American Psychological Association

Emotion

1528-3542/19/$12.00 http://dx.doi.org/10.1037/emo0000573

Why Do Depressed People Prefer Sad Music?

Sunkyung Yoon, Edelyn Verona, Robert Schlauch, Sandra Schneider, and Jonathan Rottenberg
University of South Florida

One of the cardinal symptoms of major depressive disorder (MDD) is persistent sadness. Do people with MDD actually prefer sad stimuli, potentially perpetuating their depression? Millgram, Joormann, Huppert, and Tamir (2015) observed such preferences and interpreted them as reflecting a maladaptive emotion regulatory goal to upregulate sad feelings. We assessed emotional music choice among both those with MDD and healthy controls (HC), and assessed the reasons for music preferences in these two groups. Seventy-six female participants (38 per group) completed two tasks: (1) Millgram et al.'s (2015) music task wherein participants listened to happy, neutral, and sad music excerpts and chose the one they wanted to listen to most, and (2) a novel Emotional Music Selection Task (EMST) wherein participants chose preferred music clips, varying in emotion and energy level, in paired-choice trials. In the replication music task, MDD people were more likely to choose sad music. However, inconsistent with any motivation to upregulate sadness, people with MDD reported that they chose sad music because it was low in energy levels (e.g., relaxing). EMST results revealed that MDD people had a stronger preference for both low energy and sad music, relative to HC. The strong appeal of sad music to people with MDD may be related to its calming effects rather than any desire to increase or maintain sad feelings.

Keywords: major depressive disorder, emotion, cognition, depression, music

Major depressive disorder (MDD) has been called a disorder of emotion regulation (e.g., Gross & Muñoz, 1995), but only recently has research begun to clarify how emotion regulation is problematic. One key emotion regulatory process that may be relevant to MDD is stimulus preference. In daily life, people choose to engage with some emotional stimuli and disengage from others. For instance, we might turn on "Les Misérables" to augment feelings of sadness, or watch a comedy show to maintain positive feelings. Alternatively, we might listen to relaxing music to help calm ourselves down. Thus, a person's pattern of emotional stimulus choices may reflect regulation strategies that alter what we feel or how intensely we feel it (Barrett, 1998; Gross, 1998).

Major depressive disorder (MDD) is a mood condition characterized by overwhelming sadness as a cardinal feature. Could this prevailing mood reflect that people with MDD are prone to select sad stimuli from their environment? In comparing patterns of emotional stimulus selection between individuals with MDD and healthy controls (HC), Millgram, Joormann, Huppert, and Tamir (2015) obtained strong findings that depressed individuals, unlike their nondepressed counterparts, exhibited a preference to watch sad images and to listen to sad music passages. The researchers interpreted their results as suggesting that people with MDD prefer sad stimuli because they wish to upregulate their experience of sadness.

Millgram et al.'s (2015) study was important as an early investigation of emotional stimulus choices in depression, and the authors' interpretation of depressed people's preference for sad material is provocative. That said, this interpretation should be examined more closely for several reasons. First, the view that depressed individuals select sad-mood-inducing activities because they want to feel sad carries with it an implication that depressed individuals are in some sense to blame for their sad state. Of course, it is possible that depressed people do indeed have self-defeating emotion regulatory goals. However, given its potentially pejorative implication, it is important both to replicate the finding of a preference for sad material, and test its interpretation.

Second, some clinical and research evidence runs counter to the idea that depressed people prefer sad feeling states. Clinicians, for example, frequently observe that depressed individuals express outward distress over their feeling state and go to great lengths to curtail their unpleasant emotions. Research findings also indicate that depressed people tend to hold negative attitudes toward negative emotional states (Beblo et al., 2012; Brockmeyer et al., 2012; Slee, Garnefski, Spinhoven, & Arensman, 2008). For instance, depressed individuals report greater attempts to avoid negative-emotion-evoking thoughts or avoid unpleasant situations (Ottenbreit & Dobson, 2004) relative to control subjects, and also report feeling nervous or have a greater fear of losing control when experiencing both negative and intense positive emotions (Hughes, Gunthert, Wenze, & German, 2015; Stapinski, Abbott, & Rapee, 2010; Werner-Seidler, Banks, Dunn, & Moulds, 2013). Although preference for emotion and preference for emotional stimuli are not identical, they should ordinarily be linked (i.e., usually people

Sunkyung Yoon, Edelyn Verona, Robert Schlauch, Sandra Schneider, and Jonathan Rottenberg, Department of Psychology, University of South Florida.

Correspondence concerning this article should be addressed to Jonathan Rottenberg, Department of Psychology, University of South Florida, 4202 East Fowler Avenue, PCD4118G, Tampa, FL 33620. E-mail: rottenberg@usf.edu

would avoid engaging with the negative emotional stimuli that induce the states they most want to avoid). Given these findings, it is conceivable that depressed people would avoid emotional stimuli that ultimately make them experience unwanted feelings, perhaps even to a greater extent than healthy controls.

Third, other findings on depression and emotional stimuli preference run counter to Millgram et al. (2015). Punkanen, Eerola, and Erkkilä (2011) found that patients with MDD did not differ in their preference for sad and happy music excerpts, but instead showed reduced preference for angry and highly energetic music excerpts, compared to healthy controls. In addition, Rentfrow and Gosling (2003) found that higher levels of depression symptom severity were significantly associated with lower levels of preferring positive affect inducing music, but not with negative affect inducing music. Furthermore, two studies examining the effect of a sad mood manipulation on nonclinical participants' preferences for emotional music using standardized sad and happy music excerpts demonstrated that sad mood was associated with avoidance of happy music but did not increase preference for sad music excerpts (Friedman, Gordis, & Förster, 2012; Hunter, Schellenberg, & Griffith, 2011). Although emotional stimulus choices in clinical depression may not be the same as transient nonclinical sadness, these results show that dysphoric moods do not necessarily lead to increased selection of sad music.

Fourth, interpretations of the findings in Millgram et al. (2015) are potentially limited by the study design. One consideration is that sad test stimuli may differ from other test stimuli in several ways. Millgram et al.'s (2015) emotional stimuli passed a manipulation check that focused on one feature (e.g., sad stimuli were significantly sadder than happy stimuli across the whole sample of depressed and nondepressed participants). Other stimulus features, such as energy-eliciting levels (hereinafter referred to as energy level of music), were not examined. Indeed, sad music clips are both sadder and less energetic than happy and neutral music clips due to the use of a minor key and slower tempo (see Juslin & Laukka, 2004, for a review). Notably, in a study that examined energy level as well as emotion of music, patients with MDD showed reduced preference for high energetic music excerpts relative to healthy controls, but did not differ in their preference for sad music excerpts (Punkanen et al., 2011). It is plausible that depressed people might prefer sad music not because the music is sad, but because it elicits low levels of energy (i.e., is calming). If so, this would contradict the idea that depressed people want to augment the intensity of sad emotions.

Finally, Millgram et al. (2015) only included sad stimuli, and did not include another class of negative emotion stimuli as a point of comparison. This leaves open the possibility that depressed individuals' tendency to select sad stimuli over happy and neutral stimuli stems from a more general preference for negative emotional material.

The present study, therefore, aimed to revisit the topic with the intention both to replicate portions of Millgram et al. (2015) and to conduct an independent study that extends our understanding of emotional stimulus preference in MDD. Our study focused on music preferences for three reasons: (1) The music preference task in Millgram et al. (2015) yielded a strikingly large effect size for depression (i.e., the MDD group preferred sad to happy music relative to the healthy controls with an odds ratio of 6.50); (2) people often listen to music to regulate emotion (Lonsdale & North, 2011), and (3) abundant research shows that there are systematic individual differences in musical preference (e.g., Rentfrow & Gosling, 2003).

