NÖRO PSİKİYATRİ ARŞİVİ
ARCHIVES OF NEUROPSYCHIATRY

RESEARCH ARTICLE

Article No: 62

Arch Neuropsychiatry 2026;63:393–401
https://doi.org/10.29399/npa.29151

Emotional Responses and Emotion Regulation in Drug-Free Women with Major Depressive Disorder

Damla İŞMAN HAZNEDAROĞLU, İbrahim SUNGUR, Ali Saffet GÖNÜL

SoCAT Lab, Department of Psychiatry, School of Medicine, Ege University, Izmir, Türkiye

ABSTRACT

Introduction: Major depressive disorder (MDD) is marked by increased negative emotions and decreased positive emotions, indicating impaired emotion regulation. This study aimed to examine emotional responses to positive and negative visual stimuli in drug-free female patients with MDD compared to healthy controls and to explore the connection between these responses and emotion regulation strategies.

Methods: Forty-six drug-free female patients diagnosed with MDD and 40 age and educational level-matched healthy women were included. All participants underwent structured psychiatric interviews (SCID) and completed the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), and Emotion Regulation Questionnaire (ERQ). Emotional responses to six basic emotions (sadness, disgust, anger, fear, happiness, surprise) were assessed during two block-design slide sessions using images from the International Affective Picture System (IAPS). Emotional response intensity was analyzed with repeated measures ANOVA, controlling for baseline emotion scores, menstrual cycle phase, and stimulus order.

Results: Across the experiment, patients reported significantly higher overall levels of sadness ($F=56.7$, $p<0.001$), disgust ($F=22.3$, $p<0.001$), anger ($F=31.4$, $p<0.001$), fear ($F=48.7$, $p<0.001$), and surprise ($F=6.7$, $p=0.01$), and lower overall levels of happiness ($F=47.4$, $p<0.001$) compared with controls across the experiment. When baseline levels were covaried, patients exhibited heightened reactivity to negative stimuli, specifically in disgust ($F=11.7$, $p=0.001$), anger ($F=4.3$, $p=0.04$), and fear ($F=14.6$, $p<0.001$), while responses to sadness and surprise did not differ. Furthermore, when baseline emotional states were controlled, emotional reactivity to positive stimuli, including happiness, did not differ between groups.

Conclusion: Contrary to a generalized emotion context insensitivity hypothesis, our findings demonstrate emotion-specific dysregulation in MDD. Drug-free female patients showed heightened reactivity to negative stimuli in terms of disgust, anger, and fear, but not sadness or surprise. Importantly, emotional responses to positive stimuli, including happiness, were comparable between patients and healthy controls. These results underscore the importance of evaluating basic emotions separately in depression research and highlight the potential value of targeting emotion-specific processes in treatment approaches.

Keywords: Anger, disgust, emotion regulation, emotional responses, fear, major depressive disorder, visual stimuli

Cite this article as: İşman Haznedaroğlu D, Sungur İ, Gönül AS. Emotional Responses and Emotion Regulation in Drug-Free Women with Major Depressive Disorder. Arch Neuropsychiatry 2026;63:393–401. doi: 10.29399/npa.29151

INTRODUCTION

Emotions are defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) as complex psychological states that encompass subjective experiences, physiological responses, and behavioral reactions. Affect and mood, which represent observable expressions and sustained emotional states, are largely shaped by emotions (1). Given the broad and multifaceted nature of emotions, they are often studied through more discrete and manageable constructs. Paul Ekman identified six basic emotions (happiness, sadness, anger, fear, disgust, and surprise) that are cross-culturally valid and characterized by universal expressions (2).

Highlights

- **The happiness response to positive stimuli in patients was similar to controls.**
- **Patients showed increased reactions of disgust, anger, and fear to negative stimuli.**
- **No significant difference found between groups in sadness, happiness, and surprise.**

Correspondence Address: Damla İşman Haznedaroğlu, SoCAT Lab, Department of Psychiatry, School of Medicine, Ege University, Izmir, Türkiye • **E-mail:** damla.isman.haznedaroglu@ege.edu.tr
Received: 13.05.2025, **Accepted:** 12.01.2026, **Publication Date:** 26.03.2026

Emotion regulation refers to the processes that modify the experience and expression of emotions. Two widely studied strategies are cognitive reappraisal, which involves altering one's interpretation of a situation to change its emotional impact, and expressive suppression, which entails suppressing the outward expression of emotion (3). Emotional responses can be measured through self-report, as well as psychophysiological or neurophysiological methods (4). Experimental induction of emotions can be achieved using standardized techniques such as visual stimuli, music, autobiographical recall, situational procedures, or guided imagery.

Major depressive disorder (MDD) is characterized by increased negative emotions and decreased positive emotions, reflecting impaired emotion regulation. Three major hypotheses have been proposed regarding emotional responses in MDD: the positive attenuation hypothesis (reduced response to positive situations), the negative potentiation hypothesis (increased response to negative situations), and the emotion context insensitivity hypothesis (reduced responsiveness to both positive and negative stimuli) (5,6). However, findings across studies remain inconsistent. While some studies reported exaggerated negative reactivity, others emphasized generalized blunting, and these discrepancies are often due to heterogeneous samples, concurrent medication use, or lack of differentiation between basic emotions.

A critical gap in the literature is the insufficient examination of basic emotions separately in patients with MDD (6–9). Most studies have treated negative affect as a single dimension, thereby obscuring emotion-specific alterations. Moreover, the role of emotion regulation strategies (e.g., cognitive reappraisal, suppression) in shaping these emotional responses has not been adequately integrated, despite their clinical relevance for treatment planning. Finally, the influence of gender differences is often overlooked. Previous research has shown that women generally experience emotions more intensely than men, and menstrual cycle effects may further modulate emotional reactivity (10).

