Is the Relationship Between Anxiety and Creativity Moderated by Other Emotional States?

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ABSTRACT. The purpose of the present study was to determine what effect facilitating and debilitating anxiety have on creativity when moderated by emotional states. Prior research into the relationship between anxiety and creativity has suggested that a 2-factor model should be applied to further study (Byron & Khazanchi, 2011). It was hypothesized that debilitating anxiety would be negatively associated with creative performance on a caption-writing task and that this relationship would be moderated by an emotional state. Participants in the study were undergraduates taking Introduction to Psychology (N = 102). After taking the 7-item Generalized Anxiety Disorder Scale (GAD-7) and a modified scale from Alpert and Haber (1960), participants were asked to write captions for 2 provided photographs drawn from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2008). The 1st photo for all participants, a priming photo of either pleasant or unpleasant valance and high or moderate arousal, preceded a neutral photo moderate in valance and arousal. Statistical analysis of the 2 judges’ ratings on the creativity of the neutral captions yielded high interrater reliability. Although the findings did not support the hypothesis, facilitating anxiety significantly positively correlated to creativity (r = .27) and inversely correlated to debilitating anxiety (r = .40). Debilitating anxiety significantly correlated with anxiety as measured by the GAD-7 (r = .53). Findings suggested that facilitating anxiety, not debilitating anxiety, has a significant effect on creative ability as measured by the caption-writing task.
anxiety interferes with or is unrelated to creative performance (Byron & Khazanchi, 2011; De Dreu, Nijstad, & Baas, 2011; King, Walker, & Broyles, 1996). Are the men and women renowned as mad artists merely exceptional intellectuals, or does their creative ability lie dormant in all who suffer at the hands of anxiety, unrevealed to them until, under the right conditions, they find themselves capable of more complex inner thoughts and emotions? To get a little closer to the answer of this question, the present study sought to determine the relationship between creativity and anxiety when a two-factor model for anxiety was applied.

**Debilitating and Facilitating Anxiety**
Anxiety can have both debilitating and facilitating effects (Raffety, Smith, & Ptacek, 1997). Facilitating anxiety serves as a motivating factor, and debilitating anxiety has been associated with worry and distraction (Raffety et al., 1997). In a study examining the effects of an academic stressor on academic performance, participants were asked to maintain diaries recording facilitating and debilitating anxiety in the days before an academic stressor. The researchers found that facilitating anxiety correlated positively with test scores significantly, and debilitating anxiety correlated negatively with test scores (Raffety et al., 1997).

**Creativity, Anxiety, and Arousal**
In a study examining the neurobiological factors of creativity, Carlsson et al. (2000) conducted a Creative Functioning Test (CFT) to test for creativity and measured anxiety using Spielberger state and trait anxiety inventories (STAI). The study revealed a significant correlation between trait anxiety in participants (found using the STAI) and a high score on the CFT, which indicated high creativity. Carlsson et al. (2000) also reported that overall blood flow during a resting period was significantly higher for highly creative participants. These findings reinforced those of Martindale et al. (1996), who found that participants high in creativity were more responsive to stimuli than were participants low in creativity. Martindale et al. (1996) also reported slower habituation of arousal among creative individuals than among those low in creativity.

Anxiety as it relates to creativity was examined in depth by a meta-analysis conducted by Byron and Khazanchi (2011). Byron and Khazanchi compiled 59 studies examining state or trait anxiety as it related to creativity. Results indicated that trait anxiety and creativity were negatively correlated. The significant positive correlations found between creative ability and trait anxiety in two studies (Carlsson et al., 2000; Martindale et al., 1996) and the more frequent reports of negative correlations (Byron & Khazanchi, 2011; King et al., 1996) have suggested that the relationship between these two factors may be moderated by other factors. King et al. (1996) examined the five factor model of personality in relation to creativity and found a lack of relationships among creative ability, creative accomplishment, and neuroticism (a personality factor highly correlated with trait anxiety).