The replication phase of the study involved using the same music stimuli and procedures as Millgram et al. (2015), to examine whether individuals with MDD report an increased choice of sad material relative to neutral or pleasant material. To help interpret the findings, we included a direct assessment of participants' spontaneously reported reasons for music preferences. If participants with MDD most frequently reported feeling sadness as the reason for their music choice (e.g., I chose this because the music is sad), it would support Millgram et al.'s (2015) interpretation that the choice reflects upregulation of sad mood. If the reported reasons were related to other features of music such as energy levels (e.g., because the music is relaxing), it might undermine the idea that the choice reflects a maladaptive emotion regulatory goal.

Similarly, to aid interpretation, we also assessed ratings of energy as well as other emotional experiences in response to the music. For example, if the MDD group's preferred music, relative to the HC's, is not only sadder but also less energetic, it would challenge the interpretation that depressed people prefer a sad stimulus only because it is sad. Furthermore, we explored affective changes after listening to preferred music. Millgram et al. (2015) assumed that people (including depressed individuals) would report feeling sadder after engaging with sad stimuli, which fits their interpretation that depressed people prefer stimuli that make them sadder or maintain sadness over time. However, it is important to test this assumption, as it is possible that MDD people might report other kinds of reactions after listening to their preferred music (i.e., increased positive emotions).

The extension phase involved a novel music selection task with a new set of musical excerpts. The Emotional Music Selection Task (EMST) allowed participants to make a choice on pairs of music excerpts that varied on emotion (happy, neutral, sad, and fear) and energy levels (high and low). The inclusion of "fear" stimuli afforded us an additional comparison to examine whether depressed individuals have a unique preference (or aversion) for sadness, or negative emotions in general. Finally, the EMST used a paired choice paradigm, in which participants were presented with a pair of stimuli and asked which stimulus was preferred to watch or listen to. Our paired choice task had a greater number of trials than Millgram et al. (2015), which should increase task reliability, and such a task may be more generalizable to complex everyday emotional situations than tasks that present stimuli serially. The paired stimulus design also enabled examination of strength of preference (or lack of preference).

Hypotheses were the following:

> *H1 (Replication music choice task):* We expected to replicate Millgram et al.'s (2015) key finding that MDD group status would predict a greater likelihood of choosing sad music excerpts as most preferred.

> *H2 (Replication music choice task):* We expected that the descriptions and ratings by the MDD group of their preferred music excerpts would indicate both sadder and less energetic experiences compared to the descriptions and ratings by the HC group of their chosen music excerpts.

H3 (EMST): When examining energy level of music excerpts as well as emotion, we expected a significant interaction between group (the MDD and the HC groups) and energy levels (high and low energetic), such that the MDD group would show a unique preference for low energetic music excerpts relative to healthy controls.

Method

Participants

Thirty-eight depressed and 38 age-matched nondepressed female undergraduate students were included in the current study. Although some aspects of our design are novel, we estimated the required sample size based on Millgram et al.'s (2015) Study 2 (Music study). In their Study 2, the researchers reported Wald's chi-square statistics. Using the statistics on the MDD group's preference for sad versus happy music, compared to the HC, we converted the Wald's chi-square to effect size f. With the converted effect size f, we performed a power analysis for the repeated measures ANOVA, using G*power software (Faul, Erdfelder, Lang, & Buchner, 2007). To correctly detect significant interactions (i.e., Emotion (sad, happiness) and Group (MDD, HC)) with an $\alpha = .05$ and power = .95, the power analysis showed that 48 participants (24 per group) were needed. Due to the lack of previous literature to guide expectation for the interactions among Emotion, Energy level, and Group, we sought to recruit 80 participants (40 per group), which would allow us to detect a .27 effect size (f) 95% of the time.

The recruitment occurred in two phases. In the first phase, participants were screened via an online research participation system using two questions: "During the past two weeks, how often have you felt sad, down, or depressed?" and "How often have you been less interested in your usual activities?" The four answer options were (a) not at all, (b) some of the time, (c) more than half the time, and (d) all the time. For potential MDD participants, only those who responded with (c) or (d) to either one of the questions were potentially eligible to enroll. For healthy controls, participants were required to respond (a) to both questions. Through the online screening, 151 students were invited to a clinical interview and consented to participate in the study for course credit. All study procedures were approved by the Institutional Review Board of the University of South Florida.

In the second phase, participants were interviewed in person to examine if they met all eligibility criteria. The mood module of SCID-I (the Structured Clinical Interview for *DSM–IV* Axis I Disorders; Spitzer, Williams, Gibbon, & First, 1992) was used to confirm an MDD diagnosis (the MDD main symptom criteria remained identical in *DSM–5*; American Psychiatric Association, 2013). All MDD group participants met the criteria for current MDD on the SCID-I. None of the HC group participants met the current or past MDD criteria based on the SCID-I.

The MINI (the Mini-International Neuropsychiatric Interview; Hergueta, Baker, & Dunbar, 1998) was used to examine exclusion criteria (i.e., alcohol or substance abuse disorder, bipolar disorder, and psychotic ideation). Participants were excluded for a history of serious brain injury or other neurological disorders, alcohol or substance dependence or abuse within the past 6 months, a lifetime history of bipolar disorder, and psychotic ideation.

The first author (an advanced graduate student) and an undergraduate research assistant conducted diagnostic interviews. Both interviewers had previous experience administering clinical interviews. To complete training on this study, the interviewers assessed the first five participants together (i.e., one of the interviewers sat quietly in the room and assessed a participant at the same time as the other was interviewing the participant) and compared each other's clinical decisions afterward. In each case, the interviewers reached an agreement about whether or not a participant had MDD, or met exclusion criteria.

After the interview, 39 depressed and 40 nondepressed participants met inclusion criteria and completed the tasks. One from the MDD group and two participants from the HC group were excluded from the analysis for not following instructions (e.g., too many missing values on questionnaires). In total, 38 participants were included and analyzed per group for the replication music choice task. For the EMST, two additional participants from the MDD group were excluded due to a technical error with data ($n = 1$) and lack of attention during the EMST (i.e., using a cell phone; $n = 1$). Thus, data from 36 MDD and 38 HC were analyzed for the EMST. A flowchart of recruitment is presented in Figure 1.

Replication Music Choice Task

Following Millgram et al. (2015) Study 2, the same six music excerpts (one classical and one modern genre per each emotion category) were used to replicate the original findings. Excerpts were from sad music ("Adagio for Strings" by Samuel Barber; "Rakavot" by Avi Balili), happy music ("Track 8" by Jay Hannah; "Infernal Galop" from *Orpheus in the Underworld* by Jacques Offenbach), and neutral music ("Pickles" by Edgar Meyer; "First Thing" by Four Tet). Each music excerpt lasted 30 seconds. Participants listened to the six music excerpts in a randomized order and afterward were asked to choose the one music excerpt they most wanted to listen to in the future.

For this task, we asked an additional question in which participants freely reported their reasons for their chosen music. The first author initially categorized each participant's response into four categories: (a) negative emotions (e.g., because the music sounds sad or dark; or because the music makes me sad), (b) relaxing or calm (e.g., because the music sounds calm; it makes me relaxed), (c) physical feature of music (e.g., I like the sound of strings), and (d) other. Multiple categorization was allowed. To test interrater reliability, the responses were categorized independently by the lead author and a research assistant, who was blind to the hypotheses, into the four categories. Cohen's Kappa coefficient for these judgments was .78, indicating adequate agreement (Landis & Koch, 1977). After reporting their reasons, participants listened to each musical excerpt again and rated how much they experienced happiness and sadness using a 9-point Likert scale (e.g., 0 = *not at all*, 8 = *extremely*). For happiness, the average score of happy and joyful was used (average Cronbach's alphas of six music excerpts = .84). For sadness, the average score of sad and downhearted was used (average $\alpha = .73$). In addition, participants rated how energetic the music excerpt was to them using the same 9-point Likert scale.

