Oliver Herdson

16th September 2021

Student number: 20902961

Psychology - Master of Science Research

The Enhancing and Impairing Effect of Sad Music: Moderating Role of Cognitive Reappraisal

Word count: 9,232

Note: sections of the introduction were submitted for publishing in a review:

Herdson, O., Eerola, T., & Javadi, A.-H. (in revision) Analysis and Classification of Music-induced States of Sadness

Abstract

Seemingly paradoxical, sad music has exhibited potential in improving mood in individuals, as well as being detrimental to mood and indicative of maladaptive behaviours concerning emotion regulation. Research suggests that different adaptive and maladaptive behaviours underlie sad music listening. As such, cognitive reappraisal (CR) was explored, investigating its effectiveness at promoting adaptive behaviours associated with sad music listening, while negating the negative psychological outcomes. CR is a cognitive skill that focuses on the reframing and re-evaluation of negative events in a positive way. Across two studies, the combined effect of sad music and CR, when exposed to neutral or sad events on mood, was explored. Data analyses revealed that CR significantly enhanced mood notably more than the control task. A three-way interaction effect revealed that increases to MDD severity was associated with worse mood regulation across all but one condition. Only happy music and the control task was associated with an increase in mood regulation despite increased MDD severity. Therefore, CR was shown to be effective in improving one's mood, though mood regulation typically decreased as MDD severity increased. The discussion covered how these results fit into the existing literature and covers the theoretical implications.

Key Words: Cognitive Reappraisal, Sad Music, MDD, Emotion Regulation

Major Depressive Disorder (MDD) is a fast growing, concerning issue in modern day society, with a point prevalence of over 19% after a rise in years gone by (Macrory, 2016). This prevalence highlights the need to be able to reach those in need of help, especially given that it is one of the more burdensome mental health disorders (Eaton et al., 2008), one that has a vast array of effects, including a range of comorbidities and long-term health issues (Naylor et al., 2012). An issue for those with MDD is the inability to effectively regulate their own emotions (Beauregard et al., 2006). As well as this, maladaptive behaviours such as rumination (McLaughlin & Nolen-Hoeksema, 2011) and attentional biases towards negative information and sad affect are often exhibited by those with MDD (Donaldson et al., 2007). Thus, when this is paired with the difficulty in providing therapeutic services to all those who need it, with less than 60% of cases receiving treatment (McManus et al., 2016), it has become imperative for researchers to consider ways to develop more easily accessible, wide-spread interventions.

One such intervention that arises to thought is music therapy (MT). MT exists in two forms: active and receptive, though the distinction between these forms can become blurred. For instance, one is constantly receptive to music while actively engaging with it and, similarly, there are many ways in which an individual may become actively engaged while listening to music. One may, for example, tap a rhythm or hum along. Despite this, important distinctions about what each format *requires* exist. On a fundamental level, active MT relies on a trained therapist and the ability to play or learn an instrument (Maratos et al., 2008), meaning it is not always easily accessible, while receptive MT requires only listening to music (Leubner & Hinterberger, 2017) and thus has greater potential to be deployed as an intervention to the masses with musical ability / 'willingness to engage in musical lessons' being removed as a barrier. However, many individuals with MDD may be self-detrimental with music, by seeking out sad affect through sad music (Garrido & Schubert, 2015a, 2015b). Hence, the mission becomes finding a way to preserve a music listener's musical preference, while avoiding

negative psychological effects by promoting adaptive tendencies to pair with music-listening. Cognitive reappraisal (CR) is a cognitive strategy focused on positive thinking and the re-evaluation (or reappraisal) of sad events (Cutuli, 2014; Gross, 2014; Gross & John, 2003; Lazarus & Alfert, 1964). Thus, promoting CR in individuals often produces positive effects (Aldao et al., 2010; Dryman & Heimberg, 2018; Liu & Thompson, 2017). In this thesis, the therapeutic applications of both sad music and CR will be discussed, culminating in an approach to combine the two into a more efficacious and potentially more targeted and accessible intervention.

Sad Music

Paradoxical in nature, the enjoyment of negative emotions, such as sadness, has long been a topic of debate and discussion amongst researchers. While it may be simpler to assume that negative emotions are only implicated in negative experiences, psychological research has contributed to our understanding of the complexity behind negative emotion and its implication in positive and pleasurable experiences. Many aspects of society channel negative emotion to induce enjoyment, yet mediums, such as theatre, film, art, and music, highlight that stimuli that express negative emotions do not deter from popularity (Hanich et al., 2014; Schramm & Wirth, 2010). Sad music, in particular, has become an intriguing area of research, as many individuals can achieve enjoyment from experiencing negative emotions in sad music (Garrido & Schubert, 2011). Particularly evoking sad music has great power over certain individuals, such as those with high empathy (Eerola et al., 2016; Huron & Vuoskoski, 2020), producing a wide range of emotions. However, research suggests a difference between the emotion that music expresses and subsequently induces (Gabrielsson, 2001). As such, sad music has been shown to not only express and induce negative emotion (Garrido & Schubert, 2013), but also positive experiences, such as pleasure (Sachs et al., 2015). The nature of sad music and its ability to produce positive affects in individuals has thus been long discussed, stretching from

philosophical discussions (Hindemith, 1961) to more recent studies (Warrenburg, 2020) exploring sad music and the range of emotions it may induce. The nature of, and interaction between, sad music and sad mood is unique amongst other emotions (Sizer, 2019), thus the complexity and importance of this topic warrants greater investigation.

Philosophical discussions of sad music focus on whether true sadness is experienced in response to sad stimuli. Two philosophical camps are considered: the *cognitivists* and the *emotivists*. Cognitivists claim that sad music would not elicit real emotion due to a lack of real-life consequences (Kivy, 1991), while emotivists believed that music-induced sadness was genuine sadness - perhaps an adaptive strategy for experiencing catharsis, understanding feelings, and emotional assurance (Levinson, 1990), an idea supported by the presence of physiological responses to sad music (Garrido, 2017). While considering this as a discussion of absolutes may oversimplify a complex issue, it suggests that sad music is a deeply affective tool. Psychology has, over time, become more involved in investigating this phenomenon. While these philosophical arguments may be reductionist, trying to explain the complexities of sadness through a narrow approach, they may act as a framework to explore sadness, as the possibility of varied, differential existences of 'sadness' are contemplated.

A common division utilised within music research is the separation of the emotion expressed by music and the emotion induced (Evans & Schubert, 2008; Juslin & Sloboda, 2001). Some research has suggested that emotions induced from music listening are congruent with emotions expressed by the music, as rated by musical features (i.e., sad music was given a slower tempo), and by participant ratings respectively (Hunter et al., 2010; Lundqvist et al., 2009; Song et al., n.d.). However, other research reported discrepancies between expressed and induced sadness (Hunter et al., 2010; Kawakami et al., 2013; Schubert, 2016). It has been suggested that sad music does not elicit basic emotions, such as sadness, but creates feelings of 'being moved' (Vuoskoski & Eerola, 2017) and *aesthetic awe* – a profound and memorable

aesthetic response (Konečni et al., 2008). Non-genuine sadness may be experienced because the emotions one experiences from music are vicarious and non-threatening (Kawakami et al., 2014). This supports cognitivist beliefs that music does not induce 'real' emotion, as the sadness from listening to music is lacking real-life consequences. Alternatively, sadness may require context, and thus relevance to the listener is key for emotion to be induced (Schubert, 2016; Vuoskoski & Eerola, 2012, 2015).

With this debate in mind, researchers sought to elucidate the outcomes of listening to sad music. Typically, individuals seek positive affect when experiencing negative affect (van den Tol & Edwards, 2013). This idea is in line with the mood management theory of music preference, in which music-listening choices are based on the inclination to maintain positive mood or enhance a negative mood (Knobloch & Zillmann, 2002; Zillmann, 1988). However, many seek sad music when already low in mood (van den Tol, 2016), potentially using sad music with adaptive behaviours to achieve positive outcomes, thus experiencing mood enhancement (van den Tol, 2016). However, maladaptive tendencies in individuals listening to sad music, such as rumination, are associated with the maintenance of negative mood and emotions (Schubert et al., 2018) and are more evident in sadder individuals, or those experiencing MDD (Garrido et al., 2017; van den Tol, 2016). Additionally, sad music can intensify negative emotion perception (Baranowski & Hecht, 2017; Lawrie et al., 2019), meaning a desire to listen to sad music may produce increased perception of negative stimuli, representing a cycle where sad individuals listen to sad music, and will thus perceive more sadness in subsequent events/stimuli. The research field for sad music has not settled on a comprehensive understanding of why sadness associated with music can attenuate both positive and negative moods (Campbell et al., 2020). Additionally, individuals have different preferences, with some favouring music associated with sadness (Eerola & Peltola, 2016),

while others exhibit different adaptive and maladaptive behaviours in response to sad music (Garrido & Schubert, 2013).

Over time, the literature has shifted towards understanding multiple music-induced sad states (SSs) to expand our understanding of sadness by elucidating the negative and positive outcomes of listening to sad music, as well as enabling the interpretation of sad emotion more formulaically to reduce the variability within the literature. For instance, Taruffi and Koelsch (2014) suggested that nostalgia was more commonly experienced, rather than the overarching category of 'sadness'. However, a comprehensive breakdown of states is far from agreed upon. Peltola and Eerola (2016), for instance, observed via three large samples that nostalgia was not the primary label encompassing sad experiences related to music. Through exploratory and confirmatory factor analyses they broke sadness down into three categories: grief, melancholia, and sweet sorrow. These states were largely negative experiences for participants. However, sweet sorrow was a positive experience. These states indicate a proposed structure for music-induced sadness, and the separation of grief and melancholia has also been supported by recent research (Warrenburg, 2020). Eerola and Peltola (2016) expanded upon this initial structure of sadness, identifying three emotion categories to further explore the effects of sad music listening: sublime, comforting, and grief-stricken sorrow. These studies provide a range of differential SS, but do not propose an integrated model through which the SSs can be explored. Developing this understanding into a more comprehensive model of music-induced sadness will help to elucidate the variability in the literature of sad music. Warrenburg (2020) claimed that further classification of music-induced SSs is required, even considering an infinite spectrum of states. While this is not yet possible, there is an abundance of literature alluding to a range of emotions regarding sad music. The more of these that can be identified and understood, the greater the understanding of sad music and its effects will be.

