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Muted Affect, Amped-Up Volume: Reduced Music-Evoked Fear Responses in Psychopathy

Amy Goltermann, Sam Colman, Xan Carey, Dylan Tossavainen, Alon Florentin, Garrett Ienner, Huidi Yang, John Yaurimo, Pranav Lowe, Helena Julia Torres-Siclait, Jonah Zinn, Barbara Angie Clergé Boirond, Alexis Egazarian, Nkiruka Olivia Marie Amu, Naud Jacob Zwier Veldhoen, Amelia Karim, Stephanie Devli, Stephen Spivack, Star Fitzmaurice, Claire Elise Berner, Jennifer Marina Perez, Morolayo Ayodele, Jennifer Freda, Sagar Shah, Kim Jin, Ibrahim Sheikh, Sahar Hafezi, Samantha Golden, Tom Zhou, Daria Fomina, Jinge Ren, Liam Walsh, Victoria Tong, Shelby McClelland, Lucy Cranmer, Theadora Bulajic, Andrea Poinçot-Leopardi. Corresponding Author: Pascal Wallisch

Department of Psychology, New York University

Author contributions: PW designed the study and analyzed the data. AG, SC, & XC drafted the manuscript. DT, AF, GI, HY, JY, PL, HJTS, JZ, BACB, AE, NOMA, NJZV, AK, SD, SS, SF, CEB, JMP, MA, JF, SS, KJ, IS, SH, SG, TZ, DF, JR, LW, VT, SM, LC, TB, APL recorded the data. All authors reviewed and revised the manuscript and approved the final version.

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Abstract

It is widely observed that music can induce emotions in listeners, but little is known about the underlying mechanism. We may begin to explore relationships between personality traits and emotional responses to music by comparing subpopulations — such as those with psychopathic tendencies — to that of the general population. Psychopathy is characterized by a lack of empathy, and tends to be accompanied by diminished fear and anxiety. As such, we hypothesize a difference in emotional response between our control group and individuals who score highly on tests of psychopathic tendencies such as the Dark Triad Dirty Dozen Test (DTDD) and the Levenson Self-Report Psychopathy Scale (LSRP). In an experiment with 944 undergraduate students, where we exposed them to music and recorded the emotions they report in response, we found significant negative correlations between music-evoked anxiety and both LSRP and Dark Triad Psychopathy specifically, implying indeed reduced emotional responses and affect in individuals with psychopathic traits. We posit that this relationship could account for the differences in music preferences in individuals with psychopathic traits.

Introduction

Music evokes strong emotions (Schaefer, 2017). This pertains to both music-specific emotions such as chills (de Fleurian & Pearce, 2021), basic emotions such as joy (Juslin & Västfjäll, 2008) as well as emotions mediated by music, such as nostalgia (Barrett et al., 2010; Sedikides et al., 2022). In addition, we know much about the physiological mechanisms underlying these responses (Baltes et al., 2011) as well as the fact that music genuinely induces these emotions - listeners are not simply recognizing or perceiving the emotions inherent in the music (Scherer & Zentner, 2001). However, less is known about individual differences in response to music and their underlying mechanisms (Baltes & Miu, 2014). There are many issues when trying to link

music-evoked emotions to personality characteristics in a differential fashion. One promising avenue is to contrast emotionality in subpopulations with known differences in emotional processing with the general population. One such condition is Psychopathy.

Psychopathy is characterized by lack of empathy and shallow affect, in addition to antisocial tendencies such as pathological lying and manipulativeness (Kiehl & Hoffman, 2011). Whereas individuals with psychopathic traits exhibit particularly severe lack of social emotions, such as shame, guilt, remorse, or regret (Hare, 1998), it is also known that they tend to have diminished anxiety and fear responses (Marsh et al., 2011).

Unfortunately, the antisocial tendencies of individuals high in psychopathic traits make the diagnosis of Psychopathy challenging. For instance, instruments like the Levenson Self-Report Psychopathy Scale (LSRP, Levenson, Kiehl, & Fitzpatrick, 1995) rely heavily on the veracity of the self-reports provided by individuals. In cases of Psychopathy, we can not rely on the integrity of these reports. This problem is not contained to the LSRP. Other measures, like the Dark Triad Dirty Dozen (DTDD; Jonason & Webster, 2010) that attempt to situate Psychopathy in the context of other "dark personality" traits such as Narcissism and Machiavellianism suffer from the same problem. Of course, individuals with Psychopathy also exhibit a diminished physiological response, e.g., skin conductance response to distressing stimuli (Hare, 1978). However, eliciting such physiological responses is not a practical diagnostic path in most situations, as measuring such responses requires advanced sensory and signal processing equipment. In addition, this apparatus is rather cumbersome and prone to motion artifacts, it only works in highly artificial and contrived situations. Moreover, the kind of autonomic physiological responses measured in this way are not sufficiently specific - other conditions, such as arthritis (Geenen et al., 1996), damage to the limbic system (Lee et al., 1988) or Parkinson's Disease (Sommeraurer et al., 2015), among others, also exhibit altered and diminished physiological responses.

