasks were conceptual, and the only difference between these tasks was in the retrieval instructions (Ramponi et al., 2010). The study presented participants with three lists of 15 neutral and 15 emotional associates, with each list designated for phonemic, semantic, or unstudied tasks. All participants took both semantic and phonemic lists in the study phase. In the test phase, one group received incidental retrieval instructions, while the other group received intentional retrieval instructions to minimize cross-test contamination. The results revealed that although emotionality showed its superiority effect on explicit memory, no such effect was observed on implicit memory. Specifically, emotional content did not affect conceptual implicit memory. This study emphasized the importance of specific episodic context and intentional retrieval of stimuli from that context.

As previously mentioned, there are conflicting findings regarding the effect of emotion on implicit memory, and researchers have pointed out different explanations for this discrepancy. Factors such as attentional processes, the type of task used to measure implicit memory, and participant characteristics are all potential explanations. One particular group of interest in the study of emotion and implicit memory is individuals with depression. Hence, the subsequent part explores how depression affects implicit memory performance, with a focus on emotion and mood congruency.

Implicit Memory in Depressed Participants

In DSM-5-TR, under the title of depressive disorders, several distinct types of disorders (e.g., Major Depressive Disorder) are classified (APA, 2022). The presence of an empty, sad, or irritable mood with somatic and cognitive symptoms has remarkable effects on one's functional capacity (APA, 2022). Since depression is a prevalent disorder that affects individuals' cognitive functioning, there are memory studies, which have sample of participants with depression or in depressed mood (Jenkins & McDowall, 2001; Liu et al., 2023). These studies consistently reveal that participants with depression or in a depressed mood had impaired explicit memory, while their implicit memory remained intact (Jenkins & McDowall, 2001; Williams et al., 1997). Although there are several studies concerning this issue, the main aim of this part of the current review is to present information from the key studies regarding the interaction between depression and implicit memory, with the intention of providing a general overview of the topic.

Some early studies investigating the effects of depression and depressed mood on implicit memory generally focused on specific processing differences in non-depressed and depressed individuals (e.g., Barry et al., 2006; Hertel & Hardin, 1990). For instance, Hertel and Hardin (1990) indicated that depressed individuals showed impairments in strategy use initiation. In their study, participants were induced into different moods and required to take explicit and implicit memory tasks. Results revealed that participants who were induced into depressed moods showed similar performance to those who were induced into neutral moods on the implicit memory test, but not on the explicit memory test. However, when depressed participants were given specific instruction about strategy use, performance differences on the explicit memory test between depressed and neutral mood participants disappeared. This led researchers to conclude that depression affects strategy initiation. Similarly, Danion et al. (1991) conducted a study involving major depression (according to the criteria of DSM-III) patients who were hospitalized and control participants. The purpose was to examine whether there was a deficiency in effort-demanding processing, which was measured by free recall as an explicit memory task, compared with an implicit memory task that assessed automatic processing. The study found that depressed patients performed worse on explicit free recall tasks than control groups, but their performance on implicit memory tasks was similar to that of control groups. Researchers have concluded that depression disturbs effortful memory processing, which involves elaborating strategies for remembering information. Overall, these studies suggest that depressed participants perform similarly to control groups on tasks that do not require effortful, conscious processing (Barry et al., 2006).

Bazin et al. (1994) conducted a study to investigate the differences in explicit and implicit memory performance between patients with major depression (based on the criteria of DSM-III-R) and healthy participants. In the study phase, participants were required to read aloud 40 words, and then underwent a cued recall task to assess explicit memory performance and a word stem completion task to assess implicit memory performance. The results revealed that prior exposure to words had a similar effect on severely depressed patients and control participants in the word completion task, which did not require an explicit recollection of the words. On the other hand, the explicit memory performance of patients with severe depression was significantly impaired. It is concluded that some memory tasks, such as word stem completion test for implicit memory, may not be affected by memory impairments in patients with depression. Although the studies mentioned above did consider the dissociation between explicit and implicit memory, they did not take into account differences within implicit memory tasks, such as conceptual versus perceptual tasks.

