UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECTS OF INTEGRAL AND INCIDENTAL ANGER AND ANXIETY ON CREATIVE PROCESSES

A THESIS

SUBMITTED TO THE GRADUATE FACULTY

In partial fulfillment of the requirements for the

Degree of

MASTER OF SCIENCE

By

KEITH STRASBAUGH

Norman, Oklahoma

2019

THE EFFECTS OF INTEGRAL AND INCIDENTAL ANGER AND ANXIETY ON CREATIVE PROCESSES

A THESIS APPROVED FOR THE

DEPARTMENT OF PSYCHOLOGY

BY

Dr. Shane Connelly, Chair

Dr. Jennifer Barnes

Dr. Michael Mumford

Acknowledgements

This endeavor would not have been possible without the guidance in life and academics that I have received from my graduate advisor, Shane Connelly. Additionally, the wisdom of Jennifer Barnes and Michael Mumford supported my efforts to pursue my goals exponentially. I am also grateful for the encouragement, love, and friendship provided by my family: Elizabeth Monzingo, Hayley Campbell, Linzee Manor, Lynze Jones, Nosi Khumalo, Shawntal Brown, Jessica Johnston-Fisher, Ashley Jorgensen, Marina Mery, Madhuri Ramasubramanian, Michelle Todd, and countless others—it is because of you all that I am able to hold this degree. And to my Patronus, who chased away the dementors and lit the path to achieving my dreams, G. Shane Brown, Jr.…

You showed me the beauty in the full spectrum of human love and emotion. It was with your dedication to my education and aspirations that I was able to maintain this exploration into emotions and creativity. And just as you believe in me, I believe in you.

Always.

Table of Contents

Abstract

Contemporary studies show mixed effects of negative emotions, such as anger, on creative performance. However, prior research has focused on creativity in general or idea generation, rather than considering the broader range of creative processes. Few discrete emotions beyond anger have been explored with respect to creativity, and emotions are commonly incidental rather than integral to the creative task. This study focuses on the effects of two different negative emotions, anger and anxiety, when they are either integral or incidental to a creative work task. Additionally, this research examines the effects of engaging in different types of creative processes on subsequent emotional states, an issue that has not been previously explored. Utilizing two separate studies, this research investigated the effects of integral and incidental anger and anxiety on dimensions of two creative processes, idea generation and idea evaluation. Results indicate that integral relative to incidental emotion result in greater flexibility, or conceptual shifts of categories in ideas generated, and emotion (state anger or state anxiety) and the type of emotion induced (integral or incidental) interacted such that integral anger resulted in the most flexibility and incidental anger resulted in the least. Furthermore, emotion and type of emotion induced interacted to influence fluency, or the number of ideas generated, such that integral anger resulted in the largest number of idea generated, whereas integral anxiety resulted in the least. Finally, incidental anxiety performed better than integral anxiety and overall incidental emotion performed better than overall integral emotion on flexibility of idea evaluation. Implications and future directions are discussed.

Keywords: *Incidental emotions, integral emotions, idea generation, idea evaluation, creativity, anger, anxiety*

The Effects of Integral and Incidental Anger and Anxiety on Creative Processes

The literature on anger and anxiety communicates a deleterious relationship with a number of workplace outcomes. Anger can result in less desire to work with others (Allred, Mallozzi, Matsui, & Raia, 1997), low perceived organizational support, and higher absences, turnover intentions, and accidents on the job (O'Neill, Vandenberg, DeJoy, & Wilson, 2009). Similarly, anxiety poses challenges against performance (McCarthy, Trougakos, & Cheng, 2016), workplace perceptions (Muschalla, 2017), and group cohesion (Thomas & Hynes, 2007). Yet, contemporary literature has encouraged examining these emotions through a contextual lens and inspires a shift away from commonly held beliefs that anger and anxiety are harmful.

Indeed, the creativity literature suggests a complex picture framed by the theory that negative emotions may have differential effects for creative performance (Baas, De Dreu, & Nijstad, 2011a; George & Zhou, 2002). Much of the research on creativity and negative emotions is complicated at best, requiring more study of whether negative state emotions, such as anger and anxiety, lead to harmful or advantageous outcomes for creativity (Amabile, Barsade, Mueller, & Staw, 2005; Baas, De Dreu, & Nijstad, 2008; Vosburg, 1998). While some research proposes anger follows a general trend of producing creativity that peaks initially and then sharply decreases over time, with a relatively unstable pattern (Baas, De Dreu, Nijstad, 2011b), others more explicitly state that anger may be beneficial to creative performance (Yang & Hung, 2015) or has either little to no impact on creativity (Fernández-Abascal & Díaz, 2013). Anxiety also faces a similar lack of consensus: it can share a weak negative relationship (Byron & Khazanchi, 2011) or be associated with greater creative performance (Carlsson, 2002). A potential explanation for these varying results is that negative emotions exert differential effects on different aspects of the creative process. However, this has not been explicitly tested.

Additionally, this domain of the emotions literature traditionally looks at incidental rather than integral emotions and narrows its focus on creative processes that may be impacted by their induction. Emotions explicitly linked with a creative task may have different influences on creativity than those unrelated to a task. As a result, there is a need to determine how incidental or integral negative emotions, such as anger and anxiety, impact different types of creative processes.

This paper aims to further examine these discrepancies in the literature through two separate studies that explore the impacts of integral and incidental anger and anxiety on idea generation and idea evaluation tasks, respectively. This endeavor contributes to theory in several ways. This paper explores the relationship of integral and incidental emotions to creative task performance and highlights the critical difference between these types of emotions (i.e., integral emotions may show stronger effects on performance than incidental emotions). Furthermore, this research develops the creativity and emotions literatures by utilizing cognitive appraisal theory to explain the impacts of these negative emotions on creative processes. This paper also provides practical implications by allowing a better understanding of how these emotions influence employees in the workplace, and whether individuals experiencing anger or anxiety may obtain diminished or enhanced performance capabilities.

Creativity and Emotions in the Workplace

Creative outcomes and processes have been of interest for decades. Mumford and Gustafson (1988) define creativity as quality, original, elegant solutions to complex, novel, ill-defined problems. Similarly, Amabile (1988) defines creativity as the production of an original and useful task solution. Both definitions share a number of similarities (i.e., creativity is the production of a useful and original solution to an unfamiliar and complex problem) and

communicate a beneficial contribution for firms and organizations in an evolving market. Two of the eight creative processes outlined by Mumford, Mobley, Uhlman, Reiter-Palmon, and Doares (1991), idea generation and idea evaluation, are particularly helpful in achieving competitive advantages in dynamic environments, as being able to generate novel ideas and evaluate their value and feasibility is essential to creating and marketing new products (McAdam, 2004; Schulze & Hoegl, 2008). At their core, these creative processes involve different aspects of cognitive functions. In terms of creative problem solving, idea generation is focused on producing potential solutions to a task through the use of additional creative processes. Information encoding works with combining and reorganizing categories of gathered information to essentially mold the way in which one understands and solves a problem or task (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Whereas idea evaluation takes this process a step further. Idea evaluation has been described as assisting in generating "real-world creativity", as it identifies potential constraints to potential solutions and examines the feasibility of employing their usage (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991). Thus, given the different components that go into idea generation (i.e., two creative processes function in tandem to produce ideas) and idea evaluation (assessing the feasibility and appropriateness of these ideas or solutions), differential effects on performance may occur. Specifically, additional cognitive factors (i.e., emotions) may affect these cognitive processes and, given the contrasting aims of idea generation and idea evaluation, outcomes may vary.

Indeed, the literature demonstrates that emotions produce fluctuating results on idea generation and idea evaluation processes, with the literature expressing disparities with regard to whether positive or negative emotions cause positive or negative effects on creative performance. However, Baas, De Dreu, and Nijstad (2008) propose that it is not so much the

valence of the emotion that impacts creative task performance (i.e., positive, negative, or neutral) but rather the level of cognitive arousal (i.e., activating or deactivating) associated with the emotion that determines the manifestation of creative performance. Their meta-analysis demonstrated that both anger and happiness, despite their opposing negative and positive valences, were both associated with improvements in creative performance because they are cognitively activating. Whereas deactivating moods (e.g., relaxed, sadness) resulted in lower creative performance. Accordingly, negative emotions do not always produce negative effects on creative performance. Consistent with cognitive appraisal theories and emotion, dimensions beyond valence could be important and in need of further consideration.