**Creativity and Mental Health**
The relationship between depression and emotional expression and creativity has been found to be moderated by the emotional state of the participant (Forgeard, 2011). Lower levels of depression, measured to detect predisposed mood, were correlated with higher scores on a creative caption-writing and scoring task when induced by a negative emotion.

Depression carries a significant diagnostic overlap with generalized anxiety disorder (GAD; Moffitt et al., 2007). Symptoms of GAD, according to the Diagnostic and Statistical Manual of Mental Disorders, include excessive worry, difficulty in controlling such worry, and disruptions to daily routines as a result of anxiety and worry (5th ed; DSM-V; American Psychiatric Association, 2013). These symptoms are similar to those of debilitating anxiety as discussed by Raffety et al. (1997). For the present study, it was expected that the relationship between debilitating anxiety and creativity would be similar to that between depression and creativity.

In a study spanning 40 years, Kyaga et al. (2013) revealed that authors were more likely to suffer from anxiety disorders and other psychiatric disorders than were those from other professions. Authors were also more likely to suffer from unipolar depression and drug and alcohol abuse (Kyaga et al., 2013). In their meta-analysis, Byron and Khazanchi (2011) noted that future research “should consider the two-component model of anxiety in relation to creative performance as it may reveal possible differential relationships between different components of anxiety and creativity” (p. 279). Byron and Khazanchi believed that the next step in studying anxiety as it related to creativity was examining creativity in the context of the two-factor model.
Hypotheses
For the present study, we first hypothesized that debilitating anxiety would be negatively associated with creative performance on a caption-writing task. Our second hypothesis predicted that facilitating anxiety would be positively associated with creative performance. We proposed a third hypothesis that the induction of a negative state would yield greater creative performance from participants, following a fourth hypothesis that the relationship between facilitating anxiety and creative performance would be moderated by the emotional state of the participant, being stronger when a negative emotional state has been induced in the participant.

Methods
Participants
Participants \((N = 102)\) were recruited from the participant pool of the department of psychology at a mid-sized eastern university. No demographic information on the sample is available. However, demographic information on the university’s subject pool is available. Of the 700 participants who made up the subject pool for the psychology department, age ranged from 17 to 26 years \((M = 18.76, SD = 1.00)\). The subject pool was made up of 58% female students, 41% male students, and 1% of students who declined to answer questions regarding sex. The subject pool was made up of 66% White, 20% Black, 4% Asian, 8% other students, and 2% of students in the subject pool who declined to identify a race. In the subject pool, 72% were first-year students, 20% were sophomores, 7% were upper-class students, and 1% declined to identify their class. In the subject pool, 12% of participants identified themselves as currently employed, and 26% indicated that neither of their parents had completed a college-level education.

Materials
The three measures employed in the present study for anxiety included the 7-item Generalized Anxiety Disorder Scale \((GAD-7)\) borrowed from Spitzer, Kroenke, Williams, and Löwe \((2006)\), and modified scales adopted from Alpert and Haber \((1960)\) that measure facilitating and debilitating anxiety separately.

Debilitating and facilitating anxiety. Two filter questions were included in the modified Alpert and Haber \((1960)\) measure as an attention check. Eight questions corresponded to a facilitating anxiety score, and nine items corresponded to a debilitating anxiety score. All items in the modified anxiety measurement contained a statement followed by a response range of \((a)\) always, \((b)\) most of the time, \((c)\) not often, or \((d)\) never. Test-retest reliability over a 10-week interval was .83 for facilitating anxiety and .87 for debilitating anxiety as reported by Alpert and Haber \((1960)\). When reliability for the facilitating and debilitating anxiety measures was estimated in the current study, facilitating anxiety yielded a Cronbach’s \(\alpha = .70\), and debilitating anxiety yielded a Cronbach’s \(\alpha = .72\).

