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Music, emotion regulation, & distress tolerance: Investigating how music may influence distress tolerance in college students

Marie JaeDee Wood
University of Arkansas, Fayetteville

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Jae Dee M. Wood

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J. William Fulbright College of Arts and Sciences

The University of Arkansas

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Introduction

Music has a powerful effect over our lives. Henry David Thoreau once said, "When I hear music, I fear no danger. I am invulnerable. I see no foe." But what is so special about music that it makes someone feel invulnerable? Music seems to have a mystifying power that gives us more power over our emotions and can distract us from current negative situations. People report many emotion-related reasons for listening to music, including emotion regulation strategies for improving mood, maintaining positive mood, distract from negative mood, and reducing fear (Thoma, Ryf, Mohiyeddini, Ehlert, & Nater, 2012). Listening to music has also been linked to more efficient emotion regulation (Saarikkallio & Erkkila, 2007). However, the relationship between music and emotional distress tolerance, the ability to sit with negative emotional states, has not been studied in an experimental research setting. In this research project I investigated music's relationship with emotion, emotion regulation, and emotional distress tolerance.

Emotion & Affect

Understanding, defining, and distinguishing between emotions can be difficult. There are many different theories about emotions. Among them include dimensional theories that place emotions along different affective dimensions. An example of this includes Russell's core affect model (Russell, 1980; 2003) where feelings are reduced to their simplest components, pleasure (negative to positive) and arousal (low to high). To visualize this model, arousal is placed on a y-axis and pleasure is placed on the x-axis and affective states fall in their place around the grid in a circular fashion. Simple affective states such as distress would be labeled as moderately aroused and moderately displeasing. This model does not attempt to define emotions (directed at specific objects,

paired with cognitions, behaviors, and physiological changes) or moods (prolonged and mild emotional experiences). There are other dimensional emotion theories that include additional dimensions and also different dimensions such as Wundt's three-dimensional model using pleasantness-unpleasantness, rest-activation, and relax-attention (Scherer, 2000). Others models used to define emotions include basic emotions approach (emotions such as anger are unique and are derived from a biological mechanism that cause cognitions, perceptions, and behavior), appraisal models (appraisal of emotions switch on biological bases for emotional responses), psychological construction (emotions are folk categories and are caused by basic ingredients not specific to emotions, instead study measurable outcomes and constructive process), and social construction (social or cultural artifacts influence emotional performances) according (Gross & Barrett, 2011). Additional models include circuit models (emotions derived from evolutionary neural circuits), lexical models (language and culture defines emotions), componential models (cognitions elicit emotions states and responses follow evaluation) (Scherer, 2000).

Since there are many emotional models to choose from, in this study I focused on the Core Affect model (Russell, 2003). This model defines each affect in two dimensions that allows for the simplest operational definitions. Also, this model was chosen since music, like affect, can be vary in arousal and pleasantness.

Emotion Regulation

Psychologists have gained interest in studying different methods used to influence or regulate individual's emotions. According to Gross (1998), emotion regulation includes a variety of methods individuals use to manage their emotions. This includes when and to what degree emotions are experienced and how they perceive, respond to,

and express emotions. This process can be conscious or unconscious, beneficial or maladaptive. Individuals use a variety of emotion regulation strategies with varying levels of success including acceptance, avoidance, problem-solving, reappraisal, rumination, and suppression (Aldao, Nolen-Hoeksema, Schweizer, 2010). The complete list of strategies used by all individuals would be quite extensive. For example, in one study participants identified over 200 mood regulatory strategies (Parkinson, Totterdell, Briner, and Reynolds, 1996). Since there are numerous strategies with varying levels of effectiveness, it is important to research which strategies are most effective in certain situations or for different people. Although a number of individuals claim to use music as an emotion regulation tool (Saarikkallio & Erkkila, 2007) more research is needed to see the effectiveness of this strategy.

Music and Emotion Regulation

Music has caught the attention of researchers in psychology. People report listening to music for a variety of reasons including boredom, self-expression, concentration, and to increase arousal (Rentfrow, 2012; North, Hargreaves, & Hargreaves, 2004). Listening to music also has a variety of consequences including personality formation (North et al., 2004), consumer purchases (Gorn, Tuan Pham, & Yatming Sin, 2001), social bonding, and even emotion regulation (Rentfrow, 2012; Thoma et al., 2012). Reasons for listening to music and its consequences have interesting relationships.

For example, when individuals listen to music, the body and brain react in interesting ways. For example, when people listen to music their limbic and paralimbic systems may be activated triggering intensive emotional responses (Thoma et al., 2012).

The body becomes excited by the central nervous system if music is deemed arousing or relaxed by the parasympathetic nervous system if music is deemed as soothing.

Music has been shown as an effective emotion regulation strategy and emotion induction strategy for some individuals (Eerola & Vuoskoski, 2013; Thoma et al., 2012; Vastfjall, 2002). But what about music evokes and influences emotions? Past research has analyzed several different aspects of music evoking emotion significantly including but not limited to elements (e.g. major-major, tempo, genre, lyrics), situation (e.g. concert, through headphones, background), and individual differences (e. g., musical expertise, musical preferences, memory) (Eerola et al., 2013). There have been mixed results and findings on how these factors interact with music and emotion, maybe due to the complexity of the relationship or the variations in research design.