To address these gaps, the present study focused on a homogeneous sample of drug-free female patients with MDD, thereby eliminating potential confounds of psychotropic medication and controlling for gender-based variability in emotional processing. Standardized visual stimuli from the International Affective Picture System (IAPS) were used to elicit emotional responses, and basic emotions were assessed separately. In addition, emotion regulation strategies were measured with the Emotion Regulation Questionnaire (ERQ) and examined in relation to emotional responses.

The primary aim of this study was to compare emotional responses to positive and negative stimuli in drug-free female patients with MDD versus euthymic healthy controls. The secondary aim was to investigate the association between emotion regulation strategies and emotional responses. We hypothesized that: (a) Depressed patients would show heightened responses to negative emotional stimuli compared to controls. (b) Depressed patients would exhibit diminished responses to positive emotional stimuli compared to controls. (c) If both hypotheses were not confirmed, this would support the "emotion context insensitivity" hypothesis in MDD.

METHODS

Participants

The study sample consisted of 46 drug-free female patients and 40 age and education-level-matched healthy controls. All patients met the DSM criteria for MDD and were in a current major depressive episode at the time of participation. To avoid the potential confounding effects of psychotropic medication, only medication-free patients (no psychotropic medication within the past 7 days, or 14 days for fluoxetine) were included. A trained psychiatrist (first author of the paper) interviewed both patient and control groups with the SCID.

Inclusion criteria for the patient group were: female sex, age 20–50 years, diagnosis of MDD with a current depressive episode. Inclusion criteria for the control group were: female sex, age 20–50 years, and no psychiatric diagnosis per SCID. Exclusion criteria for both groups were: comorbid psychiatric disorders (e.g., bipolar disorder, psychotic disorders, substance use disorders), neurological or serious medical illnesses, cognitive impairment, and pregnancy. The restriction to female participants was to control for gender-related differences in emotional reactivity (10); in addition, menstrual cycle phase (follicular/luteal) was recorded and entered as a covariate in the analyses.

Exclusion criteria for both groups included the presence of severe medical or neurological illness, organic mental disorders, psychotic features in the depressive episode, comorbid psychiatric diagnoses other than MDD, and a family history of bipolar or psychotic disorders in first-degree relatives.

For the patient group, the severity of depressive symptoms was assessed with the 17-item Hamilton Depression Rating Scale (HAM-D-17) (11). In addition, all participants completed the Beck Depression Inventory (BDI) (12), Beck Anxiety Inventory (BAI) (13), and ERQ (14). After the psychiatric interview, the participants underwent the emotion experiment, which is detailed below. Our study was approved by the Ege University Ethics Committee (number 10-5/6, approval date May 27, 2010), and conformed to the provisions of the Declaration of Helsinki.

Emotion Experiment

After the diagnostic interview and completion of the scales, participants underwent the emotion induction experiment, which consisted of two slide shows in a block design. Each block lasted approximately 11 minutes and was presented twice: one designed to elicit positive emotions and the other negative emotions. Stimuli were displayed on a white screen using a projector in a dark, quiet room. The photographs were selected from the International IAPS, a standardized and extensively validated set of visual stimuli for eliciting reliable emotional responses (15).

Three categories of pictures were used: (a) neutral or low-arousal images, (b) high-arousal positive or negative images, and (c) relaxation-inducing images. Each slide block followed the same sequence: 30 neutral or low-arousal images, 50 high-arousal positive or negative images, and 30 relaxation-inducing images. Every image was presented for six seconds. Pictures were selected among those with the highest normative arousal scores in IAPS validation studies (16).

Participants rated the intensity of their current emotional state on a 10-point Visual Analog Scale (VAS) both before and after the first slide block. They also rated their motivation and alertness toward the experiment on a 100-point scale. During the task, VAS ratings were again collected after exposure to positive or negative images and following relaxation images. Between the two blocks, participants viewed a neutral five-minute video clip to reduce carryover effects. To minimize order effects, the sequence of positive and negative slide shows was counterbalanced across participants. After each block, participants were asked to rate their level of attention with the question, "To what

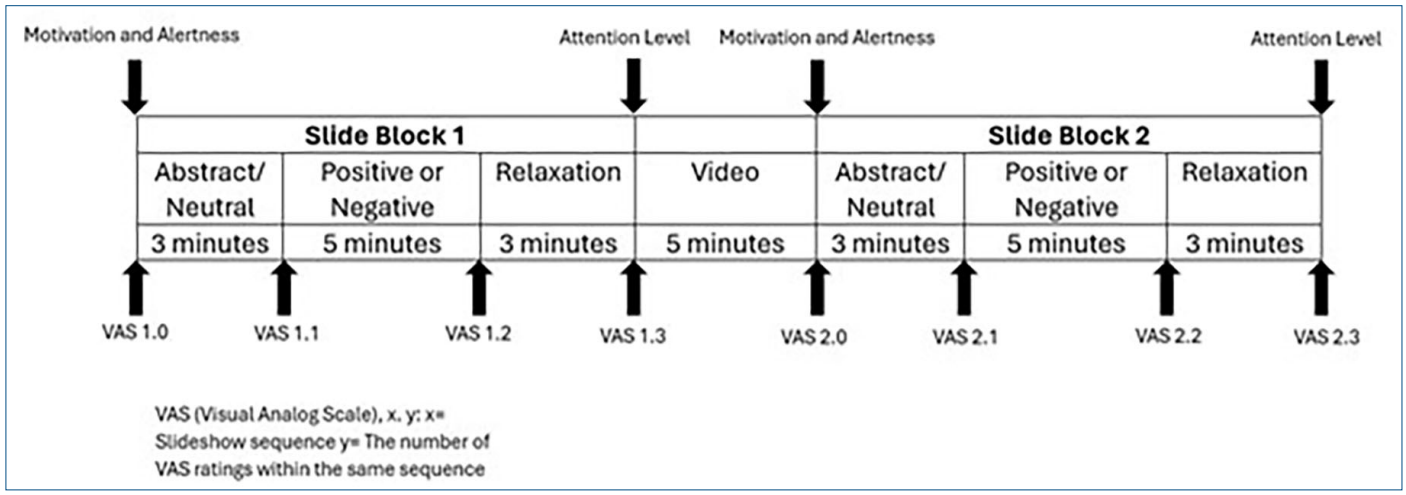

Figure 1. Experimental model.

extent were you able to focus on the task?" to monitor engagement. The experiment is summarized in Fig. 1.