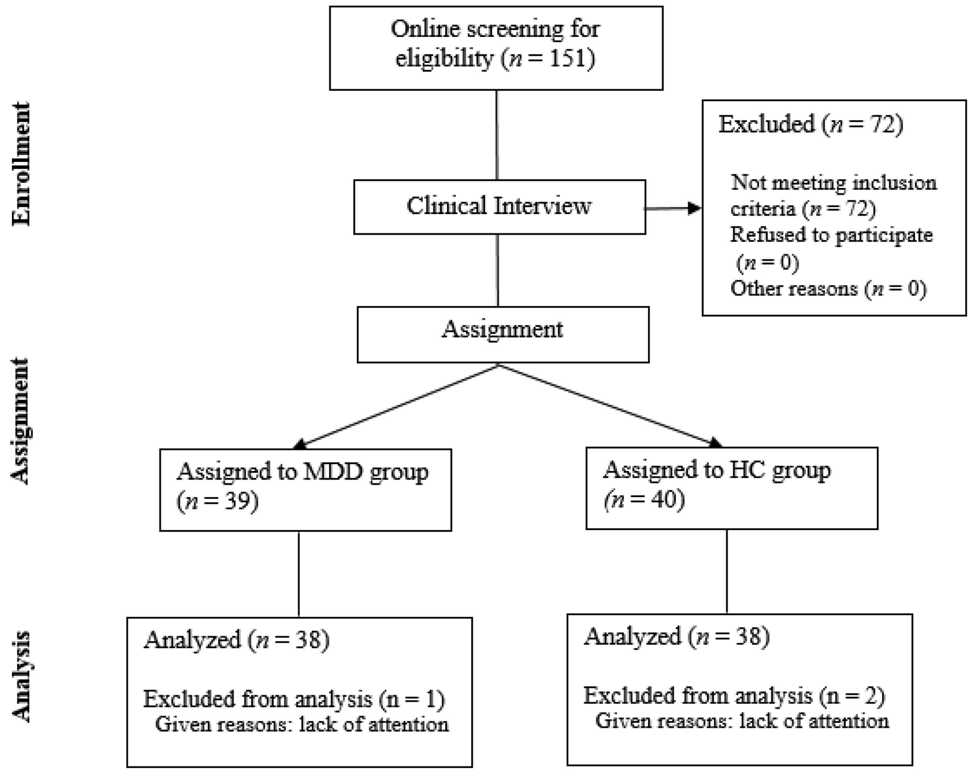

Figure 1. Flow chart of recruitment. MDD = major depressive disorder; HC = healthy controls.

Extension Emotional Music Selection Task (EMST)

In the EMST, we considered two levels of energy (high, low) and four emotions (happy, sad, fear and neutral). Because it is difficult to find neutral music clips with different energy levels, energy level was not considered for neutral stimuli, resulting in seven different conditions (happy/high, HH; happy/low, HL; sad/high, SH; sad/low, SL; fear/high, FH; fear/low, FL; and neutral, N), for a total of 16 excerpts (2 excerpts per emotion/energy condition and 4 excerpts for neutral).

Music excerpts were selected from Eerola and Vuoskoski's (2011) standardized emotional music excerpts (using mean ratings of each emotion, valence, and energy). The screening criteria for music excerpts required mean ratings (on a 1–9 scale) of (1) greater than 4 on target emotion for each emotion, and less than 3 on all emotion ratings for neutral condition, (2) greater than 4 on energy level for high, and (3) less than 4 on energy level for low. Based on these criteria, 16 music clips were selected. All the music excerpts were instrumental pieces (film soundtracks). We normalized the volume of all music files using a volume normalizer application, and also set the computer volume at the same level for all participants. Each music excerpt lasted 10 seconds. When the original excerpt was longer than 10 seconds, the first 10 seconds of the clip was used.[1]

On each trial, participants listened to a pair of music clips, and then used a mouse to choose the one they would prefer to listen to again. The cursor began each trial positioned in the middle. After hearing both clips, participants moved the mouse to the left and clicked if they preferred the first music excerpt and to the right if they preferred the second, or they could leave the cursor in the middle and click to indicate a nondecision. Participants could take up to 5 seconds to make a decision. Participants listened to 84 unique pairs of music clips presented in a random order with two breaks. The pairs comprised the 12 emotion/energy excerpts compared separately to each of the other emotion/energy conditions and 2 of the neutral excerpts. Thus, each condition appeared equally 24 times (i.e., HH stimuli were presented 24 times, and so were the other conditions). This made it possible to compare the number of choices per condition between the MDD and HC groups. The task duration was approximately 35 min.

[1] Information on the chosen music excerpts from Eerola and Vuoskoski's (2011) database: Excerpt no. 19 (M_{happy} = 5.50, M_{energy} = 5.83) and 264 (M_{happy} = 6.17, M_{energy} = 5.00) were selected for HH, and no. 61 (M_{happy} = 5.83, M_{energy} = 2.80) and 201 (M_{happy} = 5.67, M_{energy} = 3.00) for HL. Excerpt no. 40 (M_{sad} = 6.20, M_{energy} = 4.33) and 210 (M_{sad} = 5.67, M_{energy} = 4.83) were for SH, no. 41 (M_{sad} = 6.17, M_{energy} = 2.60) and 44 (M_{sad} = 6.00, M_{energy} = 2.20) were for SL, no. 100 (M_{fear} = 6.00, M_{energy} = 5.50) and 103 (M_{fear} = 5.83, M_{energy} = 6.00) were for FH, and no.106 (M_{fear} = 5.50, M_{energy} = 2.80) and 107 (M_{fear} = 5.50, M_{energy} = 2.83) were selected for FL. As for N, four music excerpts were selected: excerpt no. 155 (M_{energy} = 3.00), 180 (M_{energy} = 3.00), 204 (M_{energy} = 4.17), and 353 (M_{energy} = 4.00).

Participants rated their familiarity with each music excerpt after the task. We examined familiarity ratings of music excerpts to see the potential difference among excerpts. A binominal regression with familiarity ratings as a dependent variable and music excerpt as an independent variable (i.e., 12 music excerpts) showed no significant difference in familiarity among music excerpts, Wald $\chi^2(11) = 7.96$, $p = .716$.

After completing the EMST, participants listened to each music excerpt again in a random order, and rated how much they experienced happy, sad, and fear emotions and energy levels using 9-point Likert scales (with 0 = *not at all*, 8 = *extremely*). For happiness, the average score of happy and joyful was used (α = 72). For sadness, the average score of sad and downhearted was used (α = 68). The average score of scared and jittery was used for a fear composite, which showed lower reliability than expected (α = .37).

Other Measures

Demographic characteristics. Ethnic background, age, education, and current medication usage were measured.

BDI and BAI. Beck Depression Inventory-II (Beck, Steer, & Brown, 1996) and Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988) were 21-item scales used to assess whether the two groups differ in terms of depression and anxiety symptom severity. This information was used as a manipulation check on clinical status. In the current sample, Cronbach's alpha for BDI and BAI were .97 and .95, respectively.

Emotional states before tasks. Emotional states prior to the tasks were measured using words from the PANAS-X (Watson & Clark, 1999) using a 5-point Likert scale from 1 (*very slightly*) to 5 (*extremely*). For happiness, the average score of happy and joyful was used (α = .92). For sadness, the average score of sad and downhearted was used (α = .90). The average score of scared and jittery was used for fear (α = .69). Since other constructs such as affective reactions to materials were measured using 9-point Likert scales, we transformed the 5-point Likert scale to a common 9-point Likert scale prior to statistical analyses (i.e., 1 = 0, 2 = 2, 3 = 4, 4 = 6, 5 = 8).

Procedure

After providing informed consent, participants were screened using MINI and SCID-I mood modules to check study eligibility. Those who passed the screening completed the BDI-II and BAI and rated current emotional states. Participants performed the replication music task and then the EMST in that order, as well as an image-viewing task that is not the focus of the current report. The whole session lasted approximately 150 min. At the end of the procedures, participants were thanked and debriefed.

