The Dark and Bright Sides of Anxiety: A Comprehensive Examination of the Relation between
State Anxiety, Trait Anxiety, and Job Performance

by

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A thesis submitted in conformity with the requirements
for the degree of Doctor of Philosophy
Rotman School of Management
University of Toronto

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Abstract

Research has consistently tapped into a “dark side” of anxiety by demonstrating that anxiety has a negative relation with performance, while neglecting to consider the possibility of a “bright side” of anxiety by examining whether anxiety can benefit performance. The purpose of this research was to conduct a comprehensive examination of the anxiety and job performance relationship by considering the potential for a dark and bright side. First, I developed a dual-process model of anxiety outlining the process through which state and trait anxiety might lead to debilitative and facilitative job performance. Drawing from Interference Theory (Wine, 1980), I predicted that anxiety leads to debilitative performance through off-task cognition. Drawing from the Integrative Resource Model (Kanfer & Ackerman, 1989), Processing Efficiency Theory (Eysenck & Calvo, 1992), and Attentional Control Theory (Eysenck, Derakshan, Santos, & Calvo, 2007), I predicted that anxiety leads to facilitative performance through self-regulatory processing. Second, guided by motivation theory (Vroom, 1964), I extended my theoretical model by specifying a condition under which anxiety might lead to debilitative and facilitative performance. Specifically, motivation is predicted to moderate the relationship between anxiety and off-task cognition, and between anxiety and self-regulatory processing. Two controlled
laboratory experiments tested the overall model. Experiment 1 consisted of a simulated work environment with 306 participants. Experiment 2 consisted of a similar work simulation with 327 participants. In both experiments, trait anxiety was assessed through self-report, three levels of state anxiety were induced in participants, and performance on in-basket tasks was examined. Experiment 2 also manipulated two levels of motivation. Findings do not support a bright side of anxiety and suggest that the dark side of anxiety is quite robust. Both trait and state anxiety led to higher levels of off-task cognition, which led to lower performance. Both trait and state anxiety led to lower levels of self-regulatory processing, which led to higher performance. Experiment 2 extended these results by finding that motivation buffered the relationship between state anxiety and self-regulatory processing, and between state anxiety and off-task cognition. Motivation did not have an effect for trait anxiety. Contributions and practical implications are discussed.
Acknowledgements

This dissertation would not have been possible without the guidance of many individuals who in one way or another extended their valuable assistance to me over the past five years.

I would like to express the deepest gratitude to my advisor, Julie McCarthy, who made my journey through doctoral studies such an incredible experience. It would not have been possible without your support, encouragement, caring and guidance. Your excitement and passion for research is something that I will take with me forever. Your hard work and scholarship have set an example I hope to match one day. Thank you.

I would like to thank my dissertation committee members, Jia Lin Xie and Brian Connelly, for always bringing new insight to my work, guiding my writing and helping to develop me as a researcher. Sincere thanks also to Deborah Powell and Soo Min Toh. My dissertation would not be possible without the help of Meera Persaud and Christine Chan for their dedication with data collection. I have been fortunate to have the aid of the SSHRC doctoral fellowship which has supported me while I completed my PhD.

I would also like to thank my fellow PhD students at the Rotman School of Management for their support. Alexander Garcia Muradov, you have made the years of graduate school some of the best years of my life. Ivona Hideg, thank you for all your help, advice, and coffee breaks throughout the years 😊

Thank you to Sonya Basarke for being there for me day in and day out – you alone understood the ups and downs of the last five years and I could not have done it without your support. Thank you to Ellen Chang for having the incredible ability to motivate and inspire me; I am so thankful to have you in my life. Thank you to Samantha Montes for being the best mentor I could have possibly wished for. In you, I have made a lifelong friend.

Finally, I would like to thank my family, my big sister Debbie Cheng who I’ve always looked up to, and my mom and dad, Lisa and Louis Cheng, for your selflessness and generosity in putting aside your own priorities so that I could be in this position today. Thank you for listening to all the struggles and for being my biggest cheerleaders. You will never know how much I appreciate everything you have done for me. I owe you a debt that can never be re-paid. This dissertation is dedicated to you. To Justin Moy, my greatest supporter, thank you for your patience, your unwavering support, and always believing in me.
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The Dark and Bright Sides of Anxiety: A Comprehensive Examination of the Relation between State Anxiety, Trait Anxiety, and Job Performance

“Now is the age of anxiety.”

– W. H. Auden, American Poet, 1907-1973

This quote, spoken decades ago, has never resonated more strongly than it has today. Statistics indicate that 26% of United States citizens report feeling anxious for the majority of the week (United States General Social Survey, 2006). Given that individuals are spending a disproportionate amount of hours at work, combined with an accelerated pace of work and lower job security (Cooper, 1999), it is certainly the case that anxiety is prevalent in the workplace. In fact, research using the 2002 Canadian Community Health Survey and the National Population Health Survey indicates that approximately one in five employees perceiving their regular work days to be stressful tend to call in sick (Statistics Canada, 2006). Worse yet, a large scale study found that work stress led to depression and anxiety disorders in a sample of employees with no previous history of these disorders (Melchior et al., 2007). Moreover, anxiety has increased dramatically over the years. Meta-analytic findings indicate that between 1952 and 1993, anxiety has increased one full standard deviation (Twenge, 2000).

