Biased Emotional Preferences in Depression: Decreased Liking of Angry and Energetic Music by Depressed Patients

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Abstract

Depression is a highly prevalent mood disorder, which has been associated with low levels of energetic arousal, delays in approach and avoidance processes, and problems expressing and regulating negative emotions such as anger. We designed a novel experiment to test the hypothesis that depressed patients' preferences for emotional stimuli also demonstrate this tendency. To investigate how depressed patients differ in their preferences for music excerpts, both healthy (n = 30) and depressed (n = 79) participants were presented with 2 sets of 30 musical excerpts that represented the basic emotions (anger, sadness, and happiness), as well as different points on the 2-dimensional model of emotions (valence and energetic arousal). Depressed patients were found to dislike music that was highly energetic, arousing, or angry, which is assumed to be related to their problems with emotion regulation. The present study has practical implications for the use of music and music therapy in the treatment of depression.

Introduction

Depression is a widespread mood disorder, which has been linked to avoidance behavior[1-3] and underactivation of the approach system.[4] It has been proposed that avoidance behavior[5,6] or inadequate progressing of approach and avoidance processes lead to depression and anxiety disorders.[7] The motivation behind approach and avoidance is thought to differ in terms of valence and preference.[8] In approach motivation, behavior is instigated or driven by a positive or desirable event or possibility, whereas in avoidance motivation, behavior is instigated or driven by a negative or undesirable event or possibility.[8] According to Carver,[4] both approach and avoidance behavior can lead to positive feelings when doing well and to negative feelings when doing poorly. This implies that when the approach process is working poorly, it induces sadness and depression, and when the avoidance process is working poorly, it leads to fear and anxiety.[4]

Previous studies have shown that emotion recognition and preferences for certain emotions may reflect one's current mood and personality.[9] Could problems in approach and avoidance processes also be observed in depressed patients' preferences for emotional stimuli? This could be the case, because liking and disliking are affective reactions to perceived stimuli, and clearly involve and activate the approach and avoidance systems as well.[10]

If we take the common dimensional model of emotions,[11,12] systematic biases in preferences can be found for musical stimuli selected from quadrants of the affective space, which illustrate the processes of avoidance and approach. For instance, we could expect that depressed and nondepressed participants differ in their preference for stimuli that are highly energetic and highly negatively or positively valenced. Based on the knowledge that sufferers of depression show an underactivation of the approach system (generally related to positive emotions), and a dominance of the avoidance system, we would expect depressed patients to show less of a preference for highly negatively and highly positively valenced stimuli, when compared to nondepressed controls. As regards preference for energy or arousal, approach motivation and behavior require intense energy and depressed patients suffer from a lack of energy (see eg, Beck Depression Inventory)[13,14] as well as problems with energy management.[15] Therefore, it is logical to assume depressed

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patients and the control group will differ in their preferences for stimuli, which represent high energetic arousal. Indirect support for this notion can be found in studies that examine the correlation between music preferences and personality; for example, energetic and rhythmic music is positively related to such personality traits as extroversion and agreeableness.[9,16] In other words, individuals who enjoy energetic and rhythmic music tend to be talkative and full of energy, the particular qualities typically missing in an emotional state of depression.

Approach and avoidance motivation and behavior have been linked to a person's strategies of emotional self-regulation,[17] while depression has been defined as a disorder where the regulation of emotion is impaired.[18] Depression has been especially related to the problems expressing and regulating negative emotions like anger. According to the early psychoanalytic theories, depression was caused by the suppression of anger, and a turning of those feelings against the self.[19] There are several studies that have documented the problems regarding the regulation of negative emotions by depressed patients. They have shown that such patients tend to resort to frequent use of such strategies as expressive suppression, thought suppression, rumination, and catastrophizing; while at the same time, they are less likely to use strategies such as reappraisal and self-disclosure. They go on to show that this is directly related to the degree of depression and anxiety symptoms exhibited.[18,20-22] Depressed patients' tendency to suppress anger has been shown in many studies. Riley and his colleagues found that depressed patients suppressed their anger more often than either participants from the posttraumatic stress disorder group, or the normal group. Furthermore, the more severely depressed patients showed higher levels of hostility and anger than the less depressed patients.[23] In another study, depressed patients scored significantly higher than nondepressed controls on self-report measures of anger and anger suppression regardless of whether the target of anger was the spouse or other people.[24] There is also evidence that people who have recovered from a major depression still have problems in expressing anger;[25] and another study found that depression can be predicted in terms of self-blame, rumination, catastrophizing, acceptance, and low positive reappraisal by using the cognitive emotion regulation questionnaire.[26] Although negative emotions have been generally thought to be avoidance-oriented and positive emotions to be approach-oriented, anger seems to be an exception. Both dispositional anger[27] and felt anger[28] have been associated with left lateralized encephalogram (EEG) arousal, which indicate that the hemispheric asymmetries are in part due to behavioral motivation and that anger is associated with an approach orientation.[27,28] Correspondingly, anger has also been associated with a dominance of the Behavioral Activation System over the Behavioral Inhibition System.[29] For all these above-mentioned reasons, it could be assumed that preferences for angry musical stimuli would be lower for depressed patients than nondepressed controls.