Statistical Analyses

Statistical analyses were conducted using SPSS software Version 24. In order to examine if music excerpts in both the replication task and the EMST induced intended sadness and happiness, more than other music clips, a series of repeated measures ANOVAs were run with sadness, happiness, and energy levels (for the EMST only) as dependent variables, Music condition (Happy, Sad, Neutral for the replication task; HH, HL, SH, SL, FH, FL, *N* for the EMST) as a within-subjects factor, and Group (MDD, HC) as a between-subjects factor. To examine Hypothesis 1, that MDD group status would predict choice of sad music excerpts in the replication music choice task, a multinomial logistic regression was conducted with Group (MDD, HC) as an independent variable and Music condition (happy, sad, neutral) as a dependent variable. Hypothesis 2, that the MDD group's rated experience of their most preferred music would be not only sadder but also less energetic than the HC group's rated experience of their most preferred music, was tested using a series of ANOVAs. In these ANOVAs, ratings for the chosen music (Happy, Sad, Energy level) were the dependent variables and Group (MDD, HC) was the independent variable. To test hypothesis 3, that the MDD group would prefer low energetic music excerpts compared to the HC in the EMST, a repeated measures ANOVA was run in which the number of choices was the dependent variable, Emotion (Happy, Sad, Fear) and Energy (High, Low) were within-subjects factors, and Group (MDD, HC) was a between-subjects factor. Throughout the analyses, when Mauchly's sphericity test was violated, Huynh-Feldt correction was used.

Results[2]

Demographic and Clinical Characteristics

Detailed demographic features and clinical symptoms by group are displayed in Table 1. The typical participant was roughly 20 years of age, in their first year of college, and Caucasian. There were no group differences in age, education, or ethnic background (*p*s > .05). As expected, the MDD group reported much higher depression symptom severity (BDI-II) and anxiety symptom severity (BAI) relative to the HC. Among the MDD group, 23.7% were taking antidepressants.

---

[2] Additional analyses.: Neutral and no-choice in ESST music task: In order to examine possible group difference in N and no-choice conditions, independent t-tests were performed per task with N choice and no choice as dependent variables and Group (MDD, HC) as a grouping variable. There was no group difference in both choices: $t(72) = 1.728$, $p = .088$ for N in music task, $t(72) = 1.96$, $p = .054$ for no-choice in music task, $t(74) = .029$, $p = .977$.

Choice analyses of ESST music task with samples of less than 10% ($\leq$8) of no-choice: Due to the possibility of inattention in participants who had many no-choices (did not move the cursor either left or right), we conducted the same analyses per task using samples who had less than 10% ($\leq$8) of no-choice. Five from the MDD and one from the HC groups were excluded, which makes 31 MDD and 37 HC. The interactions between Emotion and Group, $F(2, 132) = 6.731$, $p = .002$, $\eta_p^2 = .093$, and Intensity and Group, $F(1, 66) = 7.297$, $p = .009$, $\eta_p^2 = .100$, remained significant. These results indicated that no-choice was unlikely to have had a significant impact on our main findings.

Controlling for levels of anxiety: In order to control for significant group difference in anxiety, main analyses were conducted again with anxiety (i.e., BAI) as a covariate.

For the replication music study, a multinomial logistic regression using anxiety as a covariate found that the significant group effect was no longer significant, $\chi^2(2) = 4.48$, $p = .107$, with the effect of anxiety also non-significant in this model, $\chi^2(2) = 1.85$, $p = .397$. For the EMST study, considering both emotion and energy level of music, a repeated measures ANOVA with anxiety as a covariate showed that the interaction of Emotion and Group became non-significant, $F(2, 142) = 2.63$, $p = .076$, $\eta_p^2 = .036$; however, the Energy and Group interaction remained significant, $F(1, 71) = 7.86$, $p = .006$, $\eta_p^2 = .100$. Compared to the HC group, the MDD group less preferred high energetic music ($p = .002$) and more preferred low energetic music ($p = .042$). Furthermore, the MDD group showed preference for low energetic over high energetic music ($p < .001$), whereas the HD group did not show such a pattern ($p = .535$). Overall, the results demonstrated that the preference for low energetic music in the MDD group vs. HC group becomes prominent when accounting for anxiety.

Table 1
Demographic and Clinical Characteristics of the Sample

Characteristic	MDD (n = 38) Mean (*SD*)	HC (n = 38) Mean (*SD*)	*t*	*p*
Age (year)	19.8 (1.7)	19.5 (1.9)	.75	.46
Education (year)	13.4 (1.3)	13.1 (1.0)	.96	.34
Caucasian (%)	52.6	55.6	1.63	.80
BDI	28.6 (10.7)	3.1 (2.5)	14.08	<.001
BAI	26.3 (11.9)	6.0 (6.2)	9.12	<.001
Antidepressants (%)	23.7			

Note. t-test was used for continuous data and χ^2 was used for categorical. MDD = major depressive disorder; HC = healthy controls; BDI = Beck Depression Inventory; BAI = Beck Anxiety Inventory.

Replication Music Task

Manipulation check and characteristics of stimuli. In order to examine if the sad and happy music excerpts induced intended sadness and happiness, more than other music clips, a series of repeated measures ANOVAs were conducted. The means and standard deviations of affective ratings are presented in Table 2. For happy ratings, there was a significant main effect for Music condition, $F(1.76, 130.76) = 116.81$, $p < .001$. As expected, follow-up Bonferroni tests indicated that participants reported more happiness when listening to happy music excerpts than other clips, ps < .001.

The results for sad ratings also yielded a significant main effect of Music condition, $F(1.36, 100.81) = 115.19$, $p < .001$. Participants reported more sadness from listening to sad music excerpts compared to others, ps < .001. These results suggest that the six music clips successfully induced the intended emotions.

Preferred music choice. To examine Hypothesis 1 that MDD group status would predict a greater likelihood of preferring the sad music excerpt, a multinomial logistic regression was conducted. Figure 2 presents a summary of the chosen excerpts for the MDD and HC groups. As expected, group predicted music preference, $\chi^2(2) = 23.02$, $p < .001$. More specifically, compared to the HC group, the MDD group was more likely to choose sad music clips relative to happy music clips, b = 2.60, Wald $\chi^2(1) = 17.26$, odds ratio (OR) = 13.53, 95% CI [3.96, 46.25], $p < .001$, and more likely to choose neutral music clips relative to happy music clips, b = 1.86, Wald $\chi^2(1) = 6.66$, OR = 6.44, 95% CI [1.56, 26.50], $p = .010$. In contrast, those in the HC group were most likely to choose a happy music clip. These results are thus consistent with H1, replicating Millgram et al.'s (2015) finding that the MDD group often preferred sad music clips whereas the HC group tended to prefer happy music clips.

Reported experiences of the most preferred music clips per group. Additionally, we ran a series of ANOVAs to examine whether there were group differences in ratings of the most preferred music excerpt. Group differences were observed for ratings of happy, $F(1, 74) = 15.96$, $p < .001$, $\eta_p^2 = .177$, 95% CI [.046, .324], sad, $F(1, 74) = 8.73$, $p = .004$, $\eta_p^2 = .106$, 95% CI [.011, .244], and energy levels, $F(1, 74) = 22.59$, $p < .001$, $\eta_p^2 = .234$, 95% CI [.083, .381]. Specifically, MDD's affective reaction to their preferred music was less happy ($M_{MDD} = 3.5$, $SD_{MDD} = 2.3$, vs. $M_{HC} = 5.7$, $SD_{HC} = 2.4$), sadder ($M_{MDD} = 1.4$, $SD_{MDD} = 1.5$, vs. $M_{HC} = 0.5$, $SD_{HC} = 1.2$), and less energetic ($M_{MDD} = 3.5$, $SD_{MDD} = 2.4$ vs. $M_{HC} = 6.1$, $SD_{HC} = 2.3$), compared to the HC group.