These statistics raise serious concerns, as anxiety experienced at work may have substantial implications for both employees and organizations. From the perspective of employees, anxiety causes employees to increase their prescription medicine, experience lower optimism and life satisfaction, and experience an increase in workplace accidents, feelings of isolation, and depression (Clark & Watson, 1991; Haslam, Atkinson, Brown, & Haslam, 2005; Schimmack, Oishi, Furr, & Funder, 2004; Shepperd, Grace, Cole, & Klein, 2005). From the perspective of organizations, anxiety can incite lower work morale and workplace attendance,
more negative employee attitudes, and higher levels of counterproductive workplace behaviours and turnover (Baba, Jamal, & Tourigny, 1998; Jones, 1980; Keyes, 2005; Maslach, 1976; Rodell & Judge, 2009). Moreover, the financial cost of anxiety in the workplace is estimated to be staggering (Greenberg et al., 1999).

The prevalence and impact of anxiety on various outcomes signifies that anxiety is a vitally important topic for research. Several researchers have acknowledged the importance of anxiety in an organizational context, for example, in relation to selection (e.g., Fletcher, Lovatt, & Baldry, 1997; McCarthy & Goffin, 2004) and organization socialization (e.g., Fisher, 1986; Saks & Ashforth, 1997). Yet the small number of studies on anxiety in the organization behaviour literature is startling. In contrast, the topic of anxiety figures prominently in many psychology and clinical psychology theories (Spielberger, 1972). Within this broader literature on anxiety, the prevailing notion is that anxiety is negative. Anxiety conjures up distressing thoughts and images, suggesting that it is something to be avoided (Baughman & Welsh, 1962). Empirical research also suggests that anxiety is associated with low performance on a range of criteria, such as academic tests (Hembree, 1988), selection tests (Proost, Derous, Schreurs, Hagtvet, & De Witte, 2008), and job interviews (McCarthy & Goffin, 2004). It has even been said that “...anxiety must be driven out of the workplace [italics added] to foster optimum performance and quality” (Reio & Callahan, 2004, p. 18). Thus, a “dark side” of anxiety has been widely theorized.

While this research has contributed to our general understanding of anxiety, in particular with regard to a “dark side” of anxiety, research has yet to examine just how robust the dark side of anxiety is. Specifically, it does not include consideration of the possibility for anxiety to have a “bright side”. A sole focus on the dark side of anxiety may be overly simplistic and
unrepresentative of the relation between anxiety and performance as a whole. The omission of a “bright side” of anxiety is a significant limitation in past research and theorizing on anxiety and performance. Yet, underlying several theoretical frameworks of anxiety is an intimation of a bright side of anxiety, in that it directs attention to self-regulatory processes (Eysenck & Calvo, 1992; Kanfer & Ackerman, 1989; Eysenck et al., 2007). Anxious individuals are able to exert effortful processing to compensate for the tendency towards distraction and adjust attention towards performance on a task (Derakshan & Eysenck, 2009).

Correspondingly, there is some empirical evidence that supports a bright side of anxiety (e.g., Hanton, Thomas, & Maynard, 2004; Jones & Hanton, 1996; Jones, Hanton, & Swain, 1994; Jones & Swain, 1995). In fact, it is not difficult to think of specific individuals who are highly anxious, yet are exceptional performers on the job. For example, Hollywood actor Johnny Depp has been noted to suffer from an anxiety disorder, yet few would say his performances of various characters on screen are anything short of transformative and captivating. We may even be able to think of specific individuals in our own lives that fit this description, such as a highly anxious faculty member who produces many quality publications in top-tier outlets. Thus, past research that conceptualized anxiety from a negative perspective may have provided an incomplete picture of the relation between anxiety and performance. This inconsistency in the literature, then, highlights the need for an inclusive model of anxiety and performance that considers a dark and bright side.

The purpose of this dissertation is to advance and test a framework that considers whether anxiety can exert positive and negative effects on job performance. This work extends past research by moving beyond the widespread assumption that anxiety is a negative construct. It considers the multifaceted nature of anxiety by highlighting the potential for both a dark and
bright side of anxiety. In considering whether anxiety can exert both negative and positive
effects on job performance, two main issues arise. The first issue concerns whether anxiety can
have both negative and positive implications on job performance. To address this issue, I
consider the process through which anxiety leads to performance. Thus, the first objective of this
dissertation takes a mediation framework. Specifically, drawing from Interference Theory (Wine,
1980), Integrative Resource Model (Kanfer & Ackerman, 1989), Processing Efficiency Theory
(Eysenck & Calvo, 1992), and Attentional Control Theory (Eysenck et al., 2007), I posit that
anxiety may lead to facilitative performance through self-regulatory processing, while anxiety
may lead to debilitative performance through off-task cognition. A figure of the proposed model
addressing the first objective is displayed in Figure 1. This is an important theoretical
contribution; it extends past research demonstrating inconsistent results between anxiety and
performance, and integrates positive and negative relationships into one unified dual-process
model.