Here, we wonder if Psychopathy manifests in terms of music-evoked fear. Specifically, we hypothesize and predict - in light of the known literature - that individuals high in psychopathic traits will exhibit diminished fear in response to music.

As individuals with high psychopathic traits are good at masking these traits (Cleckley, 1951) - making this condition particularly hard to understand and detect - developing behavioral probes that do not solely rely on self-report are particularly important and valuable.

Method

Participants

We recruited undergraduate students at New York University who participated in the study for course credit. To ensure sufficiently high statistical power (Wallisch, 2015), a total of 944 participants (605 female, 293 male, 46 nonbinary or not disclosed) completed the study. To ensure that this sample yields a sufficiently high power to detect effects, even if they are subtle (Wallisch, 2015), we performed a power analysis with G*Power for correlation and regression analyses, see Figure 1 (Faul et al., 2007).

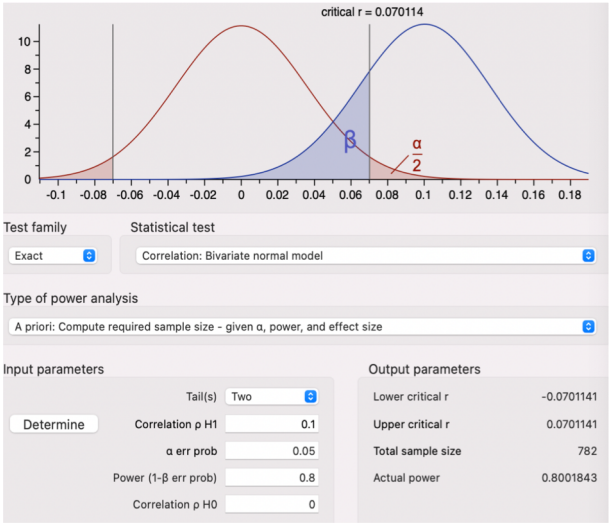

Figure 1: Power analysis with G*Power. Given that the emotions evoked by a brief stimulus can be expected to be subtle, we wanted to ensure that we are able to detect such an effect, if it should exist. Thus, we assumed a small effect size of 0.1, corresponding to a coefficient of determination of 0.01,

given commonly accepted levels of alpha (Fisher, 1925) and beta errors (Cohen, 1992). Under these assumptions, we determined that a sample size of 782 participants would yield a power of 80%. Therefore, we conclude that our sample is indeed adequately powered to detect the minimal effect size we are interested in.

Psychological Measures

In this study, we used two instruments: The Dark Triad Dirty Dozen Test (DTDD) and the Levenson Self-Report Psychopathy Scale (LSRP) to measure psychopathic tendencies. The rationale for using both is that whereas they both purport to measure the same construct and correlate highly, they do probe different facets of the condition (Bulajic et al., 2022). In addition, the DTDD yields additional metrics - Machiavellianism and Narcissism - that will allow us to determine specificity - is a diminished fear response specific to Psychopathy or a feature of Dark Triad personality traits (Furnham et al., 2013) in general? Additionally, we compute a metric of fear evoked responses by averaging the fear responses to all musical pieces across a participant.

Dark Triad Dirty Dozen Test

The DTDD is a 12-item personality inventory that consists of three subfacets: Machiavellianism, Narcissism and Psychopathy (Jonason & Webster, 2010). Participants rate each item on a 7-point Likert scale, with 1 representing strong disagreement and 7 strong agreement. Despite the brevity of the test, the DTDD is considered to be reliable and valid (Jonason & Webster, 2010).

Levenson Self-Report Psychopathy Scale

The LSRP measures psychopathic tendencies by participant responses to 26 questions on a 5-point Likert scale (Levenson et al., 1995). The LSRP supposedly consists of two underlying facets - primary and secondary Psychopathy, with primary Psychopathy referring to lifestyle choices and secondary Psychopathy to emotional responses (Vaughn et al., 2009). The LSRP is considered a reliable and valid instrument and routinely used for assessment of psychopathic tendencies in the general population (Bowling, 2005; Brinkley et al., 2001; Falkenbach et al., 2007; Fritz & Lim, 2018; Gummelt et al., 2012; Henrich et al., 2010).