After the experiment, an unstructured interview was conducted with the participant about the current mental state. The treatment of participants in major depressive episode was organized and follow-up appointments were made.

Statistical Analysis

All statistical analyses were conducted using IBM Statistical Package for Social Sciences (SPSS) program version 25. Normality and homogeneity assumptions were checked with the Shapiro-Wilk test before applying parametric tests. Group differences in demographic and clinical variables were examined with independent-samples t-tests for continuous data and chi-square tests for categorical variables. Emotional responses were analyzed using repeated-measures analysis of variance (ANOVA) with Group (MDD vs. controls) as a between-subjects factor and Emotion (six basic emotions: sadness, disgust, anger, fear, happiness, surprise) and Valence Block (positive vs. negative) as within-subject factors. Baseline VAS scores for each emotion, menstrual cycle phase (follicular vs. luteal), and stimulus order (positive-first vs. negative-first) were entered as covariates. Statistical significance was set at $p < 0.05$ (two-tailed). Correlation analyses were conducted to examine associations between emotional responses and clinical scale scores (HAM-D, BDI, ERQ). Analyses were performed separately for patients and controls. Pearson correlation coefficients (r) were calculated, and in cases where assumptions of normality were not met, Spearman's rho was used. To account for multiple testing, significance levels were adjusted using the Bonferroni correction.

RESULTS

Sample Characteristics

The major depression group had a mean age of 33.98±7.89 years and a mean age at onset of 28.98±8.65 years. Patients experienced an average of 1.67±0.79 depressive episodes, and 47.8% were in their first episode. Based on HAM-D scores, 6 (13%) patients had very severe depression, 10 (21.7%) severe, 24 (52.2%) moderate, and 6 (13%) mild depression. Marital status distributions were as follows: in the patient group, 32 (69.6%) were married, 11 (23.9%) single, 2 (4.3%) divorced, and 1 (2.2%) widowed; in the control group, 25 (62.5%) were married, 13 (32.5%) single, and 2 (5.0%) divorced. As expected, patients showed greater depressive symptomatology (HAM-D: 17.63±4.07). Beck depression inventory scores were substantially higher in patients than controls (25.93±8.10 vs 3.90±3.99; t=15.63, df=84, $p < 0.001$). ERQ-suppression did not differ between groups (t=1.44, df=83, p=0.153), whereas ERQ-reappraisal scores were lower in patients (t=7.78, df=83, $p < 0.001$). Sociodemographic features, scale scores, and illness characteristics are summarized in Table 1.

Emotion Experiment Results of the Sample Group

Emotional responses were analyzed separately for each of the six basic emotions. First, mean ratings across the entire experiment (eight consecutive measurements) were examined (Fig. 2). Emotional responses were analyzed separately for each of the six basic emotions. First, mean ratings across the entire experiment (eight consecutive measurements) were examined.

In these analyses, the baseline value of the corresponding emotion, menstrual cycle phase, and stimulus order were entered as covariates. Results adjusted for baseline values are referred to as the "emotional response reaction" (Fig. 3).

When all consecutive ratings were analyzed, significant group differences emerged for each basic emotion. Compared with controls, patients with MDD reported higher levels of sadness ($F(1, 82)=56.67$, $p < 0.001$, $\eta^2p=0.41$), disgust ($F(1, 82)=22.25$, $p < 0.001$, $\eta^2p=0.21$), anger ($F(1, 82)=31.39$, $p < 0.001$, $\eta^2p=0.28$), fear ($F(1, 82)=48.66$, $p < 0.001$, $\eta^2p=0.37$), and surprise ($F(1, 82)=6.73$, $p=0.01$, $\eta^2p=0.08$). In contrast, happiness ratings were significantly lower in the patient group ($F(1, 82)=47.40$, $p < 0.001$, $\eta^2p=0.37$).

When positive and negative stimulus sets were examined separately with baseline emotion, order, and menstrual phase included as covariates, no group differences were observed in responses to positive stimuli across the six basic emotions. By contrast, in the negative stimulus set, patients with MDD showed significantly greater reactivity in disgust ($F(1, 81)=11.71$, $p=0.001$, $\eta^2p=0.126$), anger ($F(1, 81)=4.25$, $p < 0.05$, $\eta^2p=0.050$), and fear ($F(1, 81)=14.57$, $p < 0.001$, $\eta^2p=0.152$). Sadness, happiness, and surprise responses to negative stimuli did not differ between groups.

