Moral Cognition About Harm in Anxiety Disorders: The Importance of Experienced Emotion

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Abstract
Recent work has shown that emotional arousal influences decision-making in sacrificial moral dilemmas, with heightened levels of arousal associated with increased aversion to committing moral transgressions to maximize utilitarian outcomes. Patients with anxiety disorders experience pathologically heightened states of arousal and thus may be expected to exhibit reduced utilitarian responding on such

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dilemmas. Extant evidence has been mixed, however, regarding whether anxious patients differ in their moral decisions from controls, and no study has conducted a careful examination of emotions experienced during decision-making. We administered sacrificial moral dilemmas to a cohort of 95 patients from across the spectrum of anxiety disorders to test whether they differed from matched controls on a) utilitarian decision-making, and b) ratings of experienced emotion during the moral deliberative process. Results showed no group differences between patients and controls on endorsement of utilitarian sacrificial action or on reported experience of emotionality during the experiment. Additionally, exploratory analysis revealed that specific emotions were correlated with utilitarian judgments. These results are in line with the Dual Process Theory model's prediction that decreased utilitarian responding will be concomitant with an increased emotional arousal. Our findings support past work indicating that moral cognition is intact in anxiety disorders despite the emotional dysregulation characteristic of anxious psychopathology. Future work would benefit from the use of process-dissociation techniques to further clarify whether emotional or cognitive processes may differ in anxiety disorders during moral cognition.

Introduction

Contemporary empirically-based theories of moral psychology acknowledge the importance of both cognitive and emotional processes in the production of moral thought and behavior (Conway & Gawronski, 2013; Greene et al., 2004; Haidt, 2001; Miller & Cushman, 2013; Patil et al., 2020). Greene et al. (2004) proposed the influential dual process model (DPM) of morality, which argues for the dissociable and (sometimes) competing roles of cognitive and emotional processes in the context of moral decision-making. This work is heavily reliant on "sacrificial moral dilemmas" (also referred to as "trolley problems") where participants are presented with a scenario in which they must decide whether to sacrifice a single person's life to save the lives of multiple others. Terminology used to describe responses in these scenarios identifies the decision to commit the sacrificial action as "utilitarian", indicating that it is in line with the traditional philosophical view which endorses maximizing positive outcomes (in this case by saving the maximum number of lives). The negative response (i.e. to *not* engage in the sacrificial action) is thus a "non-utilitarian" response.

The psychological motivation underlying non-utilitarian responses in moral dilemmas is thought to be mediated by a negative emotional reaction to the

notion of committing an immoral act (i.e. killing a person). This emotional reaction is often described as "harm aversion (for a review, see Miller & Cushman, 2013). Investigations using the moral dilemma paradigm have shown that endorsing the non-utilitarian response is associated with greater activation of affect-related neural systems (e.g. Greene et al., 2004), lending credence to the DPM view. Evidence has also demonstrated a link between emotional arousal and non-utilitarian judgments via the measure of skin conductance, such that greater skin-conductance-associated emotional arousal experienced during a moral dilemma is associated with a greater propensity to endorse non-utilitarian solutions (McDonald et al., 2017; Moretto et al., 2010). Further evidence for the connection between arousal and non-utilitarian responding was shown with a pharmacological modulation using the high-potency, intermediate-acting benzodiazepine lorazepam (Perkins et al., 2013). In their study, the authors showed a dose-dependent increase in utilitarian responding to moral dilemmas in a sample of healthy volunteers, thus demonstrating that a reduction in anxiety after administration of an anti-anxiolytic drug can cause an increase in utilitarian tendencies.

Recent work has also begun to narrow in on the source of the negative affect that drives non-utilitarian responses. One such source is the extent to which one finds it personally upsetting to imagine the suffering of the victim who needs to be sacrificed (harmed) in order to achieve the greater good. Reduction in this source of negative affect can predispose people to approve utilitarian moral judgements (Miller & Cushman, 2013; Reynolds & Conway, 2018). Another source of negative affect that drives moral condemnation of harmful behavior stems from aversion to harmful actions themselves without further considering outcomes (Crockett et al., 2013; Cushman, 2013; Miller et al., 2014; Patil et al., 2020).

There has also been an attempt to shed light on the connection between affective processes and responses to moral dilemmas in the context of various clinical populations (de Achával et al., 2013; Gago et al., 2019; Gleichgerrcht et al., 2013; 2015; Jiang et al., 2016; Kim et al., 2015; Larsen et al., 2019; McGuire et al., 2017; Patil et al., 2016). Of relevance to the current investigation is the diagnostic class known as anxiety disorders (which includes social anxiety disorder, panic disorder, specific phobias, agoraphobia, generalized anxiety disorder, and until the recent change to the classification system, obsessive-compulsive disorder and PTSD). Central facets of these psychopathologies often include dysregulated emotional arousal which is so severe and pervasive as to impair the individual's everyday functioning (American Psychiatric Association, 2013). This characteristic of anxiety disorders generates the hypothesis that the heightened emotional arousal experienced by patients would lead to the increased non-utilitarian responding associated with emotion according to the DPM.