Music-Evoked Emotional Responses

Each participant listens to a set of 400 brief - 7 second long - excerpts from songs (both popular and obscure) selected to cover a wide range of musical styles, including jazz, rap, rock, pop, electronica, r&b, world music, as well as country and classical music. For each of these 400 music pieces - presented in randomized order to avoid order effects - that a given participant listens to, we asked whether their experience evoked anxiety. Participants report their experience via a check box (that is either clicked or not). When piloting this experiment, we realized that participants would readily report their emotional states with these checkboxes, but were reluctant to do so with sliders that they could adjust. Importantly, this assay promises to tap into a specific, currently present emotional state, in contrast to global assessments of mood one sees in self-report questionnaires (e.g., "sometimes I feel a little anxious"), which are hard to interpret and assess. Moreover, we want to note that we do not make a distinction between fear and anxiety here. Whereas these emotions are distinct (Rosen & Schulkin, 1998; LeDoux & Pine, 2016), it is also known that individuals with psychopathic traits would not make that semantic distinction (Hancock et al., 2013), so we use these terms synonymously here. We compute "music evoked anxiety" (MEA) as the proportion of checkboxes a given participant clicked, out of the 400.

Procedure

Once participants arrived for the experiment, they confirmed informed consent. They then were walked through the scope of the study and began the study by first answering a biodata questionnaire consistent across all

participants. Then participants completed the study by filling in the self-report measures on Psychopathy and emotional responses evoked by clips of music; questions were randomized across participants. These tests were designed by the lab and recorded using MATLAB. Afterward, they were debriefed as to the purpose of the study. For the duration of the study, participants sat alone in the testing room with the computer and the study on full screen. Participants had unlimited time to answer each question, however the study took on average two hours to complete. The IRB at New York University (UCAIHS) approved all procedures.

Data Analysis

Recorded data were analyzed using the methods above by computing Spearman correlation coefficients of music-evoked fear responses and the LSRP and each facet of the DDTD (DD Psychopathy, DD Machiavellianism, and DD Narcissism). Data were analyzed using MATLAB 2019b (Mathworks, Natick, MA).

Results

What is the relationship between Psychopathy and music-evoked fear?

The central prediction of this hypothesis was that individuals with psychopathic traits would exhibit diminished fear in response to music. In order to determine whether Psychopathy measures and music-evoked fear were correlated, we first examined the distribution of anxiety-evoking songs in the sample (See Figure 2).

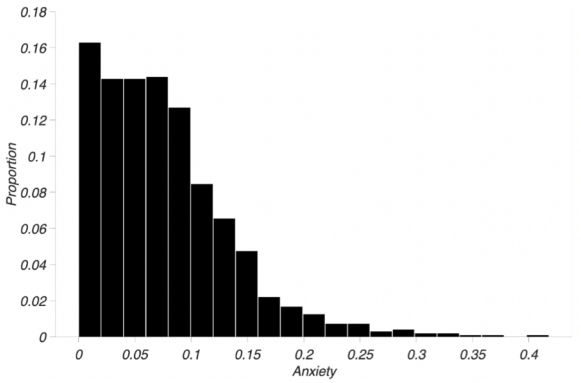

Figure 2: *Histogram of the proportion of the sample with a particular degree of music-evoked anxiety.* The x-axis indicates how much anxiety was reported by individuals in our sample. For instance, the most extreme value represents one individual who experienced anxiety in response to 40% of the clips. The y-axis denotes what proportion of the sample falls within a given bin, out of 21.

We then examined the distributions of Psychopathy scores in the sample using scores of the LSRP and the DTDD facets (DD Psychopathy, DD Machiavellianism, and DD Narcissism). Figure 3 below shows the distributions.

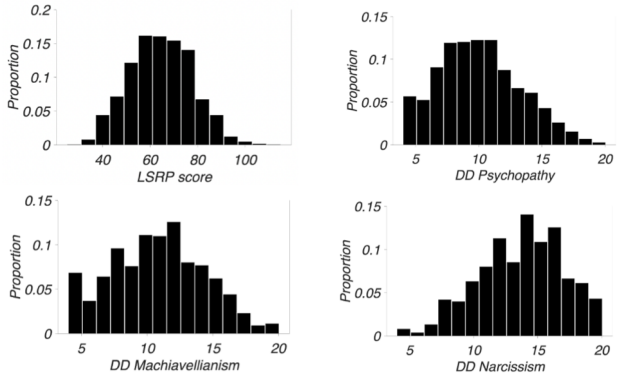

Figure 3: *Histograms of the proportion of the sample as a function of LSRP and Dirty Dozen scores.* The x-axis denotes, upper left panel: LSRP score, upper right panel: Dirty Dozen Psychopathy score, bottom left panel: Dirty Dozen Machiavellianism score and the lower right panel: Dirty Dozen narcissism score, respectively. The y-axis indicates the proportion of the sample with these scores.