Aims

The aim of the present study is to investigate how a depressed patients' emotional state and problems in approach and avoidance motivation affect their preference ratings of short 15 seconds music excerpts representing different points in the affective space described by 2 extremes of affect dimensions (valence and energetic arousal), as well as 3 basic emotions (anger, sadness, and happiness). Our hypotheses are that depressed patients' preference ratings are significantly lower than those of nondepressed controls, for music excerpts expressing (1) high negative and positive valence, (2) high energetic arousal, and (3) anger. As a control for the high energy excerpts, we look at low energy excerpts in which we do not expect to observe any difference between the groups. As a control for the anger examples, we look at ratings for stimuli that exhibit a negative emotion related to avoidance behavior (sadness) and on a positive emotion related to approach behavior (happiness). For these emotions, we do not predict any difference between the groups.

Methods

Selection of Participants

This experiment belongs to an RCT research project about improvisational music therapy on the treatment of depression,[30] approved by the ethical board of the Central Finland Health Care District. Participants with depression were recruited from the Central Finland Health Care District's psychiatric health-centers and the psychiatric polyclinics of Jyväskylä city. Healthy controls were recruited via advertisements. All participants were asked to sign declarations of informed consent before they entered the study.

Depression and Control Group

Seventy-nine patients (62 women and 17 men) with depression, aged 18 to 50 years (M = 35.7, SD = 9.8), formed the depression group. The patients' primary diagnosis was depression, as assessed by a clinical expert (F32 or F33 according to *International Classifications of Revision, Tenth Revision* [ICD-10]). Because of the frequent comorbidity of depression and anxiety,[31,32] patients with anxiety were also included (80% of them were diagnosed as suffering from mild, moderate, or severe anxiety). Neither musical skills nor any kind of musical background were a prerequisite for participation, and yet nor did they prevent it.

The control group consisted of 30 participants, approximately matched for age and background with the depression group (22 women and 8 men, mean age 33.8, SD = 9.3). None of the participants in the control group were diagnosed with depression or anxiety.

Self-Report Assessment of Liking of Music

An evaluation of music preferences was carried out only after the psychiatric tests that determined a participant's inclusion in the study. In this behavioral experiment, participants listened to 2 sets of 30 music excerpts (each 15 seconds long), that came from a previous study by Eerola and Vuoskoski.[33] These examples represented unfamiliar excerpts from film soundtracks,
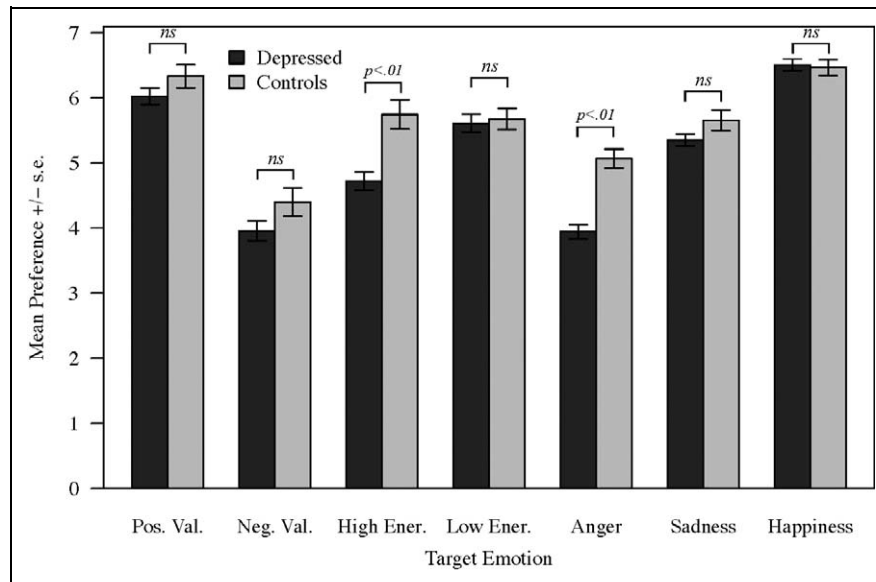
Figure 1. Mean preference ratings of music examples representing different emotion dimensions (positive and negative valence and high and low energetic arousal) and basic emotions (anger, happiness, and sadness) for depressed patients and nondepressed controls.