Some work using the moral dilemma paradigm has investigated moral dilemma responding in anxiety disorders, allowing a test of the prediction that the heightened emotional arousal characteristic of these disorders would result in lower levels of utilitarian responses (Franklin et al., 2009; Harrison et al., 2012; Mancini & Gangemi, 2015; Trafford et al., 2018; Whitton et al., 2014). However, past investigations have reported inconsistent findings: while some work did find the predicted decrease in utilitarian responding in anxiety disorders compared to healthy individuals (Mancini & Gangemi, 2015; Whitton et al., 2014), other work has found no such group differences (Franklin et al., 2009; Harrison et al., 2012; Trafford et al., 2018). It thus remains unclear whether moral cognition about harm or the emotional processes which underly this cognition are affected by anxious psychopathology.

The present work seeks to expand and clarify this literature by examining moral decision-making in the context of anxious psychopathology. We adopt a dimensional approach, investigating a sample which includes patients with diagnoses across the spectrum of anxiety disorders. This approach is also partly motivated by recent work in other domains which has begun to show the strong utility of viewing constructs such as anxiety as *continuous*, as opposed to discontinuous or categorical (Insel et al., 2010; Siddaway et al., 2018). Furthermore, a primary limitation of the extant work on this topic is its inadequacy in assessing emotional reactions in anxiety patients while facing such dilemmas, which might explain discrepant findings across studies. In other words, the DPM predicts that anxious patients will exhibit increased aversion to utilitarian action, but only *to the degree* that patients have an elevated emotional response while facing such dilemmas (compared to healthy controls).

Thus, we aimed to assess whether anxiety patients in fact experience elevated emotional arousal in response to sacrificial moral dilemmas while also assessing their moral decision-making. We hypothesized that patients would report increased levels of emotionality compared to controls during moral deliberation and that, in accordance with the DPM, this would additionally result in patients exhibiting greater aversion to utilitarian action. We additionally attempted to better characterize emotionality during moral deliberation in anxiety disorders by measuring specific emotions experienced by the patients.

Method

Participants

Ninety-five sequential patients (48 females) were included for the anxiety disorder group from an ongoing research cohort of patients with neuro-psychiatric disorders, including patients with a variety of diagnoses within the spectrum of anxiety: Obsessive-compulsive disorder (OCD; $n = 35$) (with insight, $n = 29$; without insight, $n = 6$), Panic Disorders (PD, $n = 23$) (with agoraphobia,

$n = 14$; without agoraphobia, $n = 9$), Phobias ($n = 24$) (social, $n = 8$; specific, $n = 7$; circumscribed social, $n = 6$; agoraphobia, $n = 3$), and General anxiety disorder (GAD, $n = 13$). The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (First et al., 2002) was conducted by a mental health professional (R.K.) to confirm each of the diagnoses. (Note that these data were collected before the release of the DSM-5 (APA, 2013) and thus do not reflect the slight changes it instituted to diagnostic categorization of anxiety disorders—for example DSM-5 regards OCD as a category separate from anxiety disorders. In part to address this limitation, we carefully assessed clinical differences between patient groups in our statistical analyses.) Patients had not yet initiated pharmacological therapy with our medical team at the time of inclusion in the study, and all patients were medication-naïve (data collected in 2012).

Sixty-three (26 female) age-, gender- and level of education-matched healthy control (HC) volunteers from the community were also recruited for the study. These participants underwent screening to ensure absence of history of drug abuse, neurological, and neuropsychiatric disorders. Neither anxiety disorder patients nor healthy controls were financially compensated and voluntarily participated in the study. All participants signed an informed consent form before participating in this study, which was approved by the Ethics Committee at the Institute of Cognitive Neurology (INECO, Buenos Aires, Argentina).

Measures

Moral dilemma task. Anxiety patients and healthy controls were presented with two moral scenarios (and one non-moral scenario), in counterbalanced order: one impersonal (trolley dilemma) and one personal (footbridge dilemma) moral dilemma. Both impersonal and personal moral dilemmas were used (Spanish translations from (Gleichgerrcht et al., 2013)) and posed a conflict between actively harming one individual for the welfare of the many (five individuals). The personal dilemma featured an action that was more emotionally arousing than its impersonal counterpart, as it demanded that the agent carried out an action that violated another's individual right by using personal force (Greene et al., 2009), in this case pushing a large man to his death so that his body can stop a trolley that would otherwise kill five people. Compared to the personal dilemma, the impersonal case featured an action which was less emotionally arousing by implicating the agent in a less personal manner, namely, asking to switch a trolley from a track where it would kill five people to an alternative track where it would kill just one individual, using only a mechanical lever and no personal force. The only common denominator between both types of moral dilemmas was that they pitted the non-utilitarian consideration about violating someone's rights by harming them in a personal (direct) or impersonal (indirect) manner against the utilitarian option of saving a greater number of lives.

The non-moral scenario posed a practical question and lacked any moral content (whether to take a train or bus to arrive in time for a meeting). Data from non-moral scenarios are included in every model as a control condition. Thus, if any systematic differences are observed across groups on any dependent variable, we can ascertain that this effect is specific to the moral domain by checking if the same effect is observed also for prudential, non-moral dilemmas. The three scenarios are described in more detail in Supplementary Text S1.