The literature has shown different results when considering implicit memory as a whole compared to when it is divided into conceptual and perceptual. A study by Jenkins and McDowall (2001) investigated the explicit and implicit memory performances of depressed people by considering the dissociation between conceptually-driven and data-driven processes. The study was conducted with 10 participants diagnosed with major depressive disorder (according to the criteria of DSM-IV) and 10 matched control participants. Two lists of stimuli (list A and list B) were used within three memory tasks. Each list consisted of three blocks, and each block consisted of 14 words (so each list contained 42 words). One block from each list was used in the reading task, one in the generating task, and the one remained as a baseline. In the study, the category association task was administered as a conceptual implicit memory task, whereas the free recall task was administered as a conceptual explicit memory task. The word-fragment completion test was used as a perceptual implicit memory task. Implicit tasks were associated with a specific list (list A and list B) for each participant. Since free recall tests did not require cue presentation, researchers did not link this task with any of the lists. The study started with an encoding session, including the reading and generating task. This first encoding session was followed by an interpolated task, and then the implicit memory task was applied first. These procedures were also applied in the second encoding and implicit memory task session. At the end of the second part, a free recall task was given to the participants. The results revealed that depressed participants had worse performance than the control group on the conceptual implicit and conceptual explicit memory tasks, but both groups had similar performance on the perceptual implicit memory task. The study found evidence of differences in memory performance between groups when the tasks were divided into conceptual and perceptual categories.

Mulligan (2011) found different results compared to Jenkins and McDowall (2001) regarding conceptual implicit memory deficits in depressed individuals. Mulligan's (2011) study showed that the impairment in conceptual implicit memory was not observed when explicit contamination was controlled. Explicit contamination occurs when participants notice the relationship between the test and prior study sessions in the implicit memory task. To prevent this, Mulligan (2011) used posttest questionnaires and divided participants into test-aware and test-unaware groups. Unlike previous studies, the sample of Mulligan's study consisted of non-depressed and subclinically depressed individuals. A category-cued recall test was used as a conceptual explicit memory task, while a category production test was used as a conceptual implicit memory task. The results showed that performance on the implicit memory test depended on the test awareness of the participants. When tested unaware, both groups showed comparable performance on the implicit memory task. However, when test-aware participants were compared, subclinically depressed participants showed deficits in implicit memory performance compared to the non-depressed participants. This finding highlights the importance of avoiding explicit contamination in implicit memory tasks.

The studies mentioned previously have consistently shown that individuals with depression or a depressed mood showed impairment in explicit memory performance, but the findings on implicit memory performances have been inconsistent across studies. While some studies found no difference in implicit memory performance between depressed and non-depressed participants (e.g., Danion et al., 1991), others divided implicit memory into two types, conceptual and perceptual, and found contradictory results for these two types of implicit memory tasks (e.g., Jenkins & McDowall, 2001). These results emphasize the significance of the task employed.

Emotion

The emotional content of the stimuli used in tasks is of great importance when studying on memory (Kensinger & Kark, 2018). Since depressive disorders are remarkably characterized by deficits in emotional processes (APA, 2022), studies have focused on the effects of emotion on memory performance in depressed participants (e.g., Ai et al., 2015; Callahan et al., 2016; Ridout et al., 2009). As Quoniam et al. (2003) found that, in depression, automatic emotional processing might be affected, particularly for the processing of positive stimuli. Hence, it is crucial to examine how emotions affect implicit memory performance of depressed individuals.