Anger and Anxiety Appraisals and Idea Generation

Anger and anxiety differ from each other on a number of appraisal dimensions, despite the fact that both emotions are associated with activating patterns of arousal and negative valence (Baas, De Dreu, & Nijstad, 2008; Baas, De Dreu, & Nijstad, 2011a). Smith and Ellsworth (1985) and other appraisal theorists suggest that emotions differ based on their appraisal patterns, and that this accounts for why we experience different emotions with certain situations. Cognitive appraisal theory suggests that emotion processing begins by determining if the situation one encounters is pleasant, unpleasant, or neutral, and then by perceiving other aspects of the situation which influence the experience of specific emotional states (Roseman, Spindle, & Jose 1990; Smith & Ellworth, 1985). That is, the emotions and subsequent response depend on the situation and the person's perceptions of the situation. For instance, anger has been shown to impact decision-making abilities and risk (Angie, Connelly, Waples, & Kligyte, 2011; Lerner & Keltner, 2001) and can be explained by associated cognitive appraisal patterns. Anger is typically characterized by perceived goal blockage, believing others are accountable, perceptions

of unfairness, and feelings of high control over the situation (Kuppens, Mechelen, Smits, De Boeck, 2003). Thus, we know based on these appraisals that experiencing anger may increase risk seeking behaviors because anger is associated with perception of control over the situation. Anger can be beneficial for overcoming obstacles that stand between an individual and their goals, however, social norms dictate when and how anger is appropriate to use in these situations (Lemerise & Dodge, 2008, p. 730-731).

Perceptions of a lack of control over the situation are more threatening, especially without a clear stimulus to explain the feelings, as is often the case with anxiety (Öhman, 2008, p. 710). State anxiety is characterized by feelings of low control over the situation, low certainty in regard to what may occur in the future (Frijda, Kuipers, & ter Schure, 1989), and a perceived threat to self (Butler & Mathews, 1987). These appraisals explain why anxiety can be debilitating for a variety of tasks and other cognitive processes, including working memory (Moran, 2016), as anxiety can act as a distractor which may lead to less exploratory behavior. These detriments may also be explained by the fight-flight-freeze response that is associated with anxiety as well. Gray and McNaughton (2000) propose that anxiety manifests because one cannot avoid confrontation of a threatening stimulus that has produced goal conflict. This results in activation of fight-flight-freeze, a defensive system designed to guide how one will cope with the threatening stimulus, that can either lead to negative associations with performance (Perkins, Kemp, & Corr, 2007) or a certain spark of perseverance that favors performance when the anxiety is paired with high levels of approach motivation and low levels of avoidance (Hutchinson, Burch, & Boxall, 2013). Thus, the type of situation may impact the anxiety response (i.e., fight-flight-freeze) and subsequent behavior.

The opposing nature of appraisal patterns (e.g., perceptions of high control in anger versus low control in anxiety) may explain why anger and anxiety appear to have different effects on creative processes despite the fact that both are activating emotions. Anger as an activating state may benefit idea generation tasks due to perceptions of high situational control and high certainty which could motivated individuals to overcome obstacles, and to feel comfortable exploring boundaries in their creative solutions. In contrast, anxiety, despite being an activating state, may produce poorer performance on idea generation tasks. Perceptions of low control, uncertainty, and threat to self may inhibit anxious participants from feeling comfortable enough to explore creative boundaries.

H1: State anger will result in better performance on idea generation relative to neutral emotion.

H2A: State anxiety will result in poorer performance on idea generation relative to neutral emotion.

H2B: State anxiety will result in poorer performance on idea generation relative to state anger.

Anger and Anxiety Appraisals and Idea Evaluation

The certainty associated with anger not only affords confidence in exploring creative boundaries, it may also narrow thinking in ways that will facilitate idea evaluation. When certainty is paired with the activating aspect of anger and goal blockage, tasks involving idea evaluation, which requires idea evaluation, could benefit due to the target thinking about options one is certain about and decreased motivation to explore alternatives. Anger may also fuel more criticism of poor ideas. Anxiety may also assist in evaluating the quality of solutions because anxious individuals are more likely to ruminate about and anticipate future outcomes in order to

offset feelings of threat and uncertainty. This may lead individuals to consider more pros and cons of ideas and solutions, resulting in detailed and thorough idea evaluating, especially given the high activation that accompanies anxiety. This could make it more beneficial for the idea evaluation than neutral emotion.

H3A: State anger will result in better performance on idea evaluation relative to neutral emotion.

H3B: State anxiety will result in better idea evaluation than neutral emotion.

Beyond the discrete emotion induced (i.e., anger or anxiety), another facet that may play a role in the extent to which emotions influence creative processes is whether the emotion experienced is incidental or integral to the task or situation.

Incidental versus Integral Emotions

Han, Lerner, & Keltner (2007) define incidental emotions as emotions unrelated to the task or performance of interest. Alternatively, integral emotions are closely related to the task or performance of interest. We also know from emerging literature that integral emotions may have a stronger influence on performance than incidental emotions (Hillebrandt & Barclay, 2017; Summers & Duxbury, 2012). Anxiety related to a task has been shown to lead to more impaired decisions involving risk perception than anxiety unrelated to the task (Yang, Saini, & Freling, 2015), with anger that is integral to negotiations (i.e., interacting with a confederate trained to induce anger with social cues) leading to greater deficiencies in performance than anger incidental (i.e., watching a video to induce anger) to the same task (Shao, Wang, Cheng, & Doucet 2015). Yet, no studies to date have examined how integral relative to incidental state anger and state anxiety impact creative performance, as it may potentially be observed that these negative emotions (i.e., anger and anxiety) may not always lead to detriments in performance.

Keeping the previous hypotheses in mind, it is proposed that there will be stronger effects for integral rather than incidental emotions on idea generation and idea evaluation tasks, respectively. It is expected that integral anger leads to better performance on idea generation tasks than incidental anger, and better evaluations of generated ideas in idea evaluation tasks.

H4A: Integral anger will lead to better performance on idea generation tasks than incidental anger.

H4B: Integral anger will lead to better idea evaluation than incidental anger.

H5A: Integral anxiety will lead to poorer performance on idea generation than incidental anxiety.

H5B: Integral anxiety will lead to better idea evaluation than incidental anxiety.

RQ1: How will the effects integral anger on idea generation compare with the effect of integral anxiety?

RQ2: How will the effects of integral anger on idea evaluation compare with the effects of integral anxiety?

Creative Processes and Emotion Regulation

Perhaps even less explored is the impact of performing creative tasks in the workplace on state anger and state anxiety. That is, does the act of engaging in idea generation or idea evaluation change the level of felt emotions, either decreasing or increasing it? Gross (2015) proposes that emotion regulation strategies help one in coping with their emotions. Gross (1998) proposes a model that looks at several methods for engaging in emotion regulation. One emotion regulation strategy in particular is attentional deployment or taking control of one's attention with the primary aim to alter their emotional state. For instance, one may engage in a common form of attentional deployment known as "distraction" to alleviate negative emotions that have

been induced by a situation. Distraction acts to redirect attention away from the emotional aspects of a stimulus or situation. Gross (1998) proposes that this is beneficial particularly for negative emotions, as this form of regulation can diminish the strength of emotional responses. Distraction can manifest in many forms, particularly in using a task to pull oneself away from the experienced emotion. In relation to the present study, such distraction could be performing idea generation or idea evaluation tasks.

Indeed, much of the research examining the effects of idea generation tasks supports the notion that engagement does impact emotional states. Chermanhini and Hommel (2012) suggest that idea generation leads to more positive mood states. Further exploration by Bujacz, Dunne, Fink, Gatej, Karlsson, Ruberti, and Wronska (2015) also suggests that idea generation tasks potentially lead to more positive emotional states because idea generation tasks tend to be less constrained. Thus, it is proposed that idea generation tasks will induce positive affect and reduce these discrete emotions.

H6: Engaging in an idea generation task will decrease the extent to which one feels state anger or state anxiety.

However, exploration into idea evaluation tasks still needs further study. On one hand, idea evaluation could be harmful to regulating anxiety because participants may struggle to narrow down the logic of why certain ideas are better than others. However, this type of task could also decrease anxiety because perhaps being able to consider all alternatives may potentially mitigate a perceived lack of control, which is associated with state anxiety. For anger, a similar trend may occur, where either an individual ends the task with less state anger because working towards and successfully overcoming an obstacle (i.e., identifying and defending the logic of why certain generated ideas are better than others) may act as a regulating mechanism or

one may experience more anger if they are unable to effectively choose between their options. Thus, the question remains of how a idea evaluation task may impact state anger and anxiety.

RQ3: How will engaging in an idea evaluation task affect levels of state anger and state anxiety?

The Present Studies

While previous studies have established a harmful connection between anger and anxiety with the workplace, emerging literature on creative performance is beginning to show that this may not always be the case. Regardless, there remains conflict surrounding if these emotions can produce deleterious or facilitative effects on creativity. Additionally, much of this research examines anger and anxiety incidentally rather than integrally and focuses more generally on creative ability than creative processes such as idea generation and idea evaluation. Contemporary literature examining state anger and state anxiety also proposes several avenues for the current research. As such, idea generation and idea evaluation were investigated in two separate studies to establish how these creative processes function conjointly with emotion. The purpose of these two studies, which examined idea generation and idea evaluation, respectively, was to determine how state anger and state anxiety incidentally and integrally impact creativity in the workplace in order to ascertain how these emotions may affect employee performance.

Study 1: Idea Generation

Method

Participants.