After reading each scenario, participants responded to three questions in the same order:

a. *Choice of action*: "Would you [nature of action] in order to [outcome of the proposed action]?" (Yes/No);
b. *Appropriateness*: "Is it appropriate for you to [nature of action] in order to [outcome of the proposed action]?" (on a scale of 1: *not appropriate at all* to 10: *very appropriate*);
c. *Emotional reaction*: "How strongly do you feel about this decision?" (on a scale of 1: *no emotional reaction* to 10: *max emotional reaction*).

Appropriateness and choice of action were independently assessed in light of prior work showing discrepancy between judgments and behavioral choices on moral dilemmas (Francis et al., 2016; Patil et al., 2014; 2018). Furthermore, the clinical group also reported the specific emotions they experienced while reading any given scenario (Choe & Min, 2011), with the option to choose one or more basic emotions: anger, sadness, fear, disgust, happiness, and surprise.

It is important to note here that we call affirmative choice of action and higher scores of appropriateness as "utilitarian", but what we mean by this is a "characteristically utilitarian" response as a function of the response *content* and not the underlying *motivation* (Kahane, 2015). In other words, we do not interpret an affirmative response on moral dilemma by a participant to be an explicit endorsement of the utilitarian moral principle ("those acts are better that save a greater number of lives") on her part, but only to mean that this response coincides with a response that would be endorsed by a typical, card-carrying utilitarian moral philosopher (Greene, 2014).

The clinical group completed the following questionnaires (all Spanish-validated versions):

Clinical questionnaires. Bodily Sensations Questionnaire (BSQ): The BSQ (Chambless et al., 1984; Comeche et al., 1995) is a 17-item self-report instrument tapping the fear of bodily sensations. Each item represents an anxiety-related bodily sensation (e.g., heart palpitations, feeling short of breath, dizziness, etc.). Each item is rated on a 1 (*not frightened or worried by this sensation*) to 5 (*extremely frightened by this sensation*) Likert-type scale. The total score is computed by averaging the responses to all items.

Interpretation of Intrusions Inventory (III): The III (Arjona et al., 2012; Obsessive Compulsive Cognitions Working Group, 2001, 2005) is a questionnaire composed of 31 items designed to capture appraisals or interpretations of recent intrusive thoughts, images, and impulses representing three domains, Inflated responsibility/threat estimation (e.g., "I'll feel guilty unless I do something about this thought"), Importance of thoughts (e.g., "This thought could harm people."), and Control of thoughts (e.g., "I must regain control of this thought"). Participants rated the strength of belief in their appraisals on a 11-point Likert scale (0: *I did not believe this idea at all* to 10: *I was completely convinced this idea was true*). Total III score was computed by adding response to all items.

Cambridge Depersonalization Scale (CDS): The CDS (Aponte-Soto et al., 2014; Sierra & Berrios, 2000) is a 29-item questionnaire to measure the frequency and duration of depersonalization (a subjective experience of unreality in one's self) and derealization (unreality of the outside world) symptoms. Domains of the scale include abnormal sensory experiences, cognitive and emotional complaints, and space and time distortions. Each item was rated on two Likert scales for frequency over the past month (1: *never*, 5: *all the time*) and duration of the experience (1: *a few seconds*, 6: *more than a week*). Average scores for frequency and duration were calculated with higher values (range 0–290) indexing more frequent and longer-lasting symptoms of depersonalization over the preceding month.

Penn State Worry Questionnaire (PSWQ): The PSWQ (Meyer et al., 1990; Sandìn & Chorot, 1991) is a 16-item self-report questionnaire commonly used to measure pathological worry in both clinical and non-clinical populations. Respondents report how true each statement is for them on a 5-point Likert scale (1: *not at all typical of me*, 5: *very typical of me*). The score ranges from 16 to 80.

Beck Depression Inventory-II (BDI-II): Depressive symptoms over the past 2 weeks were measured using the BDI-II (Beck et al., 1996). The BDI-II consists of 21 items that assess a wide range of depressive symptoms (e.g., sadness, suicidal thoughts and wishes, concentration difficulty, or loss of energy). The total score of these items reflect the severity of depression: Symptom scores from 14 to 19 indicate a mild depression, 20 to 28 a moderate, and above 28 a severe depression (Beck et al., 1996).

State–Trait Anxiety Inventory (STAI): The State-Trait Anxiety Inventory (STAI) is a commonly used measure of trait and state anxiety (Seisdedos, 1988; Spielberger et al., 1983). The STAI–trait (STAI-T) form indexes relatively stable individual differences in the tendency to perceive stressful situations as dangerous or threatening. STAI–state (STAI-S) form, on the other hand, measure individual differences in state anxiety.