After finding that MDD's rating of their preferred music was less happy and sadder, and also less energetic, than the HC group, we also wanted to check whether these reports represented changes from baseline experience (prior to the tasks). A repeated measures ANOVA was conducted in which Time (before, after) was a within-subjects factor, and Group (MDD, HC) was a between factor with affective ratings (happy, sad) as the dependent variables, respectively. The results showed a Time by Group interaction for the happy ratings, $F(1, 74) = 14.29$, $p < .001$, $\eta_p^2 = .162$, 95% CI [.037, .308]. Specifically, as presented in Figure 3, the MDD group's happy ratings started out relatively low but increased significantly after listening to their preferred (most often sad) music clips ($p < .001$). Those in the HC group reported moderate levels of happiness to begin with and did not change significantly after listening to their preferred music clip ($p = .096$). For sadness ratings, there was also a significant Time by Group interaction, $F(1, 74) = 23.71$, $p < .001$, $\eta_p^2 = .243$, 95% CI [.090, .389]. Consistent with the previous analysis, the MDD group reported less sadness after listening to their preferred (often sad) music clip than at baseline ($p < .001$). The HC

Table 2
Means (and Standard Deviations) of Affective Ratings in the Replication Music Choice Task and the Emotional Music Selection Task

Task	Condition	Happy	Sad	Fear	Energy
Replication task	Happy music	4.7 (2.2)	.2 (.5)		
	Sad music	1.2 (1.3)	3.1 (2.0)		
	Neutral music	2.2 (1.6)	.9 (1.0)		
EMST	HH	4.6 (1.8)	.1 (.5)	.9 (1.1)	5.2 (1.2)
	HL	3.8 (1.9)	1.0 (1.2)	.3 (.6)	2.7 (1.3)
	SH	1.8 (1.3)	1.8 (1.4)	1.2 (1.2)	3.4 (1.4)
	SL	.7 (1.0)	3.6 (1.8)	.7 (1.1)	1.8 (1.2)
	FH	1.2 (1.8)	.6 (.8)	3.3 (2.0)	2.3 (1.4)
	FL	.2 (.6)	.9 (1.3)	3.0 (2.0)	2.2 (1.0)
	N	1.3 (.9)	1.0 (.9)	1.0 (1.0)	

Note. EMST = Emotional Music Selection Task; HH = Happy high energetic; HL = Happy low energetic; SH = Sad high energetic; SL = Sad low energetic; FH = Fear high energetic; FL = Fear low energetic; N = Neutral music excerpt.

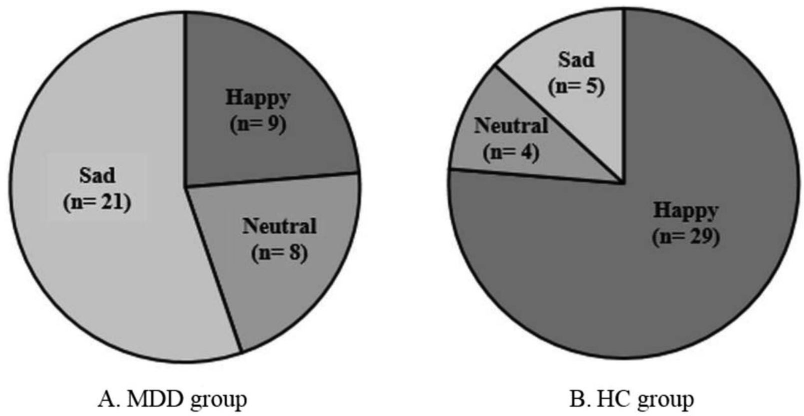

Figure 2. The MDD and HC groups' music choice in the replication music task. MDD = major depressive disorder; HC = healthy controls.

group, in contrast, reported very low sadness levels at baseline, which did not significantly change after hearing their music clip (p = .356). Together, countering the idea that the effect of the music clip among the MDD group would exaggerate negative feelings, results were the opposite. Even though the sad clip was most popular, listening to it tended to make the MDD participants feel better.

Self-reported reasons for sad music choices in the MDD group. We also explored the spontaneously reported reasons for the sad music choice among the MDD group. Among MDD people (n = 21) who chose a sad music excerpt as their most preferred, 13 participants reported reasons relating to the selected music being relaxing, calming, or soothing. Furthermore, two participants reported that they chose sad music because the music was powerful. The remaining responses included "I have heard the song before," "it sounds like the music I usually listen to," and "it reminded me of stories of heroes and adventure." Only a small fraction (3 participants) reported reasons that were related to negative emotion such as pensive, emotionally dark, or sad.[3] The overview of all reasons for sad music in the MDD group is presented in Table 3.

The EMST

Manipulation check. Again, a series of ANOVAs were conducted to check if the music excerpts induced intended emotions and energy levels. The results showed a main effect for Music condition, $F(3.85, 277.65) = 126.98$, $p < .001$. Across groups, participants reported more happiness while or after listening to both HH and HL music excerpts compared to other conditions, ps $< .001$.

A parallel repeated measures ANOVA with sadness ratings was conducted. The results showed a significant main effect of Music condition, $F(4.06, 288.45) = 91.66$, $p < .001$. Across groups, participants reported more sadness while or after listening to both SH and SL music excerpts compared to the other music excerpts, ps $\leq .001$. Finally, a repeated measures ANOVA on fear ratings again indicated a main effect of Music condition, $F(3.06, 211.16) = 90.27$, $p < .001$. Participants reported more fear to both FH and FL compared to the other conditions, ps $< .001$. Thus, as predicted, the music excerpts induced the intended emotions.

Finally, a repeated measures ANOVA was run on energy level ratings. Again, we observed an effect of Music condition, $F(4.99, 359.58) = 89.95$, $p < .001$. As we intended, participants reported feeling more energetic to the high energy conditions versus their low energy counterparts (M_{HH} vs. M_{HL}, $p < .001$; M_{SH} vs. M_{SL}, $p < .001$; M_{FH} vs. M_{FL}, $p < .001$). Means and standard deviations of affect and energy ratings are presented in Table 2.

Music choice. In order to test whether the MDD group would prefer less energetic music compared to the HC group (Hypothesis 3), a repeated measures ANOVA was conducted on preferences. Because neutral music excerpts did not have two levels of energy, analyses were run without neutral stimuli. The results revealed significant interactions of Emotion and Group, $F(2, 144) = 7.75$, $p < .001$, $\eta_p^2 = .097$, 95% CI [.007, .236], and Energy and Group, $F(1, 72) = 10.95$, $p < .001$, $\eta_p^2 = .132$, 95% CI [.021, .277]. These effects are depicted in Figures 4 and 5, respectively. Bonferroni-corrected simple effects testing of the Emotion $\times$ Group interaction found that, compared to healthy controls, the MDD group chose fewer happy music excerpts ($p < .001$) but more sad music excerpts ($p = .016$). In addition, both groups preferred happy and sad music to fear music excerpts (ps $< .001$). Finally, healthy controls preferred happy music excerpts more than sad ($p < .001$), but there was no consistent difference in preference for the MDD group ($p = .99$). The latter finding is not what would be expected based on Millgram et al.'s (2015) findings (or our replication) that MDD people typically preferred sad over happy music.

Bonferroni-corrected simple effects tests of the Energy $\times$ Group interaction showed that the MDD group chose fewer high energy excerpts than HC participants ($p < .001$). By contrast, the MDD group chose more low energy excerpts than the HC group ($p = .025$). In addition, analyses within the HC group indicated that they preferred high energy music excerpts over low energy music excerpts ($p < .001$); however, the MDD

[3] Although only five HC participants chose sad music, a similar pattern was found in the HC group. Among the HC group who chose a sad music excerpt, three reported reasons related to the music being calming, peaceful, and relaxing. The other two participant's reasons were "the music had a lot of variety in structure" and "I heard it before".