selected and evaluated initially by an expert panel (12 expert musicologists consisting of staff members and 3rd to 5th year university students who had all studied a musical instrument for 10 years or more) using a large pool of excerpts (360), and further validated with a larger, nonclinical population (116 university students aged 18-42 years with no particular musical training), with a smaller but still considerable stimulus set (110 excerpts). Emotions represented by the examples covered basic emotions and the 3-dimensional emotion model by Schimmack and Grob,[34] which is a variant of the common 2-dimensional models suggested by Russell[11] and Thayer.[12] The three-dimensional model was portrayed by Set 1, which contained 30 excerpts representing 3 affect dimensions: valence, energy arousal, and tension arousal. The 10 excerpts for each emotion dimension consisted of 3 examples from each extreme of the dimension (6 altogether), and the remaining 4 examples were chosen from the middle of the dimensional scales. The extremes, and hence also middle regions, of the dimensions were defined by percentiles (<30% or >70%) taken from the previous rating study.[33] For the purposes of this study, we were specifically interested in the extreme examples of the dimensions. Also, due to previous findings related to depression, we omit tension from the present study and focus instead on the remaining 2 dimensions: valence and energy arousal. Basic emotions were presented by Set 2, which also contained 30 excerpts in total, 6 from 5 basic emotion categories (anger, happiness, sadness, fear, and tenderness). These excerpts were also defined by the same earlier rating study,[33] with the categories of fear and tenderness being ignored in the current study so as to provide unequivocal answers to the particular hypotheses motivated by the background literature. Participants rated the amount they liked each excerpt individually and in a randomized order, using a 9-point Likert scale, and using a computer interface and headphones. Procedures for both groups were identical.

Results

To explore the difference in preferences between the clinical and control groups for the examples representing each of the different target emotions, separate mixed-effects ANOVA analyses were carried out. For the hypotheses concerning the dimensional models, the target emotion was the within-participants factor consisting of 3 replicates (excerpts representing each particular extreme of the dimension), and the group (clinical or control) was the between-participants factor. Finally, the preference ratings constituted the dependent variable.

Starting with the first hypothesis, whether the preference ratings for highly positively and negatively valenced excerpts differ between groups, the comparisons in both accounts did not reach statistical significance. For the excerpts representing a high positive valence, groups did not differ in preference, $F(1,29) = 0.77$, $P = .38$, and similar results were obtained for examples representing high negative valence, $F(1,29) = 1.37$, $p = .25$. However, the presumed trend was apparent in both cases (see Figure 1), in which the clinical group exhibited lower preference ratings for excerpts with both a high positive valence and high negative valence, in comparison with the controls. The second hypothesis, whether the high energy examples would be less preferred by the clinical group, was supported by the analysis, $F(1,29) = 10.97$, $\eta^2 = .27$, $p<.01$. As can be seen in Figure 1, the ratings of the clinical group were significantly lower in comparison with the controls. For the low energetic arousal examples, no differences were obtained ($F = 0.09$, $P = .76$), again, consistent with our hypothesis.

Let us turn now to the ratings for examples of the basic emotions in the Stimulus Set 2. The third hypothesis was that the depression group's preference ratings for anger examples would be lower than the control group's. This was supported

by the mixed ANOVA results, $F(1,29) = 8.35$, $\eta^2 = .22$, $P < .01$, since the clinical group's mean ratings of preference for the anger examples was clearly lower than the control's mean (see Figure 1). To verify that this finding did not apply to just any negative emotion, preference for sadness was also subjected to the same analysis, but no significant differences emerged between the groups ($F = .61$, $P = .41$). The same analysis was then done to the preference ratings of both groups for happy examples. This analysis also resulted in nonsignificant differences between the groups ($F = .03$, $P = .87$), thus supporting the notion that anger plays a special role in depression, as it was the only basic emotion in which the depressed group differed significantly from the control.

In sum, the patients suffering from clinical depression did prefer various emotional stimuli in a different manner when compared with a control group. These differences concerned mainly a dislike for highly energetic and angry emotional excerpts, as had been predicted from the previous results on depression and the approach-avoidance mechanism in general. However, not all the predicted differences were verified by the experiment. Preferences for highly positive and highly negative valenced examples did not show the presumed differences, might be due to an inadequate sample size for such a subtle effect.