GAD. The GAD-7 was provided to participants to determine if and how much each participant experienced GAD. Participants responded to a prompt that asked them to identify the frequency that they experience seven symptoms of GAD over a 2-week period. Responses for participants range from \((a)\) not at all sure, \((b)\) several days, \((c)\) over half the days, to \((d)\) nearly every day. Responses were tallied, ranging from 0 to 3, and added up to create a score out of 21. Using this method, a higher score means that the participant suffers more from GAD, whereas a lower score implies that they suffer less. Reliability of the GAD-7 was found in the analysis of the measure performed by Spitzer et al. \((2006)\) who reported a Cronbach’s \(\alpha = .92\). The present study reported reliability of the GAD-7 through a Cronbach’s \(\alpha = .87\).

Creativity. Ten photographs were selected for their valance (positive vs. negative emotional value) and arousal from the International Affective Picture System \((Lang et al., 2008)\). Valance and arousal measurements for the 10 photos are listed in Table 1. Of the 10 photos, five categories were created, placing two photos in each category.

The five categories included unpleasant moderate arousal \((UM)\) for photos scored unpleasant in valance and moderate in arousal, unpleasant high arousal \((UH)\) for photos scored unpleasant in valance and high in arousal, pleasant moderate arousal \((PM)\) for photos scored pleasant in valance and moderate in arousal, pleasant high arousal \((PH)\) for photos scored pleasant in valance and high in arousal, and neutral for photos scored moderately for valance and arousal. The neutral photo captions written by participants were then used as a measure of creative performance through the scores assigned to them by two judges.

Participants also completed a Self-Assessment Mannequin \((SAM; Lang, 1980)\) after completion of the priming and neutral photo captions to measure valance and arousal levels in participants.
Responses to the SAM valence and arousal manikins have been validated by showing them highly correlated with response to valence and arousal semantic differential items (Bradley & Lang, 1994).

Design and Procedure
The present study employed a between-subjects design to prevent the influence of a carry-over effect during the creative generation task. The GAD-7 and modified Alpert and Haber (1960) measure were counterbalanced to rule out the effects of survey fatigue. Institutional review board approval (Protocol #UMCIRB 13-002029) was secured. Participants provided consent the day of testing before being provided the testing materials. After completing the two anxiety measures, participants were presented with one of the emotion-inducing photographs (UM, PM, UH, PH) and asked to write a caption related to the photograph. Within each experimental group (UM, PM, UH, PH), half of the participants received one photograph, and the other half received the other photograph. This ensured that the results found were not due to unique characteristics of a particular photo, but rather due to the valance and arousal levels of the photos.

After writing the caption for the first photograph, participants were asked to complete the SAM for valence and arousal. Following the SAM, each participant was presented with one of the two neutral category photographs and asked to write a caption related to that photograph. Following the neutral caption-writing task, participants were asked to complete another SAM set.

For the photo set, participants were instructed to generate a caption for both photos that provided insight into the photo (see Appendix A). Participants were also told that they could be as creative as they wanted when writing answers and that no response could be wrong for this task. Participants were instructed to not revise their work once they had completed a caption and moved on to the next photo.

The intent of having participants first compose a caption for the priming photo was to induce the valance and arousal variable in the participant. The priming photos’ effectiveness was then checked by the SAM, after which it was expected that the manipulation would affect the caption task on the neutral photo. Priming photo captions were not scored because they were completed before any manipulation could be introduced.

After participants completed the creative generation task, two judges scored the neutral photo from each participant (see Appendix B). These scores were used as a measure of creative ability. Responses were indicated on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). For each statement, they answered seven questions including (a) “The caption is relevant to the photo”; (b) “The caption includes creative use of elements found in the photo”; (c) “The caption creates a story for what was happening in the photo”; (d) “In addition to creating a story for the photo, the story created was different from what one would expect for this photo”; (e) “The caption contains elements of self-expression”; (f) “The caption is of a good quality”; and (g) “The caption appears to be inspired by emotions or experiences.” The reliability of the creativity measure was estimated with the intraclass correlation coefficient, the value of which was .92.

Statistical Analysis
Linear correlation/regression analyses were employed to determine the nature of the relationship between creative performance and scores on the three anxiety scales. The G’Power program was employed to conduct power analyses. With $\alpha = .05$, the sample size of 102 provided 88% power for detecting a medium-sized correlation ($\rho = .30$).