Social cognition questionnaires. *Interpersonal Reactivity Inventory* (IRI): IRI (Davis, 1983; Pérez-Albéniz et al., 2003), a 28-item self-report questionnaire with four

subscales, was used as a gauge of trait empathy. Participants reported agreement with statements on a 5-point Likert scale (1: *never true for me*, 5: *always true for me*). The four subscales consisted of: fantasy (F) scale, which measures the propensity to identify with fictional characters; perspective taking (PT) scale, which indexes the dispositional tendency to consider others' perspective in inter-personal interactions; empathic concern (EC) scale, which measures the *other-oriented* tendency to experience feelings of warmth, compassion, and concern for other people; personal distress (PD) scale, which measures the *self-oriented* tendency to feel personal unease and discomfort in reaction to the emotions of others. Considering recent assessments of the IRI, based on correlational and exploratory factor analyses (Baldner & McGinley, 2014), we decided *a priori* to focus on each subscale separately, with the exception of the FS scale, as it does not correspond well to modern conceptualizations or current research on the social neuroscience of empathy (Lamm & Singer, 2010).

Moral Behavior Inventory (MBI): Participants completed the MBI (Mendez et al., 2005), a 24-item scale presenting situations (e.g., "Fail to keep minor promises", "Temporarily park in a handicap spot", etc.) to be labeled as "not wrong", "mildly wrong", "moderately wrong", or "severely wrong". The MBI aims to measure participants' ability to distinguish right from wrong, providing a measure of "moral gnosia".

Data analysis

Statistical analysis was carried out in R programming language. Effect size measures are reported along with Bayes factors (Aczel et al., 2018; Lakens, 2013). We ensured that our data met the statistical assumptions associated with the general linear model-based statistical tests that we employed (Nimon, 2012). Welch's *t*-test and ANOVAs were used as a default for between-group comparisons because they account for unequal variances between groups (Delacre et al., 2017; 2018).

To investigate whether we were statistically justified in combining our patient samples into a single transdiagnostic 'anxiety' (or clinical) group, we first assessed degree of homogeneity between the four clinical groups (Phobias, PD, OCD, and GAD). One-way analyses of variance (ANOVAs) were thus conducted between these four groups to assess diagnostic group differences on all ancillary self-report measures of clinical and cognitive characteristics. Results of these tests can be viewed in Supplementary Figure S1a–S1g and S2a-S2d. None of the measures or their sub-scales showed significant differences between the four clinical groups, and these groups were therefore combined into a single 'anxiety disorders'/'clinical' group for all subsequent analyses. Clinical groups additionally showed no differences on ratings of moral dilemma appropriateness or experienced emotion during dilemmas (Supplementary Figure S3a–S3f).

Analyses next proceeded to assess group differences between patients and controls on responses (yes-no responses as well as appropriateness ratings) to personal, impersonal, and non-moral dilemmas. The two groups were likewise compared on their reported emotional arousal during the decision-making process. Lastly, we examined relationships in patients between appropriateness ratings and specific emotions experienced.

Bayesian statistics. When traditional null hypothesis testing results in a failure to reject the null hypothesis (H0), this cannot be taken as evidence in support of the null hypothesis, because *p*-values are unable to quantify support in favor of the H0 (Wagenmakers, 2007). Therefore, Bayes Factors (BF) were calculated for group comparisons to assess the relative likelihood of the null and alternative (H1) hypotheses (Jarosz & Wiley, 2014). A BF_{01} of greater than 1 implies that the data are more likely to occur under H0 than under H1. Similarly, a BF_{01} lower than 1 indicates that the data are more likely to occur under H1 than under H0. Thus, if the analysis indicates that $BF_{01} = 3$, this means that the data are 3 times more likely to have occurred under H0 than under H1. Based on prior guidelines (Etz & Vandekerckhove, 2016), BFs between 1 and 3, between 3 and 10, and larger than 10 are interpreted as ambiguous, moderate, and strong support, respectively. Note that, where relevant, we provide natural logarithm values for Bayes Factors (i.e., $\log_e(BF_{01})$), which need to be exponentiated to get the BF_{01}.

Data visualization

For the sake of parsimony and clarity of textual presentation, many statistical parameters are included in the figures rather than the main text (an approach adopted in the R package *ggstatsplot* (Patil, 2018)).

Data availability

All data and scripts are available at Open Science Framework: https://osf.io/pwsq6/.