Rather than taking a cognitivist approach, in declaring no genuine sadness is experienced, these classifications instead provide a means through which a range of feelings and experiences may derive from sadness, not just a one-dimensional feeling of sadness. Thus, such models can consider music as being a genuine source of sadness. Such research, exploring differential SSs provide a range of sad experiences that may exist separately from one another (Eerola & Peltola, 2016; Peltola & Eerola, 2016). Thus, this exploration of different experiences associated with listening to sad music is crucial to the understanding of how to utilise sad music in therapeutic interventions. When understanding the negative experiences and how they are induced, as well as by understanding the positive experiences and what makes them work, potential interventions can be considered that shift an individual away from negative experiences, and towards positive ones. For example, by comparing melancholia and sweet sorrow, it is highlighted that melancholia often gives rise to maladaptive tendencies, while sweet sorrow may be where sad individuals utilise adaptive tendencies to enhance their mood (Peltola & Eerola, 2016).

Experiences of melancholia are typically associated with personality traits that contribute to the enjoyment of music that increases feelings of sadness (Ladinig & Schellenberg, 2012; G. Martin et al., 1993). Research also suggests that those who feel sadder and are more depressed were more likely to show a preference for sad music (Hogue et al., 2016; Xue et al., 2018) and that higher rumination predicts sad music preference (Chen et al., 2007; Garrido & Schubert, 2015b; Sachs, Damasio, et al., 2020a). Paired with findings from Garrido et al. (2017), who identified that those with MDD were more likely to ruminate, this highlights the maladaptive tendencies which are symptomatic of the melancholic state (Peltola & Eerola, 2016). Alternatively, sweet sorrow, associated with positive psychological outcomes, was centred around self-reflection, and adaptive coping mechanisms, such as solace, validation, and reflection were found to be helpful when experiencing negative life events

(Hanser et al., 2016; van den Tol et al., 2016). Sweet sorrow may reflect those times when individuals exhibit positive emotion regulation (ER) strategies through cognitive and social domains and (re-) experiencing effect, retrieving memories, and mood enhancement (van den Tol & Edwards, 2013). Moreover, high absorption levels, a trait which predicts an individual's tendencies to be deeply impacted by music (Sandstrom & Russo, 2013; Wild et al., 1995), predicts sad music-liking due to its ability to regulate and enhance positive emotions (Sachs, Damasio, et al., 2020b). Consequently, an individual's trait and behavioural tendencies towards different ER strategies may be closely tied to the outcomes experienced from listening to sad music.

Emotion Regulation

Vanderlind et al. (2020) considered how MDD is associated with ER dysfunctions. Consequently, individuals with MDD often attempt to down-regulate positive emotion and show reduced preference for positive emotions (Vanderlind et al., 2020). In a review, Liu and Thompson (2017) considered how those with MDD may be impaired in the selection and implementation of ER strategies, two factors that were considered vital in the success of ER (Gross & Jazaieri, 2014). Different strategy selection was linked to differential depressive symptomatology, finding that rumination and suppression increased depressive symptoms, while CR was associated with fewer symptoms (Aldao et al., 2010; Nolen-Hoeksema et al., 2008). Liu and Thompson (2017) concluded that MDD is implicated in the maladaptive use of ER strategies as well as suggesting that this could be corrected when those with MDD were given ER strategies under instruction. Thus, this represents a targetable deficit for interventions, as the ER strategy selection and implementation deficits seen in those with MDD can potentially be overcome via guidance and instructions. An ER skill that may help individuals to achieve this is CR, with lower levels of CR being associated with greater

depressive symptomatology, in a meta-analysis which found a small-to-moderate effect size (Aldao et al., 2010).

Cognitive reappraisal ability (CRA), as discussed prior, is a cognitive ability based around reframing negative events and thoughts in a positive manner (Cutuli, 2014; Gross, 2014; Gross & John, 2003; Lazarus & Alfert, 1964). CRA is thought to be implicated in the reduction of depressive symptoms through improving interpersonal functioning and well-being while being associated with the expression of greater positive emotions and fewer negative emotions (Gross & John, 2003). In a systematic review, Dryman and Heimberg (2018) considered how the emotions that CR yielded, such as greater positive emotion and fewer negative emotions, were both internally felt and externally expressed. This was associated with greater quality of life, exhibited through higher life satisfaction, self-esteem, optimism, and environmental mastery (Brewer et al., 2016; Gross & John, 2003; Haga et al., 2009; Hu et al., 2014; Moore et al., 2008). This reappraisal technique utilises expressive writing surrounding stressful or negative thoughts and situations and reframing them positively and has been highlighted as an effective tool for reducing MDD (Morris et al., 2015).

As suggested, those with MDD may find it hard to regulate and suppress sad emotions which has been characterised by researchers as an underutilisation of CR (Dryman & Heimberg, 2018). This may be supported by neuroimaging findings that revealed that emotion dysregulation in those with MDD was associated with disturbances in the neural circuitry responsible for emotion self-regulation (Beauregard et al., 2006). Additionally, activation of the right midfrontal gyrus, a region associated with CRA, has been considered to represent an endophenotypic marker of depression risk (Smoskia et al., 2013). Furthermore, it is also suspected that CRA may act as a moderating factor between stress and depressive symptoms, with greater CRA being associated with reduced depressive symptoms for those with high levels of stress (Troy et al., 2010). This may suggest that greater CRA enables individuals to

avoid allowing negative stressors to contribute to the development of MDD. Alternatively, CR might serve to reduce depressive symptoms by virtue of its social implications. For instance, CR is associated both with stronger connections and liking for peers, as well increased sharing of all emotions (Gross & John, 2003). This openness and willingness to share thoughts and feelings may be associated with a strengthening of interpersonal relationships (Dryman & Heimberg, 2018). Thus, CRA appears to be heavily implicated in the development of MDD, making it a particularly promising ability to target via interventions.

Across meta-analyses and reviews, there is a plethora of support suggesting that CR is a suitable and efficacious intervention for reducing depressive symptoms (Aldao et al., 2010; Dryman & Heimberg, 2018; Liu & Thompson, 2017). Furthermore, it is believed that the repeated use of CR in therapeutic settings and interventions might increase an individual's CRA and ER strategies, thus potentially leading to reductions in depressive symptoms (Rodriguez et al., 2020). As many barriers to common therapies, such as unavailability and waiting lists for CBT, exist (Cooper, 2018), it is important to explore deploying CR interventions in more accessible methods. Additionally, discussed throughout the literature, there are sad states of emotion experienced as a result of listening to sad music, which may be entangled with maladaptive ER behaviours, such as rumination (Garrido, 2009). Garrido (2009) suggested that it was those with higher levels of MDD and who are habitual ruminators that provide an exception to the mood management theory (Knobloch & Zillmann, 2002; Zillmann, 1988), in which individuals are expected to seek out positive affect by seeking out negative affect through music. As such, it is logical to assume that if the maladaptive behaviours amongst these 'exceptions' could be replaced with adaptive behaviours promoted instead, perhaps listeners of sad music could more reliably achieve the positive outcomes associated with sad music, such as pleasure (Sachs et al., 2015) and mood enhancement (van den Tol, 2016; van den Tol & Edwards, 2013).

Furthermore, van den Tol and Edwards (2013) suggested that CR may act as a successful ER strategy, combined with sad music, to achieve positive affect. Consequently, the combination of CR with sad music may serve to enhance a sad music listeners mood. ER with music has been investigated and several cognitive mechanisms have been identified, including both rumination and reappraisal (Sakka & Juslin, 2018). As such, through the combination of music-listening with CR, the use of rumination amongst individuals would be expected to be instead replaced by reappraisal through the following mechanisms:

1. Sad music listeners who achieve negative affect often do so through maladaptive ER strategies (Schubert et al., 2018). Thus, by replacing those strategies with instructed CR, the chance of enhanced mood improves while a shift towards negative affect should be averted.
2. Sad music has been found to enhance some individuals' mood as a function of coping mechanisms, such as (re-)experiencing affect and the processing of emotions (Garrido & Schubert, 2015a, 2015b; van den Tol & Edwards, 2013).
3. The presence of CR should, in itself, allow individuals to reframe any negative thoughts and experiences more positively, thus producing positive affect.

This Thesis

This research paper will look to explore the combined effects of CR and sad music, looking to confirm the above mechanisms as well as exploring the possibility of implementing this as an intervention for MDD. It is predicted that: (1) CR will enhance mood, regardless of the mood of the music accompanying the task, and (2) sad music may result in reduced mood regulation for those with high MDD scores as compared to those with lower MDD scores, but (3) the reduced mood regulation in those with high MDD scores will not be exhibited in the experimental condition (in which CR is present).

As such, our prediction stands that sad music may be detrimental to those with higher MDD scores but that this detriment may be averted if the sad music is accompanied by CR. Thus, the aim of this thesis is to negate the potential negative impact of sad music on those who may be more likely to utilise it in maladaptive manners via the introduction of and engagement with CR.

Methodology

Participants

In study 1, the sample consisted of 103 undergraduate students (Mean age (SD) = 19.39 (1.39)), of which 97 were female and 6 were male. Meanwhile, study 2 consisted of 77 undergraduate students (20.31 (1.91)), of which 58 were female and 19 were male. For GEE, a small to moderate sample size is considered to be $n > 50$ (Paul & Zhang, 2014). Thus, as many participants were recruited within the allotted time as possible, with a minimum target of $n > 50$ participants. All participants were recruited from the University of Kent.