An Analysis of Variance (ANOVA) was employed to determine if the four experimental groups differed on creative performance. With $\alpha = .05$, the sample size provided 53% power to detect a medium-sized effect ($f = .25$).

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<th>TABLE 1</th>
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<td>Photo Valance and Arousal Measurements</td>
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*Note. UM = unpleasant moderate arousal; PM = pleasant moderate arousal; UH = unpleasant high arousal; PH = pleasant high arousal; neutral = moderate pleasantness moderate arousal.

Valence and arousal measurements were drawn from research from Lang et al. (2008) on the International Affective Picture System.
To test the moderation hypothesis, within-group slopes for the relationship between creative performance and anxiety were compared using the methods described by Weaver and Wuensch (2013). This test involved computing the standardized slope (r) for predicting creative performance from level of facilitating anxiety within groups (one primed with a pleasant photo and the other primed with an unpleasant photo) and then employing Fisher’s z to test the null that rho was the same in both populations.

Results
A statistical analysis focused on judge interrater reliability, the relationship between creative performance and scores on the anxiety scales, and assessed whether the priming photos had an effect and the nature of that effect for both valance and arousal. An assessment of the relationship discovered by Forgeard (2011) between low levels of depression and higher scores on a creative generation task under the influence of an induced negative emotion and the present study was made to determine if anxiety fit into the model suggested by Forgeard (2011).

Captions (N = 102) were submitted to the judges to be scored. Each caption received two scores: one from the first judge, the other from the second judge. Interrater reliability, estimated using a two-way mixed, consistency, average-measures intraclass correlation coefficient (McGraw & Wong, 1996), was excellent, ICC = .92 (Cicchetti, 1994). A measure of creative ability was created through the averaging of both judges’ scores on captions.

The first two hypotheses were supported: Facilitating anxiety was significantly positively correlated with creative performance (r = .28, p = .005) and significantly negatively correlated with debilitating anxiety (r = -.40, p < .001). Debilitating anxiety was significantly positively correlated with anxiety as measured by the GAD-7 (r = .53, p < .001).

As a manipulation check, the effectiveness of the priming photos inducing their intended effects on participants was assessed through responses on the SAM for valance and arousal. The SAM response range for both conditions was between -4 and 4. Mean valance levels on the first application of the SAM were significantly higher when participants had been primed by a pleasant photo (n = 51, M = 1.31, SD = 1.66) as opposed to when they had been primed with an unpleasant photo (n = 50, M = 0.10, SD = 1.84), t(99) = 3.48, p = .001. The two pictures used in the unpleasant condition did not differ significantly from each other (M1 = 0.08, M2 = 0.12, SD1 = 1.85, SD2 = 1.88), t(48) = 0.08, p = .94. Likewise, the two pictures used in the pleasant condition did not differ significantly from each other (M1 = 1.04, M2 = 1.54, SD1 = 1.99, SD2 = 1.32), t(49) = 1.06, p = .30. No significant difference was detected in SAM arousal ratings between moderate (n = 45, M = -0.98, SD = 1.96) and high arousal priming conditions (n = 47, M = -0.57, SD = 2.21), t(90) = 0.92, p = .36. The two pictures used in the moderate arousal condition did not differ significantly from each other (M1 = -0.05, M2 = -0.72, SD1 = 2.06, SD2 = 2.44), t(43) = 0.98, p = .33. Likewise, the two pictures used in the high arousal condition did not differ significantly from each other (M1 = -0.43, M2 = -0.38, SD1 = 2.21, SD2 = 2.14), t(45) = 0.09, p = .92.

The second application of the SAM followed participants’ generation of the neutral caption. To determine if the priming effect persisted beyond generation of the neutral caption, SAM scores were compared between groups. Participants scored significantly higher on the valance scale of the SAM when they had experienced the pleasant priming condition (n = 47, M = 1.23, SD = 1.40) than when they had undergone the unpleasant priming condition (n = 50, M = 0.52, SD = 1.71), t(95) = 2.25, p = .027. Participants’ SAM ratings of arousal in the second application did not differ significantly between those primed with a moderate arousal photo (n = 45, M = -0.42, SD = 2.28) and those primed with a high arousal photo (n = 47, M = -0.40, SD = 2.15), t(90) = 0.04, p = .97.