Results

Descriptive results of responses to dilemmas can be viewed in Supplementary Table S2. In line with expectations based on past work, all participants (both healthy controls and anxiety patients) rated sacrificial action in the impersonal dilemma higher in moral appropriateness compared to the personal dilemma. To test the primary hypothesis of the current study, we assessed for differences in ratings of moral appropriateness of utilitarian action and of emotional arousal endorsed by anxiety patients compared to healthy controls. There was no group difference either for appropriateness (Figure 1(a)) or for emotionality
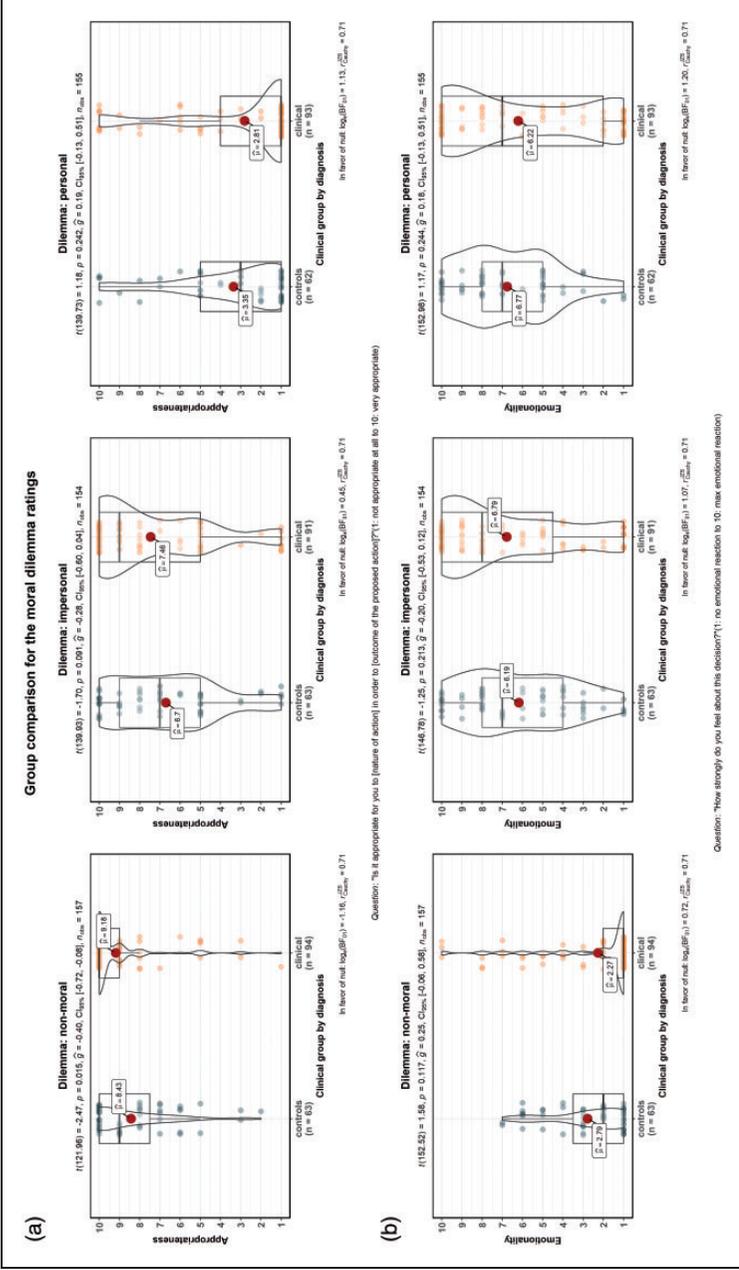
Figure 1. Group comparisons of dilemma ratings. The Welch's *t*-tests showed no differences between patients and healthy controls in ratings of (a) appropriateness or (b) emotionality in moral dilemmas. Although patients did find non-moral action to be more appropriate than healthy controls, this effect was not observed with another measure and will not be significant after a correction for multiple comparison.

(Figure 1(b)) ratings on either impersonal or personal moral dilemmas. Similar null effects were also observed with a dichotomous measure (Figure 2(a) to (c)). Although we did observe a group difference for non-moral cases such that anxiety patients found the action to take a train instead of a bus to not be late for a meeting to be more appropriate, no such difference was observed with the dichotomous measure and, therefore, we do not further discuss this finding.

Specific state emotions experienced during moral dilemmas

Patients reported feeling more negative emotions, primarily fear, anger, and disgust, while facing moral dilemmas as compared to during the non-moral scenario (Figure 3). No participants reported experiencing positive emotion (happiness) in response to reading moral dilemmas.

Specific state emotions and utilitarian appropriateness

We additionally investigated whether patients' experiences of specific emotions had any effect on how appropriate they found utilitarian action to be. Results revealed that experiencing anger and disgust reduced perceived appropriateness of utilitarian course of action, while experiencing sadness had the opposite effect (Figure 4).

Exploratory correlational analyses

The associations between all clinical and affective self-report measures and moral dilemma appropriateness ratings were assessed using bivariate Spearman correlation analyses. Holm's correction for multiple comparisons was applied. These tables can be viewed in Supplemental Materials (Figure S4a–S4c).