This study utilized a between-subjects 2x2 factorial design with a control group. A total of 131 undergraduate psychology majors were recruited from the University of Oklahoma and received introductory course credit for their participation. After evaluating the data for

participants who either correctly guessed the purpose of the study or completed the emotion measurement incorrectly (i.e., these participants did not indicate their levels of state anger or state anxiety on the emotion measurement questionnaire after the emotion manipulation) or were under the age of eighteen, the final sample was 117.

Procedure.

Participants were given packets and informed that they will be completing a study examining the effects of individual traits and situational factors on problem-solving abilities. They first completed the Positive And Negative Affect Schedule or PANAS (Watson, Clark, & Tellegen, 1988). Then, they worked through a battery of covariates and, upon completion, were induced with either incidental or integral anxiety, incidental or integral anger, or with no emotion. After emotion induction, participants completed PANAS again. The participants then engaged in three idea generation measures: Alternate Uses (Christensen, Guilford, Merrifield, & Wilson, 1960), Consequences (Christensen, Merrifield, & Guilford, 1958), and an adjusted version of Plot Titles (Berger & Guilford, 1969). For the Alternate Uses task, participants were asked to generate as many alternate uses for a common item, such as a shoe, as possible. For Consequences, participants were asked to provide as many responses as possible to scenarios, such as what would happen if half of Earth's gravity vanished. And finally, participants were asked to generate as many titles as possible for the plot of a story, that was created by the author to reflect more modern-day plots. Three idea generation tests were administered in counterbalanced fashion so the results would not be limited to one specific type of task. Afterwards, participants completed PANAS once more, a secondary battery of covariates, the demographics, and were then debriefed.

Manipulations.

The type of emotion (i.e., state anger versus state anxiety) and the nature of the emotion (i.e., incidental versus integral) were manipulated in this study. After manipulation, PANAS was utilized to assess to what degree on a Likert-scale of 1 to 5 that the participants felt a particular emotion (e.g., anger, anxiety) prior to giving the participants the idea generation tasks.

For the contextual performance of the incidental anxiety and anger conditions, respectively, participants were asked to write about a time in which they experienced either anger or anxiety, which has support for inducing targeted incidental emotions (Dunn & Schweitzer, 2005; Strack, Schwartz, & Gschneidinger, 1985). For the contextual performance of the integral emotion conditions, a similar method to Shao, Wang, Cheng, and Doucet (2015) was used, in which the participants interacted with a confederate during task performance in order to induce integral emotion. For the integral anxiety condition, participants were informed by the experimenter that they must successfully defend their subsequent responses to a panel of judges consisting of two graduate students and a professor in order to receive full credit for participation. As for the integral anger condition, participants were given a challenging hour-long spatial reasoning task and ten minutes into the task, were informed with no sympathy by the experimenter they had completed the wrong packet and would need to stay later than anticipated in order to receive full credit for participation. The packets were then collected by the experimenter and destroyed in front of the participants before they proceeded to the idea generation tasks.

Dependent Variables.

While all participants were given three idea generation tasks, the order of administration of these was counterbalanced across conditions. Because the emotion manipulation was likely to

exert the most influence on the idea generation task completed immediately after the emotion induction, only the first idea generation task was used in the dependent measure. The dependent variables measured included quality, originality, elegance, flexibility, and fluency. Quality represents the completeness and logicality of the proposed ideas; originality represents the novelty; elegance represents the coherence of the ideas; flexibility is the extent to which the ideas can be applied to a wide domain of conceptual categories; and fluency is the number of ideas generated (Besemer & O'Quin, 1999; Runco & Acar, 2012; Scott, Lonergan, & Mumford, 2005). In order to assess these variables, three research assistants were trained to identify behavioral anchors for quality, originality, elegance, and flexibility. (Because fluency was counting the number of ideas, they were separately trained on how to identify differences in ideas generated.) The behavioral anchors consisted of scales from 1 to 5 (1 = poor, 2 = poor to average, 3 = average, 4 = average to excellent, 5 = excellent) and had raters determine to what extent the responses fall on these scales. For example, a generated response to Alternate Uses for a shoe may be "to kill a bug". To rate this response, three trained raters referred to examples determined by benchmark raters and then rated this response in comparison to others. Inter-rater reliabilities on overall quality (rwg* = .87), originality (rwg* = .91), elegance (rwg* = .75), flexibility (rwg* = .86), and fluency (rwg* = .98) were assessed.

Covariates.

Covariates included: a 30-item Verbal Reasoning EAS measure (Ruch & Ruch, 1980); the Big Five Inventory, consisting of 44-items with a five-point Likert scale asking to what extent participants agree with statements such as, "Is original, comes up with new ideas" (Goldberg, 1981); a free response question for gender; and a 20-item combined trait affect scale (i.e., trait anger and trait anxiety) with a five-point Likert scale asking to what extent participants

agree with statements such as, “I am quick tempered” (Ree, French, MacLeod, & Locke, 2008; Spielberger, Jacobs, Russell, & Crane, 1983). Verbal reasoning in itself is important to measure because since participants read and wrote their responses, verbal ability may potentially dictate the extent in which they are able to do so. The Big Five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) have been shown to impact anger and anxiety in such a way that they influence emotion regulation strategies and task performance (Sorić, Penezić, & Burić, 2013). Trait and state emotions are essential to measure because trait emotions often lead to stronger effect sizes of influence on task performance (Byron and Khananchi, 2011; Deffenbacher, Oetting, Thwaites, Lynch, Baker, Stark, & Eiswerth-Cox, 1996). Previous research on anger and anxiety asserts that there is gender difference in anger and anxiety expressions such that males and females respond different to both emotions on a wide spectrum of activities (Bieg, Goetz, Wolter, & Hall, 2015; Thomas, 1989). Thus, through previous research, these variables have been shown to impact the manifestation of task performance paired with emotions.

Results for Study 1

T-tests for Manipulation Checks.

IBM SPSS version 25 was used to assess participant emotions before and after the induction manipulations (i.e., integral vs. incidental, state anger vs. state anxiety, control or neutral emotion). Although integral anger, integral anxiety, and incidental anger, were successfully induced, this was not the case for incidental anxiety. Dependent samples t-tests showed significant differences of pre-integral anger (M = 1.33, SD = .87) to post-integral anger (M = 2.04, SD = 1.37) induction, t (23) = -2.33, p = .029; pre-integral anxiety (M = 1.78, SD = 1.03) to post-integral anxiety (M = 2.21, SD = 1.40) induction, t (18) = -2.19, p = .042; and pre-

incidental anger (M = 1.21, SD = .52) to post-incidental anger (M = 1.52, SD = .73) induction, t (46) = -2.99, p = .031, in the expected direction. There were no significant differences between pre-incidental anxiety (M = 1.81, SD = 1.14) to post-incidental anxiety (M = 1.70, SD = 1.07) scores, t (26) = .50, p = .621. As anticipated, there were no significant differences between the first measurement of negative affect for the control condition (M = 1.36, SD = .66) and the second measurement of negative affect for the control condition (M = 1.36, SD = .73), t (26) = .00, p = 1.00.

Hypotheses Tests and Interpretation.

Utilizing the methodology proposed by Cho and Abe (2013), directional hypotheses were assessed with a one-tailed test for Study 1. These one-tailed tests included H1, H2A, H2B, H4A, H5A, and H6. With the level of significance set at $p < .05$, the obtained p-value was divided in in half for the analyses. The research question for study 1, RQ1, utilized a two-tailed test under the same methodology, as there were no directional predictions for how this relationship might manifest.

In order to test H1, an independent samples t-test was used to assess differences between anger and neutral emotion on performance of idea generation. There were no significant differences between anger and neutral emotion for quality, originality, elegance, flexibility, or fluency. As a result, there was no support for H1. In order to test H2A, an independent samples t-test was used to assess differences between anxiety and neutral emotion. While there were no significant relationships between anxiety and neutral emotion for quality, originality, elegance, and fluency, there was a significant difference between anxiety and neutral emotion on flexibility, such that neutral emotion (M = 3.31, SD = .58) performs better than anxiety (M = 2.99, SD = .68). As a result, partial support for H2A was found, neutral emotion performs better

than anxiety on flexibility for idea generation (refer to Table 1). In order to test H2B, an independent samples-test was conducted to assess differences between anger and anxiety. There were no significant differences between anger and anxiety for quality, originality, elegance, flexibility, or fluency. As a result, there was no support for H2B. With regard to H4A, an independent samples t-test was conducted to examine differences between integral and incidental anger on idea generation, such that integral anger leads to better performance than incidental anger. While there were no significant differences for quality and elegance, it was found that integral anger (M = 3.24, SD = .42) performs better than incidental anger (M = 3.03, SD = .41) on originality; flexibility (integral anger, M = 3.60, SD = .59) (incidental anger, M = 2.75, SD = .77); and fluency (integral anger, M = 6.68, SD = 2.06) (incidental anger, M = 4.73, SD = 2.21) (refer to Table 2). As a result, there was partial support found for H4A, integral anger performs better than incidental anger on originality, flexibility, and fluency for idea generation. For H5A, an independent samples t-test was conducted for differences between integral and incidental anxiety on idea generation, such that integral anxiety will lead to poorer performance than incidental anxiety. There were no significant differences between integral and incidental anxiety on quality, originality, elegance, flexibility, or fluency. As a result, no support was found for H5A. Additionally, in order to test H6, a dependent samples t-test was used to examine the relationship between post-state emotion induction and post-task performance on the intensity of emotion felt by the participants. The mean scores for post-manipulation state anxiety (M = 1.91, SD = 1.23) and post-task state anxiety (M = 1.70, SD = 1.21) were not significantly different, t (45) = 1.53, p = .133. However, post-manipulation state anger (M = 1.83, SD = 1.15) and post-task state anger (M = 1.40, SD = .84), t (47) = 2.83, p = .007, were significantly different. Thus,

partial support for H6 was found, performing a idea generation task lessened the effects of induced state anger, but not induced state anxiety.