Those who were not fluent in English were excluded from participation due to the necessity to fully understand the English language in order to understand and engage with the cognitive reappraisal instructions and task. This was assessed by a ‘demographics’ question in which participants were asked how long they had been within an English-speaking educational system for. Only those who had accumulated 3 or more years in an English-speaking system were eligible for the study. However, all recruited participants were fluent in English. All participants gave written informed consent. The procedure of the study was approved by the local ethics committee in the School of Psychology at University of Kent.

Design

This thesis, comprised of two studies, utilised completely within-subjects designs - maximising the utility of participants. Significant durations (22 hours) between sessions were

implemented to avoid any priming effects from prior sessions. A 2 (mood of music: sad and happy) × 2 (condition; where the experimental condition involved a CR task paired with sad topics compared to the control condition which utilised a descriptive writing task and neutral topics) design was utilised, meaning there were four conditions: the happy music, experimental condition; the sad music, experimental condition; the happy music, control condition; and the sad music, control condition.

Materials

Qualtrics Survey 1

Qualtrics survey 1 was designed by the research team and was used to collect demographics information. The survey also consisted of a collated questionnaires section, including the following:

MDD Scores. The public health questionnaire (PHQ-9) was used to assess MDD scores (Kroenke et al., 2001). The PHQ-9, which is commonly used in clinical settings, is a 9-item self-report questionnaire consisting of an overarching question - 'Over the last two weeks, how often have you been bothered by any of the following problems?' – for topics such as "Feeling down, depressed, or hopeless?" and adopts a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Kroenke et al. (2001) found that the PHQ-9 was a valid and reliable measure for MDD severity and thus determined that due to its validity, reliability, as well as its sensitivity, specificity and brevity, it was an effective measure for MDD severity in a research context.

Mood rating. Mood ratings, taken after every trial, were collected via a sliding scale (0-100), with 0 being low mood and 100 being great mood.

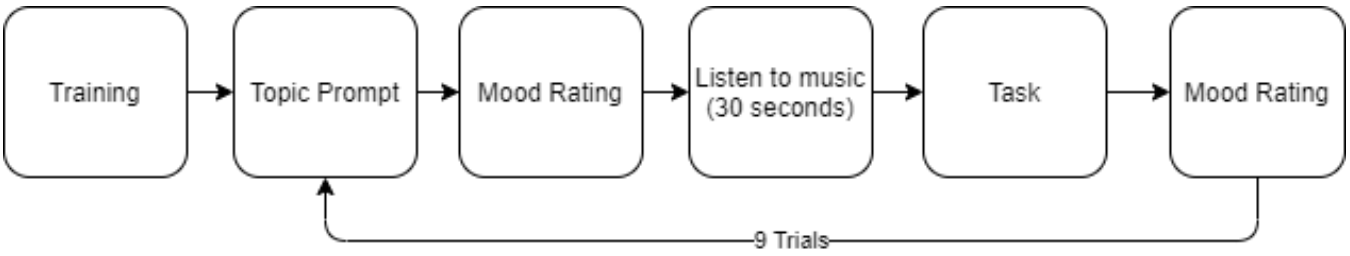
Topic Generation. Qualtrics survey 1 also consisted of a section in which participants were asked to generate nine sad topics that were relevant and personal to themselves. Example prompts were offered (such as: “loss of a loved one”, or “a failed exam”) to help participants generate their topics. A title (5 word maximum) was required as well as a brief description of what the topic consisted of.

Qualtrics survey 2

The Qualtrics survey 2 was used for the main sessions of the experiment and consisted of training modules followed by the experimental trials (see Figure 1).

Figure 1

Procedure of study 1 and study 2. See Table 1 for the tasks in each study and condition.



Music Stimuli

Pilot Study. A pilot study was conducted to aid in the final stimuli selection. 354 30-second instrumental excerpts were rated by 140 participants (Mean age [SD] = 19.9[5.35]). Of these, 123 were female, 15 were male, and 2 selected ‘other’. After participants were recruited, they completed a brief demographics form and then began the music-listening trials. Here, the 30-second music clips were presented to participants one-by-one. After each clip, participants were asked to rate that clip on a slider scale (1-100) for familiarity (1 being completely unfamiliar and 100 being extremely familiar) and then mood (1 being extremely sad with 100 being extremely happy). Then, they would hear the next song. A between-subjects design was utilised meaning each participant only listened to 59 excerpts. The songs that participants heard

were set to be randomly assigned. Subsequently, songs were ordered by mood and filtered out according to their familiarity: songs with high levels of familiarity were removed so that familiarity would not constitute a confounding factor.

Music excerpts. The final selection of music excerpts for the studies were all 30 seconds each, consisted of no lyrics and were divided into happy and sad groups based on ratings were obtained via the pilot study. Nine sad songs and nine happy songs were selected for the main experiment based off their mood ratings as well as familiarity scores. Excerpts with low familiarity were selected to minimise pre-existing associations that any participants may have had with any of the selected excerpts.

Procedure: Study 1

Participants were invited to participate via a credit-reward system for their university module. After signing up, participants were asked to read an information sheet and then fill out a consent form. After giving informed consent, the participants were directed to the first session. Here, they completed Qualtrics survey 1 and generated the nine sad topics, to be used later in the experimental condition of the main experiment. After this was completed, session 1 was finished. Participants were then randomly assigned to an order of conditions, with half taking part in the experimental condition first, the other half doing the control condition first. Participants would complete their second session, using the Qualtrics survey 2. After completing their first session, participants would then complete the other session the next day (control/experimental, depending on what they have already completed).

The main (experimental and control) sessions (see Figure 1 and Table 1) began with participants being introduced to the task with a training session. A description and instructions were provided through written text. In the experimental condition, this explained the goals of CR and how to approach CR, while in the control condition, the descriptive writing task was

explained. Then, the training was to be completed. Depending on the condition, participants were asked to write a brief CR passage (experimental condition) or description (control condition) of a provided topic. They were then shown an example answer written by the researchers. This was done four times in each session. After, the main task trials could begin. In these trials participants were prompted by a topic and were then asked to rate their mood (Mood Time 1) on the slider scale. They would then listen to a 30-second clip of music before starting the respective writing task. In the experimental condition, participants were given a sad topic prompt selected from their list that they wrote in the first session. They would then listen to the music clip before writing a CR passage about the topic. Guidance was offered on how to approach this through written instructions: “Please think back to the 'sad event' you thought of before. We will then ask you to write a small passage of text covering the following points” followed by a list of points to cover including “How does the topic make you feel?” as well as “did you learn anything from it?”. Meanwhile, in the control condition, participants were given a researcher-provided neutral topic, such as: ‘the weather’. They would then listen to the music clip before writing a descriptive passage about the topic. Both writing tasks required a minimum of 300 characters (approximately 50 words) before they could continue. In total, each block had nine trials and the mood of the music was randomised for each trial. Self-report mood ratings were taken after every writing task was completed (Mood Time 2). Each session took participants approximately 30 minutes to complete.

Procedure: Study 2

Study 2 was nearly identical to study 1 but was different in only one aspect (see Table 1): in study 2’s experimental condition, participants were given the descriptive writing task with their sad events instead of the cognitive reappraisal. This was done to act as a comparison to study 1, allowing for greater inferences to be taken surrounding the role of CR as a variable. The rationale behind study 2’s inclusion is as follows: study 1’s experimental condition differed

from its control in two ways: the task and topic. Thus, the differences between these conditions alone cannot be attributed solely to CR, but rather CR and the topic. In study 2 however, the experimental and control both had the same descriptive writing task, while only the topic changed. Therefore, any differential effects between the two studies, concerning condition, can be more safely attributed to cognitive reappraisal if they only appear in study 1 and not study 2. Thus, by running study 1 alone, the impact of CR could not be isolated from the effects of the topic. Study 2 and the absence of CR instead allows for any differential effects between study 1 and study 2 to be attributed to CR, and not merely the topic assigned to the participant.

Table 1

The variables present in each condition for both study 1 and study 2. See Figure 1 for the procedure of the task.

Study	Condition	Topic	Task
Study 1	Experimental	Sad	Cognitive Reappraisal
	Control	Neutral	Descriptive writing task
Study 2	Experimental	Sad	Descriptive writing task
	Control	Neutral	Descriptive writing task

Note. The music mood was randomised trial by trial. Thus, the order of happy and sad music within a given block varied from participant to participant.

Statistical Analysis

Analysis of the data was carried out using SPSS (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp).

To enable the exploration of the potential confounding effect that MDD may have had on baseline mood (mood ratings taken prior to topic prompts and music), a Pearson's correlation was run between MDD scores and starting mood. There was a significant negative

correlation between MDD scores and baseline mood in both study 1 (in the experimental ($r(101) = -.394$, $p < .001$) and the control condition ($r(101) = -.420$, $p < .001$) and study 2 (in the experimental; ($r(75) = -.311$, $p < .01$) and the control condition; ($r(101) = -.224$, $p \leq .05$)), depicting that as MDD scores increased, baseline mood decreased (see Table 2).

Table 2.

Summary of the Pearson's correlations between MDD scores and baseline mood across conditions in study 1 and study 2.

Study	Condition	*df*	*r*	*p*
Study 1	Experimental	101	-.394	.001***
	Control	101	-.430	.001***
Study 2	Experimental	75	-.311	.006**
	Control	75	-.224	.05*

Note. *$p < .05$. **$p < .01$. ***$p < .001$

Consequently, it was decided that a change score would be utilised for the dependent variable:

$$Mood\ regulation = Mood\ Time\ 2 - Mood\ Time\ 1$$

The rationale followed that by calculating a change score, an individual's mood regulation would be measured, not their baseline mood. This, incidentally, is also closer aligned with the aforementioned aims of the thesis: focusing on mood regulation, not just mood. By using this change score, it was ensured that the DV was not simply measuring the confound of MDD's low mood, nor that the effects were arising from the mood induced by the topics, but rather an individual's mood regulation.