Discussion

The present work sought to clarify the connection between anxiety, emotion, and moral cognition by assessing decisions on moral dilemmas in a transdiagnostic anxiety disorders sample. While the Dual Process Model (DPM) would predict a decreased tendency to endorse utilitarian action in anxiety patients due to increased emotional arousal, past empirical investigations in clinical samples have found inconsistent results regarding such a group difference (Franklin et al., 2009; Harrison et al., 2012; Mancini & Gangemi, 2015; Trafford et al., 2018; Whitton et al., 2014). Because the predicted association is motivated by the assumption of heightened experience of emotion in anxiety disorders compared to healthy controls, we explicitly assessed levels of emotion experienced during moral decision-making.
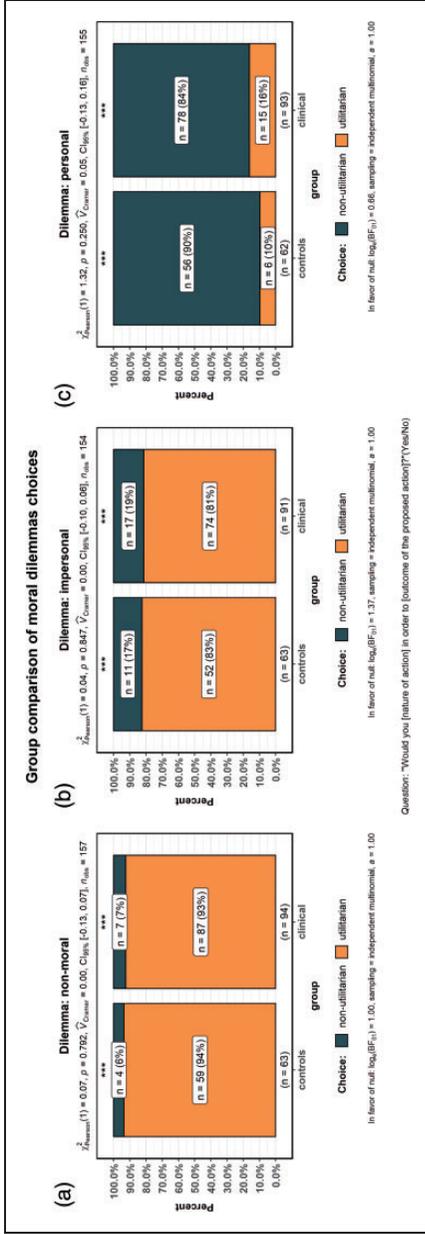
Figure 2. Group comparisons of dilemma dichotomous ratings (YES = utilitarian/NO = non-utilitarian). In line with results with continuous measure of appropriateness, the dichotomous measure showed no differences in ratings between patients and controls on (a) non-moral, (b) impersonal, or (c) personal moral dilemma. Note: *ns* indicates non-significance, $*$ indicates $p < 0.05$, $**$ indicates $p < 0.01$, and $***$ indicates $p < 0.001$ for one-sample proportion test carried out for each group. As can be seen, both groups preferred utilitarian option more frequently on non-moral and impersonal scenarios, while they preferred non-utilitarian option on personal dilemma.
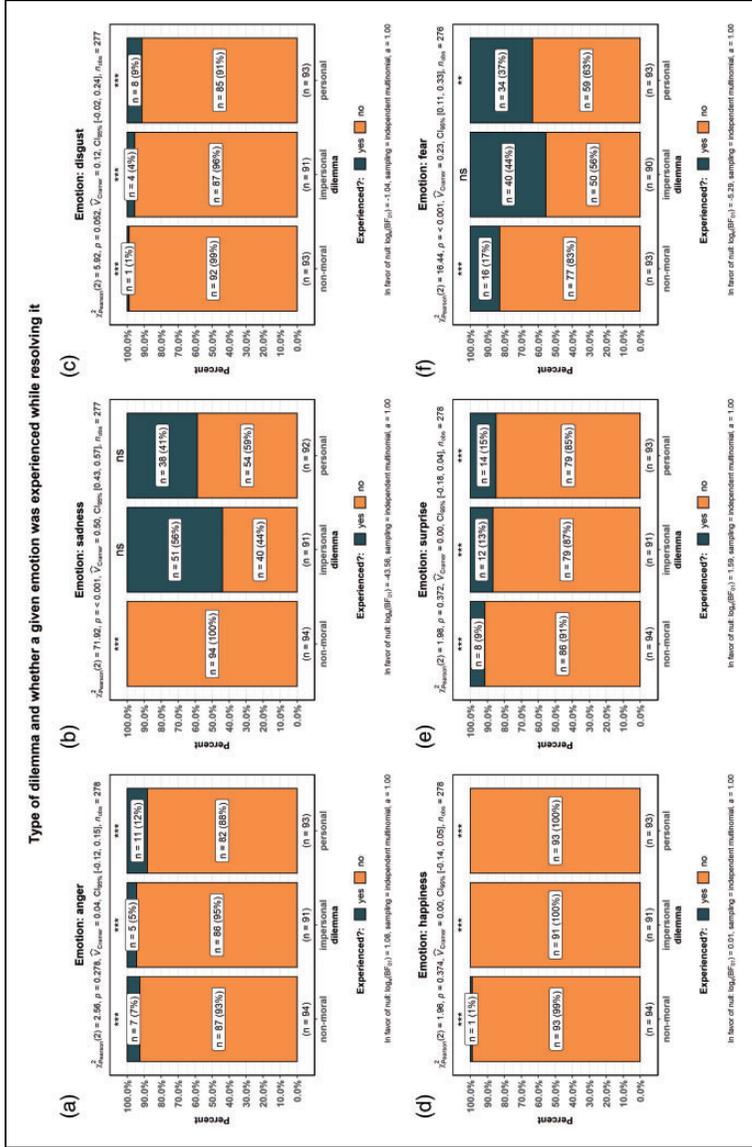
Figure 3. Patients' self-reported subjective experience of specific state emotions for each scenario. Negative emotions (sadness, fear, and disgust) were experienced more frequently when considering *moral* dilemmas, while none of the specified emotions were experienced by patients while reading the non-moral scenario. None of the patients reported feeling happiness after reading any of the moral dilemmas. Note: *ns* indicates non-significance, * indicates $p < 0.05$, ** indicates $p < 0.01$, and *** indicates $p < 0.001$ for one-sample proportion test carried out for each emotion and for each scenario.
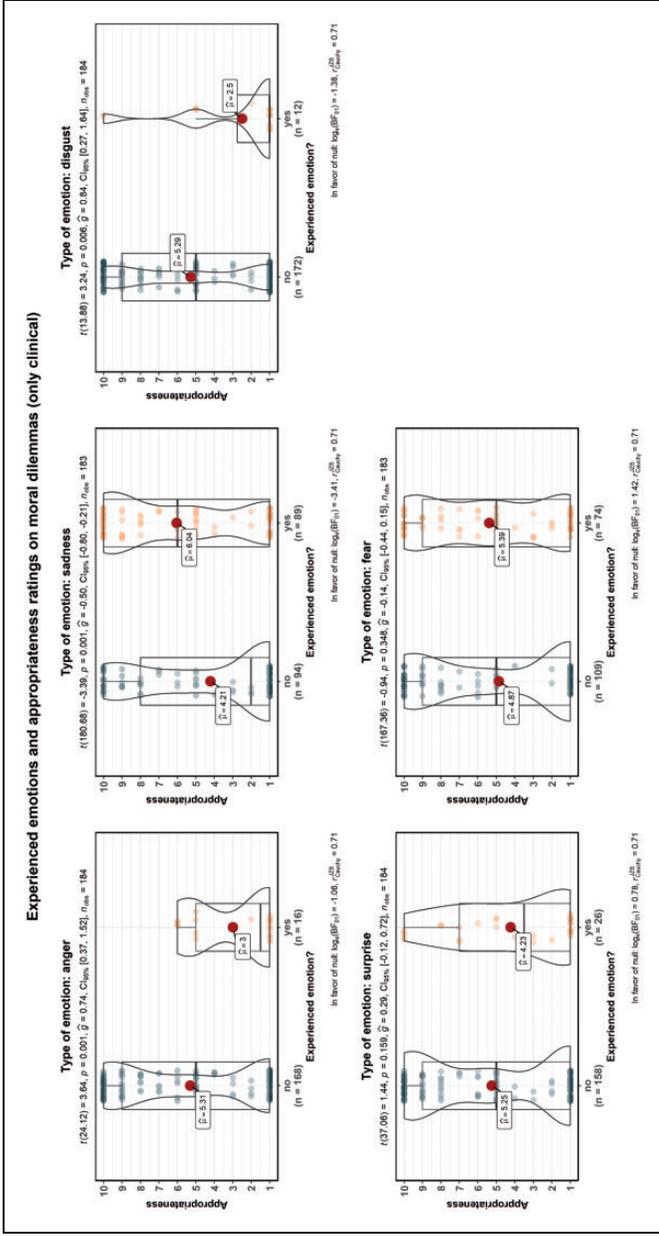
Figure 4. Experienced emotions and appropriateness ratings on moral dilemmas (only clinical). Patients who reported to have felt anger and disgust found the utilitarian action to be less appropriate as compared to patients who did not experience these emotions. Additionally, patients who experienced sadness while reading the moral dilemma found the utilitarian action to be more appropriate as compared to patients who did not experience this emotion. Note that similar analysis is not shown for the happiness emotion because none of the patients reported to have experienced this emotion while reading moral dilemmas.