With respect to the research question for idea generation, the question of how integral anger functions in comparison to integral anxiety was asked. As a result, a 2x2 ANCOVA with a control group was used to assess this relationship (refer to Table 3 for means and standard deviations, and Table 4 for correlations amongst dependent variables and covariates). First, the covariates were tested with the independent variables (anger vs. anxiety, integral vs. incidental) on quality, originality, elegance, flexibility, and fluency. Then, all non-significant covariates were removed from the final analyses (refer to Table 5 for ANCOVAs). Main effects for emotion and emotion type were not found quality, originality, and elegance. For flexibility, main effects for emotion and emotion type were not found. However, an interaction effect was found, $F(1, 112) = 18.46$, $p = .001$, indicating that integral anger resulted in the greatest amount of flexibility ($M = 3.60$), followed by neutral emotion ($M = 3.31$), incidental anxiety ($M = 3.13$), integral anxiety ($M = 2.81$), and incidental anger ($M = 2.75$), which resulted in the poorest amount of flexibility (refer to Figure 1). Emotion and emotion type also interact to influence fluency. Integral anger results in the most fluency ($M = 6.68$), followed by incidental anxiety ($M = 5.39$), neutral emotion ($M = 5.09$), incidental anger ($M = 4.73$), and integral anxiety ($M = 4.28$) (refer to Figure 2). Accordingly, integral anger results in better flexibility and fluency than integral anxiety.

Discussion

The results of study 1 produce a number of interesting findings. First, this study showed some differences between incidental and integral anger with respect to idea generation, such that those who experience integral anger appear to produce more original ideas than incidental anger,

with a greater quantity overall (i.e., fluency) and with more categorical shifts between these ideas (i.e., flexibility). Second, the results demonstrated anxiety results in less flexibility than neutral or no emotion. Additionally, this study showed that flexibility and fluency were better in the integral anger condition compared with the integral anxiety condition. It is also interesting to note another finding that was not hypothesized, fluency and flexibility were significantly better for the incidental anxiety condition relative to the incidental anger condition. Finally, performing idea generation tasks may help regulate state anger, but does not regulate state anxiety.

Study 1 is open to some limitations. First, incidental anxiety failed to be induced. Based on the observed means, anxiety seemed to decrease after performing the induction task (i.e., the participant writing about a time in which they felt anxious). This may have had a cathartic release, as previous literature suggests that writing about negative emotions may help regulate and prevent their potentially harmful effects (Baikie & Wilhelm, 2005; Pennebaker, 1997). Next, the sample size for integral anxiety was significantly lower than the other conditions (n = 19). This group appeared to face the most attrition due to difficulties completing PANAS correctly (i.e., filling out the first interval of portion correctly by identifying which emotion they felt on a Likert scale of 1-5, but not the second interval). Study 2 will correct for this by making instructions more explicit. And finally, while it was found that state anger indicates idea generation task performance may regulate participants out of their anger, there is the potential that the length of time required for performing the tasks could have acted as a regulating mechanism as well. Future research could perhaps better examine this relationship by providing participants with a shorter idea generation task and no task to examine whether this result was due to time or task performance.

Despite these limitations, the pattern of findings in study 1 has a number of implications for theorizing about creative processes and negative emotions. First, similar to Baas, De Dreu, and Nijstad (2008), it was found that anger is beneficial to creative performance. Specifically, anger that is integral rather than incidental produces stronger facilitative effects, which supports the findings of Shao, Wang, Cheng, and Doucet (2015)—who proposed that integral anger exerts a more powerful influence than incidental anger on task performance. With regard to anxiety, it was found that relative to neutral or no emotion there are detriments to performance. This also supports the work of Byron and Khazanchi (2011), who proposed anxiety shares a negative relationship with creativity. Anger and anxiety likely produce contrasting effects on idea generation given their appraisal patterns and how these may function in conjunction with this creative process. The idea generation task used in this study required participants to generate ideas on the spot, which may be affected by the appraisal patterns of overcoming an obstacle for anger and dealing with uncertainty for anxiety—both of which may impact motivation. Additionally, anxiety may have been deleterious to performance given the fight-flight-freeze theory proposed by Gray and McNaughton (2000), in which the way anxiety manifests impacts whether performance will be enhanced or hindered. It is possible that given the uncertainty of freely generating ideas, participants may have experienced the harmful component of anxiety (i.e., flight or freeze). Future research could perhaps explore this idea in more depth and determine if there is a way to channel anxiety to lessen its impact on idea generation.

Study 2: Idea Evaluation

Method

Participants.

The second study also utilized a between-subjects 2x2 factorial design with a control group. A second sample of 142 undergraduate psychology majors from the University of Oklahoma were recruited for this study and received introductory course credit for their participation. After evaluating the data for participants who either correctly guessed the purpose of the study or completed the emotion measurement incorrectly (i.e., these participants did not indicate their levels of state anger or state anxiety on the emotion measurement questionnaire after the emotion manipulation) or were under the age of eighteen, the final sample was 132 participants.

Procedure.

Participants experienced a similar procedural structure to Study 1, however they now evaluated their own generated ideas. That is, they completed PANAS, the covariates, the idea generation tasks, and were then induced with either incidental or integral anxiety or incidental or integral anger using the same methodology as Study 1. The participants then completed PANAS and evaluated the ideas they had generated by selecting their top three ideas they personally generated and then explained why these were their top three. Afterwards, the participants completed PANAS one final time, a secondary battery of covariates, demographics, and were then debriefed.

Manipulations.

The same manipulation checks and independent variables used in Study 1 were used in Study 2.

Dependent Variables.

Three trained raters were used to evaluate these responses on scales developed for assessing the idea evaluation tasks on quality, originality, elegance, and flexibility. (Fluency was omitted given that each task response was limited to three evaluations; whereas in idea generation, the participants could generate as many responses as possible.) Similarly, the raters used the same rating scales (e.g., they rated on a scale of 1 to 5 where the response falls in regard to quality, elegance, originality, or flexibility), but with appropriate benchmarks for judging idea evaluation on creative performance. Inter-rater reliabilities on overall quality (rwg* = .86), originality (rwg* = .77), elegance (rwg* = .74), and flexibility (rwg* = .84) were assessed.

Covariates.

Study 2 utilized the same covariates as study 1.

Results for Study 2

T-tests for Manipulation Checks.

IBM SPSS version 25 was used to assess participant emotions before and after emotion induction (i.e., integral vs. incidental, state anger vs. state anxiety, control or neutral emotion). Although integral anger, integral anxiety, and incidental anger were successfully induced, incidental anxiety was not induced in Study 2 as well. That is, there were significant mean differences of pre-integral anger (M = 1.19, SD = .56) to post-integral anger (M = 2.15, SD = 1.29) induction, t (26) = -4.91, p = .001; pre-integral anxiety (M = 1.85, SD = 1.16) to post-integral anxiety (M = 2.65, SD = 1.35) induction, t (25) = -2.50 , p = .019; and pre-incidental anger (M = 1.21, SD = .74) to post-incidental anger (M = 1.57, SD = .88) induction, t (27) = -2.79, p = .010, in the expected direction. However, similar to study 1, there were no significant differences between pre-incidental anxiety (M = 1.81, SD = 1.00) to post-incidental anxiety (M =

1.78, *SD* = .97) induction scores, *t* (26) = .16, *p* = .873. As expected, there were no significant differences between the first measurement of neutral emotion (*M* = 1.45, *SD* = .45) and the second measurement of neutral emotion (*M* = 1.51, *SD* = .66), *t* (23) = -.09, *p* = .494.

Hypotheses Tests and Interpretation.

Utilizing the methodology proposed by Cho and Abe (2013), study 2's directional hypotheses were assessed with a one-tailed test. These one-tailed tests included H3A, H3B, H4B, and H5b. With the level of significance set at $p < .05$, the obtained p-value was divided in half for the analyses. For the research questions for study 2, RQ2 and RQ3, a two-tailed test under the same methodology was utilized, as there were no directional predictions for how these relationships might manifest.