Discussion

Preference ratings seem to raise valuable new information about depression. The reason might be that they are based on affective reactions and they occur without extensive perceptual and cognitive encoding, and those are made faster and with greater confidence than cognitive judgments.[10]

The main result of this study showed that depressed patients' preference ratings differed when it came to the target emotion of energy (in terms of the dimensional model of emotions in music) and anger (in terms of the basic emotion model). Depressed patients gave significantly lower preference ratings than the controls for examples of music, which were high in energetic arousal. In low energy examples, no differences between groups emerged. Both these findings were consistent with the hypothesis. However, although the ratings of depressed patients were lower than the nondepressed at both ends of the valence dimension, no significant difference between the groups was observed, which did not support the proposed hypotheses.

Why might depressed patients dislike music with high energetic arousal? One symptom of depression is a lack of energy (see eg, Beck Depression Inventory),[14] which has been related to problems of energy management in depression.[15] A dysfunction in optimal energy management (homeostasis) has been linked to hypoactivation in the left frontal and hyperactivation in the right frontal lobes of depressed patients.[1-3,5] Left forebrain activity has been associated with physical and mental energy enrichment,[15] and correlates with social engagement,[36,37] whereas right forebrain activity has been associated with physical and mental energy expenditure,[15] and correlates with depression.[38] In the current study, we used music examples that exhibited high energetic arousal, but which were neutral concerning valence and tension. In other words, it is the high level of energy in particular that depressed patients disliked. High energetic arousal has been associated to approach motivation and behavior.[12] In depression, this system is impaired,[4] and depressed patients suffer from a loss of physical and mental energy. Therefore, it is understandable that depressed patients might not prefer stimuli with a high energetic arousal, because it is the opposite to their own physical and mental state and challenges their dysfunctional energy management system.

The depressed patients' dislike of anger examples is probably related to their general problems in dealing with anger.[23,24] As previously mentioned, this is manifested in such emotion regulation strategies as expressive suppression, thought suppression, rumination, and catastrophizing.[18] In terms of avoidance and approach systems, anger is a negative emotion associated with the approach motivation.[39] Earlier findings suggest that clinical depression relates to low engagement of the approach system,[1-4] and this is confirmed in the present study by the depressed patients' dislike of anger examples. Sadness is also a negative emotion, but it is associated with an avoidance motivation; and happiness is also associated with an approach motivation, but it is a positive emotion. Interestingly, sadness and happiness did not reveal significant differences in preference ratings between depressed and nondepressed participants, even though the depressed patients gave slightly lower ratings for sadness examples than the controls. Based on these results, it could be argued that negative emotion with approach motivation such as anger is something that depressed patients particularly dislike.

It is also important to mention that valence in music stimuli expressing sadness is often evaluated more positively than valence in anger examples.[33] Moreover, because avoidance motivation and behavior is operating at an approximately normal level in depression,[1-3] it is logical that the liking ratings for sadness examples did not reveal any major difference between groups. Why is it then, that the happiness examples with high energetic arousal and approach motivation did not reveal any difference between groups, even though the high energy examples did so? Perhaps the reason lies in the high positive valence of the happiness examples, which differed from the high energetic arousal examples, where valence was neutral. Another reason could be that the dimensional models of emotion do not reveal this phenomenon as clearly as the basic emotion model, or perhaps the musical examples themselves contain other, uncontrolled properties (associations, textures, or timbral characteristics).

In future research, it would be intriguing to study the role of depression and anxiety separately concerning the preferences for emotional music stimuli. In the present study, most of the depressed patients (80%) also suffered from comorbid anxiety (mild, moderate or severe). According to Higgins,[40,41] even though there is a strong correlation between sadness and anxiety, feelings of depression are uniquely related to the approach process, whereas feelings of anxiety are uniquely related to the avoidance process. Also, the findings concerning biased emotional preferences in depression should be explored in other domains of emotion stimuli such as faces or affective pictures.

Music is a powerful mood inducer,[42,43] and there is evidence that it improves depressed patients' clinical state and mood,[44-46]

and even attenuates frontal EEG asymmetry in depressed adolescents.[47] Our findings concerning depressed patients' dislike of examples that manifest high energetic arousal and anger could be used systematically in music therapy practice. In music therapy, depressed patients could learn safe ways to express their suppressed emotions of anger through musical expression, which could disinhibit suppression, and release energy from the avoidance system into the approach system. This would gradually help the depressed patients to learn to use more beneficial emotion regulation strategies such as reappraisal and self-disclosure.