Many studies have reported that emotion regulation is one of more important uses of music (Saarikkallio & Erkkila, 2007). Adolescents report using music to both change affect and also maintain affect, even when affect is negative (Saarikkallio & Erkkila, 2007). It also seems that people prefer to listen to music that corresponds with their affect and arousal (Thoma et al., 2012). While it seems logical to listen to positive music to decrease negative affect, listening to negative music has been linked to have beneficial emotion regulation benefits. Sad music assures individuals they are not the alone in their struggles, allows for clarification and understanding of emotions, and distracts from stress (Saarikkallio & Erkkila, 2007).The relationship between the emotions expressed in a song seems to have a complex and paradoxical relationship with its utility in emotion regulation.

Individuals utilize music as an emotion regulation strategy to varying degrees and a number of different ways. People who report using music in mood regulation use the adaptive emotion regulation strategy of reappraisals more and use the maladaptive strategy suppression less (Saarikallio, 2012). However, using music as a way to discharge or divert negative emotions has maladaptive consequences (i.e. higher levels of anxiety) while using music as entertainment predicted lower levels of depression (Thomson, Reece, & Di Benedetto, 2014). Music seems to have a complex and understudied effect with emotion regulation. The reasons individuals listen to music seems to be a primarily impact their psychological wellbeing.

Emotional distress tolerance

Emotional distress tolerance is defined as the ability for people to sit with negative states (Leyro, Zvolenksy, & Bernstein, 2010). Persons with low distress tolerance typically avoid negative affect states and tend to use avoidance or escape strategies. Distress tolerance may be the underlying factor to a number of mental health issues and emotion dysregulation. Emotion dysregulation, or the trait construct of maladaptive responses to emotions, has been linked with poor distress tolerance (Brandt, Zvolensky, & Bonn-Miller, 2012). Patients who suffer from borderline personality disorder have difficulties tolerating emotional distress (Leyro et al., 2010). Also, low distress tolerance levels are associated with using alcohol and marijuana as coping mechanisms (Leyro et al., 2010). Patients with HIV and low distress tolerance have more addition health and emotional issues (Leyro et al., 2010). Also, in an HIV population, poor distress tolerance predicted more anxiety and depression mediated by more emotion dysregulation (Brandt et al., 2012). Various psychosocial interventions have targeted

improving distress tolerance for populations that have been difficult to treat in the past with promising outcomes (Leyro et al., 2010).

Emotional distress tolerance has been evaluated using the self-report Distress Tolerance Scale (Simons & Gaher, 2005) that examines tolerance, appraisal, absorption, and regulation of emotional distress. Another self-report measure used is the Discomfort Intolerance Index which measures perceived inability to tolerate physical distress (Mchugh & Otto, 2012). Behavioral methods have also been used to gauge distress tolerance such as the Mirror Tracing Persistence Task (MTPT; Strong et al., 2003) and the cold presser task (Hayes et al., 1999), where the tasks measure frustration. The number of mixed methods have had a variety of findings. The only correspondences between modalities seems to occur between the cold presser tasks, anxiety sensitivity (believing anxiety will cause further negative consequences), and between self-report measures mood, anxiety, and quality of life (Ameral, Palm Reed, Cameron, Armstrong, 2014). There does not seem to be a study that finds a relationship between behavioral and self-report measures for distress tolerance (Ameral et al., 2014). Researchers have theorized these inconstancies exist due to perceived distress tolerance gauged on self-report differing from behaviors assessed during tasks (Ameral et al., 2014). Also, since emotional distress, physical distress, and frustration are different aspects of distress tolerance, these tasks and scales may not be measuring the same concept. Also, there have been noted gender effects on distress tolerance (Simons & Gaher, 2005). Typically females tend to self-report having less tolerance for distress compared to men (Ameral et al., 2014; Simons & Gaher, 2005).

Little or no research has been done to evaluate music's effect on distress tolerance. Additional research should target the direct effects on music inducing more positive emotions and its impact on distress tolerance. Using music as a replacement coping mechanism could help patients improve distress tolerance in a healthy manner.

The Current Study

The purpose this research project was to study music's possible effects on distress tolerance. Specifically, I predicted that (1) positive, arousing music would increase distress tolerance while negative, arousing music would decrease distress tolerance, and (2) Music would have a stronger effect on distress tolerance for people who regularly use music as an emotion regulation strategy. This study also examined individual differences related to music and distress tolerance, such as gender and music in mood regulation.

Methodology

Recruitment

In this study, participants were recruited from the University of Arkansas general psychology subject pool and were awarded class credit for their participation. Before coming into the lab participants filled out surveys online in Qualtrics to screen out participants who were not eligible. Inclusion criteria included no major psychiatric disorder, no currently severe symptoms of distress, and not currently taking psychotropic medications. In total, 390 people completed the survey, and 292 were eligible. All eligible participants were invited to sign up for a laboratory session, of these 99 completed the study. All participants read a consent form and signed it they choose to participate in the study.

Measures

Brief-Music in Mood Regulation Scale (B-MMR; Saarikallo, 2012) is a 21-item scale assessing an individual's music-related mood-regulation (overall α = .94) for seven related strategies: entertainment (α = .84), revival (α = .85), strong sensation (α = .88), diversion (α = .83), discharge (α = .87), mental work (α = .87), and solace (α = .87). Items were answered on a 5-point Likert-scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Higher scores reflect more use of music as tool for emotion regulation. This scale and all of its subscales had adequate reliability/internal consistency.