Participants' mood regulation was analysed via a generalised estimating equation (GEE) while condition and music mood were deployed as within-subject variables. Furthermore, the effects of MDD were analysed by incorporating PHQ-9 scores as a continuous variable in the form of a covariate. GEE was used as this approach to population average models is thought to provide a closer approximation of the true underlying relationship (Hubbard et al., 2010). By employing a repeated measures design, the variance within individuals can be examined. Using GEE allows for the utilisation of all data available for each participant: with 18 trials per participants, relying on averages would result in lost data. Additionally, music has highly variable and individual effects, thus by using a GEE, population average effects can be determined by examining these meaningful within-participant variances. Furthermore, in the long-format version of the dataset, the repeated measures were comprised of mood ratings in response to either sad or happy music excerpts and thus some correlation between these measures would be expected. The GEE model was favoured over basic regression approaches for its ability to allow for these correlations. For post-hoc analyses of significant interaction effects, separate GEE analyses were run, exploring specific variables in closer detail.

Results

The Shapiro-wilk test was run to assess the distribution of the residuals in both studies. The results suggested that the data were not normally distributed (both ps < .001). The use of GEE was consequently supported as it does not rely on distributional assumptions but instead functions on population-average effects (Hubbard et al., 2010).

Three nested GEE models were run, each utilising a different correlation structure: independence, exchangeable, and unstructured. The model using an unstructured correlation structure had the lowest QIC for both studies (Quasilikelihood under the Independence model Criterion; study 1: 1865; study 2: 1398) and were therefore determined as having the best model

fit, as compared to the independent and exchangeable correlation structure. Thus, using a GEE with an identity link function with a Gaussian variance distribution (the standard for GEE when used with a continuous outcome variable; Cui, 2007), and unstructured correlation structure, the effects of condition (experimental vs control), music mood (sad vs happy) and MDD (continuous variable) on mood change were assessed. The GEE analysis returned 103 clusters, indicating that the observations from each individual participant were taken as a cluster. With GEE's power for calculating population-average effects, combined with the approach of treating each individual as an independent cluster, will enable for the interpretation of meaningful effects that have taken into account each individual's highly variable and individualistic relationship with music (as aforementioned in the 'Statistical Analysis').

Study 1

In line with hypothesis 1, a significant main effect of condition was found (β = -13.195, *SE* = 2.319, Wald χ^2 = 32.38, $p < .001$) where those in the experimental condition showed significantly greater mood regulation post-task compared to those in the control condition (experimental: Mean[95% Confidence Interval] = 13.72[13.72, 17.66], control = 2.48[1.62, 3.35]). There was not a significant main effect of music mood or MDD, nor were any of the two-way interactions between the three variables significant (see Table 3). Interestingly, there was a significant three-way interaction effect between condition, music mood, and MDD (β = 0.567, *SE* = 0.278, Wald χ^2 = 4.170, p = .041). To investigate this, a three-way median split on MDD scores was used, allowing for the investigation of the estimated marginal means for condition and music at different levels of MDD (see Table 4).

Table 3.

The main and interaction effects of the GEE analysis investigating the effects of condition, music, and MDD on mood change.

	β coefficient	SE	Wald χ2	*p*
(Intercept)	17.012	2.406	50.020	<.001**
Condition	-13.195	2.319	32.380	<.001**
Music	-0.096	2.353	0.000	0.967
MDD	-0.055	0.182	0.090	0.762
Condition*Music	-3.657	2.960	1.530	0.217
Condition*MDD	-0.098	0.187	0.280	0.599
Music*MDD	-0.148	0.217	0.470	0.494
Condition*Music*MDD	0.567	0.278	4.170	0.041*

*Note. ** p < .001, * p < .05*

Table 4.

The estimated marginal means of the three-way interaction effects displaying the mean mood change in each condition, split by low, medium, and high MDD.

MDD	Condition	Music	Mean	95% Confidence Intervals
Low	Experimental	Sad	16.710	[13.59, 19.83]
		Happy	15.820	[12.73, 18.90]
	Control	Sad	2.990	[1.21, 4.77]
		Happy	1.500	[-0.52, 3.52]
Medium	Experimental	Sad	16.400	[14.25, 18.56]
		Happy	14.680	[12.23, 17.12]
	Control	Sad	2.130	[0.91, 3.34]
		Happy	2.990	[1.56, 4.41]

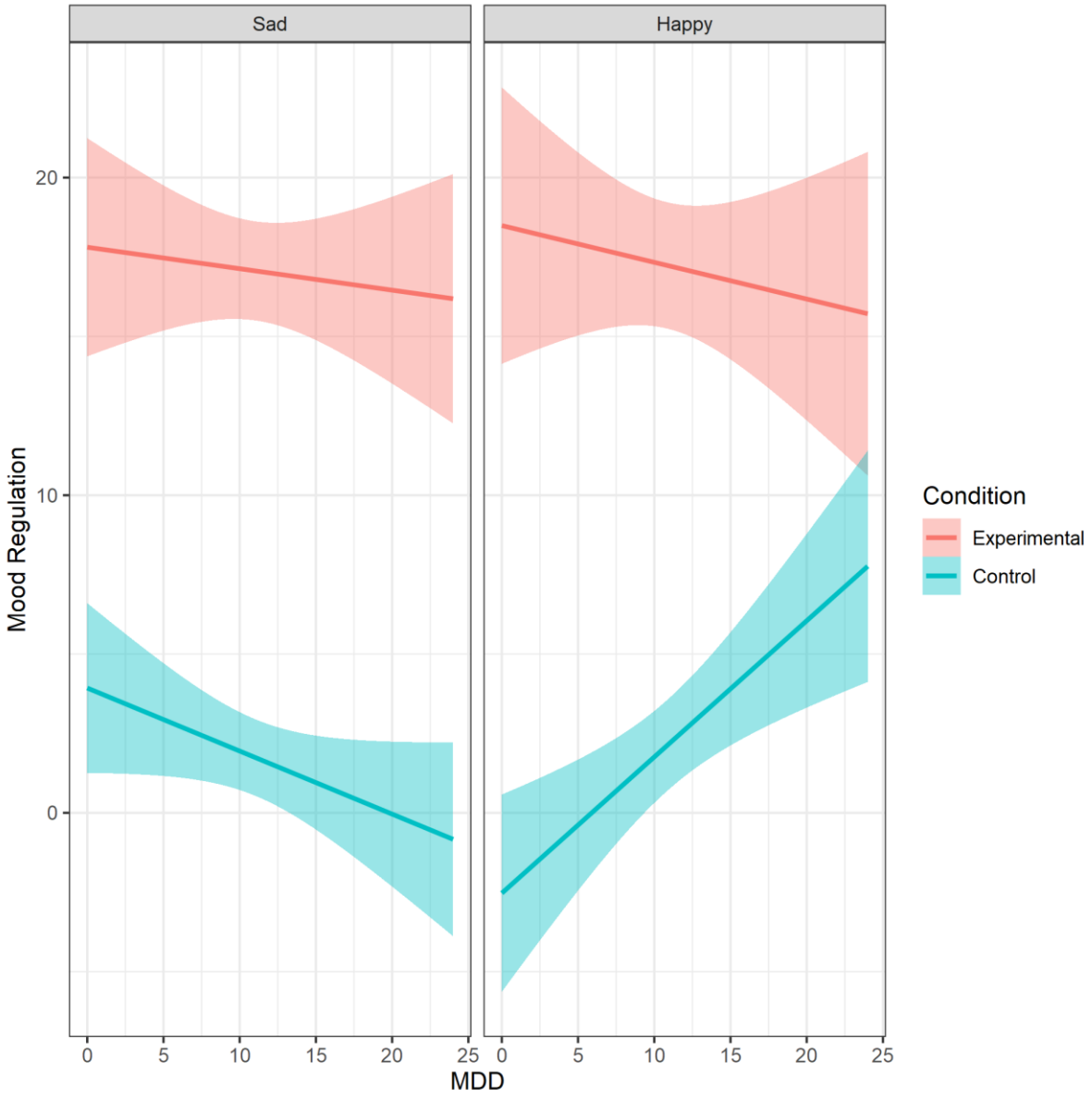
High	Experimental	Sad	16.100	[13.35, 18.84]
		Happy	13.540	[9.76, 17.32]
	Control	Sad	1.270	[-0.33, 2.87]
		Happy	4.470	[2.32, 6.63]

The estimated marginal means (EMMs) depict that the experimental condition was associated with greater mood regulation, regardless of MDD severity or music. Additionally, within the experimental condition, sad music was consistently associated with greater mood regulation than happy music. Notably, the mood regulation gap between sad and happy music, in the experimental condition, became larger as MDD severity worsens.

Generally, a trend can be seen highlighting that mood regulation improves as MDD gets less severe. However, the opposite can be seen for those in the control conditions listening to happy music. In this instance, mood regulation improves as MDD gets more severe. This is reflected in the cross-over interaction effect displayed in the ‘happy’ element, but not the ‘sad’ element, of the graphical representation of the three-way interaction below (see figure 2).

Figure 2.

Plot highlighting the three-way interaction effect between condition, music, and MDD. In all but one condition, mood regulation worsens as MDD becomes more severe. It improved as MDD became more severe only for those listening to happy music in the control condition.



Note. The shaded area reflects the 95% confidence intervals from the GEE model. MDD: Major depressive disorder, as scored on the PHQ-9.

Study 2

In study 2, the same analysis was run, with the only difference being the design of the conditions: the notable difference being the absence of CR in study 2's experimental condition.