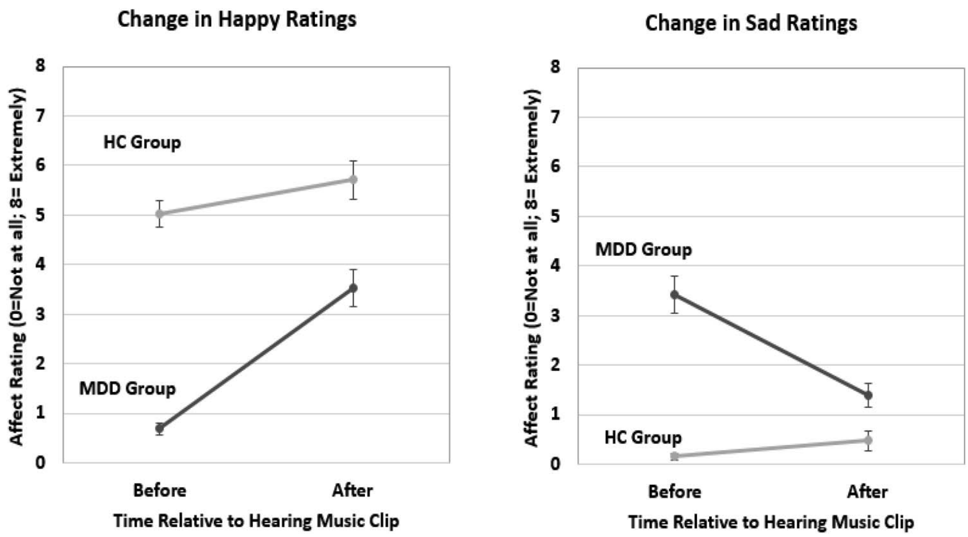

Figure 3. Analysis of change in affect ratings from before to after hearing preferred music clip.

group did not show a consistent preference for low energy music relative to high energy music (p = .752). The details of the analysis are presented in Table 4.

In sum, these results indicate that the MDD group was more likely than the HC group to prefer low energy music excerpts across emotions including sadness. The MDD group also preferred fewer happy and more sad music excerpts than the HC group. Effects did not generalize to other negative emotions, as no group difference was observed in preferences for fearful music excerpts. Finally, while the MDD group did not demonstrate an absolute preference for sad over happy music, the HC group preferred happy to sad music.

Comparisons among Sad and Happy music pairs. Although the repeated measures ANOVA examined the interaction of Emotion and Energy on music choice across pairs, it did not provide specific information about each pair. If the MDD group's preference for sad music was driven solely by their preference for low energy, as we originally hypothesized, we would expect that the MDD group chose low energetic music excerpts over high energetic ones regardless of emotion (e.g., the MDD group would prefer SL (sad low energetic) and HL (happy low) to SH (sad high) and HH (happy high)). To test this, we conducted a generalized estimating equation (GEE) analysis.

Table 3
Replication Task: All Reasons for Sad Music Choice in the MDD Group

Reason for sad music choice	Category
1. It is relaxing and calm	B
2. It had a very calming effect. Soothing beat	B
3. It was calming and I liked the deeper notes	B, C
4. It's soft and soothing	B
5. It calmed me down and helped me relax	B
6. I like the depth that each note brought. It was relaxing and something I would meditate to	B
7. It was very calming and sophisticated	B
8. It was calming. I could imagine the person playing this. I could feel the music, the emotion	B
9. Although it was somewhat suspenseful, it was still relatively calm and had a nice flow without being extremely loud or soft	B
10. Calming but also deep	B
11. Mellow—had lots of dimension. Easy to study to or relax to	B
12. Calming, good day-dreaming music	B
13. Sounded like a movie soundtrack and was relaxing	B, D
14. Smooth and mysterious. It made me a little more pensive	A
15. Emotional–dark. Mysterious undertones	A
16. Stimulating/stirring. Sounded kind of sad	A
17. Empowering orchestra/ violin	C
18. Sounds like music I usually listen to	D
19. I've heard that song and I've seen it played before by a full symphonic orchestra. The song gives me so many ranges of emotion	D
20. Because it was deep and powerful	D
21. It reminds me of stories of heroes and adventure	D

Note. MDD = major depressive disorder; A = negative emotions; B = relaxing or calm; C = physical feature of music; D = other.

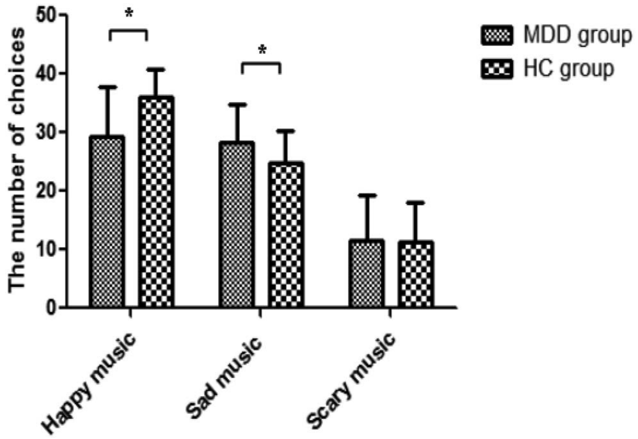

Figure 4. The average number of choices for each emotional music condition per group. MDD = major depressive disorder; HC = healthy controls; error bar = *SD*. * $p < .05$.

Table 4
Results From a Repeated Measures Analysis of Variance, Emotional Music Selection Task

Source of variation	*SS*	*MS*	*F*	η_p^2	*P*
Within-subjects					
Emotion	8829.330	4414.665	138.102	.657	<.001
Emotion × Group	495.592	247.726	7.750	.097	.001
Error	4603.211	31.967			
Energy	234.636	234.636	8.150	.102	.006
Energy × Group	315.266	315.255	10.951	.132	.001
Error	2072.817	28.789			
Emotion × Energy	64.515	32.257	2.749	.037	.067
Emotion × Energy × Group	16.155	8.077	.688	.009	.504
Error	1689.647	11.734			
Between-subjects					
Group	26.211	26.211	7.816	.098	.007
Error	241.458	3.354			

Specifically, we performed four separate GEE contrasts (SL vs. HH, SL vs. HL, SH vs. HH, SH vs. HL). In these analyses, group was a predictor and binary music choice of music was the dependent variable. Contradicting the idea that depressed people always prefer sad to happy music, pairs with sad high energy music (SH vs. HH, SH vs. HL), revealed no group differences (Wald $\chi^2(1) = 2.43$, $p = .119$ for SH vs. HH, Wald $\chi^2(1) = 1.39$, $p = .239$ for SH versus HL). However, in pairs with sad low energy music (SL vs. HH, SL vs. HL), the MDD group was more likely to choose the sad low energy option than healthy controls (Wald $\chi^2(1) = 17.94$, $p < .001$ for SL vs. HH; Wald $\chi^2(1) = 6.98$, $p = .008$ for SL versus HL; B = 1.58, *SE* = .37, Exp(B) = 4.85 for SL versus HH, B = 1.00, *SE* = .38, Exp(B) = 2.72 for SL versus HL). In fact, MDD people chose the SL option more than three times more often (47%) than did controls (14%) when it was paired with HH, and were more than twice as likely (43%) to choose the SL option than were controls (20%) when it was paired with HL.

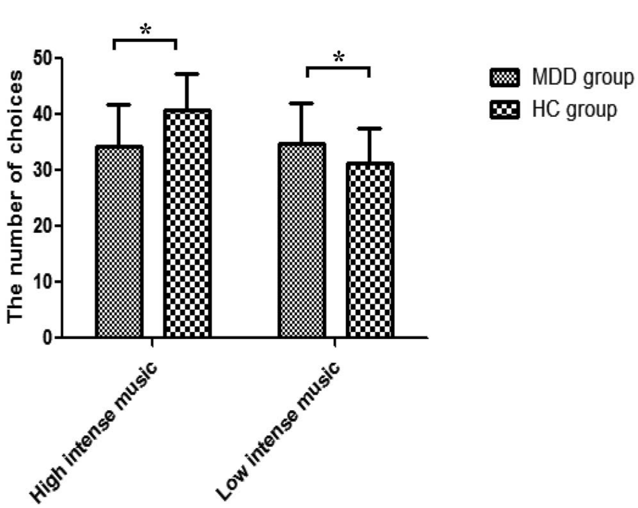

Figure 5. The average number of choices for each energy music condition per group. MDD = participants with the major depressive disorder; HC = healthy controls; error bar = *SD*. * $p < .05$.