Positive And Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) is a 20 item scale that asks participants to describe their feeling emotions in the present moment. There are two subscales: Positive Affect and Negative Affect. Participants rate each item on a Likert-scale between 1 (*not at all*) and 5 (*a great deal*). Each item is a single word representing a feeling or emotions that falls under positive affect (e.g. proud) or negative affect (e.g. nervous). The PANAS was used to evaluate positive and negative mood at the start of the study, after the musical stimulus was introduced, and after the distress tolerance task was over. This gave us data about how positive and negative affect changed when the musical stimulus was introduced and how it changed after the distress tolerance task. Higher scores reflect stronger affect. Alphas for PA were acceptable (ranging from .82 to .89 across the three time points). Alpha for NA were acceptable (ranging from .70 to .90 across three time points).

Procedure

Participants began by filling out a number of surveys on a computer using Qualtrics, including the Brief Music in Mood Regulation Scale (B-MMR; Saarikalla,

2012). Additional measurements were also give but have not yet been analyzed including Short Test of Musical Preferences (STOMP-21; Renfrow & Gosling, 2003; Zweigenhaft, 2008), Uses of Music Inventory (UOM; Chamorro-Premuzic & Furnham, 2007) and the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). After the surveys were completed, participants completed their first PANAS measure on paper (Watson et al., 1988).

Then participants were randomly assigned to one of three music conditions, where they listened to music that corresponds with their condition for five minutes. In the positive condition, participants listened to arousing, positive music (Mozart - Symphony No. 41 "Jupiter" in C major). Also previous research has shown music influenced ad evaluation more so when music induced higher arousal, regardless of positive of negative valence (Gorn et al., 2001). Thus we used arousing music in this study. This song was chosen because prior research this song was used to induce a high pleasantness and high arousal (Balch, Myers, & Papotto, 1999). In the negative condition, participants listened to arousing, negative music (Mussorgsky: Night on Bald Mountain), also used in prior work (Balch et al., 1999). In the third control condition, participants listened to a neutral musical stimulus the controls for high arousal while having neither positive nor negative affect (Beethoven - Für Elise). Neutral music is hard to define and operationalize. In past research some studies replaced music with sound of natures, piano scales, or silence for a neutral condition (Vastfjall, 2002). To make sure this control condition was similar to the experimental conditions, I choose a classical piece of music that was neither positive nor negative. This would serve as a control to examine if the presence of arousing music is enough to affect distress tolerance or if affect is key. The song chosen was a popular

classical piece that most people would find familiar and was not strongly identified with positive of negative valence (Lee, Hill, & Work, 2012).

Since negative mood induced by music has been found to inhibit performance while positive moods may lead to performance enhancement, I predicted that positive arousing music will facilitate distress tolerance (Thompson, Schellenberg & Husain, 2001). Also all music was arousing since previous research has shown music has been shown to influence ad evaluation more so when music induced higher arousal, regardless of positive of negative valence (Gorn, et al., 2001). All of the music chosen was instrumental so participants were not distracted from the task since lyrics would bias the musical stimulus. During this 5-minute interval, participants were asked to fill out a sham survey to evaluate the music. This survey was a tool used to engage the participant in listening to music rather than evaluating its results for data. The music continued to play as the participant filled out another PANAS.

Past research has shown that evoking emotions is most accurate and effective when music and affective pictures are presented in combination rather than isolated (Baumgartner, Esslen, and Jancke, 2006). Therefore the music continued to play as the participant completed the emotional distress tolerance task. Also, songs with conflicting cues (i.e. a sad song played while viewing a happy picture and vice versa) has been shown to elicit both happiness and sadness in the same moment (Larsen & Stastny, 2011). In the Laboratory for Emotion and Addictive Processes (LEAP), we are developing a picture-viewing task to gauge emotional distress tolerance. Unlike previous behavioral tasks assessing distress tolerance, which focus on pain or frustration tolerance (Hayes et al. 1999; Strong et al, 2003), our goal was to measure emotional distress

tolerance. Participants sat at a computer and were told they will look at a series of 45 distressing images, taken from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2008). They were told to signal when they felt distressed (e.g. press the letter q) and signal again when the image was too distressing to continue viewing (e.g., press the letter p). Theoretically, the quicker they moved on to the next image the less tolerance they had for distress. This is a new behavioral measure our lab has now used in multiple previous studies. From this task there are five different ways to measure distress tolerance. The first is mean time viewing each slide (the averaged amount of time before the participant pressed the p-button). The second is a count of the number of slides a participant viewed the full 30 seconds (the amount of times the participant never pressed the p-button). The third is the number of times the participant felt no distress while viewing the slides (never pressed the q-button). The fourth is the mean initial distress response time (the average of many seconds after viewing the slide they pressed the q-button). The fifth is the mean distress response time (the average amount of time after pressing q-button the participant pressed the p-button).

After the distress tolerance task was completed, the experimenter stopped the music. The participants then filled out the third PANAS. At this point participants completed another computer task. This second task showed participants the images a second time and asked participants to rate slides on a variety of scales (distress, sadness, happiness, etc.). This second task was added so we could determine what emotions were elicited by each slide and to what degree. Six emotions were rated (distress, sad, anger, anxiety, disgust, happy, fear) on a 6 point Likert scale. This gave us individual information about a participant's emotional reaction to each slide. The participant then

watched a funny video to reduce negative effects from looking at distressing images. Debriefing occurred and the participant was free to go.