Finally, we investigated four correlations between the music-evoked anxiety scores and LSRP Psychopathy, DD Psychopathy, DD Machiavellianism, and DD narcissism (see Figure 4).

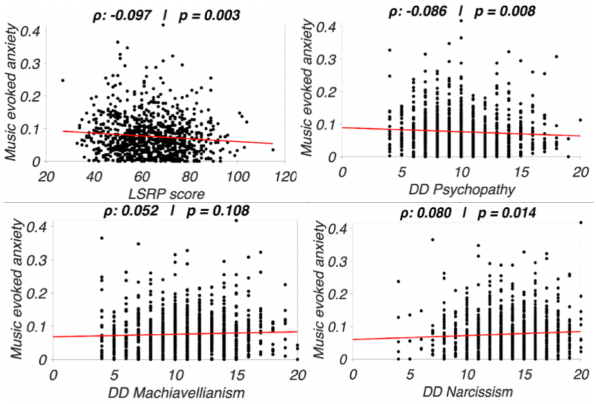

Figure 4: *Scatterplots between condition scores and music evoked anxiety.* The x-axis denotes, upper left panel: LSRP score, upper right panel: Dirty Dozen Psychopathy score, bottom left panel: Dirty Dozen Machiavellianism score and the lower right panel: Dirty Dozen narcissism score, respectively. The y-axis indicates the degree of music-evoked anxiety reported by a given participant. Each black dot represents a participant. The red lines represent the best fit lines using least squares regression.

For the sample, the scores on the LSRP (M = 64.1, SD = 13.2) and music-evoked anxiety (M = 0.076, SD = 0.0602) were negatively and significantly correlated, ρ(942) = -0.097, p = 0.003. The Dirty Dozen Psychopathy scores (M = 10.2, SD = 3.09) and music-evoked anxiety (M = 0.076, SD = 0.0602) were also negatively and significantly correlated, ρ(942) = -0.086, p = 0.008. The Dirty Dozen Narcissism scores (M = 13.6, SD = 3.12) and music-evoked anxiety (M = 0.076, SD = 0.0602) were significantly correlated, ρ(942) = 0.08, p = 0.014. Dirty Dozen Machiavellianism (M = 10.9, SD = 3.38) and music-evoked anxiety (M = 0.076, SD = 0.0602) were not significantly correlated ρ(942) = 0.052, p = 0.108.

Discussion

In this study, we found that MEA is negatively and significantly related to psychopathic traits, as measured both by LSRP and DD Psychopathy. This finding is consistent with our hypothesis that individuals with Psychopathic traits would exhibit a diminished fear response, as shown in other domains. To our knowledge, this is the first time such a pattern has been established for the response of psychopathic individuals to music. In addition, this tendency is specific to Psychopathy - a diminished MEA is not a feature of dark triad personality in general, as there is no relationship between MEA and Machiavellianism, and a - weak but significant - positive one between MEA and Narcissism, consistent with the insecurity-based account of Narcissism provided by Kowalchyk et. al. (2021).

We note that whereas this trend is statistically significant, it is not strong on the level of the individual. However, this is not surprising, given the subtle intervention (brief excerpts) and the fact that the emotions evoked by a given music piece are determined by many factors, including nostalgia and specific experiences and preferences. Yet, we were able to detect this effect, highlighting the critical importance of well powered samples (Wallisch, 2015).

Another limitation consists in the fact that - due to the ongoing Coronavirus pandemic - we were restricted to NYU students as the sample. This immediately suggests an avenue for further exploration. First, it is important to validate these findings in a more representative sample of the community at large, in particular with respect to a broader range of age and educational background.

In addition, when doing so, it might be instructive to assess whether this pattern is specific to MEA or other emotions as well, in other words, what is the signature of music evoked emotional responses in individuals with Psychopathy more generally. We propose to do so here. Finally, we posit that these findings might shed light on the musical preferences of individuals with Psychopathy more generally. Anecdotally, we found that such individuals are prone to preferring more intense music that evokes anxiety in the general population. If psychopathic individuals do not experience this anxiety, they might prefer such music.

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