Correlation analyses were conducted separately for patients and controls. After applying the Bonferroni correction, no significant associations

Table 1. Demographic and clinical characteristics of participants

	Patient (n=46)	Control (n=40)	Comparison
Age (Year ± SD) (min-max)	33.46±7.42 (20–50)	33.98±7.89 (20–49)	p=0.755 t=-0.314 df=84
Education (Year ± SD)	11.30±4.73	11.83±5.39	p=0.634 t=-0.477 df=84
Disease Characteristics			
Age of disease onset (Year ± SD) (min-max)	28.98±8.65 (9–48)	-	-
Total Duration of Illness (Weeks ± SD) (min-max)	103.98±141.11 (4–676)	-	-
The mean number of major depressive episodes (± SD) (min-max)	1.67±0.79 (1–4)	-	-
Duration of last episode (Weeks ± SD) (min-max)	77.54±140.25 (3–676)	-	-
Scale Scores			
Beck A (± SD)	26.47±11.81	4.70±4.32	p <0.001 t=11.529 df=56.771
Beck D (± SD)	25.93±8.10	3.90±3.99	p <0.001 t=16.311 df=67.586
ERQ Reappraisal score (± SD)	22.89±6.49	33.25±5.69	p <0.001 t=-7.843 df=82.986
ERQ Suppression score (± SD)	15.98±5.89	14.02±6.59	p=0.156 t=1.433 df=78.816
Ham-D (± SD)	17.63±4.07	-	-

Beck A: Beck anxiety inventory; Beck D: Beck depression inventory; ERQ: emotion regulation questionnaire; Ham-D: Hamilton depression scale; n: number; SD: standart deviation.

were observed in patients between HAM-D, BAI, ERQ-reappraisal, or ERQ-suppression scores and emotional responses to either positive or negative stimuli. In contrast, BDI scores in patients showed significant positive correlations with disgust following positive stimuli (r=0.52, 95% CI [0.27, 0.70], p <0.001) and with anger following negative stimuli (r=0.52, 95% CI [0.26, 0.71], p <0.001). No significant correlations were identified in the control group.

DISCUSSION

In this study, we examined basic emotional responses to standardized positive and negative stimuli in drug-free female patients with MDD compared to healthy controls. Our findings showed that patients with MDD exhibited significantly heightened responses to negative emotions, particularly disgust, anger, and fear, while no significant differences were observed in sadness, happiness, or surprise. Importantly, after controlling for baseline emotional states, patients with major depressive disorder did not differ from healthy controls in their emotional responses to positive stimuli, including happiness, contrary to the emotional attenuation hypothesis (5–7). Correlation analyses further revealed that depressive symptom severity, as measured by the BDI, was associated with stronger reactivity to disgust and anger, highlighting the clinical relevance of specific negative emotions in MDD.

Discussion of Emotion Stimulation Experiment Results

Sadness

Prior studies have reported mixed findings regarding sadness reactivity in depression. Rottenberg et al. (2002) showed that depressed patients interpreted neutral films with greater negative valence and exhibited slightly higher sadness to negative stimuli (17). Dunn et al. (2004) found increased sadness after positive stimuli but no group differences after negative stimuli (18), while Guhn et al. (2019) reported blunted reactivity in persistent depression and heightened negative affect in recurrent cases (19). In a meta-analysis of 19 studies examining positive and negative emotional reactivity in depression, it was reported that depressed patients showed less "negative emotional reactivity" than controls, contrary to the data of previous studies (7). It was reported that the methodology and measurement criteria of the studies included in this meta-analysis were quite different from each other and that the data of a total of 465 depressed patients included in the analysis were heterogeneous in terms of characteristics, medication use, and comorbidity.

In our study, patients had higher mean sadness scores than controls across the experiment, including during neutral and abstract images, which is consistent with previous reports (7,20). However, no significant group differences emerged in sadness reactivity to positive or negative stimuli, even when analyses were repeated by depression severity. One possible explanation is compensatory fronto-limbic activation, particularly in early stages of illness, which may mask group differences. Neuroimaging studies have shown abnormal fronto-limbic activity in depressed patients (21) and altered basal metabolism (22). Frontal hyperactivity has been observed in early-phase patients, while hypoactivity tends to emerge with chronicity (23). These findings suggest that the similarity in sadness responses between groups may