Results

Demographics

Ninety-five undergraduates were brought into the lab and completed this study (*Mage*= 18.87, 69.5% Female, 84.2% White, 5.3% African American, 2.3% Hispanic, 4.2% Asian American, 4/2% Native American/Alaskan Native). There were 32 participants in the negative musical condition, 29 in the neutral, and 34 in the positive musical condition. Four participants' data were not included in the analyses due to missing data.

Positive and Negative Affect.

There was a main effect for PA over time, $F(2, 182) = 111.53$, $p < .05$. Specifically, follow-up tests revealed that PA did not change from Baseline (M =25.81, SD =6.64*)* to Time 2 (M =25.49, SD =8.08), $F(1, 91) = .34$, *ns.* PA did decrease from Time 2 to Time 3 (M = 17.99, SD =5.78*)*, $F(1, 91) = 136.96$, $p < .05$. Thus, the distress tolerance task but not music exposure significantly influenced positive affect. There was not a difference in positive affect by condition when collapsed across time, $F(4, 91) = .83$, *ns*. Musical condition did not influence the change in positive affect over time, $F(4, 182) = 1.78$, *ns*.

There was a main effect for NA over time, $F(2, 182) = 85.29$, $p < .05$. Specifically, follow-up tests revealed that NA significantly decreased from Baseline (M =12.94, SD =3.21) to Time 2 (M = 11.87, SD = 2.75), $F(1, 91) = 15.83$, $p < .05$. NA increased from Time 2 to Time 3 (M = 19.10, SD = 7.17*)*, $F(1, 91) = 104.88$, $p < .05$.

Thus both the distress tolerance task and music exposure significantly swayed negative affect. There was not a difference in negative affect by condition when collapsed across time, $F(2, 91) = 94.29$, *ns*. Although typically a non-significant omnibus interaction would preclude looking at adjacent time points, the analyses revealed that musical condition did sway the change in negative affect only between baseline and Time 2, $F(2, 92) = 8.60$, $p < .05$. This suggests that the large change in negative affect from Time 2 to Time 3 (consistent across musical conditions) obscured a smaller interaction between music and negative affect over time at the start of the study. Thus, I chose to explore the interaction by examining only the change in NA from Baseline to Time 1 as influenced by music condition.

Specifically, participants in the neutral musical condition between Time 1 and Time 2 $F(1,28) = 19.88$, $p < .05$ and the positive condition $F(1,32) = 16.05$, $p < .05$ had a significant decrease in NA when the negative musical condition did not $F(1,31) = .63$, *ns* (Refer to Figure 1). Thus, the positive and neutral musical stimulus decreased negative affect from baseline during the music exposure while the negative musical stimulus had no significant effect on negative affect.

Musical condition on Distress Tolerance and Gender

There were no significant effects of the musical conditions on the distress tolerance task. (see Table 1). There was also no effect of musical condition on the emotional ratings of slides (see Table 2). In past studies using a distress tolerance task gender differences were found so exploratory analysis were done to see if this effect was present (Tull, Gratz, Coffey, Weiss, & McDermott, 2013). In the current study, females tended to not tolerate the distress tolerance task as much as males. Specially, females

viewed each slide for a shorter amount of time, viewed less slides for the full amount of time, reported more slides as distressing, and reported distress quicker (See Table 3). However there was no difference in time after reporting initial distress that participants could not continue viewing the slide. There were no significant interactions between gender and condition; all *F*s less than 1.5. There was an effect on slide ratings based on gender (see Table 4). Specifically, females rated their response to slides as making them feel more anger, anxiety, disgust, distress, and fearful than males. For happiness there were no significant gender differences. There were no interactions between gender, condition, and slide ratings.

Brief music in Mood regulation and Distress Tolerance

After running correlational analysis, the B-MMR scale total score had no significant correlations with any distress tolerance task measures. Only the diversion subscale negatively correlated with viewing more slides for the full 30 seconds (see Table 5). So people who use pleasant music to forget unwanted thoughts and feelings viewed less slides for the full 30 seconds and therefore less tolerance for distress. When splitting results by condition, there were more significant correlations between the B-MMR and the distress tolerance task. In the negative condition, listening to music for discharge correlated with viewing slides for a shorter mean amount of time and viewing less slides for the total 30 seconds (see Table 5a). There were no significant correlations between the B-MMR and the distress tolerance task in the neutral musical condition (see Table 5b). In the positive musical condition, using music for mental work correlated with viewing slides for a shorter amount of time and viewing less slides for the full 30 seconds (see Table 5c). Also in the positive musical condition listening to music for solace

correlated with viewing less slides for the full 30 seconds. So when listening to positive music during a distress tolerance task, using music for solace and mental work was associated with poorer distress tolerance.

After correlational analysis, no significant correlations between the B-MMR and emotional slide rating task were found (see Table 6). When splitting results by condition there were significant relationships. In the negative musical condition, listening to music for revival and diversion was associated with rating slides as eliciting more fear (see Table 6a). In the neutral musical condition, there were no significant correlations (see Table 6b). In the positive musical condition, listening to music for entertainment was associated with rating slides as eliciting more disgust (see Table 6c).

Discussion

Distress Tolerance, Gender, and Affect

During the distress tolerance task, PA decreased while NA increased regardless of music condition. Both of these relationship had strong F statistics showing that the distress tolerance task had a large impact on affect. This validates that dealing with emotion distress greatly impacts emotion. Future studies should investigate other methods of minimizing the effect distress has on emotion. In addition, different music selections could be played during the task to their possible relationship with distress tolerance and emotion.