There is limited research on the effects of emotion on implicit memory in participants with depression or depressed mood. One of these studies was conducted by Denny and Hunt (1992) with 16 inpatient women who were diagnosed with unipolar depressive disorder (according to the criteria of DSM-III-R) and 16 non-depressed women. The study involved presenting the participants with two lists of 48 words, each with positive or negative emotional valence. The participants underwent a self-orienting task consisting of a 24-words list, followed by a word fragment completion task to assess implicit memory, and a free recall task to assess explicit memory performance. For explicit memory performance, depressed participants recalled more negative words than positive ones, while non-depressed participants showed the opposite pattern. However, there was no difference in the implicit memory performance of either group, and both groups showed the same level of priming for positive and negative words. It was concluded that, under the condition that memory was measured implicitly, negative and positive information was equally available in non-depressed and depressed participants. Although Denny and Hunt (1992) found a difference in explicit memory performance for negatively and positively valenced words, Danion et al. (1995) did not indicate this difference in their study. Danion et al. (1995) recruited 30 hospitalized patients with major depression (according to the criteria of DSM-III-R) and 30 healthy participants. The study included 90 words with neutral, negative, and positive valence. After a study session, participants completed a word stem completion task to measure implicit memory performance, as well as free recall and recognition tasks for explicit memory performance. The results for the explicit memory performance revealed that both groups of participants recalled more positive and negative words than neutral words and recognized more neutral words than negative ones. Both groups also showed equivalent priming for positive, negative, and neutral words in the implicit memory performance. Therefore, the results suggest that there was no difference in the explicit and implicit memory performance of depressed patients and control participants, and emotional valence had an effect on explicit memory performance only when intentional recollection was required.

To sum up, while the studies by Denny and Hunt (1992) and Danion et al. (1995) reported different findings regarding explicit memory performance, both studies found no difference between depressed patients and healthy participants in implicit memory performance, and the affective valence (both positive and negative) of the stimuli had an equivalent effect on implicit memory performance. In other studies, such as Ilsley et al. (1995), the results were consistent with Denny and Hunt (1992) and Danion et al. (1995), while Bradley et al. (1994) and Ruiz-Caballero and González (1994) reported contradictory results that confirmed the difference between depressed and non-depressed participants in implicit memory performance for emotional stimuli, as noted in the meta-analysis conducted by Phillips et al. (2010) involving 89 studies.

In addition to the emotional content of stimuli, the emotional state of individuals can also affect memory in different ways. It is essential to differentiate between the effects of “integral” emotion originating

from stimulus and the effects of “incidental” emotion originating from individuals’ emotional state when considering this topic. In the following section, the effect of “incidental” emotion on memory performance is discussed.

Mood-Congruent Memory

According to the effect of mood-congruent memory, information that is congruent with the person's current mood is more likely to be recalled than information that is not compatible (Bower, 1981; Watkins, 2002). In other words, people are more likely to remember information that matches their current mood. This has been supported by research conducted on both healthy individuals (e.g., Bradley et al., 1994) and clinical samples (e.g., Bazin et al., 1996; Wisco, 2009). Mood-congruent memory findings have indicated that healthy participants are more likely to remember positively valenced words than negatively valenced ones, whereas the opposite pattern has been observed in those with depression (Blaney, 1986; Roediger & McDermott, 1992). This suggests that depressed people have a tendency to retrieve unpleasant information more readily than pleasant information (Watkins, 2002). Furthermore, studies have demonstrated opposite results for the effect of mood-congruent memory on explicit and implicit memory in depressed participants. A meta-analysis study carried out by Matt et al. (1992) using seven studies involving clinically depressed patients found that individuals with major depressive disorder tended to remember negative information more easily than positive information in explicit mood-congruent memory tasks. Meanwhile, the control groups were more likely to remember positive information. Thus, studies have shown that the effect of mood-congruent memory on explicit memory is consistent in depressed individuals, with depressed patients being more likely to recall negative information (Gaddy & Ingram, 2014). However, research on implicit mood-congruent memory has yielded inconsistent results.