Results of this study did not support the prediction of decreased utilitarian responding in anxiety disorders compared to healthy controls. No differences were found between patient groups or between patients and healthy controls on either personal or impersonal dilemmas in terms of endorsement of utilitarian sacrificial action (Figure 1). As predicted in light of this null finding, anxiety patients in our sample also reported a similar degree of emotionality during decision-making compared to controls. Because the DPM posits that increased aversion to utilitarian action is driven by increased emotional arousal during moral dilemmas, group differences in endorsement of utilitarian action would *not* be expected in the absence of differences in emotion.

However, emotional experience during the process of decision-making did appear to exert an influence on ratings of moral appropriateness when examined in the anxiety patients. Specifically, anxiety patients who reported experiencing anger and/or disgust rated utilitarian action as less appropriate than those who reported not experiencing these emotions. Additionally, patients who experienced sadness gave significantly *higher* endorsements of utilitarian action, possibly reflecting the sad nature of the cost-benefit analysis they approved of (Carmona-Perera, et al., 2014).

These results are in line with a similar pattern of results observed with healthy samples in the past literature (Baron et al., 2018; Choe & Min, 2011; Horne & Powell, 2016; Szekely & Miu, 2015) and suggest that the mechanisms underlying emotional aversion to utilitarian action are preserved in anxiety disorders.