Appendix

Table A1. List of Audio Tracks Representing Dimensional Model of Emotions (Set 1)

Nro[a]	Target Emotion	Album Name	Track	Min:Sec
026	Valence (positive)	The Omen	9	00:00-00:24
053	Valence (positive)	Gladiator	17	00:14-00:27
055	Valence (positive)	Dances with Wolves	10	00:28-00:46
040	Valence (neutral)	The English Patient	7	00:00-00:31
056	Valence (neutral)	Man of Galilee CD1	2	00:19-00:42
063	Valence (neutral)	Batman	9	00:57-01:16
100	Valence (neutral)	Cape Fear	2	01:25-01:40
092	Valence (negative)	The Fifth Element	13	00:17-00:31
067	Valence (negative)	Lethal Weapon 3	7	00:00-00:16
068	Valence (negative)	Road to Perdition	6	00:34-00:49
072	Energetic arousal (high)	Man of Galilee CD1	2	03:02-03:18
073	Energetic arousal (high)	Shine	5	02:00-02:16
074	Energetic arousal (high)	Shine	15	01:00-01:19
034	Energetic arousal (medium)	Big Fish	15	00:55-01:11
077	Energetic arousal (medium)	Lethal Weapon 3	4	01:40-02:00
080	Energetic arousal (medium)	Oliver Twist	7	01:30-01:46
085	Energetic arousal (medium)	Oliver Twist	6	00:51-01:07
038	Energetic arousal (low)	Dracula	7	00:00-00:12
033	Energetic arousal (low)	The Portrait of a Lady	9	00:00-00:22
087	Energetic arousal (low)	Road to Perdition	16	00:17-00:32
004	Tension arousal (high)	Cape Fear	1	02:15-02:30
008	Tension arousal (high)	Man of Galilee CD1	6	00:40-01:07
017	Tension arousal (high)	The Untouchables	8	01:38-01:53
052	Tension arousal (medium)	Blanc	12	00:51-01:06
079	Tension arousal (medium)	Batman	4	02:31-02:51
096	Tension arousal (medium)	The Missing	3	02:45-03:06
097	Tension arousal (medium)	Shallow Grave	4	01:04-01:19
101	Tension arousal (low)	Juha	2	02:11-02:26
107	Tension arousal (low)	The Godfather	5	01:12-01:28
110	Tension arousal (low)	Big Fish	8	00:12-00:34

[a]Numbers refer to list of stimuli in Eerola & Vuoskoski,[33] in which the stimuli and the emotions ratings are available at https://www.jyu.fi/music/coe/materials/emotion/soundtracks/

Table A2. List of Audio Tracks Representing Basic Emotions (Set 2)

Nro[a]	Target Emotion	Album Name	Track	Min:Sec
001	Anger	Lethal Weapon 3	8	04:15-04:29
002	Anger	The Rainmaker	7	01:45-02:00
003	Anger	The Alien Trilogy	9	00:03-00:18
005	Anger	The Fifth Element	19	00:00-00:20
018	Anger	The Fifth Element	17	00:00-00:19
069	Anger	Hellraiser	5	00:00-00:15
031	Sad	The English Patient	18	00:07-00:32
081	Sad	Juha	16	00:00-00:15
084	Sad	Blanc	18	00:00-00:16
086	Sad	Running Scared	15	02:06-02:27
088	Sad	Blanc	10	00:13-00:31
109	Sad	Pride & Prejudice	13	01:02-01:20
021	Happy	The Rainmaker	3	02:55-03:13
022	Happy	Batman	18	00:55-01:15
023	Happy	Shallow Grave	6	02:02-02:17
071	Happy	The Untouchables	6	01:50-02:05
075	Happy	Batman	18	00:55-01:15
105	Happy	Pride & Prejudice	4	00:10-00:29
011	Fear	Batman Returns	5	00:09-00:25
013	Fear	JFK	8	00:08-00:25
014	Fear	The Alien Trilogy	5	00:26-00:41
015	Fear	Hannibal	1	00:40-00:54
017	Fear	The Untouchables	8	01:38-01:53
070	Fear	Grizzly Man	16	01:05-01:32
028	Tender	Grizzly Man	1	00:00-00:27
041	Tender	Shine	10	01:28-01:48
042	Tender	Pride & Prejudice	1	00:10-00:26
043	Tender	Dances with Wolves	4	01:31-01:48
044	Tender	Pride & Prejudice	12	00:01-00:15
106	Tender	Lethal Weapon 3	10	01:59-02:17

[a]Numbers refer to list of stimuli in Eerola & Vuoskoski,[33] in which the stimuli and the emotions ratings are available at https://www.jyu.fi/music/coe/materials/emotion/soundtracks/

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