The effects of priming on creative performance were tested with a 2 (high vs. low valance) x 2 (high vs. moderate arousal) ANOVA. The main effect of valence and the interaction fell well short of statistical significance (p = .29). Accordingly, the third hypothesis was not supported. Interestingly, despite an absence of effect of the arousal condition on participants’ SAM arousal ratings, creative performance was significantly higher in the high arousal condition (n = 54, M = 26.42, SD = 8.81) than in the moderate condition (n = 48, M = 22.32, SD = 9.14), F(1, 98) = 5.36, p = .023, ηp2 = .052.

A comparison of the relationship between facilitating anxiety and creativity between participants who were primed with a pleasant photo (r = .27) versus an unpleasant photo (r = .31) was conducted to determine if the unpleasant condition would yield similar results to what Forgeard (2011) found in the negative emotional induction condition. We anticipated that the
strength of the association between facilitating anxiety and creative performance would be greater when participants were primed with an unpleasant photo. No significant difference in strength of association was found between pleasantness conditions ($z = 0.24, p = .81$). Accordingly, Hypothesis 4 was not supported. An exploratory analysis indicated that arousal priming did not significantly moderate the relationship between creative ability and facilitating anxiety ($z = -0.27, p = .78$). When debilitating anxiety or GAD-7 anxiety were substituted for facilitating anxiety, the differences in strength of association remained insignificant.

**Discussion**

The hypothesis that debilitating anxiety would have a negative effect on creative ability, and that this effect would be moderated by the emotional state of the participant, was not supported. A significant relationship between facilitating anxiety and creativity was observed, but the strength of this association was not significantly affected by differences in photo priming valances, revealing that emotional state did not act as a moderator in the observed relationship.

**Creative Ability, Two-Factor Model of Anxiety, and Happiness**

Although the hypothesis that debilitating anxiety would be negatively correlated with creative ability was not supported, one type of anxiety was found to have a significant relationship with creative ability. Facilitating anxiety was positively correlated with creative performance. Although unexpected, this finding was consistent with the two-factor model of anxiety.

The assessment of the SAM valance category and photo priming types revealed a significant relationship with photo valance categories. Participants who were primed using a pleasant photo were more likely to score higher on the SAM valance category than their unpleasantly primed counterparts. Although this finding could support the effectiveness of the International Affective Picture System (Lang et al., 2008), future research should examine if this relationship was the result of differences in the valance of the captions generated by participants.

Valence of the priming photo had no significant effect on creative performance. This finding revealed that the happiness state of the participant does not act as a moderator in the observed relationship between facilitating anxiety and creativity.

**Creative Ability and Arousal**

Although the condition of arousal was included to control for the possibility of an uncontrolled variable obscuring results, a significant finding resulted from its inclusion in the study. High arousal priming was significantly associated with greater creative performance.

Both applications of the SAM failed to reveal a difference in arousal between high and moderate photo priming conditions. This led to the conclusion that (a) the effect of the arousal priming was not salient to participants, (b) the creative ability measure was more sensitive to arousal ratings than to the SAM, or (c) the manipulation of arousal was confounded with some unknown factor that enhanced creative performance. Research in this area should look to using physiological measures of arousal and creativity as measured by performance on a standardized test such as the Remote-Associations Test in order to maintain a tighter control of variables not possible with the caption task and SAM (Mednick, 1968).

**The Two-Factor Model of Anxiety**

Although the expected inverse relationship between creative ability and debilitating anxiety was not found, facilitating anxiety and debilitating anxiety were negatively correlated. This finding fit well into the two-factor model of anxiety and strengthened the assumption that these two factors are not independent of each other.