The GEE analysis returned no significant results for the main effects nor interactions (see Table 5). Unlike study 1, study 2's experimental condition did not differ significantly from the control. Similarly, study 2 saw no 3-way interaction, suggesting that, once again, with the absence of CR from the experimental condition, no effects on mood regulation are observed. The absence of significant results here, therefore, allows for the inference that the results found in study 1 were not a result of the topic's mood induction, but instead were driven by the presence of CR.

Table 5.

Table showing the main and interaction effects exhibited in study 2.

	β coefficient	SE	Wald $\chi 2$	*p*
Intercept	2.870	1.812	2.510	0.110
Condition	-2.448	2.428	1.020	0.310
Music	-2.817	2.333	1.460	0.230
MDD	-0.168	0.127	1.750	0.190
Condition*Music	3.001	2.985	1.010	0.310
Condition*MDD	0.144	0.164	0.780	0.380
Music*MDD	0.265	0.178	2.210	0.140
Condition*Music*MDD	-0.100	0.224	0.200	0.660

Discussion

In study 1, participants listened to happy and sad music while performing one of two tasks, a cognitive reappraisal (CR) task based around a sad, personal topic, or a descriptive writing task about a neutral topic. Study 1 revealed a range of interesting findings. Firstly, as expected given the support for CR within the literature, a main effect of condition was found whereby mood regulation was greater in the experimental condition compared to in the control

condition. This reflected that CR (experimental condition) promoted positive mood regulation. There was no significant main effect of music nor MDD suggesting that, alone, these factors do not contribute to mood regulation. However, this was not the case as evidenced by the presence of the three-way interaction between condition, music, and MDD.

In study 2, no significant main effects or interaction effects were found. With the difference between study 1 and 2 being the omission of CR in study 2 within the experimental condition, this difference between results found would largely indicate that the presence of CR in study 1 was a major driving force behind the results exhibited. Further, the complete absence of any significant effects from study 2 would suggest that the topic mood induction did not influence individuals' mood regulation. Had condition still influenced mood regulation in study 2, in the absence of CR, then the effects being witnessed in study 1 may too have been arising from the mood induction and would thus most likely be representing the effect of natural mood repair overtime. However, as this was not the case, and the effects were only present in study 1, more confidence can be had in the inference that the effects witnessed hereby were not reflective of natural mood repair overtime, but instead were genuine effects of the CR task.

The significant main effect of condition, in which undergoing the experimental condition resulted in greater mood regulation compared to the control condition, would suggest that CR was an effective mood regulation intervention. This is in concordance with hypothesis 1 as when CR was used participants experienced greater mood regulation, regardless of all other variables, compared to when CR was not used. This is strongly supported by previous research, with the use of CR being linked to reduced depressive symptoms and improved wellbeing (Gross & John, 2003), as well as greater internally felt and externally expressed positive emotion (Dryman & Heimberg, 2018). Therefore, this finding from study 1 adds to the literature suggesting that CR can be promoted alongside music to increase positive mood. CR functions via prompting individuals to reframe negative events in a more positive light,

allowing them to experience positive affect (Morris et al., 2015), thus while it was expected that the CR task within study 1 would likely induce this process while participants completed the experiment – it is noteworthy that this approach remained effective despite the brevity of the task.

Hypotheses 2 and 3 focused heavily on how mood regulation would vary given the complex interplay between the examined variables. The significant three-way interaction, therefore, addressed these hypotheses provided valuable insight into the relationship of these variables. The three-way interaction revealed that within the experimental condition, happy and sad music worked similarly in improving mood and that this was seen across all MDD severities. This suggested that severity of MDD is less impactful on mood and ER when music-listening is combined with CR. This is therefore in agreement with hypothesis 3 as those who undertook the CR task were able to maintain relatively high mood regulation regardless of music mood or MDD severity. Notably, within the experimental condition, those listening to sad music did exhibit greater mood regulation than those listening to happy music, though this was only to a small degree. That said, this difference did increase as MDD became more severe. Further, mood regulation in the control conditions was consistently lower than in the experimental condition. However, as MDD became more severe, mood regulation worsened for those listening to sad music while it improved for those listening to control music.

The fact that those in the experimental condition largely exhibited similar mood regulation across music moods and MDD severities may provide support to research focused on ER strategies. Those with MDD may react worse to sad music due to a tendency to use maladaptive ER strategies, meaning that the negative outcomes can be negated by promoting positive ER strategies under instruction (Liu & Thompson, 2017). Additionally, this further supports findings that CR is an effective intervention for reducing depressive symptoms (Aldao et al.,

2010; Dryman & Heimberg, 2018; Liu & Thompson, 2017), and would suggest that it does so across different severities and regardless of external stimuli such as happy or sad music.

Interestingly, within the control condition, sad music was more effective for improving mood for the least severe MDD group, while happy music was more effective within the most severe MDD group. This may indicate that in the absence of cognitive interventions to aid ER, people with lower MDD scores can benefit from sad music - for the purpose of ER - more effectively, as compared to those with more severe MDD. This finding is in agreement with hypothesis 2. As such, this agrees with previous research that suggests those with MDD often experience greater negative affect after listening to sad music (Garrido et al., 2017; van den Tol, 2016). This increased negative affect may be due to a tendency for those with higher MDD scores to use maladaptive ER techniques. This detrimental effect, therefore, was not seen in the experimental condition as CR (an adaptive ER technique) was prompted (Garrido, 2017). Within the most severe MDD group, the use of CR allowed both sad and happy music to produce positive mood regulation, suggesting that sad music is only more detrimental for those with high MDD when CR is not used. This further evidences hypothesis 4, as reduced mood regulation in response to sad music was only seen in the control condition for this group, and not in the experimental condition.

The fact that sad music was more detrimental in the control condition and that happy music was more beneficial was perhaps unsurprising. Although those experiencing sad music do exhibit an aversion to happy music (Friedman et al., 2012; Matsumoto, 2002; Taylor & Friedman, 2015), this does not necessarily mean that (1) sad music will be beneficial to them or (2) that happy music will stop being beneficial. Instead rather, this aversion behaviour may simply indicate and emphasise the deep-rooted nature of the maladaptive tendencies exhibited by those who opt for sad music when already sad, and by those with MDD. Additionally, the results here may indicate the potential of abiding by adaptive ER stratgey selection, as outlined

in the mood management theory (Knobloch & Zillmann, 2002; Zillmann, 1988) in which individuals seek out positive affect. Applied to the context of music, such individuals would thus be aided in their ER by the happy music, driven by a desire to positively regulate their mood. Such findings emphasise the importance of cognitive strategies and ER selection as mood regulation mechanisms, especially when concerning being exposed to negative stimuli – in this case, sad music. Future studies could explore such mechanisms further to help inform the understanding of sad music and investigate how to encourage positive ER selection, like CR.

Limitations and future directions

Given the variability within the sad music literature, it is not always clear which musical stimuli is best suited to a given design. Consequently, it is important to give consideration to the possible associated impacts of the selected stimuli and design on the experience of the participants.

Sad Music

Furthermore, previous research has found that features of the music listened to, above whether it is happy or sad, can affect the mood elicited. For example, music including lyrics has been linked to greater emotional responses (Ali & Peynircioğlu, 2006; Brattico et al., 2011). Familiarity with the song has also been seen to influence the mood elicited, and may be as influential, or more so, than the music mood itself (Garrido et al., 2016; Kim, 2011). Familiar music with lyrics has been seen to produce larger impacts on mood due to connections to the message conveyed in the lyrics, high aesthetic value to the listener, and triggering memories linked to the music (van den Tol & Edwards, 2015). However, in the current studies, unfamiliar, researcher-selected music (as determined by the pilot study) with no lyrics was used to reduce the influence of differing levels of personal connection between participants affecting the mood induced. While this ensured that familiarity was not a confounding variable, a greater

effect on mood may have been seen if participants had been able to select a piece of music which they thought of as sad or happy and were familiar with. In fact, participant-selected, familiar music has been shown to induce deeper mood effects (in both directions) as compared to researcher-selected music (Ali & Peynircioğlu, 2010). This must therefore be considered a limitation of the current studies due to their utilisation of researcher-selected music.

Such features, which may contribute to the level of personal meaning an individual has towards a piece of music may be very impactful in the subsequent emotions induced. Thus, future research could replicate these studies using participant-selected happy and sad songs, to expore whether this deeper connection to the music (through meaningful lyrics and familiarity) results in a deeper genuine sadness as well as greater subsequent ER. Furthermore, allowing participants to select their own sad or happy music may increase the ecological validity of studies into mood induced by music (Eerola & Vuoskoski, 2013).

Personality

It is important to also keep in mind that each individual will have their own relationship and associated tendencies with music. Moreover, this becomes even more complex when considering that in this study, MDD is an area of interest. For instance, it has been found that those with high levels of MDD and rumination are more likely to both show a stronger liking for sad music and to subsequently show increased MDD as a result of listening to sad music (Garrido & Schubert, 2015a, 2015b). As well as that, brain regions associated with empathy (Schnell et al., 2011) has also been found to be associated with increased synchronisation when listening to sad music (Sachs, Habibi, et al., 2020). Other personality traits, such as absorption have been shown to influence whether an individual shows liking towards sad music as well as the reward responses to negative stimuli (Sachs, Damasio, et al., 2020a). These, combined with the features of the sad music itself that has an influential role on outcomes, highlight the difficulty in disentangling individuals' relationship, whether adaptive or maladaptive, with sad

music. Future research should remain wary of how such factors may be influencing individuals' responses to sad music.

Methodological Considerations

Furthermore, in the current study, due to time constraints, music was presented to participants in 30-second clips, which may not have been long enough to elicit deep emotional responses. Some research into musical stimuli suggests that 30-to-60 seconds is sufficient to induce an emotional response and allow self-reporting of this experience (Eerola & Vuoskoski, 2013). However, contrary research suggests that there is a threshold of nine-minutes between emotions and mood induction (Garrido, 2014). This threshold would strongly suggest that emotional responses would not have been picked up by this design, confirming that mood was measured, not deep emotional responses. While in the current studies, *mood* change was the target dependent variable, such research would suggest that by having longer musical excerpts, future studies could instead focus on deep emotional responses which may spark more ecologically valid responses and findings.