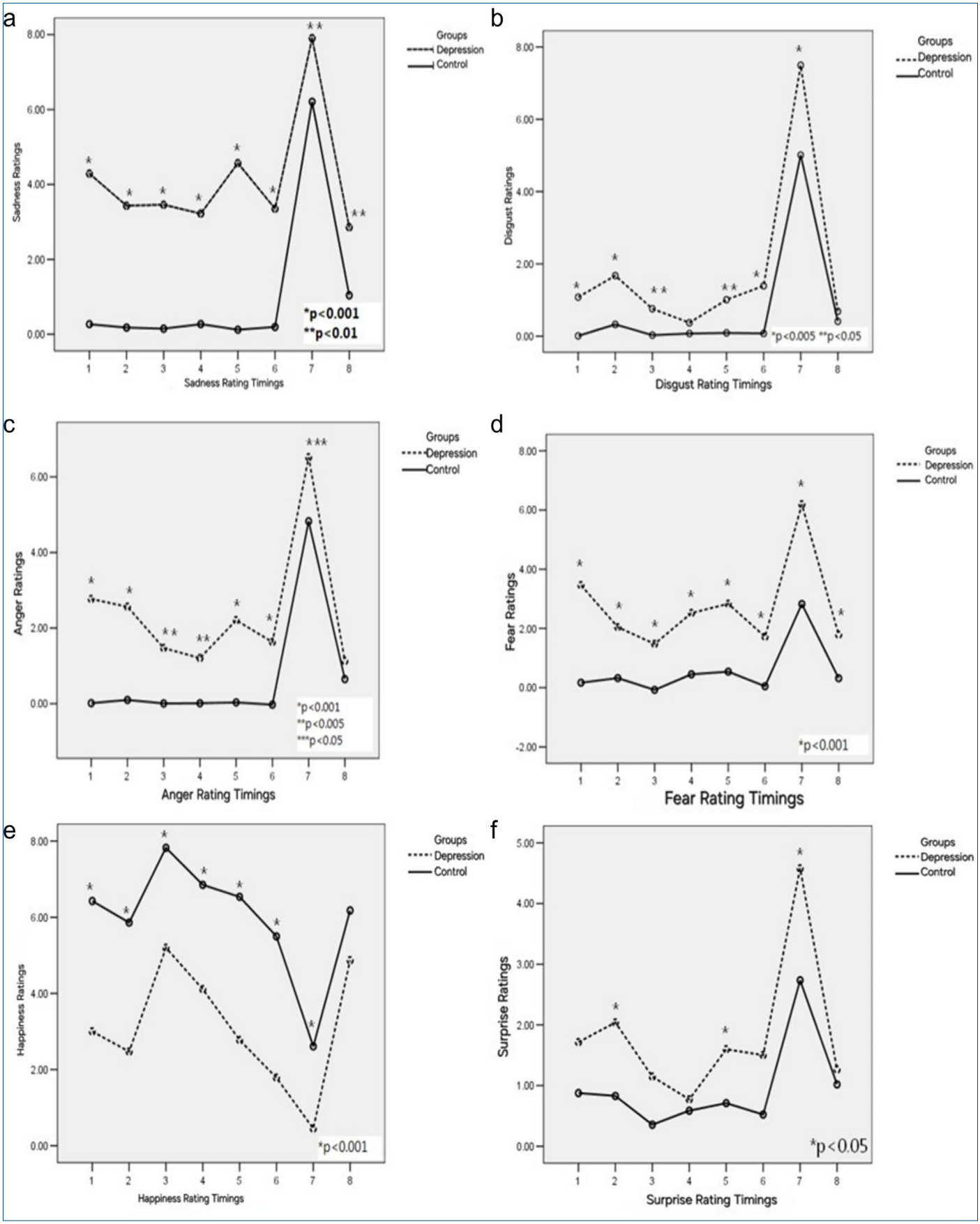

Figure 2. Scores obtained for each emotion throughout the whole experiment: Mean sadness scores during the experiment, MDD showed significantly higher levels of sadness compared to controls (a). Mean disgust scores during the experiment, MDD showed significantly higher levels of disgust compared to controls (b). Mean anger scores during the experiment, MDD showed significantly higher levels of anger compared to controls (c). Mean fear scores during the experiment, MDD showed significantly higher levels of fear compared to controls (d). Mean happiness scores during the experiment, MDD showed significantly lower levels of happiness compared to controls (e). Mean surprise scores during the experiment, MDD showed significantly higher levels of surprise compared to controls (f).