Also, females tended to find the viewing the slides as more distressing and also rated slides more negatively. This confirms that gender bears weight on distress tolerance. However, we did not investigate the underlying factors between gender and

distress tolerance. Future studies should investigate what about gender influences the ability to tolerate distress.

Music and Affect

It seems that our musical selection did not influence affect as predicted. There were no significant changes in PA measured by the PANAS between baseline and the 5 minute music exposure. This was surprising since music has been shown to yield positive emotions (Sloboda & Juslin, 2010). This may be due to the fact that not all participants enjoy classical music. Also, the participants did not select this music. Listening to preferred genre or self-selected music during medical treatment has been shown to decrease distress and anxiety (Clark et al., 2006). If participants listened to music they enjoyed or even personally picked there may have been different results.

It seems that the musical selections did not alter negative affect as predicted. Since across conditions negative affect decreased from baseline to post-music exposure the presence of arousing music regardless of valence was able to decrease negative affect. On one hand, both the neutral and the positive selections lowered negative affect during music exposure. It is interesting the neutral piece significantly decreased negative affect. As mentioned before, control or neutral conditions are difficult to define in experimental design. This song may have had positive memories for participants and memories tied to music can elicit emotion (Juslin, Liljestrom, Vastfall & Lundqvist, 2010). A different control such as musical scale could be used in future experiments to address this problem. On the other hand, the negative musical piece did not significantly change negative affect. Although this song has been shown to elicit negative emotions in past research (Balch et al., 1999) this did not hold true in our sample.

All these insignificant results between music and affect could be due to smaller sample sizes of a range of 29-34 participants per condition. There are also a number of unknown confounds tied to musical emotion that could be playing a role. A number of mechanisms are associated with musical emotion including brain stem reflexes, evaluative conditioning, emotional contagion, visual imagery, episodic memory, and musical expectancy (Sloboda & Juslin, 2010). Depending on which mechanism or mechanisms was in activated during a music exposure, different emotional responses follow. I did not attempt to evaluate which mechanisms the participants used. In addition, the situation that music is listened to impacts what emotions are elicited (Juslin et al., 2010). The lab setting is very different from listening to music in other situations such as live music at a concert or listening to the radio while driving. It is possible that listening to the musical selection in the lab setting may not translate to real world musical experiences.

None of the musical pieces had a significant direct effect on change in positive or negative affect during the distress tolerance task. This suggests that music does not influence affect when facing emotional distress. Therefore music may not serve as an effective emotion regulation strategy for distress. However, the significant effect sizes for changes in affect for the music exposure were less powerful than the changes in affect during the distress tolerance. It could be since this specific music selections were not powerful enough to alter affect during the music exposure, they were not powerful enough to influence affect during distress tolerance task. In future studies it would be useful to find music selections that have a powerful effect during pure music exposure with each participant.

Music in Mood Regulation and Distress Tolerance

Music seems to have a complex relationship with both affect and distress tolerance. It seems that our music selections did not affect distress tolerance as predicted. There were no significant effects of the musical conditions on the distress tolerance task or the emotional ratings of slides. This supports that listening to music does not influence emotional distress tolerance. However, there were different significant relationships found when examining the relationship between the B-MMR, a trait measure, and the distress tolerance laboratory task when separating conditions. Using music for diversion was associated with poorer distress tolerance when including all participants and for participants in negative condition. In past research, diversion has been linked to increased depression and anxiety (Thomson et al. 2014). This leads us to believe that listening music to forget unwanted thoughts and feelings hinders distress tolerance. The effect size was also larger in the negative musical condition when compared to the entire sample suggesting negative music might be partially responsible for poorer distress tolerance.

On the other hand, in the positive musical condition, mental work and solace were both associated with less distress tolerance. This suggests that listening to music for comfort, acceptance and understanding or clarification of thoughts and emotions hindered distress tolerance when listening to the positive music. This was surprising since both solace and mental work have been linked to reappraisal, an advantageous emotion regulation strategy (Saarikallio, 2012). These past studies did not compare music in mood regulation strategies with distress tolerance. The data from this study suggests that music in mood regulation has a unique relationship with tolerating distress. Also this relationship varies by the type of music listening to.

When examining to what degree certain emotions were elicited by viewing the B-MMR there were no significant results when looking at the entire sample. In the negative musical condition, listening to music for revival and diversion were both associated with eliciting more fear. Since no other musical condition had any significant results for eliciting fear, this suggests that both listening to music for revival or diversion and negative music have a unique relationship with eliciting fear. In the positive music condition, listening to music for entertainment correlated with eliciting more disgust. This is interesting since using music for entertainment is defined as listening to positive music to maintain a pleasant mood (Saarikallio, 2012). So it seems plausible that using music to maintain a pleasant mood could facilitate distress tolerance and emotion regulation. Following this line of thought, it seems likely that in positive music condition using the entrainment strategy would correlate in the opposite direction but this was not what our results revealed. This further shows how complex of relationship music has with distress tolerance.

Of all the music in mood regulation strategies, diversion had more significant relationship with distress tolerance than any other strategy. This would suggest that using music to forget emotions and thoughts greatly hinders distress tolerance. It would be beneficial to educate music listeners to not engage in this strategy when faced with distress. Since there were a large number of insignificant correlations between the B-MMR and the distress tolerance task, this suggests these strategies do not have a bearing on tolerating distress.