Furthermore, in these studies, participants were asked to listen to multiple music clips of sad or happy music, with mood being measured directly after the task in each condition. However, this design may not have allowed time for participants to experience deep happiness or sadness before the next stimuli was presented. This also offers an explanation as to why participants in the current study may not have experienced genuine enough sadness to show all the effects hypothesised. However, even if the effects seen do not persist, the combination of CR and music was shown to be capable of producing short-term mood regulations, similar to that of other art interventions (Aalbers et al., 2019; Martin et al., 2018). The intervention, therefore, could still be beneficial to those with MDD. Nevertheless, future research could assess mood induction after multiple, longer sessions of music to assess whether this affects the results seen when conducted in scenarios that reflect greater ecological validity.

Finally, mood regulation (a change score) was used as the outcome measure. It may be the case that baseline differences between those with high and low MDD scores, measured before the topic prompt, music and task, affected the outcome measure of mood regulation (Clifton & Clifton, 2019). The correlations between MDD scores and baseline mood indicated that those with higher MDD scores had lower baseline mood. Consequently, these individuals may have shown regression towards the mean, resulting in a larger change in mood than those with low MDD scores, who remained more stable across the trials. Consequently, it is important to take these findings of mood regulation with caution as MDD and the associated lower baseline moods may act as a confounding variable across both studies. So, while the intervention did still exhibit its potential in enhancing mood, future studies could focus on measuring its effectiveness with alternative outcome measures to ensure the effects exhibited here were not completely driven by baseline differences.

Sample Considerations

A consideration around the sample used need also be noted. Throughout both studies, there was a largely unbalance sample with regards to gender. The samples were mostly comprised of females, which means the results here must be interpreted with caution, as their generalisability to the wider population might be weakened by this unbalance. Instead, the results might more strongly reflect the relationship between ER strategies, music, and MDD in women, and not the wider population. It has been found that there exist gender differences in both MDD and music-listening behaviours, such that females are more likely to make use of mood management strategies (Miranda & Claes, 2007; Zillmann, 1988). Consequently, it is possible that the females in these studies already show greater tendency towards adaptive ER strategies when listening to music. Thus, the differences between conditions and music moods may become more exaggerated if observing only male participants or grouping by gender.

Implications

Results from these studies contribute to our understanding of sad music and its role in emotion regulation with both theoretical and potential clinical implications. A theoretical implication of these studies comes from the findings which highlighted that sad music was comparatively less effective in producing mood regulation as compared to happy music, but that this effect was absent when CR was used. However, despite what some literature may suggest concerning sad music, the effect of sad music here was not mood impairing nor detrimental. Instead, both music moods were associated with positive mood regulation. Furthermore, and perhaps most importantly, findings from these studies would suggest that the introduction of a short CR task was sufficient to remove the disparity in resultant mood regulation exhibited between sad and happy music. As such, a clinical implication that may arise from this is the potential development of a CR-based intervention in conjunction with music listening. Should an individual exhibit maladaptive tendencies surrounding their music listening habits, a short CR intervention to be deployed during their everyday music listening may represent an effective method of mood improvement. Further, this thesis would suggest that this can be done effectively with both sad and happy music and would therefore allow the individual to maintain the musical preference – which may increase the likelihood of individuals engaging with and continuing with the intervention. For such an intervention to be developed, future research should consider the effects of prolonged and repeated exposure to the combination of sad music and CR to ensure that the positive effects offer a long-term solution as well as to explore what effects this may have on mental health conditions such as MDD over time.

Conclusion

The results of the current study suggest that CR can be used as an effective intervention, allowing individuals to experience mood regulation when listening to both happy and sad

music. Specifically, CR enables those listening to sad music to experience similar mood regulation to those listening to sad music. These results are important as those with MDD are often seen to use maladaptive ER techniques, which in turn results in worsened mood after sad music listening (Garrido, 2017; van den Tol, 2016). As depressed individuals show a preference for sad music listening, steps must be taken to avoid this mood impairment (Millgram et al., 2015). In the current study, as hypothesised, sad music was less effective for promoting mood regulation in those with high MDD scores, when CR was not used. However, when CR was used, both music moods performed similarly, indicating that CR replaced maladaptive ER techniques associated with sad music listening and enabled those with greater MDD scores to listen to sad music and experience similar mood regulation as when happy music was listened to.

The current study shows that CR could be promoted in those with MDD, who often listen to sad music as a maladaptive ER strategy, enabling these individuals to retain their ‘everyday’ musical preferences while negating the associated negative psychological outcomes. Moreover, this format of CR, combined with music listening, is a highly accessible approach. Consequently, such CR techniques could be widely delivered as an app intervention or as part of music therapy that could potentially be put into practice on a daily basis.

References

Aalbers, G., McNally, R. J., Heeren, A., de Wit, S., & Fried, E. I. (2019). Social media and depression symptoms: A network perspective. *Journal of Experimental Psychology: General*, *148*(8), 1454–1462. https://doi.org/10.1037/xge0000528

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. In *Clinical Psychology Review* (Vol. 30, Issue 2, pp. 217–237). Pergamon. https://doi.org/10.1016/j.cpr.2009.11.004

Ali, S. O., & Peynircioğlu, Z. F. (2006). Songs and emotions: Are lyrics and melodies equal partners? *Psychology of Music*, *34*(4), 511–534. https://doi.org/10.1177/0305735606067168

Ali, S. O., & Peynircioğlu, Z. F. (2010). Intensity of emotions conveyed and elicited by familiar and unfamiliar music. *Music Perception*, *27*(3), 177–182. https://doi.org/10.1525/mp.2010.27.3.177

Baranowski, A. M., & Hecht, H. (2017). The Auditory Kuleshov Effect: Multisensory Integration in Movie Editing. *Perception*, *46*(5), 624–631. https://doi.org/10.1177/0301006616682754

Beauregard, M., Paquette, V., & Lévesque, J. (2006). Dysfunction in the neural circuitry of emotional self-regulation in major depressive disorder. *NeuroReport*, *17*(8), 843–846. https://doi.org/10.1097/01.wnr.0000220132.32091.9f

Brattico, E., Alluri, V., Bogert, B., Jacobsen, T., Vartiainen, N., Nieminen, S., & Tervaniemi, M. (2011). A Functional MRI Study of Happy and Sad Emotions in Music with and without Lyrics. *Frontiers in Psychology*, *2*. https://doi.org/10.3389/fpsyg.2011.00308

Brewer, S. K., Zahniser, E., & Conley, C. S. (2016). Longitudinal impacts of emotion regulation on emerging adults: Variable- and person-centered approaches. *Journal of Applied Developmental Psychology*, *47*, 1–12. https://doi.org/10.1016/j.appdev.2016.09.002

Campbell, E. A., Berezina, E., & Gill, C. M. H. D. (2020). The effects of music induction on mood and affect in an Asian context. *Psychology of Music*, 030573562092857. https://doi.org/10.1177/0305735620928578

Chen, L., Zhou, S., & Bryant, J. (2007). Temporal Changes in Mood Repair Through Music Consumption: Effects of Mood, Mood Salience, and Individual Differences. *Media Psychology*, *9*(3), 695–713. https://doi.org/10.1080/15213260701283293

Clifton, L., & Clifton, D. A. (2019). The correlation between baseline score and post-intervention score, and its implications for statistical analysis. *Trials 2019 20:1*, *20*(1), 1–6. https://doi.org/10.1186/S13063-018-3108-3

Cui, J. (2007). QIC program and model selection in GEE analyses. In *The Stata Journal* (Vol. 7, Issue 2).

Cutuli, D. (2014). Cognitive reappraisal and expressive suppression strategies role in the emotion regulation: An overview on their modulatory effects and neural correlates. In *Frontiers in Systems Neuroscience* (Vol. 8, p. 175). Frontiers Research Foundation. https://doi.org/10.3389/fnsys.2014.00175

Donaldson, C., Lam, D., & Mathews, A. (2007). Rumination and attention in major depression. *Behaviour Research and Therapy*, *45*(11), 2664–2678. https://doi.org/10.1016/j.brat.2007.07.002

Dryman, M. T., & Heimberg, R. G. (2018). Emotion regulation in social anxiety and depression: a systematic review of expressive suppression and cognitive reappraisal. In *Clinical Psychology Review* (Vol. 65, pp. 17–42). Elsevier Inc. https://doi.org/10.1016/j.cpr.2018.07.004

Eaton, W. W., Martins, S. S., Nestadt, G., Bienvenu, O. J., Clarke, D., & Alexandre, P. (2008). The burden of mental disorders. In *Epidemiologic Reviews* (Vol. 30, Issue 1, pp. 1–14). Oxford Academic. https://doi.org/10.1093/epirev/mxn011

Eerola, T., & Peltola, H.-R. (2016). Memorable Experiences with Sad Music—Reasons, Reactions and Mechanisms of Three Types of Experiences. *PLOS ONE*, *11*(6), e0157444. https://doi.org/10.1371/journal.pone.0157444

Eerola, T., & Vuoskoski, J. K. (2013). A Review of Music and Emotion Studies: Approaches, Emotion Models, and Stimuli. *Music Perception*, *30*(3), 307–340. https://doi.org/10.1525/MP.2012.30.3.307

Eerola, T., Vuoskoski, J. K., & Kautiainen, H. (2016). Being Moved by Unfamiliar Sad Music Is Associated with High Empathy. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.01176

Emotion regulation: Conceptual and empirical foundations. - PsycNET. (n.d.). Retrieved June 9, 2021, from https://psycnet.apa.org/record/2013-44085-001