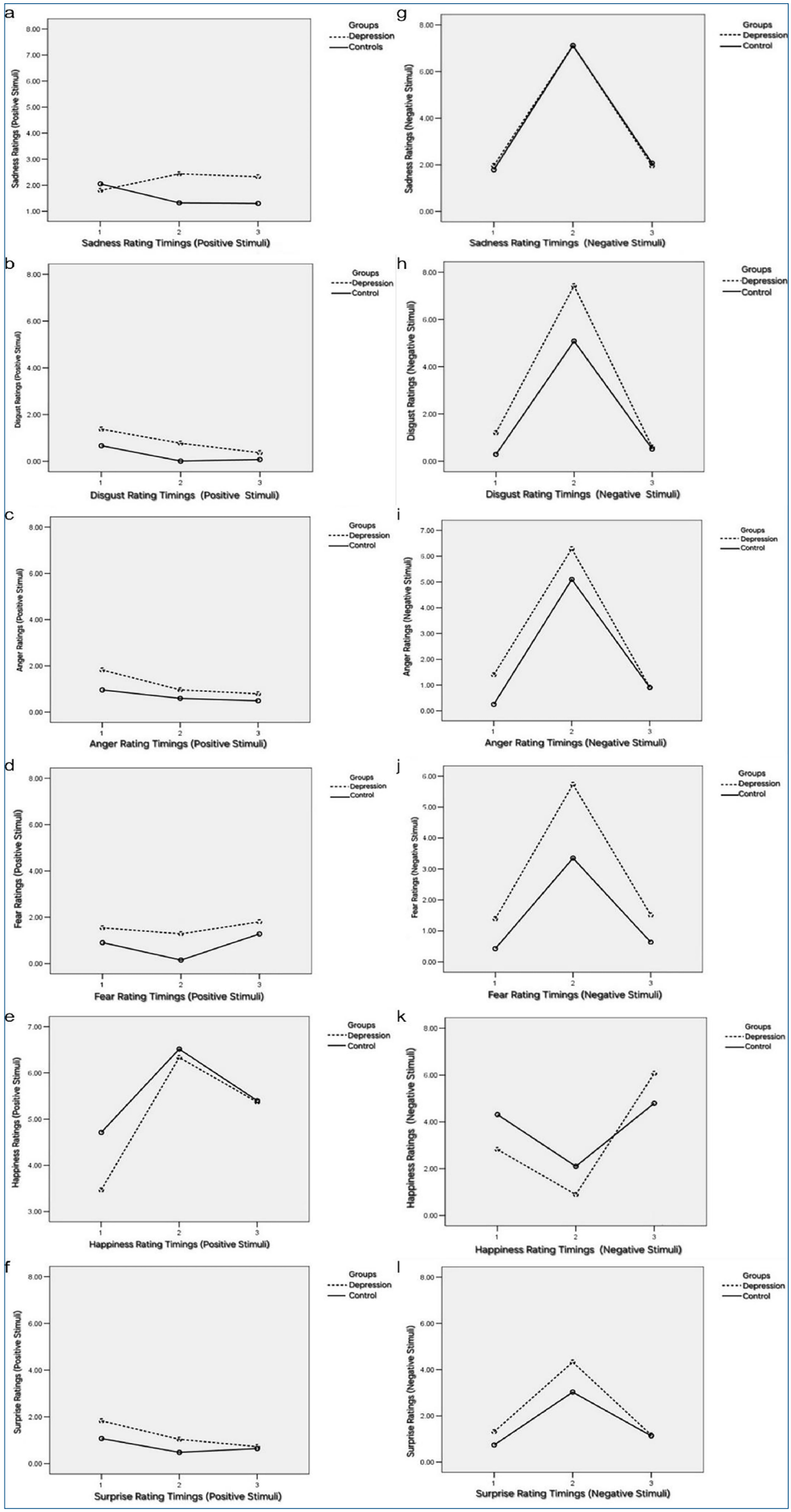

Figure 3. Emotional response reactions to positive and negative stimuli after controlling for baseline emotion, stimulus order, and menstrual cycle phase. In the positive stimulus set, no significant group differences were observed for any of the six basic emotions. In the negative stimulus set, patients with major depressive disorder exhibited significantly higher emotional reactivity in disgust, anger, and fear compared with healthy controls, whereas responses in sadness, happiness, and surprise did not differ between groups [a–f, emotional ratings in response to positive stimuli for sadness (a), disgust (b), anger (c), fear (d), happiness (e), and surprise (f); g–l, emotional ratings in response to negative stimuli for sadness (g), disgust (h), anger (i), fear (j), happiness (k), and surprise (l)]

reflect compensatory mechanisms in early depression and highlight the importance of considering illness duration when interpreting sadness reactivity.

Disgust

Recent evidence suggests that depressive patients display a pronounced attentional bias toward disgust stimuli (24–26). In a self-report study without experimental stimuli, depressed patients have been shown to report elevated levels of disgust (25). Furthermore, Wang et al. (2025) found that depressed individuals showed a significantly stronger attentional blink effect when viewing disgusted faces, meaning that such stimuli capture attention more powerfully and impair subsequent processing (24). Importantly, this blink effect at the 300-ms lag with disgust faces (D3) was a strong predictor of depression severity. Neuroimaging evidence provides further support: Surguladze et al. (2010) demonstrated increased activation in the left insula, left orbitofrontal gyrus, and bilateral inferior temporal gyri when depressed patients viewed disgusted facial expressions, suggesting a processing bias toward disgust in depression (26). In line with these findings, our patients exhibited higher mean disgust ratings than controls across the experiment. Although responses to positive stimuli did not differ significantly, disgust reactivity to negative stimuli was markedly greater in the depression group, consistent with prior studies.

Anger

Historically, depression has been conceptualized as "anger turned inward." Supporting this notion, several studies have reported significant improvements in anger symptoms following antidepressant treatment (27,28). For instance, Besharat et al. (2013) demonstrated that anger in MDD is strongly associated with emotion regulation deficits and anger rumination, suggesting that the way patients manage anger, rather than anger itself, plays a central role in depressive symptomatology (29). More recently, a large-scale meta-analysis Pop et al. (2025) reported that anger is positively associated with maladaptive regulation strategies such as avoidance, suppression, and rumination, while negatively associated with adaptive strategies such as acceptance and cognitive reappraisal (30). These findings underscore the clinical relevance of targeting anger regulation in therapeutic interventions.

Neuroimaging studies also suggest a neural basis: Lee et al. (2007) observed reduced activity in the bilateral inferior and medial orbitofrontal cortex of depressed patients when viewing angry faces compared to controls (31). Given the orbitofrontal cortex's role in modulating subcortical emotion-generating structures, these findings implicate impaired emotion regulation in depression. Behavioral studies further reinforce this perspective. Leyman et al. reported that depressed patients maintained longer attentional focus on angry facial expressions than healthy controls (32), while Ellis et al. (2013) demonstrated heightened anger reactivity in depression (33). Consistent with this literature, our study found that patients with MDD reported higher mean anger scores across the experiment. Although group differences were not observed in responses to positive stimuli, patients exhibited significantly greater anger reactivity to negative stimuli, aligning with our hypothesis and with previous findings of impaired anger regulation in depression (34). Taken together, these results highlight the importance of anger as a specific target for both theoretical models of depression and clinical interventions.

Fear

Fear is one of the most consistently heightened emotions in depression, particularly in response to aversive stimuli (35). Previous behavioral studies have shown that depressed individuals tend to rate fear-eliciting stimuli as more intense and aversive than controls, and this heightened sensitivity has been linked to increased vulnerability to relapse and symptom persistence (7,36–38).

Our findings support this literature. Patients reported higher mean fear scores than controls across the experiment, and their reactivity to negative stimuli was significantly greater. In contrast, fear responses to positive stimuli did not differ between groups, suggesting that this alteration is specific to aversive contexts. These results point to a behavioral bias in fear processing that may contribute to the maintenance of negative affect in depression. Clinically, such exaggerated fear responses could help explain why patients with MDD often experience heightened avoidance and difficulty regulating threat-related emotions.

Happiness

Reduced positive emotional reactivity is a well-documented feature of depression, though findings remain inconsistent across studies. For instance, Sloan et al. (2001) reported that depressed women exhibited diminished responses to pleasant stimuli, suggesting a blunting of positive affect (39). Dunn et al. (2004) similarly found that depressed patients did not show the same increase in happiness ratings after positive pictures as healthy controls (18). However, their sample consisted entirely of medicated patients, many with comorbid anxiety disorders, and baseline affective states were not controlled, which may explain differences from our results. Meta-analytic evidence also supports attenuated responses to positive stimuli in MDD, consistent with the "positive attenuation hypothesis" (7).

In contrast, our study did not detect group differences in happiness responses to positive stimuli once baseline levels were accounted for. These discrepancies from prior work may be attributable to methodological differences, particularly our inclusion of only drug-free patients without comorbidities and the statistical adjustment for baseline emotion (7). Taken together, our findings suggest that while depression is often characterized by reduced positive reactivity, this effect may be less pronounced in unmedicated patients early in the illness course when baseline affective state is carefully controlled.