One pioneer study on mood-congruent memory in depression patients was conducted by Watkins et al. (1992). In this study, both implicit (word completion task) and explicit (cued recall task) memory tasks were applied to determine the involvement of priming and elaboration in mood-congruent memory of depressed (i.e., patients with major depression or dysthymia according to the criteria of DSM-III-R) and nondepressed participants. The study involved four groups of affective words: neutral, depressed, physically threatening, and positive. They created three sets of words, and each set included eight neutral, eight depressed, eight physically threatening, and eight positive words. Each participant took two of these three sets of words, which served as primed lists for either the implicit or explicit memory task. The encoding session of the words was conducted under incidental encoding instructions, and the order of the word completion and cued recall tasks was counterbalanced. The result revealed an effect of mood-congruent memory on the explicit memory task but not on the implicit memory task.

Watkins et al. (1992) used an implicit memory task, which is classified as a perceptual or a data-driven test. As a result, the lack of mood-congruent memory effect on implicit memory might only be observed in the perceptual implicit memory test (Roediger & McDermott, 1992). Another study by Watkins et al. (1996) used conceptual implicit memory tasks, where they examined the depressed (i.e., patients with major depression or dysthymia according to the criteria of DSM-III-R) and non-depressed participants and categorized the valence levels of the words into positive, negative, and neutral. Two sets of words were created, each including eight positive, eight negative, and eight neutral words. During the encoding session, participants were presented with one of these sets of words, which became a primed set, while the other became an unprimed one. Following a distractor task, participants were asked to produce an associative word related to the cue in the test phase. Participants were told that the second part of the study was about developing a

new word list. The participants were not informed that the test was related to the encoding session, thus making the assessment implicit. The study has demonstrated for the first time that mood-congruent memory bias exists in conceptual implicit memory tasks. Depressed patients had greater priming for the negative words and smallest for the positive words, while control participants showed greater priming for the positive words and smallest for the negative words.

It is apparent that there are approximately the same number of studies that have found an implicit mood-congruent bias (e.g., Bradley et al., 1994; Ruiz-Caballero & González, 1994, 1997; Watkins et al., 1996) and those that have not (e.g., Bazin et al., 1994; 1996; Danion et al., 1995; Denny & Hunt, 1992; Ilsley et al., 1995; Watkins et al., 1992). As Barry et al. (2004) indicated, the reasons why studies obtained contradictory findings might be due to variations in implicit memory tasks used (conceptual vs. perceptual), experimental designs, and methodologies.

Conclusion

One of the most common areas of research in the study of implicit memory and other memory systems concerns how emotion impacts memory performance. Given that depression is characterized by impairments in processing emotions, numerous studies have focused on the effects of emotion on memory performance in depressed individuals.

The initial focus of the current review is on the effects of emotion on implicit memory performance and how it differs from explicit memory. Some studies have supported that emotional material does not affect implicit memory, but it can affect explicit memory (e.g., Ramponi et al., 2010; Roediger & McDermott, 1992). Conversely, other research has indicated that both implicit and explicit memory can be affected by emotional material (e.g., Burton et al., 2004; Sayar & Cangöz, 2013; Watkins et al., 1996).

The second point of the review concerns research on depressed individuals and their memory performance. Studies have generally found that depressed individuals have impaired explicit memory performance, but the effect on implicit memory is more complex. Specifically, when using perceptual tasks to measure implicit memory, depression does not appear to have an effect (Jenkins & McDowall, 2001). In contrast, performance on a conceptual implicit memory task is affected by depression unless contamination is controlled (Mulligan, 2011). Despite some contradictory findings on the impact of emotion on implicit memory tasks in depressed individuals, the overall conclusion is that their performance is not significantly different from that of healthy individuals (Danion et al., 1995; Denny & Hunt, 1992). Apart from single studies, a recent meta-analysis with 26 studies (Liu et al., 2023) specifically investigated how implicit memory is affected by major depressive disorder (i.e., MDD). Analyses revealed that negative stimuli did not cause any difference in implicit memory performance between MDD patients and healthy controls. On the other hand, performance for positive and neutral stimuli was poorer in MDD. These findings lead to the conclusion that when depression is evaluated deeply by focusing on a single type, such as major depressive disorder, general understanding regarding the effects of emotion on implicit memory could vary.