Evans, P., & Schubert, E. (2008). Relationships between expressed and felt emotions in music. *Musicae Scientiae*, *12*(1), 75–99. https://doi.org/10.1177/102986490801200105

Friedman, R. S., Gordis, E., & Förster, J. (2012). Re-Exploring the Influence of Sad Mood on Music Preference. *Media Psychology*, *15*(3), 249–266. https://doi.org/10.1080/15213269.2012.693812

Gabrielsson, A. (2001). Emotion perceived and emotion felt: Same or different? *Musicae Scientiae*, *5*(1_suppl), 123–147. https://doi.org/10.1177/10298649020050s105

Garrido, S. (2009). Rumination and Sad Music : a Review of the Literature and a Future Direction. *The Second International Conference on Music Communication Science*, *December*, 3–4. http://marcs.uws.edu.au/links/ICoMusic09/index.html

Garrido, S. (2014). A systematic review of the studies measuring mood and emotion in response to music. *Psychomusicology: Music, Mind, and Brain*, *24*(4), 316–327. https://doi.org/10.1037/pmu0000072

Garrido, S. (2017). Physiological Effects of Sad Music. In *Why Are We Attracted to Sad Music?* (pp. 51–66). Springer International Publishing. https://doi.org/10.1007/978-3-319-39666-8_4

Garrido, S., Eerola, T., & McFerran, K. (2017). Group Rumination: Social Interactions Around Music in People with Depression. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00490

Garrido, S., & Schubert, E. (2011). Individual differences in the enjoyment of negative emotion in music: A literature review and experiment. *Music Perception*, *28*(3), 279–295. https://doi.org/10.1525/MP.2011.28.3.279

Garrido, S., & Schubert, E. (2013). Adaptive and maladaptive attraction to negative emotions in music. *Musicae Scientiae*, *17*(2), 147–166. https://doi.org/10.1177/1029864913478305

Garrido, S., & Schubert, E. (2015a). Moody melodies: Do they cheer us up? A study of the effect of sad music on mood. *Psychology of Music*, *43*(2), 244–261. https://doi.org/10.1177/0305735613501938

Garrido, S., & Schubert, E. (2015b). Moody melodies: Do they cheer us up? A study of the effect of sad music on mood. *Psychology of Music*, *43*(2), 244–261. https://doi.org/10.1177/0305735613501938

Garrido, S., & Schubert, E. (2015c). Music and People with Tendencies to Depression. *Music Perception*, *32*(4), 313–321. https://doi.org/10.1525/mp.2015.32.4.313

Garrido, S., Schubert, E., & Bangert, D. (2016). Musical prescriptions for mood improvement: An experimental study. *The Arts in Psychotherapy*, *51*, 46–53. https://doi.org/10.1016/j.aip.2016.09.002

Gross, J. J., & Jazaieri, H. (2014). Emotion, emotion regulation, and psychopathology: an affective science perspective. *Clinical Psychological Science*, *2*(4), 387–401. https://doi.org/10.1177/2167702614536164

Gross, J. J., & John, O. P. (2003). Individual Differences in Two Emotion Regulation Processes: Implications for Affect, Relationships, and Well-Being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Hanich, J., Wagner, V., Shah, M., Jacobsen, T., & Menninghaus, W. (2014). Why we like to watch sad films. The pleasure of being moved in aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *8*(2), 130–143. https://doi.org/10.1037/A0035690

Hanser, W. E., ter Bogt, T. F. M., van den Tol, A. J. M., Mark, R. E., & Vingerhoets, A. J. J. M. (2016). Consolation through music: A survey study. *Musicae Scientiae*, *20*(1), 122–137. https://doi.org/10.1177/1029864915620264

Hindemith, P. (1961). A composer's world: Horizons and limitations. In *New York: Doubleday*.

Hogue, J. D., Crimmins, A. M., & Kahn, J. H. (2016). “So sad and slow, so why can’t I turn off the radio”: The effects of gender, depression, and absorption on liking music that induces sadness and music that induces happiness. *Psychology of Music*, *44*(4), 816–829. https://doi.org/10.1177/0305735615594489

Hu, T., Zhang, D., Wang, J., Mistry, R., Ran, G., & Wang, X. (2014). Relation between emotion regulation and mental health: A meta-analysis review. *Psychological Reports*, *114*(2), 341–362. https://doi.org/10.2466/03.20.PR0.114k22w4

Hubbard, A. E., Ahern, J., Fleischer, N. L., van der Laan, M., Satariano, S. A., Jewell, N., Bruckner, T., & Satariano, W. A. (2010). To GEE or Not to GEE: Comparing Population Average and Mixed Models for Estimating the Associations Between Neighborhood Risk Factors and Health. *Source: Epidemiology*, *21*(4), 467–474. https://doi.org/10.1097/EDE.ObOl

Hunter, P. G., Schellenberg, E. G., & Schimmack, U. (2010). Feelings and perceptions of happiness and sadness induced by music: Similarities, differences, and mixed emotions. *Psychology of Aesthetics, Creativity, and the Arts*, *4*(1), 47–56. https://doi.org/10.1037/a0016873

Huron, D., & Vuoskoski, J. K. (2020). On the Enjoyment of Sad Music: Pleasurable Compassion Theory and the Role of Trait Empathy. *Frontiers in Psychology*, *11*, 28. https://doi.org/10.3389/fpsyg.2020.01060

Juslin, P. N., & Sloboda, J. A. (2001). *Music and emotion: Theory and research.* Oxford University Press. https://psycnet.apa.org/record/2001-05534-000

Kawakami, A., Furukawa, K., Katahira, K., Kamiyama, K., & Okanoya, K. (2013). Relations Between Musical Structures and Perceived and Felt Emotions. *Music Perception*, *30*(4), 407–417. https://doi.org/10.1525/mp.2013.30.4.407

Kawakami, A., Furukawa, K., & Okanoya, K. (2014). Music evokes vicarious emotions in listeners. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00431

Kim, J. (2011). Affective states, familiarity and music selection: power of familiarity. *International Journal of Arts and Technology*, *4*(1), 74. https://doi.org/10.1504/IJART.2011.037771

Kivy, P. (1991). *Music alone: Philosophical reflections on the purely musical experience.* Cornell University Press.

Knobloch, S., & Zillmann, D. (2002). Mood Management via the Digital Jukebox. *Journal of Communication*, *52*(2), 351–366. https://doi.org/10.1111/J.1460-2466.2002.TB02549.X

Konečni, V. J., Brown, A., & Wanic, R. A. (2008). Comparative effects of music and recalled life-events on emotional state. *Psychology of Music*, *36*(3), 289–308. https://doi.org/10.1177/0305735607082621

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9. *Journal of General Internal Medicine 2001 16:9*, *16*(9), 606–613. https://doi.org/10.1046/J.1525-1497.2001.016009606.X

Ladinig, O., & Schellenberg, E. G. (2012). Liking unfamiliar music: Effects of felt emotion and individual differences. *Psychology of Aesthetics, Creativity, and the Arts*, *6*(2), 146–154. https://doi.org/10.1037/a0024671

Lawrie, L., Jackson, M. C., & Phillips, L. H. (2019). Effects of induced sad mood on facial emotion perception in young and older adults. *Aging, Neuropsychology, and Cognition*, *26*(3), 319–335. https://doi.org/10.1080/13825585.2018.1438584

Lazarus, R. S., & Alfert, E. (1964). Short-circuiting of threat by experimentally altering cognitive appraisal. *Journal of Abnormal and Social Psychology*, *69*(2), 195–205. https://doi.org/10.1037/h0044635

Leubner, D., & Hinterberger, T. (2017). Reviewing the effectiveness of music interventions in treating depression. In *Frontiers in Psychology* (Vol. 8, Issue JUL, p. 1109). Frontiers Media S.A. https://doi.org/10.3389/fpsyg.2017.01109

Levinson, J. (1990). *Music, Art and Metaphysics: Essays in Philosophical Aesthetics.* New York: Oxford University Press.

Liu, D. Y., & Thompson, R. J. (2017). Selection and implementation of emotion regulation strategies in major depressive disorder: An integrative review. In *Clinical Psychology Review* (Vol. 57, pp. 183–194). Elsevier Inc. https://doi.org/10.1016/j.cpr.2017.07.004

Lundqvist, L.-O., Carlsson, F., Hilmersson, P., & Juslin, P. N. (2009). Emotional responses to music: experience, expression, and physiology. *Psychology of Music*, *37*(1), 61–90. https://doi.org/10.1177/0305735607086048

Macrory, I. (2016). *Measuring national wellbeing: Life in the UK: 2016*. https://www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc146/wrapper.html

Maratos, A. S., Gold, C., Wang, X., & Crawford, M. J. (2008). Music therapy for depression. In *Cochrane Database of Systematic Reviews* (Issue 1). John Wiley and Sons Ltd. https://doi.org/10.1002/14651858.CD004517.pub2

Marie Haga Pål Kraft AE Emma-Kate Corby, S. A. (2007). *Emotion Regulation: Antecedents and Well-Being Outcomes of Cognitive Reappraisal and Expressive Suppression in Cross-Cultural Samples*. https://doi.org/10.1007/s10902-007-9080-3

Martin, G., Clarke, M., & Pearce, C. (1993). Adolescent Suicide: Music Preference as an Indicator of Vulnerability. *Journal of the American Academy of Child & Adolescent Psychiatry*, *32*(3), 530–535. https://doi.org/10.1097/00004583-199305000-00007

Martin, L., Oepen, R., Bauer, K., Nottensteiner, A., Mergheim, K., Gruber, H., & Koch, S. C. (2018). Creative Arts Interventions for Stress Management and Prevention—A Systematic Review. *Behavioral Sciences 2018, Vol. 8, Page 28*, *8*(2), 28. https://doi.org/10.3390/BS8020028