One further implication of these surprising null findings is that the anxious arousal experienced in anxiety disorders is distinct from the "experienced emotion" which we assessed here. This distinction, considered with the present evidence, could shed light on the general question of which precise types of emotion/arousal are and are not relevant in influencing utilitarian moral decision-making. That is, it may be that the anxious arousal experienced at aberrant levels in anxiety disorders is not the same as the emotional arousal which has been shown by previous work to modulate moral decisions (Christensen et al., 2014; Perkins et al., 2013). Other recent work has pointed to important heterogeneity in the nature of "arousal" in terms of underlying neural circuits (Satpute et al., 2019).

Limitations and alternative explanations

It is additionally worth considering here the possibility that anxiety may exert influences on moral decision-making that were not foreseen. As one example, evolutionary accounts of anxiety often point to its function as instilling action-readiness in the face of threat (Dayan et al., 2017; Ohman & Mineka, 2001; Price, 2003). It is thus possible that individuals experiencing heightened levels of anxiety may also be in a state of heightened action-readiness, which could cause increased tendency to endorse utilitarian action as opposed to refraining from

action by selecting the non-utilitarian option. (Other possible pathways from anxiety to increased utilitarian inclination may also exist, such as through heightened irritability, a common symptom of anxiety.) Thus, purely as a speculation, it is possible that anxious patients do not differ from healthy controls in terms of their utilitarian inclination because increased anxiety *increases* utilitarian action tendencies but the preserved emotional aversion to such actions *reduces* such tendencies, leaving the final moral judgment comparable to healthy controls. Such speculations, of course, go well beyond the scope of the current data and might be investigated by future work seeking a fuller understanding of the processes involved in moral cognition in anxiety disorders.

One of the primary limitations of this work is that it uses a *conventional* approach to assessing utilitarian moral judgments. In this approach, participants are asked to judge a harmful action as either acceptable or unacceptable, which is taken to be an endorsement of either the utilitarian or deontological principle, respectively. Thus, the classical approach conflates, selecting one option with rejecting the other. However, the dual-process models maintain that the deontological and utilitarian inclinations derive from conceptually *independent* processes, rendering it possible for them to produce conflicting inclinations in high-conflict moral dilemmas. Prior work (Conway & Gawronski, 2013) has outlined a Process Dissociation (PD) approach that allows independent measurement of individual differences in the strength of deontological and utilitarian tendencies. But the data presented in the current study were collected in 2012 when this method was yet to be available.

A related limitation is that we used only a single item per category of moral dilemmas, as opposed to the battery of dilemmas used in some prior work. This was done to minimize the amount of time patients spent at the clinic. Also of note, while our clinical assessment was relatively thorough, we did not include a measure of sensitivity to disgust—an individual emotional difference which has been shown to be associated with moral cognition and may be abnormal in OCD particularly (Chapman & Anderson, 2013; Vicario et al., 2017). Future work would benefit broadly, in fact, from a more thorough assessment of alterations in cognitive processes that are known to occur in anxiety disorders, as such processes may in some cases underlie affective and behavioral responses in moral dilemmas.

Past work has used psychophysiological measures (e.g., skin reactance) to provide a more objective index about whether a person experiences the moral decision-making as emotionally arousing, and this metric has been shown to predict non-utilitarian tendencies (McDonald et al., 2017; Moretto et al., 2010). Our findings, on the other hand, rely solely on self-reported emotion, which may be a rougher metric of emotional arousal. Future work could clarify this point by additionally incorporating psychophysiological measure to see concordance between self-report and more objective indices of emotional arousal.

Additionally, our emotion measures suffered from several other limitations which could be improved upon in future investigations. Their dichotomous nature limited the available statistical analyses, which could be made much more fine-grained by substituting continuous measures (such as correlating moral judgments with degree of subjective emotional arousal). Next, our measure did not indicate whether participants experienced a *spike* in emotion at the time of considering the dilemma, so we were not able to assess with certainty whether dilemmas caused any additional emotional arousal over and above baseline arousal that participants started out with. This concern is of importance to alternative explanations of our null findings. While healthy controls may have experienced the expected spike in arousal while considering the moral dilemma (thus causing a decreased tendency toward utilitarian response) compared to their baseline, anxiety patients may *not* be susceptible to this effect of dilemmas on emotional response and may not experience a comparable surge in arousal due to their heightened baseline arousal level. As speculative as this possibility is, if this is indeed the case, then no subsequent decrease in utilitarian moral judgments would be expected in anxiety patients. Future work would thus benefit from utilizing a more direct, moment-to-moment approach to measuring the effect of moral dilemmas on emotional and arousal levels in anxious patients.

Taken together, the present findings constitute further evidence that moral decision-making in sacrificial dilemmas is preserved in anxiety disorders due to a preserved emotional response to harmful actions. Future work should further elucidate the specific cognitive and emotional processes involved that lead to this preserved judgment despite heightened predisposition toward arousal in anxiety disorders. Theoretical work should also continue to refine models of emotional arousal's involvement in moral decision-making to clarify the differential importance of heterogeneous types of emotional arousal.

Declaration of Conflicting Interests

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Supplemental material

Supplemental material for this article is available online.

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