Relaxing music has been shown to decrease the effects of the human stress response on the mind and body (Thoma et al., 2013). Since past experiments have

focused on anxiety and stress, this previous research with relaxing music does not translate to distress tolerance. In future experiments it would be beneficial to include relaxing music during the distress tolerance task and see if results differed. This would give us information if there was a difference between relaxing and arousing music on the distress tolerance task

Limitations

It is important to note this study our sample only included healthy college students at the University of Arkansas. This results of this study may not generalize to other age groups, individuals who are not college students, individuals who live in other countries, or individuals with any major psychiatric disorder. In addition, there are other methods that measure distress tolerance. As mentioned before, there is a weak or lack of relationship linking the different methods of measuring distress tolerance. If one of these different methods were used to study music and distress tolerance, the results of this study would not generalize. Also, we only evaluated affect dimensionally of positive or negative. It is important to note that emotion has more depth than simply either positive or negative affect. Arousal or more complicated aspects of emotion were not evaluated so these results do not attempt to explain these factors of emotion. In addition, listening to music in a lab setting differs from everyday experiences with music. Since the power of setting has an effect on emotion elicited by music (Juslin et al., 2010.), these results may lack external validity.

General Discussion and Future Directions

Although this study found that listening to music did not influence distress tolerance, this relationship between music and distress tolerance requires further research.

Only three songs were included in this study out of billions of song selections. There are many different genres of music that were not included in this study that could be examined. A personally selected song could be used after it was proven to significantly change affect for each individual. Since this is the only study to our knowledge investigating emotional distress tolerance with music additional research is need to further evaluate music's relationship with distress tolerance and emotion regulation.

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Figures and Tables

Figure 1

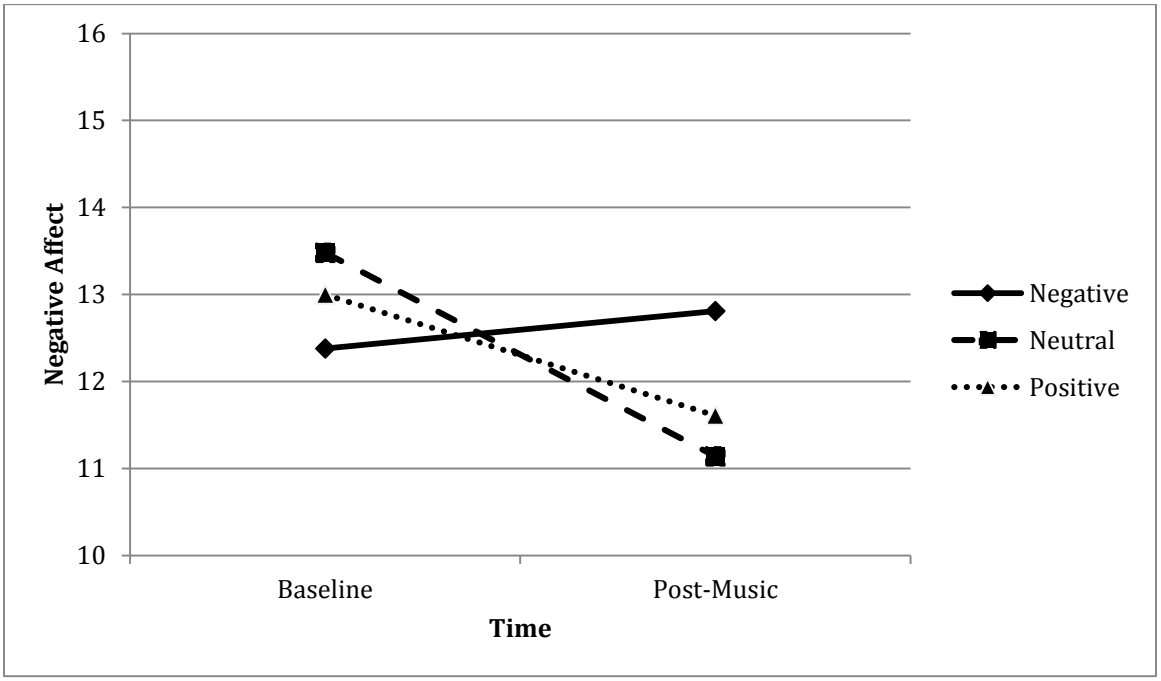

Table 1

Distress tolerance task and its relationship with music conditions

	Negative Music Condition	Neutral Music Condition	Positive Music Condition	*F*(2,91)
Distress Tolerance Measures				
Mean total slide viewing	16.33 (10.75)	15.09 (10.85)	16.44 (9.36)	0.16
Count of viewing slide for full 30 seconds	20.06 (17.62)	17.38 (17.41)	18.06 (16.94)	0.20
Count of how many slides participant reported no distress	10.81 (13.67)	8.90 (11.90)	10.82 (14.20)	0.21
Mean time into slide participant acknowledged distress	10.56 (9.29)	9.11 (8.47)	10.93 (8.69)	0.36
Mean time after acknowledging distress before moving on to next slide	8.88 (8.61)	8.66 (7.37)	8.67 (6.58)	F (2, 90) = 0.01

* $p < .05$
\+ $p < .1$

Table 2

Distress tolerance emotional slide ratings relationship with musical condition

Emotion rated	Negative Music Condition	Neutral Music Condition	Positive Music Condition	*F*(2,91)
Anger	2.40 (1.41)	2.86 (1.77)	2.61 (1.75)	.60
Anxiety	2.67 (1.70)	2.97 (1.76)	2.87 (1.67)	.26
Disgust	3.46 (1.37)	4.08 (1.49)	3.89 (1.38)	1.52
Distress	3.59 (1.41)	3.96 (1.32)	3.96 (1.39)	.76
Fear	2.41 (1.72)	2.63 (1.75)	2.52 (1.63)	.12
Sad	3.44 (1.29)	3.93 (1.26)	4.07 (1.37)	2.06