Matsumoto, J. (2002). Why people listen to sad music: Effects of music sad moods. *Japanese Journal of Educational Psychology*, *50*(1), 23–32. https://doi.org/10.5926/jjep1953.50.1_23

McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy*, *49*(3), 186–193. https://doi.org/10.1016/j.brat.2010.12.006

McManus, S., Bebbington, P. E., Jenkins, R., & Brugha, T. (2016). *Mental Health and Wellbeing in England: the Adult Psychiatric Morbidity Survey 2014*. https://files.digital.nhs.uk/pdf/q/3/mental_health_and_wellbeing_in_england_full_report.pdf

Millgram, Y., Joormann, J., Huppert, J. D., & Tamir, M. (2015). Sad as a Matter of Choice? Emotion-Regulation Goals in Depression. *Psychological Science*, *26*(8), 1216–1228. https://doi.org/10.1177/0956797615583295

Miranda, D., & Claes, M. (2007). Musical preferences and depression in adolescence. *International Journal of Adolescence and Youth*, *13*(4), 285–309. https://doi.org/10.1080/02673843.2007.9747981

Moore, S. A., Zoellner, L. A., & Mollenholt, N. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms? *Behaviour Research and Therapy*, *46*(9), 993–1000. https://doi.org/10.1016/j.brat.2008.05.001

Morris, R. R., Schueller, S. M., & Picard, R. W. (2015). Efficacy of a web-based, crowdsourced peer-to-peer cognitive reappraisal platform for depression: Randomized controlled trial. *Journal of Medical Internet Research*, *17*(3), e4167. https://doi.org/10.2196/jmir.4167

Naylor, C., Parsonage, M., Mcdaid, D., Knapp, M., Fossey, M., & Galea, A. (2012). *Long-term condition and mental health Chris Naylor February 2012*.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking Rumination. *Perspectives on Psychological Science*, *3*(5), 400–424. https://doi.org/10.1111/j.1745-6924.2008.00088.x

Paul, S., & Zhang, X. (2014). Small sample GEE estimation of regression parameters for longitudinal data. *Statistics in Medicine*, *33*(22), 3869–3881. https://doi.org/10.1002/sim.6198

Peltola, H. R., & Eerola, T. (2016). Fifty shades of blue: Classification of music-evoked sadness. *Musicae Scientiae*, *20*(1), 84–102. https://doi.org/10.1177/1029864915611206

Peltola, H.-R., & Eerola, T. (2016). Fifty shades of blue: Classification of music-evoked sadness. *Musicae Scientiae*, *20*(1), 84–102. https://doi.org/10.1177/1029864915611206

Rodriguez, L. M., Lee, K. D. M., Onufrak, J., Dell, J. B., Quist, M., Drake, H. P., & Bryan, J. (2020). Effects of a brief interpersonal conflict cognitive reappraisal intervention on improvements in access to emotion regulation strategies and depressive symptoms in

college students. *Psychology and Health*, *35*(10), 1207–1227. https://doi.org/10.1080/08870446.2019.1711090

Sachs, M. E., Damasio, A., & Habibi, A. (2015). The pleasures of sad music: a systematic review. *Frontiers in Human Neuroscience*, *9*. https://doi.org/10.3389/fnhum.2015.00404

Sachs, M. E., Damasio, A., & Habibi, A. (2020a). Unique personality profiles predict when and why sad music is enjoyed. *Psychology of Music*. https://doi.org/10.1177/0305735620932660

Sachs, M. E., Damasio, A., & Habibi, A. (2020b). Unique personality profiles predict when and why sad music is enjoyed. *Psychology of Music*, 030573562093266. https://doi.org/10.1177/0305735620932660

Sachs, M. E., Habibi, A., Damasio, A., & Kaplan, J. T. (2020). Dynamic intersubject neural synchronization reflects affective responses to sad music. *NeuroImage*, *218*, 116512. https://doi.org/10.1016/j.neuroimage.2019.116512

Sakka, L. S., & Juslin, P. N. (2018). Emotion regulation with music in depressed and non-depressed individuals: Goals, strategies, and mechanisms. *Https://Doi.Org/10.1177/2059204318755023*, *1*, 205920431875502. https://doi.org/10.1177/2059204318755023

Sandstrom, G. M., & Russo, F. A. (2013). Absorption in music: Development of a scale to identify individuals with strong emotional responses to music. *Psychology of Music*, *41*(2), 216–228. https://doi.org/10.1177/0305735611422508

Schnell, K., Bluschke, S., Konradt, B., & Walter, H. (2011). Functional relations of empathy and mentalizing: An fMRI study on the neural basis of cognitive empathy. *NeuroImage*, *54*(2), 1743–1754. https://doi.org/10.1016/j.neuroimage.2010.08.024

Schramm, H., & Wirth, W. (2010). Exploring the paradox of sad-film enjoyment: The role of multiple appraisals and meta-appraisals. *Poetics*, *38*(3), 319–335. https://doi.org/10.1016/J.POETIC.2010.03.002

Schubert, E. (2016). Enjoying Sad Music: Paradox or Parallel Processes? *Frontiers in Human Neuroscience*, *10*. https://doi.org/10.3389/fnhum.2016.00312

Schubert, E., Halpern, A. R., Kreutz, G., & Garrido, S. (2018). Attraction to sad music: The role of imagery, absorption, and rumination. *Psychology of Aesthetics, Creativity, and the Arts*, *12*(3), 251–258. https://doi.org/10.1037/aca0000160

Sizer, L. (2019). Sad Songs Say So Much: The Paradoxical Pleasures of Sad Music. *The Journal of Aesthetics and Art Criticism*, *77*(3), 255–266. https://doi.org/10.1111/jaac.12659

Smoskia, M. J., Keng, S. L., Schiller, C. E., Minkei, J., & Dichter, G. S. (2013). Neural mechanisms of cognitive reappraisal in remitted major depressive disorder. *Journal of Affective Disorders*, *151*(1), 171–177. https://doi.org/10.1016/j.jad.2013.05.073

Song, Y., Dixon, S., Pearce, M., & Halpern, A. (n.d.). *DO ONLINE SOCIAL TAGS PREDICT PERCEIVED OR INDUCED EMOTIONAL RESPONSES TO MUSIC?* Retrieved March 8, 2021, from http://www.gold.ac.uk/music-mind-brain/gold-msi/

Taruffi, L., & Koelsch, S. (2014). The Paradox of Music-Evoked Sadness: An Online Survey. *PLoS ONE*, *9*(10), e110490. https://doi.org/10.1371/journal.pone.0110490

Taylor, C. L., & Friedman, R. S. (2015). Sad Mood and Music Choice: Does the Self-Relevance of the Mood-Eliciting Stimulus Moderate Song Preference? *Media Psychology*, *18*(1), 24–50. https://doi.org/10.1080/15213269.2013.826589

Troy, A. S., Wilhelm, F. H., Shallcross, A. J., & Mauss, I. B. (2010). Seeing the Silver Lining: Cognitive Reappraisal Ability Moderates the Relationship Between Stress and Depressive Symptoms. *Emotion*, *10*(6), 783–795. https://doi.org/10.1037/a0020262

van den Tol, A. J. M. (2016). The appeal of sad music: A brief overview of current directions in research on motivations for listening to sad music. *The Arts in Psychotherapy*, *49*, 44–49. https://doi.org/10.1016/j.aip.2016.05.008

van den Tol, A. J. M., & Edwards, J. (2013). Exploring a rationale for choosing to listen to sad music when feeling sad. *Psychology of Music*, *41*(4), 440–465. https://doi.org/10.1177/0305735611430433

van den Tol, A. J. M., & Edwards, J. (2015). Listening to sad music in adverse situations: How music selection strategies relate to self-regulatory goals, listening effects, and mood enhancement. *Psychology of Music*, *43*(4), 473–494. https://doi.org/10.1177/0305735613517410

van den Tol, A. J. M., Edwards, J., & Heflick, N. A. (2016). Sad music as a means for acceptance-based coping. *Musicae Scientiae*, *20*(1), 68–83. https://doi.org/10.1177/1029864915627844

Vanderlind, W. M., Millgram, Y., Baskin-Sommers, A. R., Clark, M. S., & Joormann, J. (2020). Understanding positive emotion deficits in depression: From emotion preferences to emotion regulation. In *Clinical Psychology Review* (Vol. 76, p. 101826). Elsevier Inc. https://doi.org/10.1016/j.cpr.2020.101826

Vuoskoski, J. K., & Eerola, T. (2012). Can sad music really make you sad? Indirect measures of affective states induced by music and autobiographical memories. *Psychology of Aesthetics, Creativity, and the Arts*, *6*(3), 204–213. https://doi.org/10.1037/a0026937

Vuoskoski, J. K., & Eerola, T. (2015). Extramusical information contributes to emotions induced by music. *Psychology of Music*, *43*(2), 262–274. https://doi.org/10.1177/0305735613502373

Vuoskoski, J. K., & Eerola, T. (2017). The Pleasure Evoked by Sad Music Is Mediated by Feelings of Being Moved. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00439

Warrenburg, L. A. (2020). Redefining sad music: Music's structure suggests at least two sad states. *Journal of New Music Research*, *49*(4), 373–386. https://doi.org/10.1080/09298215.2020.1784956

Wild, T. C., Kuiken, D., & Schopflocher, D. (1995). The role of absorption in experiential involvement. *Journal of Personality and Social Psychology*, *69*(3), 569–579. https://doi.org/10.1037/0022-3514.69.3.569

Xue, C., Li, T., Yin, S., Zhu, X., & Tan, Y. (2018). The influence of induced mood on music preference. *Cognitive Processing*, *19*(4), 517–525. https://doi.org/10.1007/s10339-018-0872-7

Zillmann, D. (1988). Mood Management Through Communication Choices. *American Behavioral Scientist*, *31*(3), 327–340. https://doi.org/10.1177/000276488031003005