The positive correlation between high scores on the debilitating anxiety scale and high scores on the GAD-7 supported the two-factor model for anxiety. This indicates that the type of anxiety measured by the GAD-7 can be characterized as debilitating, which is not surprising given that the GAD-7 was designed to help diagnose GAD, an anxiety disorder characterized by anxiety strong enough to disrupt day-to-day functioning in an individual, and the two-factor model of anxiety exists. Future studies into the two-factor model for anxiety should examine the nature of this relationship.

**Limitations**

Upon arrival at the testing room, participants were promised that their participation would remain completely anonymous. In addition to ensuring that their identity remained anonymous, we promised that no identifying or personal information would be obtained. Unfortunately, a statistical analysis of how different demographics such as age, sex, race/ethnicity, and grade point average could
have played into the results cannot be reported. 

We lacked access to physiological measures of anxiety and arousal such as the measures detailed from Carlsson et al. (2000). Access to physiological measures in place of the SAM could have strengthened the present study. The use of a self-assessment was the only choice we had to measure participant arousal immediately after both priming and neutral captions were written.

Conclusion
The present research has shown that facilitating anxiety, not debilitating anxiety, has a significant effect on creative ability, and that this effect is not moderated by an emotional state (pleasurable affect) in the participant. Although the anticipated outcomes were not observed, the study did succeed in establishing a relationship between the two-factor model of anxiety and creativity. This research developed a test of creativity and a procedure that could successfully prime a participant as indicated in the valence condition of both applications of the SAM. Results of the present study revealed a significant relationship between facilitating anxiety and creativity previously unobserved, and gave insight into the often underappreciated psychology of creativity. The relationship between facilitating anxiety and creativity should be tested using standardized tests for creativity in order to control for the variables that the current study failed to do.

The effect of facilitating anxiety on academic success found by Alpert and Haber (1960) and the effect on creative performance discovered in the present research revealed that its effect could be strong in other aspects of an individual’s life as well. Future research should investigate what other types of behavior may be affected by facilitating anxiety.

The present study succeeded in its purpose to shed more light on the complicated relationship between emotional states and creative ability. The study also revealed that high scores on debilitating anxiety correlate positively with scores on a measure for GAD. Although no single study could reveal the secrets of creativity entirely, this study did reveal a piece of the delicate relationship that creativity holds with anxiety. It is in the interest of future researchers considering a two-factor approach to anxiety to observe the findings reported in the present study.

It should be the goal of future research in the two-factor model to investigate the inverse correlation between facilitating and debilitating anxiety, whether it is possible through different forms of therapy to increase an individual’s facilitating anxiety, and whether their debilitating anxiety decreases as a result. This research could benefit individuals who suffer from high amounts of debilitating anxiety. Research could also investigate whether changing individuals’ placement on the two-factor model of anxiety would alter the amount of anxiety they experience as measured by the GAD-7. The clinical applications of such research could help therapists develop new methods of treatment for GAD.

References

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APPENDIX A

Instructions for Participants

For this stage of the experiment, you will be provided with two photographs. For each, please generate a caption for the photo. Your caption should provide insight into what you believe is happening in the photo, while providing a narrative-like backdrop for the photo. There are no wrong answers, so feel free to be as creative as you wish when interpreting the photo and its message.

There is no minimum length requirement. However, please limit your responses to only the space provided. When you have finished composing a caption for a photo, please set it aside and move on to the next one. Please do not revise your earlier work once you have already begun work on the second photo. Please try to utilize correct spelling and grammar in your captions (your work will not be judged for its grammatical or spelling errors). If this is not possible, please do not let it prevent you from writing, but write as clearly as possible.

APPENDIX B

Judging Instructions

For each statement, indicate your degree of approval using a scale where 1 = strongly disagree, 2 = disagree, 3 = mildly disagree, 4 = neither agree nor disagree, 5 = mildly agree, 6 = agree, and 7 = strongly agree.

1. The caption is relevant to the photo. (If not, judges may delete this case.)
2. The caption includes creative use of elements found in the photo.
3. The caption creates a story for what was happening in the photo.
4. In addition to creating a story for the photo, the story created was different from what one would expect for this photo.
5. The caption contains elements of self-expression.
6. The caption is of good quality.
7. The caption appears to be inspired by emotions or experiences.