* $p < .05$

\+ $p < .1$

Table 3

Distress tolerance task and its relationship with gender

	Gender		*F*(1,91)
	Males (*n* = 28)	Females (*n* = 66)	
Distress Tolerance Measurements			
Mean total slide viewing	19.88 (9.60)	14.33 (10.10)	6.38*
Count of viewing slide for full 30 seconds	24.43(16.60)	16.03(169.91)	5.27*
Count of how many slides participant reported no distress	15.18 (13.73)	8.12 (12.53)	5.84*
Mean time into slide participant acknowledged distress	14.27 (8.63)	8.53(8.63)	8.98*
Mean time after acknowledging distress before moving on to next slide	10.70 (7.63)	8.03 (7.38)	*F* (2, 90) = 2.40

* $p < .05$
\+ $p < .1$

Table 4

Effect of Gender on Distress tolerance emotional slide ratings relationship

	Males (*n*=28)	Females (*n*=66)	*F*(1,94)
Emotion rated			
Anger	1.92 (.31)	2.90 (.20)	7.36*
Anxiety	2.20 (.32)	3.10 (.21)	5.58*
Disgust	3.16 (.26)	4.06 (.17)	8.27*
Distress	3.26 (.26)	4.07 (.17)	6.96*
Fear	1.89 (.32)	2.77 (.21)	5.35*
Sad	3.23 (.24)	4.06 (.16)	8.62*

* $p < .05$
\+ $p < .1$

Table 5

Distress tolerance task and its relationship with B-MMR

	Mean total slide viewing	Count of viewing slide for full 30 seconds	Count of how many slides participant reported no distress	Mean time into slide participant acknowledged distress	Mean time after acknowledging distress before moving on to next slide
			n = 94		
B-MMR subscales					*n* = 93
Entertainment	-.07	-.06	-.09	-.12	.08
Revival	-.07	-.10	-.01	-.03	-.07
Strong	.01	-.05	.01	.02	-.01
Diversion	-.10	-.17+	-.07	.07	-.12
Discharge	.08	.07	.08	.07	.09
Mental Work	-.11	-.15	-.07	-.09	-.12
Solace	-.07	-.13	-.03	-.04	-.09
Total	-.06	-.11	-.02	-.04	-.06

* $p < .05$
\+ $p < .1$

Table 5a

Distress tolerance task and its relationship with B-MMR in the negative musical condition

n = 32

	Mean total slide viewing	Count of viewing slide for full 30 seconds	Count of how many slides participant reported no distress	Mean time into slide participant acknowledged distress	Mean time after acknowledging distress before moving on to next slide
B-MMR subscales					*n* = 32
Entertainment	-.04	-.01	-.05	-.09	-.01
Revival	-.18	-.18	-.19	-.20	-.17
Strong	-.07	-.10	-.07	-.07	-.08
Diversion	-.37*	-.39*	-.24	-.27	-.34
Discharge	.25	.30	.17	.19	.26
Mental Work	.08	.06	.12	.11	.00
Solace	.09	.09	.19	.16	.06
Total	-.03	-.02	.00	-.02	-.04

* $p < .05$

\+ $p < .1$

Table 5b

Distress tolerance task and its relationship with B-MMR in the neutral musical condition

n = 29

	Mean total slide viewing	Count of viewing slide for full 30 seconds	Count of how many slides participant reported no distress	Mean time into slide participant acknowledged distress	Mean time after acknowledging distress before moving on to next slide
B-MMR subscales					
Entertainment	.02	-.04	-.11	-.05	.09
Revival	.10	.02	.11	.14	.03
Strong	.11	.06	.15	.15	.06
Diversion	.14	.01	.09	.13	.05
Discharge	.07	.09	.16	.13	.07
Mental Work	-.10	-.17	-.09	-.10	-.12
Solace	-.10	-.18	-.04	-.03	-.20
Total	.04	-.04	.06	-.07	-.01

* $p < .05$
\+ $p < .1$

Table 5c

Distress tolerance task and its relationship with B-MMR in the positive musical condition
n = 34

	Mean total slide viewing	Count of viewing slide for full 30 seconds	Count of how many slides participant reported no distress	Mean time into slide participant acknowledged distress	Mean time after acknowledging distress before moving on to next slide
B-MMR subscales					
Entertainment	-.16	-.11	-.09	-.17	-.04
Revival	-.17	-.17	.00	-.07	-.13
Strong	-.04	-.12	-.04	-.03	-.05
Diversion	-.18	-.21	-.09	-.13	-.15
Discharge	-.09	-.16	-.05	-.08	-.09
Mental Work	-.30+	-.33+	-.22	-.27	-.26
Solace	-.25	-.30+	-.24	-.28	-.18
Total	-.22	-.26	-.13	-.18	-.17