In order to test H3A, an independent samples t-test was used to assess the differences between anger and neutral emotion on performance of idea evaluation. There were no significant differences between anger and neutral emotion for quality, originality, elegance, or flexibility. As a result, there was no support for H3A. In order to test H3B, an independent samples t-test was used to assess the differences between anxiety and neutral emotion. There were no significant differences between anxiety and neutral emotion for idea evaluation on quality, originality, elegance, or flexibility. With regard to H4B, an independent samples t-test was used to examine differences between integral and incidental anger on idea evaluation, such that integral anger leads to better performance than incidental anger. There were no significant differences on quality, originality, elegance, or flexibility between integral and incidental anger for performance on idea evaluation. As a result, there was no support found for hypothesis H4B. For hypothesis H5B, an independent samples t-test was used to examine differences between integral and incidental anxiety on idea evaluation, such that integral anxiety will lead to better performance

than incidental anxiety. While significant difference were not found for quality, originality, or elegance, there was a significant difference between incidental and integral anxiety for flexibility, such that incidental anxiety (M = 3.09, SD = .45) performed better than integral anxiety (M = 2.75, SD = .68) (refer to Table 6) As a result, support was not found for H5B, integral anxiety does not perform better than incidental anxiety on flexibility, nor is there a difference between quality, originality, or elegance for performance on idea evaluation. Additionally, in order to test RQ3, a dependent samples t-test was used to examine the relationship between post-state emotion induction and post-task performance on the intensity of emotion felt by the participants. The mean scores for post-manipulation state anxiety (M = 2.22, SD = 1.25) and post-task state anxiety (M = 2.09, SD = 1.81) were not significantly different, t (52) = .723, p = .473. However, post-manipulation state anger (M = 1.85, SD = 1.13) and post-task state anger (M = 1.53, SD = 1.01), t (54) = 2.63, p = .011, were significantly different. Thus, as in study 1, performing a idea evaluation task lessened the effects of induced state anger, but not induced state anxiety.

To examine the research question for idea evaluation, of whether integral anger has different effects than integral anxiety, a 2x2 ANCOVA with a control group was used to assess this relationship (refer to Table 7 for means and standard deviations, and Table 8 for correlations amongst dependent variables and covariates). First, the effects of covariates and the independent variables (anger vs. anxiety, integral vs. incidental) were examined on quality, originality, elegance, and flexibility. Then, all non-significant covariates were removed from the final analyses (refer to Table 9 for ANCOVAs). Main effects for emotion and emotion type were not found for quality nor originality. However, a covariate effect for verbal reasoning on originality was found, F(1, 127) = 4.84, p = .030. For elegance, there were no main effects for emotion or

emotion type. For flexibility, there was not a main effect of emotion. However, there was a covariate effect of verbal reasoning, $F(1, 127) = 5.34$, $p = .022$, along with a main effect of emotion type, $F(1, 127) = 5.91$, $p = .016$, such that incidental emotions ($M = 2.99$) produced better performance on flexibility than integral emotions ($M = 2.77$). Thus, integral emotions are more detrimental to flexibility on idea evaluation tasks.

Discussion

The results of study 2 showed that incidental anxiety performs better than integral anxiety on flexibility. Similarly, it was found that incidental emotion performs better than integral emotion on flexibility. Finally, the intensity of anger one feels prior to and after idea evaluation was mitigated by performing this idea evaluation task. These results open exciting avenues for research on anxiety, along with integral and incidental emotions, and the intensity of emotions for idea evaluation.

However, while these results present a promising area for research development, study 2 is open to a number of limitations. As in study 1, incidental anxiety seemed to decrease after performing the incidental induction task (i.e., the participant writing about a time in which they felt anxious). This may support the conjecture that writing about certain negative emotion may be beneficial or cathartic for regulating negative emotions. Also similar to study 1, while it was found that post-manipulation and post-idea evaluation task mean scores for anger indicate that anger is mitigated by this type of task, there is the potential that length of time to perform the task may act as a regulatory mechanism more so than the actual task itself.

Yet, despite these limitations, study 2 presents theoretical support and potential for exploration. Much of the research that examines anger and anxiety is relative to idea generation rather than idea evaluation, however, study 2 addresses this gap in the literature and proposes

that, similar to study 1, incidental and integral emotion produce differing effects on at least one aspect of idea evaluation performance—with integral anxiety leading to poorer flexibility than incidental anxiety. This could be due to the greater uncertainty and flight-freeze response associated with anxiety (Gray & McNaughton, 2000). Additionally, anger was mitigated by engaging in the idea evaluation tasks. Perhaps performing tasks in which the participant is challenged to overcome obstacles and encouraged to take control of the situation (e.g., selecting and explaining the logic behind their top three ideas generated) regulates anger. Future research could study this relationship and investigate more closely if state anger follows the potential trend of producing strong effects initially and then sharply decreases over time as proposed by Baas, De Dreu, and Nijstad (2011b), and if idea evaluations acts as a regulatory mechanism to explain this phenomenon.

General Discussion

Overall, the results of these studies demonstrated differential impacts of negative emotions (i.e., anger and anxiety) and their intensity (i.e., incidental versus integral) on some aspects of two separate creative processes. Anxiety exerted direct effects on idea generation and idea evaluation, such that anxiety relative to neutral emotion faced the most detriments on idea generation flexibility, and incidental anxiety relative to integral anxiety performed better on idea evaluation flexibility. Additionally, anger integral to the creative task performed better than incidental anger on originality, flexibility, and fluency for idea generation. It is interesting to note that while there were no interactions for idea evaluation, there were interactions for idea generation, with the type of emotion induced (i.e., integral versus incidental) demonstrating an effect on categorical shifts in conceptual categories (i.e., flexibility) and the number of ideas

generated (i.e., fluency) for idea generation tasks. Specifically, integral anger performs better than integral anxiety on these aspects of idea generation.

These results raise a number of questions, including why integral and incidental anger and integral and incidental anxiety impact idea generation to a greater extent than idea evaluation. Along these lines, it is also intriguing that anger is down regulated by both idea generation and idea evaluation tasks. Yet, integral anxiety does not change after performing either type of task. This may be because anxiety associated with a task results in greater rumination and continuing with the task fuels the anxiety. Future research could perhaps test this theory and explore why this trend was observed.

Before discussing these studies' implications, some limitations must be addressed. First, only two discrete emotions were examined. Future research could perhaps compare other emotions (e.g., sadness vs. joy) on idea evaluation and idea generation—such as a cognitively deactivating emotion and a cognitively activating emotion. Next, incidental anxiety was difficult to induce for both studies. This suggests that anxiety generated to factors outside of a creative task may not have much impact on creativity. This may also suggest that trait anxiety and integral anxiety may be a better focus for experimental designs interested in this emotion.

However, despite these limitations, these studies make valuable contributions to the literature. First, this research supports cognitive appraisal theories (e.g., Roseman, Spindle, & Jose, 1990; Smith & Ellsworth, 1985) by demonstrating the contrasting effects of anger and anxiety on creative processes. Specifically, it appears that anger, which is characterized by certainty, high control, and perceived goal blockage, performs better on idea generation than anxiety, which is characterized by uncertainty, low control, and a perceived threat to self. Thus, these appraisal patterns may perhaps explain why anger, which perhaps leads to a more tenacious

drive in participants, is more beneficial than anxiety, which may have caused the participants to feel less comfortable exploring creative boundaries. Future research could perhaps extend beyond these initial appraisal patterns of valence (i.e., both are negative emotions) and cognitive arousal (i.e., both are cognitively activating) and examine mediators that explain how these emotions impact motivation to complete a task. For example, anger may enhance motivation, which may lead to better creative performance (Van Kleef, Anastasopoulou, & Nijstad, 2010). Whereas anxiety, which shares an opposite relationship with motivation, may hinder tasks such as problem solving (Wolf & Smith, 2009).

Next, these studies produce support for theories that incidental and integral emotions play a role in the extent to which one performs well on a given task. In both idea generation and idea evaluation, it was found that integral emotion had stronger effects than incidental emotion, whether this increased or decreased task performance. Future research on creativity and emotions can use this information to guide induction methodologies, as the stronger effects in integral emotion may lead to differing results. With regard to creativity, it was found that idea generation and idea evaluation share different relationships with anger and anxiety. This is likely given that both creative processes are associated with different cognitions (i.e., idea generation vs. idea evaluation). Perhaps future research could explore other creative processes highlighted by Mumford, Mobley, Uhlman, Reiter-Palmon, and Doares (1991), such as information encoding, which may face differential effects from anger and anxiety. For example, anxiety leads to impaired rehearsal and storage of task-relevant information (Eysenck, 1985; Moran, 2016). Thus, these harmful effects may affect encoding of information for problem-solving. Future research could perhaps explore this idea in tandem with this creative process.