Surprise

Surprise has received relatively little attention in depression research, yet available studies suggest altered processing. For instance, Kan et al. (2010) found that depressed patients tended to interpret surprise vocal tones more negatively, suggesting a bias toward negative appraisal of ambiguous emotional cues (40). Similarly, research indicates that antidepressant treatment may normalize or even enhance sensitivity to surprise expressions, with one study reporting that patients recognized surprise faces more accurately after pharmacological intervention (41).

In our study, patients with MDD exhibited higher overall surprise ratings than controls across both positive and negative stimulus blocks. However, when baseline surprise levels were statistically controlled, no significant group differences emerged in reactivity to either positive or negative stimuli. This suggests that while depressed patients may generally report elevated surprise, their specific responsiveness to experimental stimuli does not differ from controls once the initial affective state is considered. These results are consistent with the notion that baseline affect and interpretive biases, rather than stimulus-driven reactivity per se, account for differences in surprise processing in MDD.

Strengths and Limitations of the Study

Strengths of the study include the use of a homogeneous, medication-free female sample, which eliminated potential confounds related to

psychotropic treatment and gender-based variability. Furthermore, the application of standardized emotional stimuli (IAPS) and the separate assessment of six basic emotions provided a fine-grained analysis rarely addressed in previous studies. The inclusion of emotion regulation measures further strengthened the interpretability of results. Besides the strengths, this study has several limitations that should be acknowledged. The study relied on self-report measures to assess emotional responses and regulation, which are inherently subjective. Including objective physiological measures like heart rate variability or skin conductance could offer a more objective measure. The exclusive inclusion of female patients, while increasing homogeneity, limits generalizability to male populations. The sample size, though sufficient for the main analyses, was not large enough to examine subgroups such as first-episode versus recurrent patients. Finally, the cross-sectional design precludes causal inferences between depression and emotional dysregulation.

As a result, our study demonstrates that drug-free female patients with MDD show heightened reactivity to specific negative emotions such as disgust, anger, and fear, while responses to sadness, happiness, and surprise remain comparable to healthy controls in terms of negative stimuli. Crucially, emotional responses to positive stimuli were similar after controlling for baseline emotional states, challenging the notion of a global emotional blunting in depression. These results suggest that emotional dysregulation in depression may be emotion-specific rather than global, with important implications for theory and treatment. Future research should investigate the neural underpinnings of these selective abnormalities and explore targeted interventions that address emotion-specific dysregulation in MDD.

Ethics Committee Approval: The study was approved by the Ege University Ethics Committee (number 10-5/6, approval date May 27, 2010), and conformed to the provisions of the Declaration of Helsinki.

Informed Consent: Written and signed informed consent forms were obtained from both patients and control subjects

Peer-review: Externally peer-reviewed.

Author Contributions: Concept- DİH, ASG; Design- ASG, DİH; Supervision- ASG, DİH; Resource- ASG; Materials- DİH; Data Collection and/or Processing- DİH, İS, ASG; Analysis and/or Interpretation- DİH, İS, ASG; Literature Search- DİH, İS, ASG; Writing- DİH, İS, ASG; Critical Reviews- DİH, İS, ASG.

Conflict of Interest: The authors declared that there is no conflict of interest.

Financial Disclosure: The authors did not receive any specific funding for this work.