* $p < .05$
\+ $p < .1$

Table 6

Distress tolerance emotional rating task and its relationship with the B-MMR

n = 94

	Anger	Anxiety	Disgust	Distress	Fear	Sad
B-MMR subscales						
Entertainment	.14	.10	.09	.11	.07	.11
Revival	.15	.16	.08	.14	.09	.10
Strong	-.08	-.05	-.11	-.05	-.05	-.17
Diversion	.07	.08	.06	.12	.06	.01
Discharge	-.05	-.07	-.14	-.06	-.14	-.08
Mental Work	-.04	.02	.01	.01	-.03	-.09
Solace	.01	.02	-.05	.01	-.01	-.06
Total	.03	.04	-.02	.05	-.01	-.04

* $p < .05$

\+ $p < .1$

Table 6a

Distress tolerance emotional rating task and its relationship with the B-MMR in the negative musical condition

n = 32

	Anger	Anxiety	Disgust	Distress	Fear	Sad
B-MMR subscales						
Entertainment	.05	.08	-.12	-.00	.15	-.05
Revival	.12	.28	.06	.16	.30+	.08
Strong	-.07	-.02	-.07	.01	-.00	-.03
Diversion	.13	.29	.20	.28	.34+	.11
Discharge	-.18	-.08	-.27	-.10	-.22	-.01
Mental Work	-.02	.10	-.12	-.08	.00	-.06
Solace	-.04	.06	-.20	-.09	.03	-.07
Total	-.01	.13	-.12	.03	.10	-.01

* $p < .05$
\+ $p < .1$

Table 6b

Distress tolerance emotional rating task and its relationship with the B-MMR in the neutral musical condition

n = 29

	Anger	Anxiety	Disgust	Distress	Fear	Sad
B-MMR subscales						
Entertainment	.06	-.01	-.04	.022	-.12	.05
Revival	.09	-.01	.05	.019	-.09	-.02
Strong	-.15	-.11	-.11	-.11	-.19	-.30
Diversion	-.07	-.14	.02	-.01	-.17	-.16
Discharge	-.15	-.17	-.23	-.25	-.25	-.27
Mental Work	-.76	-.07	.07	.03	-.68	-.18
Solace	-.03	-.04	.07	-.03	-.03	-.17
Total	-.07	-.11	-.03	-.07	-.16	-.21

* $p < .05$
\+ $p < .1$

Table 6c

Distress tolerance emotional rating task and its relationship with the B-MMR in the positive musical condition

n = 34

	Anger	Anxiety	Disgust	Distress	Fear	Sad
B-MMR subscales						
Entertainment	.24	.19	.34*	.27	.09	.28
Revival	.25	.24	.15	.24	.11	.25
Strong	-.02	-.00	-.12	-.02	.05	-.12
Diversion	.21	.16	-.01	.11	.11	.092
Discharge	.10	.02	.00	.11	.01	-.02
Mental Work	-.02	.05	.00	.04	-.00	-.06
Solace	.11	.07	-.03	.16	.01	.04
Total	.15	.13	.05	.16	.07	.07

* $p < .05$

\+ $p < .1$

Appendix

Brief Music in Mood Regulation scale

		Strongly Disagree				**Strongly Agree**
1.	I usually put background music on to make the atmosphere more pleasant	1	2	3	4	5
2.	When I'm busy around the house and no else is around, I like to have some music on in the background	1	2	3	4	5
3.	I listen to music to make cleaning and doing other housework more pleasant	1	2	3	4	5
4.	I listen to music to perk up after a rough day	1	2	3	4	5
5.	When I'm exhausted, I listen to music to perk up	1	2	3	4	5
6.	When I'm tired out, I rest by listening to music	1	2	3	4	5
7.	Music has offered me magnificent experiences	1	2	3	4	5
8.	I want to feel the music in my whole body	1	2	3	4	5
9.	I feel fantastic putting my soul fully into the music	1	2	3	4	5
10.	For me, music is a way to forget about my worries	1	2	3	4	5
11.	When stressful thoughts keep going round and round in my head, I start to listen to music to get them off my mind	1	2	3	4	5
12.	When I feel bad, I try to get myself in a better mood by engaging in some nice, music-related activity	1	2	3	4	5
13.	When I'm really angry, I feel like listening to some angry music	1	2	3	4	5
14.	When everything feels bad, it helps me to listen to music that expressed my bad feelings	1	2	3	4	5
15.	When I'm angry with someone, I listen to music that expresses my anger	1	2	3	4	5
16.	Music helps me to understand different feeling in myself	1	2	3	4	5
17.	Music has helped me to work through hard experiences	1	2	3	4	5
18.	When I'm distressed by something, music helps me to clarify my feelings	1	2	3	4	5
19.	When everything feels bad, music understand and comforts me	1	2	3	4	5
20.	When I'm feeling sad, listening to music comforts me	1	2	3	4	5
21.	I listen to music to find solace when worries overwhelm me	1	2	3	4	5

Music rating sheet

While listening to the music selection, please answer the following questions by circling your answer

1. I am familiar with this song

   YES NO

2. I enjoy listening to this type of music

   YES SOMETIMES NO

3. I would describe this song as

   POSITIVE NEGATIVE NEUTRAL

4. If you can please try and identify the name of the song and the composer

   _____

Positive and Negative Affect Scale

This scale consists of a number of words that describe feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way RIGHT NOW, that is, AT THE PRESENT MOMENT. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____	interested	_____	irritable
_____	distressed	_____	alert
_____	excited	_____	ashamed
_____	upset	_____	inspired
_____	strong	_____	nervous
_____	guilty	_____	determined
_____	scared	_____	attentive
_____	hostile	_____	jittery
_____	enthusiastic	_____	active
_____	proud	_____	afraid