In sum, these GEE analyses suggest a more specific finding: Depressed people are particularly drawn to sad music that is low in energy. However, because the MDD group was not drawn to happy emotional music that is low in energy, this suggests a boundary for our original interpretation that MDD people will always prefer low energy stimuli.

Discussion

Do depressed people strongly prefer sad music stimuli as observed in Millgram et al. (2015)? In this study, we replicated Millgram et al.'s (2015) finding that depressed people are more likely to select sad music excerpts relative to a healthy control group. We also found no group difference in preference for fearful music excerpts, suggesting that MDD-related differences are specific to sad music. Does such a preference mean that depressed people actually seek to become sadder? Or is there another explanation? In this study, we tested an alternative hypothesis—MDD-related preference for sad stimuli reflects a preference for calming stimuli—that carries a very different interpretation. Consistent with the alternative hypothesis, depressed people reported greater happiness and less sadness when listening to their chosen music than they did at baseline. Furthermore, the most commonly reported reason for why depressed people chose sad music was that it was calming.

MDD-related preference for sad music was surprisingly robust. Despite major differences between our two choice tasks, the results from EMST are largely compatible with the results from the replication music choice task. In both cases, the MDD group selected music excerpts that were less happy, sadder, and less energetic, compared to the HC group. That said, there were some differences across tasks. For example, unlike the replication task, the MDD group did not exhibit an absolute preference for sad stimuli (it had equal preference for happy and sad music, whereas the HC group preferred happy to sad music). This raises the possibility that the magnitude of effects and the kinds of sad preference effects are somewhat tied to the specific samples of music that are used.

Taken together, while our findings affirm Millgram et al.'s (2015) MDD-related preference for sad music, we do not believe the data demonstrate that MDD people are motivated to upregulate sadness. On the contrary, those experiencing MDD reported selecting stimuli based on energy levels of sad music rather than valence of the stimuli, with two thirds of this group reporting that they selected sad music because it is low in energy (i.e., had calm, relaxing, or soothing qualities). Furthermore, the MDD group did not choose more sad music excerpts than did the HC when sad and high energetic music excerpts were presented with happy music excerpts. Perhaps most striking was the finding that the MDD group reported feeling increases in happiness and less sadness when listening to their chosen music. Such findings are consistent with an alternative account that, although those diagnosed with MDD may prefer to engage in sad stimuli, such a preference reflects their attraction to the less energetic and calming aspect of sad music. In this respect, our results are similar to Punkanen et al. (2011), who found that the preference score of patients with MDD for high energetic music was significantly lower than a healthy control group.

Our results raise the question of why might depressed people be drawn to music that is sad and low energy? There can be two possible explanations. The first explanation is that depressed people are attracted to soothing music. Sad and low energetic music tends to be flowing and have slow tempo (Juslin & Laukka, 2004), which might be appealing if depressed people seek calmness. Previous studies found that slow and flowing music with low tones (vs. stimulative) helps reduce anxiety and pain (see Nilsson, 2008, for a review). Indeed, a number of clinical research trials showed promising effects of soothing music on stress reduction (Han et al., 2010; Lee, Chung, Chan, & Chan, 2005; Nilsson, Unosson, & Rawal, 2005). In this sense, MDD-related preference for sad stimuli, rather than being maladaptive, might even reflect pursuit of an adaptive emotional goal to reduce negative emotions. Future work should track the conditions in which particular music choices serve as mood enhancers for people with MDD (e.g., behavioral activation; Hopko, Lejuez, Ruggiero, & Eifert, 2003).

A second possible explanation is that MDD-related preference for low energy might reflect emotional inertia (i.e., resistance to change in energy levels). In this case, the MDD group's preference for sad and low energetic music can be seen as maladaptive, as higher levels of emotional inertia are often related to maladjustment, such as increased sadness (e.g., Kuppens, Allen, & Sheeber, 2010). However, our self-report findings indicated that the MDD group reported feeling better after listening to their preferred sad excerpts, suggesting that sad and low energetic music listening contributed to mood enhancement, rather than mood maintenance (i.e., psychological inertia). That said, we believe caution is warranted because our study was not well designed to determine whether the MDD group's preference for sad and low energetic music reflects a match with the internal state (i.e., psychological inertia) or a mood enhancement motive. Future work here is needed. For example, to test the idea of inertia, it would be useful to experimentally manipulate the initial energy levels (e.g., high and low energy condition) in depressed people. One could subsequently examine whether temporarily being in a happy and high-energy state diminishes MDD-related preference for sad and low energetic music. If such an effect was observed, it would be consistent with MDD participants having a strong mood maintenance motive, consistent with the concept of psychological inertia.

In the EMST, the MDD group on average showed equal preference for sad and happy music, whereas their healthy counterparts exhibited a preference for happy over sad music. Could depressed people's reduced preference for happy music indicate a maladaptive emotion regulation goal? It is possible that such findings may represent depressed people's diminished interest in happy stimuli (e.g., Friedman et al., 2012; Hunter et al., 2011). Alternatively, some research suggests that "happy" stimuli may not always be positive for depressed individuals. Friedman and colleagues (2012) found that compared to those in a neutral mood, those in a sad mood felt that listening to happy music would not enhance their mood, partly because they felt it was inappropriate or wrong to listen to happy music when feeling sad, suggesting some type of cognitive dissonance. Indeed, previous studies found that recalling happy memories, an effective emotion regulation strategy for nondepressed people, does not help depressed people repair their sad mood (Joormann & Siemer, 2004), and may even worsen their sad mood after recalling them (Joormann, Siemer. & Gotlib, 2007). The current study was not well designed to determine whether decreased preference for happy stimuli of the MDD group might indicate maladaptive or adaptive emotion regulation. Future studies should therefore examine the short- and medium-term consequences of engaging in different emotional stimuli.

There are a few limitations of the current study, which might be remedied in future work. First, this study focused on music. Because we focused on music, we cannot address whether Millgram et al.'s (2015) interpretations might hold for other types of stimuli. Indeed, Millgram and colleagues reported that for an image task, depressed individuals chose to increase (rather than decrease) their emotional reactions to sad images when trained to both increase and decrease emotional reactions. Second, the current sample consists of only female students. Previous studies showed significant gender differences in musical preference (McCown, Keiser, Mulhearn, & Williamson, 1997; Staum & Brotons, 2000). Future studies can extend this research by including both genders. Third, we sampled a brief timeframe and did not examine the downstream consequences of engaging with preferred stimuli, which could speak more strongly to whether such preferences are ultimately adaptive or maladaptive. Fourth, it was not possible to perfectly cross-match emotional music clips on energy level (e.g., sad music is naturally low in energy levels relative to happy music; e.g., Schellenberg, Peretz, & Vieillard, 2008). However, we could still contrast high and low energetic music excerpts within an emotion category (i.e., HH, SH, and FH had higher levels than HL, SL, and FL, respectively). Finally, although we took steps to address volume, style, and familiarity of the music excerpts, it is not possible for us to rule out all possible variables from consideration. For example, differences in music pitch or tempo could have impacted the results. By the same token, such variations may not necessarily indicate a confound. It is possible, for example, that slowness in tempo may be part and parcel of what makes sad music sad (Juslin & Laukka, 2004); if so, control of this variable might be undesirable from the standpoint of ecological validity and generalizability of findings. To improve our chances of generalizability, we included two different clips from each emotion/energy category. Nevertheless, control of additional variables relevant to music choice will be valuable in future work.

Despite these limitations, the current study is the most definitive to date in probing depression-related preferences for sad music using different tasks, and the reasons for these preferences. Depressed people consistently chose more sad music than healthy controls across different tasks. However, depression-related preferences for sad stimuli may reflect a desire for calming emotional experience rather than a desire to augment sad feelings.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM–5)*. Washington, DC: Author.