REFERENCES

1. Association AP. Diagnostic and Statistical Manual of Mental Disorders. Vol. 21, American Psychiatric Association; 2013. [Crossref]
2. Ekman P. An argument for basic emotions. Cogn Emot. 1992;6:169–200. [Crossref]
3. Gross JJ. Emotion regulation: current status and future prospects. Psychol Inq. 2015;26:1–26. [Crossref]
4. Damasio A. Fundamental feelings. Nature. 2001;413:781. [Crossref]
5. Rottenberg J, Gross JJ, Gotlib IH. Emotion context insensitivity in major depressive disorder. J Abnorm Psychol. 2005;114:627–639. [Crossref]
6. Bylsma LM. Emotion context insensitivity in depression: toward an integrated and contextualized approach. Psychophysiology. 2021;58:e13715. [Crossref]
7. Bylsma LM, Morris BH, Rottenberg J. A meta-analysis of emotional reactivity in major depressive disorder. Clin Psychol Rev. 2008;28:676–691. [Crossref]
8. Dalili MN, Penton-Voak IS, Harmer CJ, Munafò MR. Meta-analysis of emotion recognition deficits in major depressive disorder. Psychol Med. 2015;45:1135–1144. [Crossref]
9. Demenescu LR, Kortekaas R, den Boer JA, Aleman A. Impaired attribution of emotion to facial expressions in anxiety and major depression. PLoS One. 2010;5:e15058. [Crossref]
10. Deng Y, Chang L, Yang M, Huo M, Zhou R. Gender differences in emotional response: inconsistency between experience and expressivity. PLoS One. 2016;11:e0158666. [Crossref]
11. Akdemir A, Türkçapar MH, Örsel SD, Demirergi N, Dag I, Özbay MH. Reliability and validity of the Turkish version of the Hamilton Depression Rating Scale. Compr Psychiatry. 2001;42:161–165. [Crossref]
12. Nesrin Hisli Sahin. Beck Depresyon Envanteri'nin üniversite öğrencileri için geçerliliği ve güvenilirliği. Psikoloji Derg. 1989;7:3–13.
13. Ulusoy M, Sahin NH, Erkmen H. Turkish version of the Beck Anxiety Inventory: Psychometric properties. J Behav Cogn Ther. 1998;12:163–172.
14. Yurtsever G. Emotional regulation strategies and negotiation. Psychol Rep. 2004;95:780–786. [Crossref]
15. Branco D, Gonçalves ÓF, Badia SBI. A systematic review of international affective picture system (IAPS) around the world. Sensors (Basel). 2023;23:3866. [Crossref]
16. Libkuman TM, Otani H, Kern R, Viger SG, Novak N. Multidimensional normative ratings for the international affective picture system. Behav Res Methods. 2007;39:326–334. [Crossref]
17. Rottenberg J, Kasch KL, Gross JJ, Gotlib IH. Sadness and amusement reactivity differentially predict concurrent and prospective functioning in major depressive disorder. Emotion. 2002;2:135–146. [Crossref]
18. Dunn BD, Dalgleish T, Lawrence AD, Cusack R, Ogilvie AD. Categorical and dimensional reports of experienced affect to emotion-inducing pictures in depression. J Abnorm Psychol. 2004;113:654–660. [Crossref]
19. Guhn A, Steinacher B, Merkl A, Sterzer P, Köhler S. Negative mood induction: affective reactivity in recurrent, but not persistent depression. PLoS One. 2019;14:e0208616. [Crossref]
20. Joormann J, Gotlib IH. Is this happiness I see? Biases in the identification of emotional facial expressions in depression and social phobia. J Abnorm Psychol. 2006;115:705–714. [Crossref]
21. Quevedo K, Teoh JY, Engstrom M, Wedan R, Santana-Gonzalez C, Zewde B, et al. Amygdala circuitry during neurofeedback training and symptoms' change in adolescents with varying depression. Front Behav Neurosci. 2020;14:110. [Crossref]
22. Ernst J, Hock A, Henning A, Seifritz E, Boeker H, Grimm S. Increased pregenual anterior cingulate glucose and lactate concentrations in major depressive disorder. Mol Psychiatry. 2017;22:113–119. [Crossref]
23. Mayberg HS. Limbic-cortical dysregulation: a proposed model of depression. J Neuropsychiatry Clin Neurosci. 1997;9:471–481. [Crossref]
24. Wang Y, Wang Q, Chen L, Dong X, Xu T. Disgust-induced attentional blink at Lag3: a diagnostic and therapeutic approach to depression. Front Psychiatry. 2025;16:1569746. [Crossref]
25. Schienle A, Schäfer A, Stark R, Walter B, Franz M, Vaitl D. Disgust sensitivity in psychiatric disorders: a questionnaire study. J Nerv Ment Dis. 2003;191:831–834. [Crossref]
26. Surguladze SA, El-Hage W, Dalgleish T, Radua J, Gohier B, Phillips ML. Depression is associated with increased sensitivity to signals of disgust: a functional magnetic resonance imaging study. J Psychiatr Res. 2010;44:894–902. [Crossref]
27. Luutonen S. Anger and depression –theoretical and clinical considerations. Nord J Psychiatry. 2007;61:246–251. [Crossref]
28. Busch FN. Anger and depression. Adv Psychiatr Treat. 2009;15:271–278. [Crossref]
29. Besharat MA, Nia ME, Farahani H. Anger and major depressive disorder: the mediating role of emotion regulation and anger rumination. Asian J Psychiatr. 2013;6:35–41. [Crossref]
30. Pop GV, Nechita D-M, Miu AC, Szentágotai-Tătar A. Anger and emotion regulation strategies: a meta-analysis. Sci Rep. 2025;15:6931. [Crossref]
31. Lee B-T, Seok J-H, Lee B-C, Cho SW, Yoon B-J, Lee K-U, et al. Neural correlates of affective processing in response to sad and angry facial stimuli in patients with major depressive disorder. Prog Neuropsychopharmacol Biol Psychiatry. 2008;32:778–785. [Crossref]
32. Leyman L, De Raedt R, Schacht R, Koster EHW. Attentional biases for angry faces in unipolar depression. Psychol Med. 2007;37:393–402. [Crossref]
33. Ellis AJ, Vanderlind WM, Beevers CG. Enhanced anger reactivity and reduced distress tolerance in major depressive disorder. Cognit Ther Res. 2013;37:498–509. [Crossref]
34. Daniel SS, Goldston DB, Erkanli A, Franklin JC, Mayfield AM. Trait anger, anger expression, and suicide attempts among adolescents and young adults: a prospective study. J Clin Child Adolesc Psychol. 2009;38:661–671.
35. Gross CT, Canteras NS. The many paths to fear. Nat Rev Neurosci. 2012;13:651–658. [Crossref]

36. Werner-Seidler A, Banks R, Dunn BD, Moulds ML. An investigation of the relationship between positive affect regulation and depression. Behav Res Ther. 2013;51:46–56. [Crossref]
37. Beblo T, Fernando S, Klocke S, Griepenstroh J, Aschenbrenner S, Driessen M. Increased suppression of negative and positive emotions in major depression. J Affect Disord. 2012;141:474–479. [Crossref]
38. Joormann J, Vanderlind WM. Emotion regulation in depression: the role of biased cognition and reduced cognitive control. Clin Psychol Sci. 2014;2:402–421. [Crossref]
39. Sloan DM, Strauss ME, Wisner KL. Diminished response to pleasant stimuli by depressed women. J Abnorm Psychol. 2001;110:488–493. [Crossref]
40. Kan Y, Mimura M, Kamijimo K, Kawamura M. Recognition of emotion from moving facial and prosodic stimuli in depressed patients. J Neurol Neurosurg Psychiatry. 2004;75:1667–1671. [Crossref]
41. Tranter R, Bell D, Gutting P, Harmer C, Healy D, Anderson IM. The effect of serotonergic and noradrenergic antidepressants on face emotion processing in depressed patients. J Affect Disord. 2009;118:87–93. [Crossref]