Research on mood-congruent memory in depressed individuals has yielded inconsistent results, with some studies showing a mood-congruent effect on the implicit memory performance of depressed individuals and others finding no such effect. Two potential explanations can be considered regarding the assessment of participants' current mood and the severity of the disorder. First, as depression patients are assumed to be in a negative and/or depressed mood, researchers mostly did not evaluate patients' current mood at the time of the experiment (e.g., Ruiz-Caballero & González, 1997; Watkins et al., 1996). This can be regarded as a limitation.

Since the mood-congruent memory phenomenon suggests explanations about people's current mood states (Bower, 1981), assessing participants' current mood during the experiment becomes crucial. Hence, it would be better if researchers applied tests that can give information about patients' current mood to evaluate this phenomenon more deeply. The second explanation for contradictory findings may lie in how the studies approach the severity of the disorder. The severity of the depression varies in accordance with the symptoms of the patient. Patients' conditions can be mild, moderate, or severe (APA, 2022). Memory performance of patients can potentially change with the severity of the disorder. However, not all studies on implicit memory and emotion in patients with depression have considered severity (e.g., Watkin et al., 1992). Since the severity is an important aspect of depressive disorders, future studies should pay more attention to this factor.

Given the conflicting findings in the existing literature, it is crucial for future research to address the limitations and gaps in prior studies. One important point is that researchers should be cautious about implicit memory tasks not only being perceptually driven in nature but also including tasks that are conceptually driven. Considering the inconsistent findings across perceptual versus conceptual implicit memory tasks in studies with depression patients, future studies should apply both types of tasks within the same study to evaluate implicit memory processes in depression more comprehensively. This approach would provide therapists with insight into the patient's cognitive abilities, specifically implicit memory, enabling them to establish a more productive therapeutic relationship with the patients. Another suggestion is that the researchers should consider and control for explicit contamination. Failure to control for explicit contamination may lead to findings in the studies do not accurately reflect implicit memory performance. Therefore, it becomes challenging to evaluate implicit memory processes accurately.

Additionally, researchers should clarify depression and differentiate between depression as a clinical disorder (e.g., major depressive disorder) and the experience of a depressed mood. When it is considered a clinical disorder, there are more factors to take into account, such as medication and therapy. However, not every study has clarified this distinction so far. These differences could affect the current status and course of depression, which, in turn, differentiate cognitive functioning. Moreover, diagnostic criteria in each study have varied. Typically, patients were diagnosed in accordance with the criteria of the DSM. However, the DSM is a dynamic manual that is regularly modified, and revised versions are continually being developed. As the current review has pointed out, studies conducted in different years recruited participants according to the criteria of the up-to-date DSM. For instance, some studies recruited participants based on DSM-III-R, while others relied on DSM-V. Due to these differences in participant characteristics, drawing conclusions and generalizing findings to any type of depression becomes challenging. Furthermore, studies on this topic have predominantly focused on major depressive disorder. It is noteworthy to evaluate other types of depressive disorders (e.g., persistent depressive disorder).

While these questions remain unanswered, there has been a decline in the number of studies on this topic in recent years, underscoring the need for more research in the future. It is essential to delve into these internal and external factors in order to deepen our understanding of the connection between emotions, mood, and implicit memory in the context of depression. This endeavor has the potential to provide valuable insights for future interventions and treatment strategies, specifically targeting individuals who encounter memory impairments associated with depression. This understanding can especially help therapists grasp the cognitive aspects of depression. Specifically, comprehending the cognition of depressive patients can be crucial in cognitive behavioral therapy, which is the most commonly used in the treatment of depressive disorders.

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