Barrett, L. F. (1998). Discrete emotions or dimensions? The role of valence focus and arousal focus. *Cognition and Emotion, 12,* 579–599. http://dx.doi.org/10.1080/026999398379574

Beblo, T., Fernando, S., Klocke, S., Griepenstroh, J., Aschenbrenner, S., & Driessen, M. (2012). Increased suppression of negative and positive emotions in major depression. *Journal of Affective Disorders, 141,* 474–479. http://dx.doi.org/10.1016/j.jad.2012.03.019

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56,* 893–897. http://dx.doi.org/10.1037/0022-006X.56.6.893

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck Depression Inventory-II*. San Antonio, TX: Pearson.

Brockmeyer, T., Bents, H., Holtforth, M. G., Pfeiffer, N., Herzog, W., & Friederich, H.-C. (2012). Specific emotion regulation impairments in major depression and anorexia nervosa. *Psychiatry Research, 200,* 550–553. http://dx.doi.org/10.1016/j.psychres.2012.07.009

Eerola, T., & Vuoskoski, J. K. (2011). A comparison of the discrete and dimensional models of emotion in music. *Psychology of Music, 39,* 18–49. http://dx.doi.org/10.1177/0305735610362821

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods, 39*. 175–191.

Friedman, R. S., Gordis, E., & Förster, J. (2012). Re-exploring the influence of sad mood on music preference. *Media Psychology, 15,* 249–266. http://dx.doi.org/10.1080/15213269.2012.693812

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2,* 271–299. http://dx.doi.org/10.1037/1089-2680.2.3.271

Gross, J. J., & Muñoz, R. F. (1995). Emotion regulation and mental health. *Clinical Psychology: Science and Practice, 2,* 151–164. http://dx.doi.org/10.1111/j.1468-2850.1995.tb00036.x

Han, L., Li, J. P., Sit, J. W., Chung, L., Jiao, Z. Y., & Ma, W. G. (2010). Effects of music intervention on physiological stress response and anxiety level of mechanically ventilated patients in China: A randomised controlled trial. *Journal of Clinical Nursing, 19,* 978–987. http://dx.doi.org/10.1111/j.1365-2702.2009.02845.x

Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *The Journal of Clinical Psychiatry, 59,* 2233.

Hopko, D. R., Lejuez, C. W., Ruggiero, K. J., & Eifert, G. H. (2003). Contemporary behavioral activation treatments for depression: Procedures, principles, and progress. *Clinical Psychology Review, 23,* 699–717. http://dx.doi.org/10.1016/S0272-7358(03)00070-9

Hughes, C. D., Gunthert, K., Wenze, S., & German, R. (2015). The subscale specificity of the Affective Control Scale: Ecological validity and predictive validity of feared emotions. *Motivation and Emotion, 39,* 984–992. http://dx.doi.org/10.1007/s11031-015-9497-7

Hunter, P. G., Schellenberg, E. G., & Griffith, A. T. (2011). Misery loves company: Mood-congruent emotional responding to music. *Emotion, 11,* 1068–1072. http://dx.doi.org/10.1037/a0023749

Joormann, J., & Siemer, M. (2004). Memory accessibility, mood regulation, and dysphoria: Difficulties in repairing sad mood with happy memories? *Journal of Abnormal Psychology, 113,* 179–188. http://dx.doi.org/10.1037/0021-843X.113.2.179

Joormann, J., Siemer, M., & Gotlib, I. H. (2007). Mood regulation in depression: Differential effects of distraction and recall of happy memories on sad mood. *Journal of Abnormal Psychology, 116,* 484–490. http://dx.doi.org/10.1037/0021-843X.116.3.484

Juslin, P. N., & Laukka, P. (2004). Expression, perception, and induction of musical emotions: A review and a questionnaire study of everyday listening. *Journal of New Music Research, 33,* 217–238. http://dx.doi.org/10.1080/0929821042000317813

Kuppens, P., Allen, N. B., & Sheeber, L. B. (2010). Emotional inertia and psychological maladjustment. *Psychological Science, 21,* 984–991. http://dx.doi.org/10.1177/0956797610372634

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33,* 159–174.

Lee, O. K. A., Chung, Y. F. L., Chan, M. F., & Chan, W. M. (2005). Music and its effect on the physiological responses and anxiety levels of patients receiving mechanical ventilation: A pilot study. *Journal of Clinical Nursing, 14,* 609–620. http://dx.doi.org/10.1111/j.1365-2702.2004.01103.x

Lonsdale, A. J., & North, A. C. (2011). Why do we listen to music? A uses and gratifications analysis. *British Journal of Psychology, 102,* 108–134. http://dx.doi.org/10.1348/000712610X506831

McCown, W., Keiser, R., Mulhearn, S., & Williamson, D. (1997). The role of personality and gender in preference for exaggerated bass in music. *Personality and Individual Differences, 23,* 543–547. http://dx.doi.org/10.1016/S0191-8869(97)00085-8

Millgram, Y., Joormann, J., Huppert, J. D., & Tamir, M. (2015). Sad as a matter of choice? Emotion-regulation goals in depression. *Psychological Science, 26,* 1216–1228. http://dx.doi.org/10.1177/0956797615583295

Nilsson, U. (2008). The anxiety- and pain-reducing effects of music interventions: A systematic review. *AORN Journal, 87,* 780–807. http://dx.doi.org/10.1016/j.aorn.2007.09.013

Nilsson, U., Unosson, M., & Rawal, N. (2005). Stress reduction and analgesia in patients exposed to calming music postoperatively: A randomized controlled trial. *European Journal of Anaesthesiology, 22,* 96–102. http://dx.doi.org/10.1017/S0265021505000189

Ottenbreit, N. D., & Dobson, K. S. (2004). Avoidance and depression: The construction of the Cognitive–Behavioral Avoidance Scale. *Behaviour Research and Therapy, 42,* 293–313. http://dx.doi.org/10.1016/S0005-7967(03)00140-2

Punkanen, M., Eerola, T., & Erkkilä, J. (2011). Biased emotional preferences in depression: Decreased liking of angry and energetic music by depressed patients. *Music and Medicine, 3,* 114–120. http://dx.doi.org/10.1177/1943862110395597

Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology, 84,* 1236–1256. http://dx.doi.org/10.1037/0022-3514.84.6.1236

Schellenberg, E. G., Peretz, I., & Vieillard, S. (2008). Liking for happy- and sad-sounding music: Effects of exposure. *Cognition and Emotion, 22,* 218–237. http://dx.doi.org/10.1080/02699930701350753

Slee, N., Garnefski, N., Spinhoven, P., & Arensman, E. (2008). The influence of cognitive emotion regulation strategies and depression severity on deliberate self-harm. *Suicide and Life-Threatening Behavior, 38,* 274–286. http://dx.doi.org/10.1521/suli.2008.38.3.274

Spitzer, R. L., Williams, J. B., Gibbon, M., & First, M. B. (1992). The structured clinical interview for *DSM–III–R* (SCID). I: History, rationale, and description. *Archives of General Psychiatry, 49,* 624–629. http://dx.doi.org/10.1001/archpsyc.1992.01820080032005

Stapinski, L. A., Abbott, M. J., & Rapee, R. M. (2010). Fear and perceived uncontrollability of emotion: Evaluating the unique contribution of emotion appraisal variables to prediction of worry and generalised anxiety disorder. *Behaviour Research and Therapy, 48,* 1097–1104. http://dx.doi.org/10.1016/j.brat.2010.07.012

Staum, M. J., & Brotons, M. (2000). The effect of music amplitude on the relaxation response. *Journal of Music Therapy, 37,* 22–39. http://dx.doi.org/10.1093/jmt/37.1.22

Watson, D., & Clark, L. A. (1999). *The PANAS-X: Manual for the Positive and Negative Affect Schedule-Expanded Form*. Retrieved from http://www.psychology.uiowa.edu/Faculty/Watson/Watson.html

Werner-Seidler, A., Banks, R., Dunn, B. D., & Moulds, M. L. (2013). An investigation of the relationship between positive affect regulation and depression. *Behaviour Research and Therapy, 51,* 46–56. http://dx.doi.org/10.1016/j.brat.2012.11.001

Received May 19, 2018
Revision received October 18, 2018
Accepted December 19, 2018 ■