This research also has implications for the workplace. Employees can use this information to better understand how their emotions may affect personal task performance and use this information for regulation purposes (e.g., when feeling integral anxiety, it may be beneficial to use regulation techniques to mitigate its influences on idea generation tasks). Employees encounter anxiety and anger in the workplace, particularly in highly competitive environments. Being aware of the functions of these emotions can guide performance and perhaps encourage or discourage employees from moving forward prior to regulation. For example, if an employee feels angry, their performance may benefit from performing a task without regulating the anger. On the contrary, failing to regulate anxiety may lead to unfavorable performance outcomes. Regulation techniques such as attentional deployment or distraction that use generating and evaluating ideas may help with lessening state anger if an employee needs to regulate this emotion. As a result, it may be beneficial for employees struggling with anger (i.e., incidental anger) to seek creative problem solving activities. This encouragement for overcoming obstacles and proceeding with work may perhaps increase motivation and, subsequently, lead to better performance overall.

The present endeavors open the door for further examination into the effects of negative emotions and their intensity on creative processes. Through two separate studies, it was established that anger and anxiety produce differing effects and that the type of creative process required for problem solving (i.e., idea generation vs. idea evaluation) plays a significant role in the manifestation of these emotions' effects. These discrete state emotions are complex and understanding how they function may improve the workplace. Perhaps this research has generated new ideas for exploration and, with a bit of evaluation for feasibility, a new door has opened to better understand the effects of emotions on creativity in the workplace.

References

Allred, K. G., Mallozzi, J. S., Matsui, F., & Raia, C. P. (1997). The influence of anger and compassion on negotiation performance. *Organizational Behavior and Human Decision Processes*, *70*(3), 175–187.

Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in Organizational Behavior, 10,* 123-167.

Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, *50*, 367–403.

Angie, A. D., Connelly, S., Waples, E. P., & Kligyte, V. (2011). The influence of discrete emotions on judgement and decision-making: A meta-analytic review. *Cognition and Emotion*, *25*(August), 1393–1422.

Baas, M., De Dreu, C. K. W., & Nijstad, B. a. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? *Psychological Bulletin*, *134*(6), 779–806.

Baas, M., De Dreu, C. K. W., & Nijstad, B. a. (2011a). When prevention promotes creativity: the role of mood, regulatory focus, and regulatory closure. *Journal of Personality and Social Psychology*, *100*(5), 794–809.

Baas, M., De Dreu, C. K. W., & Nijstad, B. A. (2011b). Creative production by angry people peaks early on, decreases over time, and is relatively unstructured. *Journal of Experimental Social Psychology*, *47*(6), 1107–1115.

Baikie, K. A., & Wilhelm, K. (2005). Emotional and physical health benefits of expressive writing. *Advances in psychiatric treatment*, *11*(5), 338-346.

Berger, R. M., & Guilford, J. P. *Plot Titles.* Beverly Hills, California: Sheridan Psychological Services, 1969.

Besemer, S. P., & O'Quin, K. (1999). Confirming the three-factor creative product analysis matrix model in an American sample. *Creativity Research Journal, 12*, 287–296.

Bieg, M., Goetz, T., Wolter, I., & Hall, N. C. (2015). Gender stereotype endorsement differentially predicts girls' and boys' trait-state discrepancy in math anxiety. *Frontiers in Psychology, 6*, 8.

Bujacz, A., Dunne, S., Fink, D., Gatej, A. R., Karlsson, E., Ruberti, V., & Wronska, M. K. (2016). Why do we enjoy creative tasks? Results from a multigroup randomized controlled study. *Thinking Skills and Creativity*, *19*, 188–197.

Butler, G., & Mathews, A. (1987). Anticipatory anxiety and risk perception. *Cognitive Therapy and Research*, *11*(5), 551–565.

Byron, K., & Khazanchi, S. (2011). A meta-analytic investigation of the relationship of state and trait anxiety to performance on figural and verbal creative tasks. *Personality and Social Psychology Bulletin*, *37*(2), 269–283.

Carlsson, I. (2002). Anxiety and flexibility of defense related to high or low creativity. *Creativity Research Journal*, *14*(3–4), 409–426.

Carmeli, Abraham, & Schaubroeck, John. (2007). The influence of leaders' and other referents' normative expectations on individual involvement in creative work. *The Leadership Quarterly, Vol 18*(1), 35-48.

Cho, H. C., & Abe, S. (2013). Is two-tailed testing for directional research hypotheses tests legitimate?. *Journal of Business Research*, *66*(9), 1261-1266.

Christensen, P. R., Merrifield, P. R., & Guilford, J. P. *Consequences.* Beverly Hills, California: Sheridan Psychological Services, 1958.

Christensen, P. R., Guilford, J. P. Merrifield, P. R., & Wilson, R. C. *Alternate Uses.* Beverly Hills, California: Sheridan Psychological Services, 1960.

Deffenbacher, J. L., Oetting, E. R., Thwaites, G. A., Lynch, R. S., Baker, D. A., Stark, R. S., Thacker, S., & Eiswerth-Cox, L. (1996). State–trait anger theory and the utility of the trait anger scale. *Journal of Counseling Psychology*, *43*(2), 131.

Dunn, J. R., & Schweitzer, M. E. (2005). The influence of emotion on trust. *Journal of Personality and Social Psychology*, *88*(5), 736–748.

Eysenck, M. W. (1985). Anxiety and cognitive-task performance. *Personality and Individual differences*, *6*(5), 579-586.

Fernández-Abascal, E. G., & Díaz, M. D. M. (2013). Affective induction and creative thinking. *Creativity Research Journal*, *25*(2), 213–221.

Frijda, N. H., Kuipers, P., & ter Schure, E. (1989). Relations among emotion, appraisal, and emotional action readiness. *Journal of Personality and Social Psychology*, *57*(2), 212–228.

George, J. M., & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: The role of context and clarity of feelings. *The Journal of Applied Psychology*, *87*(4), 687–697.

Gray, J. A., & N. McNaughton (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septohippocampal system* (2nd ed.). Oxford: Oxford University Press.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2,* 271– 299.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1–26.

Han, S., Lerner, J. S., & Keltner, D. (2007). Feelings and consumer decision making: The appraisal-tendency framework. *Journal of Consumer Psychology*, *17*(3), 158–168.

Hillebrandt, A., & Barclay, L. J. (2017). Comparing integral and incidental emotions: Testing insights from emotions as social information theory and attribution theory. *Journal of Applied Psychology*, *102*(5), 732–752.

Hutchison, A., Burch, G., & Boxall, P. (2013). Reinforcement sensitivity theory as a predictor of senior-executive performance. *Personality and Individual Differences*, *55*(8), 931–935.

Kuppens, P., Van Mechelen, I., Smits, D. J. M., De Boeck, P., & Ceulemans, E. (2007). Individual differences in patterns of appraisal and anger experience. *Cognition and Emotion*, *21*(4), 689–713.

Lemerise, E.A., & Dodge, K.A. (2008). The development of anger and hostile interactions. In Lewis, M., Haviland-Jones, J. M., Barrett, L. F. (3rd), *Handbook of emotions* (730-741). New York: The Guilford Press.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81(1),* 146 159.

McAdam, R. (2004). Knowledge creation and idea generation: A critical quality perspective. *Technovation*, *24*(9), 697–705.

McCarthy, J. M., Trougakos, J. P., & Cheng, B. H. (2016). Are anxious workers less productive workers? It depends on the quality of social exchange. *Journal of Applied Psychology*, *101*(2), 279.

Moran, T. P. (2016). Anxiety and working memory capacity: A meta-analysis and narrative review. *Psychological Bulletin*, *142*(5), 831–864.

Mumford, M.D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application, and innovation. *Psychological bulletin 103*(1) 27-43.

Mumford, M. D., Mobley, M. I., Reiter-Palmon, R., Uhlman, C. E., Doares, L. M., Reiter Palmon, R., Doares, L. M. (1991). Process analytic models of creative capacities. *Creativity Research Journal*, *4*(2), 91–122.

Muschalla, B. (2017). Is it a case of "work-anxiety" when patients report bad workplace characteristics and low work ability? *Journal of Occupational Rehabilitation*, *27*(1), 106–114.

Öhman, A. (2008). Fear and anxiety. In Lewis, M., Haviland-Jones, J. M., Barrett, L. F. (3rd), *Handbook of emotions* (709-729). New York: The Guilford Press.

O'Neill, O. A., Vandenberg, R. J., Dejoy, D. M., & Wilson, M. G. (2009). Exploring relationships among anger, perceived organizational support, and workplace outcomes. *Journal of Occupational Health Psychology*, *14*(3), 318–333.

Pennebaker, J. W. (1997). Writing about emotional experiences as a therapeutic process. *Psychological science*, *8*(3), 162-166.

Perkins, A. M., Kemp, S. E., & Corr, P. J. (2007). Fear and anxiety as separable emotions: An investigation of the revised reinforcement sensitivity theory of personality. *Emotion*, *7*(2), 252–261.

Ree, Melissa J., French, Davina, MacLeod, Colin, & Locke, Vance. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the state-trait inventory for cognitive and somatic anxiety (STICSA). *Behavioural and Cognitive Psychotherapy, 36*(3), 313-332.

Roseman, I. J., Spindle, M. S., & Jose, P. E. (1990). Appraisals of emotion-eliciting events. Testing a theory of discrete emotions. *Journal of Personality and Social Psychology, 59,* 899–915.

Ruch, F. L., & Ruch, W. W. (1980). *Employee aptitude survey*. Los Angeles, CA: Psychological Services.

Runco, M. A., & Acar, S. (2012). Idea generation as an indicator of creative potential. *Creativity Research Journal*, *24*(1), 66–75.

Schulze, A., & Hoegl, M. (2008). Organizational knowledge creation and the generation of new product ideas: A behavioral approach. *Research Policy*, *37*(10), 1742–1750.

Scott, G. M., Lonergan, D. C., & Mumford, M. D. (2005). Conceptual combination: Alternative knowledge structures, alternative heuristics. *Creativity Research Journal*, *17*(1), 79–98.

Shao, B., Wang, L., Cheng, D., & Doucet, L. (2015). Anger suppression in negotiations: The roles of attentional focus and anger source. *Journal of Business and Psychology*, *30*(4), 747–758.

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, *48*, 813–838.

Sorić, I., Penezić, Z., & Burić, I. (2013). Big five personality traits, cognitive appraisals and emotion regulation strategies as predictors of achievement emotions. *Psihologijske Teme, 22*(2), 325-349.

Spielberger CD, Jacobs G, Russell S, Crane R. (1983). Assessment of anger: The state-trait anger scale. In: Butcher JN, Spielberger CD, eds. Advances in Personality Assessment. Vol 2. Hillsdale, NJ: Erlbaum; 1983: 161–189.

Strack, F., Schwarz, N., & Gschneidinger, E. (1985). Happiness and reminiscing: The role of time perspective, affect, and mode of thinking. *Journal of Personality and Social Psychology, 49,* 1460–1469.

Summers, B., & Duxbury, D. (2012). Decision-dependent emotions and behavioral anomalies. *Organizational Behavior and Human Decision Processes*, *118*(2), 226–238.

Thomas, M., & Hynes, C. (2007). The darker side of groups. *Journal of Nursing Management, 15*, 375–385.

Thomas, S. P. (1989). Gender differences in anger expression: health implications. *Research in Nursing & Health*, *12*(6), 389–98.

Van Kleef, G. A., Anastasopoulou, C., & Nijstad, B. A. (2010). Can expressions of anger enhance creativity? A test of the emotions as social information (EASI) model. *Journal of Experimental Social Psychology*, *46*(6), 1042-1048.

Vosburg, S. K. (1998). The effects of positive and negative mood on idea generation performance. *Creativity Research Journal, 11,* 165–172.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.

Wolf, L. F., & Smith, J. K. (1995). The consequence of consequence: Motivation, anxiety, and test performance. *Applied Measurement in Education*, *8*(3), 227-242.

Yang, J. S., & Hung, H. V. (2015). Emotions as constraining and facilitating factors for creativity: Companionate love and anger. *Creativity and Innovation Management*, *24*(2), 217–230.

Yang, Z., Saini, R., & Freling, T. (2015). How anxiety leads to suboptimal decisions under risky choice situations. *Risk Analysis*, *35*(10), 1789–1800.

Table 1
Independent Samples T-test for Anxiety and Neutral Emotion for Idea Generation

Variable	Emotion	*n*	*M*	*SD*	*t*	*p*
Quality	Anxiety	46	3.20	.60	.207	.837
	Neutral	23	3.23	.28		
Originality	Anxiety	46	3.20	.35	.990	.326
	Neutral	23	3.29	.28		
Elegance	Anxiety	46	2.66	.39	-.957	.342
	Neutral	23	2.57	.31		
Flexibility	Anxiety	46	2.99	.68	1.94	**.057**
	Neutral	23	3.31	.58		
Fluency	Anxiety	46	4.93	2.42	.287	.775
	Neutral	23	5.09	1.64		

Note. Significant relationships are listed in bold. (One-tailed)

Table 2
Independent Samples T-test for Incidental and Integral Anger for Idea Generation

Variable	Type of Anger	*n*	*M*	*SD*	*t*	*p*
Quality	Incidental	23	3.07	.53	-.879	.384
	Integral	25	3.19	.37		
Originality	Incidental	23	3.03	.41	-1.74	**.088**
	Integral	25	3.24	.42		
Elegance	Incidental	23	2.62	.38	-1.13	.265
	Integral	25	2.74	.36		
Flexibility	Incidental	23	2.75	.77	-4.33	**.001**
	Integral	25	3.60	.59		
Fluency	Incidental	23	4.73	2.21	-3.16	**.003**
	Integral	25	6.68	2.06		

Note. Significant relationships are listed in bold. (One-tailed)

Table 3
Study 1 Means and Standard Deviations for Idea Generation

	Quality			Originality			Elegance			Flexibility			Fluency		
	n	*M*	SD	*n*	*M*	SD	*n*	*M*	SD	*n*	*M*	SD	*n*	*M*	SD
Incidental Anger	23	3.07	.53	23	3.03	.41	23	2.62	.38	23	2.75	.77	23	4.73	2.21
Incidental Anxiety	27	3.22	.74	27	3.22	.34	27	2.61	.35	27	3.13	.67	27	5.39	2.77
Integral Anger	25	3.19	.37	25	3.24	.42	25	2.75	.36	25	3.60	.59	25	6.68	2.06
Integral Anxiety	19	3.18	.33	19	3.18	.38	19	2.72	.43	19	2.81	.67	19	4.28	1.66
Control	23	3.23	.28	23	3.29	.28	23	2.57	.31	23	3.31	.57	23	5.09	1.64
Integral Emotion Total	44	3.18	.35	44	3.22	.40	44	2.73	.39	44	3.26	.73	44	5.64	2.23
Incidental Emotion Total	50	3.15	.65	50	3.13	.38	50	2.62	.36	50	2.95	.73	50	5.09	2.52
Anger Total	48	3.13	.45	48	3.14	.42	48	2.69	.37	48	3.20	.80	48	5.74	2.33
Anxiety Total	46	3.20	.60	46	3.20	.35	46	2.66	.39	46	2.99	.68	46	4.93	2.42

Table 4
Study 1 Correlations, Means, and Standard Deviations of Dependent Variables and Covariates for Idea Generation

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Quality	3.18	.49	--													
2. Originality	3.20	.37	.43**	--												
3. Elegance	2.65	.37	.15	.05	--											
4. Flexibility	3.14	.72	.28**	.51**	-.48**	--										
5. Fluency	5.30	2.27	.28**	.40**	-.22*	.78**	--									
6. Verbal Reasoning	26.5	7.03	-.06	.02	.01	-.12	-.08	--								
7. Extraversion	3.45	.94	-.03	-.04	-0.1	.08	.07	-.07	--							
8. Agreeableness	3.97	.55	.15	-.07	.04	-.07	-.11	.03	.13	--						
9. Conscientiousness	3.60	.60	-.06	.07	-.02	.01	.04	-.13	.15	.22*	--					
10. Neuroticism	2.69	.81	.04	.09	.07	.07	.14	-.03	-.30**	-.13	-.35**	--				
11. Openness	3.38	.66	.07	.04	.07	.03	-.02	.03	-.24**	.16	-.08	.14	--			
12. Trait Anger	19.54	4.38	-.05	-.01	-.17	.14	.16	-.10	.09	-.35**	-.08	.30**	-.18*	--		
13. Trait Anxiety	21.20	5.22	-.06	.08	.02	.01	.06	-.07	-.30**	-.15	-.18	.60**	.13	.41**	--	
14. Gender	.36	.48	-.03	.15	.02	.07	.01	-.19*	-.02	-.17	-.09	-.32**	.01	.00	-.12	--

Note. $n = 117$; * $p < .05$ (two-tailed); ** $p < .001$ (two-tailed)

Table 5
ANCOVA Results of Independent Variables on Participant Scores for Dependent Variables for Idea Generation

	Quality			Originality			Elegance			Flexibility			Fluency		
	F	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
Corrected Model	.373	.827	.013	1.59	.181	.054	.961	.432	.033	6.77	.001	.195	4.11	.004	.128
Intercept	4547.54	.001	.976	8198.35	.001	.987	5682.03	.001	.981	2508.83	.001	.957	641.90	.001	.851
Emotion (e.g., Anger, Anxiety)	.423	.517	.004	.659	.419	.006	.059	.809	.001	2.41	.123	.021	3.77	.055	.033
Emotion Type (e.g., Incidental, Integral)	.111	.739	.001	1.25	.265	.011	2.17	.143	.019	3.77	.055	.033	.874	.352	.008
Emotion x Emotion Type	.617	.434	.005	2.54	.114	.022	.013	.909	.001	18.46	**.001**	.141	11.71	**.001**	.095

Note. $n = 117$. No covariates came back as significant and are subsequently unlisted. Significant relationships are listed in bold (two-tailed). Quality R-Squared = .013(Adjusted R-Squared = -.022). Originality R-Squared = .054 (Adjusted R-Squared = .020). Elegance R-Squared = .033 (Adjusted R-Squared = -.001). Flexibility R-Squared = .195 (Adjusted R-Squared = .166). Fluency R-Squared = .140 (Adjusted R-Squared = .112).

Table 6
Independent Samples T-test for Incidental and Integral Anxiety

Variable	Type of Anxiety	*n*	*M*	*SD*	*t*	*p*
Quality	Incidental	27	3.04	.59	.119	.906
	Integral	26	3.02	.71		
Originality	Incidental	27	2.99	.55	-.116	.908
	Integral	26	3.01	.83		
Elegance	Incidental	27	2.91	.46	-.618	.539
	Integral	26	2.99	.54		
Flexibility	Incidental	27	3.09	.45	2.144	**.038**
	Integral	26	2.75	.68		

Note. Significant relationships are listed in bold. Levene's test indicated unequal variances for flexibility ($F = 5.87$, $p = .019$), so degrees of freedom were adjusted from 51 to 43. (One-tailed)

Table 7
Study 2 Means and Standard Deviations

	Quality			Originality			Elegance			Flexibility		
	n	*M*	SD	*n*	*M*	SD	*n*	*M*	SD	*n*	*M*	SD
Incidental Anger	28	3.04	.87	28	2.93	.62	28	3.06	.52	28	2.89	.48
Incidental Anxiety	27	3.04	.57	27	2.99	.54	27	2.91	.45	27	3.09	.45
Integral Anger	27	3.05	.58	27	2.94	.62	27	3.17	.45	27	2.79	.53
Integral Anxiety	26	3.02	.71	26	3.02	.83	26	2.99	.54	26	2.75	.68
Control	24	3.03	.87	24	2.90	.74	24	3.02	.61	24	2.84	.62
Integral Emotion Total	53	3.03	.64	53	2.98	.73	53	3.08	.50	53	2.77	.60
Incidental Emotion Total	55	3.05	.62	55	2.96	.58	55	2.98	.49	55	2.99	.47
Anger Total	55	3.05	.58	55	2.94	.62	55	3.11	.48	55	2.84	.50
Anxiety Total	53	3.02	64	53	3.00	.69	53	2.95	.50	53	2.92	.59

Table 8
Correlations, Means, and Standard Deviations of Dependent Variables and Covariates for Idea Evaluation

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Quality	3.04	.67	--												
2. Originality	2.96	.68	.65**	--											
3. Elegance	3.03	.52	.66**	.28**	--										
4. Flexibility	2.87	.56	.50**	.69**	-.07	--									
5. Verbal Reasoning	27.05	5.49	.06	.19*	.09	.15	--								
6. Extraversion	3.37	.92	-.11	.00	-.10	-.04	.04	--							
7. Agreeableness	3.98	.63	.02	-.07	.12	-.14	-.01	.14	--						
8. Conscientiousness	3.7	.58	.04	.00	.04	-.04	-.03	-.08	.26**	--					
9. Neuroticism	2.93	.84	.10	.01	.05	-.01	-.03	-.06	-.20*	-.31**	--				
10. Openness	3.46	.63	.05	.13	-.01	.10	.05	.02	-.08	-.08	.16	--			
11. Trait Anger	19.25	4.24	.07	.08	-.04	.10	.09	.14	-.44**	-.15	.27**	.09	--		
12. Trait Anxiety	21.47	5.33	.09	.12	.00	.04	.00	-.10	-.18*	-.39**	.49**	.25**	.38**	--	
13. Gender	0.28	.45	-.09	-.01	-.12	.08	.03	-.22*	-.19*	.01	-.30**	.10	.02	-.14	--

Note. $n = 132$; * $p < .05$ (two-tailed); ** $p < .001$ (two-tailed);

Table 9
ANCOVA Results of Independent Variables on Participant Scores for Dependent Variables for Idea Evaluation

	Quality			Originality			Elegance			Flexibility		
	F	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2	*F*	*p*	η_p^2
Corrected Model	.017	.999	.001	1.06	.384	.040	.925	.452	.028	2.32	.047	.084
Intercept	2427.93	.001	.950	58.73	.001	.318	4147.39	.001	.970	97.95	.001	.411
Verbal Reasoning	--	--	--	4.84	**.030**	.037	--	--	--	5.34	**.022**	.041
Emotion (e.g., Anger, Anxiety)	.046	.831	.001	.462	.498	.004	2.69	.103	.021	.874	.352	.007
Emotion Type (e.g., Incidental, Integral)	.020	.888	.001	.076	.783	.001	.977	.325	.008	5.91	**.016**	.045
Emotion x Emotion Type	.000	.986	.001	.047	.829	.001	.018	.894	.001	2.15	.146	.017

Note. $n = 132$. Significant covariates are listed. Significant relationships are listed in bold (two-tailed). Dashes indicate instances where the specific variable was not used as a covariate. Quality R-Squared = .001 (Adjusted R-Squared = -.031). Originality R-Squared = .040 (Adjusted R-Squared = .002). Elegance R-Squared = .028 (Adjusted R-Squared = -.002). Flexibility R-Squared = .084 (Adjusted R-Squared = -.048).

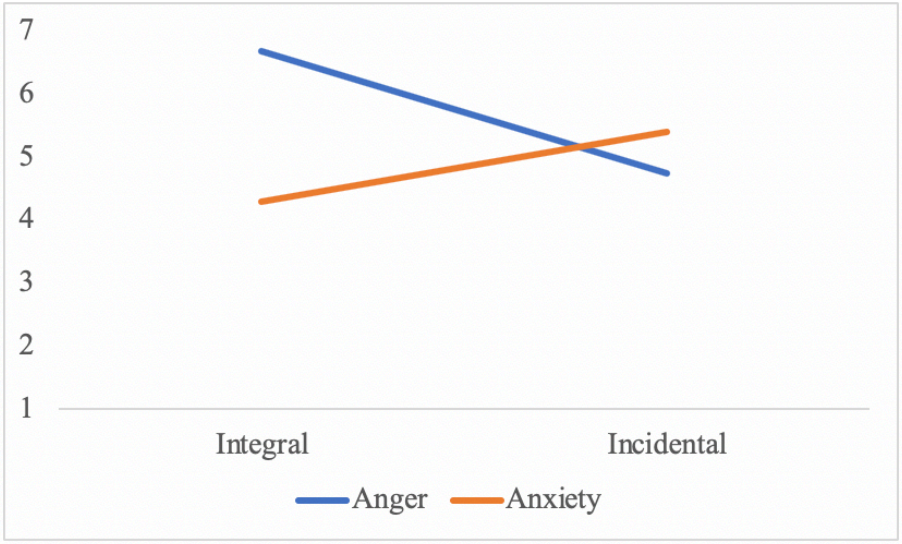

Figure 2. Mean interaction effect of integral and incidental anger and anxiety on fluency for idea generation.

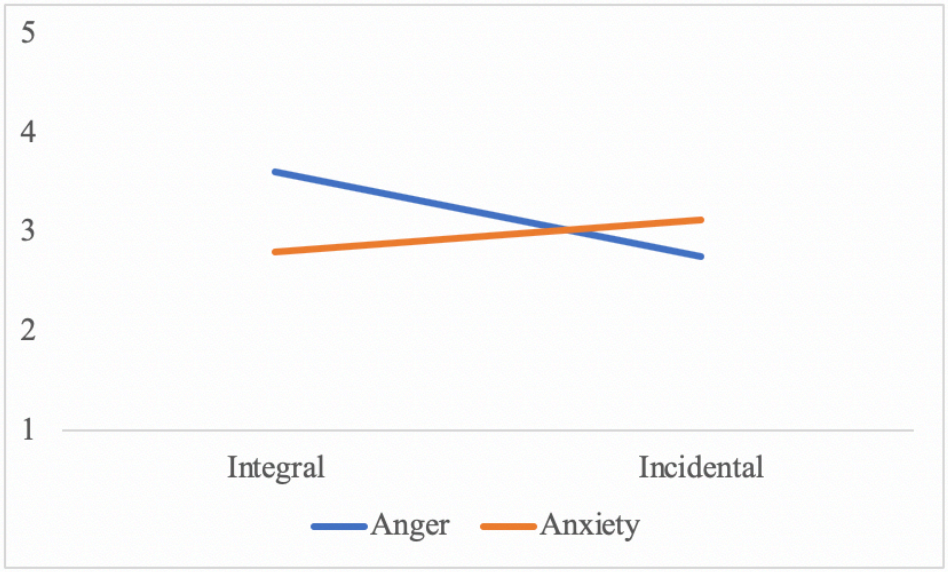

Figure 1. Mean interaction effect of integral and incidental anger and anxiety on flexibility for idea generation.