The second issue that arises concerns when anxiety might lead to higher or lower levels
of performance. Thus, the second objective of this research takes a moderation framework. I
draw from classic motivation theory (e.g., Vroom, 1964) and extend my theoretical model by
considering motivation as a potential boundary condition. Specifically, I predict that the relation
between anxiety and self-regulatory processing, and the relation between anxiety and off-task
cognition, will be moderated by motivation. A figure of the proposed model addressing the
second objective is displayed in Figure 2. This is a significant contribution, as it advances our
theoretical understanding of the anxiety and performance relation by pinpointing when anxiety
might lead to debilitative and facilitative performance.
This dissertation is organized into five main parts. First, I review the construct of anxiety and distinguish it from related but distinct constructs such as neuroticism, negative affect, psychological distress, and stress. Second, I outline a theoretical model of anxiety and job performance by demarcating the mechanisms through which anxiety may lead to debilitative and facilitative performance by drawing from key theoretical frameworks. Third, I expand my theoretical model and put forth motivation as a moderator influencing when anxiety may debilitate or facilitate job performance. Fourth, I present two controlled experimental studies to test my hypotheses. Finally, I discuss the results of the experimental studies and outline theoretical and practical implications of this research.

**Conceptualization of Anxiety**

The construct of anxiety was a core construct in Freudian theories (1920). According to Freud, understanding anxiety was “the most difficult task that has been set us” (Freud, 1933, p. 113). Freud considered anxiety to be an “unpleasant affective state or condition of the human organism” (Spielberger, 1985, p. 173) or “all that is covered by the word ‘nervousness’, apprehension and anxious expectation” (Freud, 1924). It was not until Spielberger’s seminal work on anxiety that anxiety received widespread empirical examination. Spielberger (1985) defined anxiety as the tendency to experience a combination of emotional and physiological symptoms such as tension, worry, apprehension, and dread, with regard to the appraisal of threatening situations and cognitions of impending danger. In addition, anxiety is typically accompanied by physiological and behavioral markers, such as heart palpitation, disturbances in respiration, sweating, restlessness, tremor, and shuddering (Spielberger, 1972).

Individuals who experience anxiety possess hypervigilant cognitive schemas that present situations as threatening (Beck, 1976; Ellis, 1962). Anxious individuals are constantly scanning
the environment for signs of threat, which makes them prone to heightened distractibility (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). They exhibit a range of information processing biases, such that they are more likely to attend to threat-related stimuli, construe threat from ambiguous stimuli, and preferentially recall threat-related information (Mughal, Walsh, & Wilding, 1996). In addition, they have self-doubts regarding their ability to manage threatening situations, feel they lack the ability to cope, and lack confidence in their abilities (Shell & Husman, 2008). They feel they have no control over performance outcomes (Hembree, 1988) and have negative expectations of success; they are thus motivated by their desire to avoid negative performance outcomes (Elliot & McGregor, 1999). By the same token, anxiety can serve a motivating function, as anxious individuals are more sensitive to signs of negative feedback and are thus more vigilant in monitoring their surroundings and themselves (Eysenck & Derakshan, 2011). This hypervigilence can signal to individuals that more resources, such as effort, need to be allocated to the immediate task (Eysenck & Calvo, 1992).

**Trait and State Anxiety**

Spielberger (1966) pointed to the multifaceted nature of anxiety and distinguished between trait anxiety and state anxiety. Trait, or dispositional anxiety, is defined as “individual differences in the frequency that anxiety states are manifested over time” (Spielberger, 1972, p. 10). Trait anxiety is a relatively stable individual difference variable, such that all individuals carry a propensity to experience higher or lower levels of anxiety symptoms in the face of threatening situations. State anxiety is defined as “subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system” (pp. 16-17). State anxiety is a transient situation-specific variable, such that certain situations are likely to arouse more anxiety (i.e., job interviews) than others.
(i.e., lunch with a friend). While there are many types of specific anxieties, such as social anxiety, which refers to feelings of nervousness or apprehension regarding exhibiting “correct” social behaviors (McCarthy & Goffin, 2004), this dissertation is concerned with a broad examination of the core anxiety types, trait and state anxiety.

It is first important to consider the effect on job performance for individuals who are prone to experiencing trait anxiety. Understanding the trait anxiety-job performance relation is imperative because all employees carry a propensity for experiencing higher or lower levels of trait anxiety. Finding that trait anxiety leads to poor performance would be a serious issue. It would impact employee performance, health and well-being, and overall organizational functioning. It would suggest that anxiety needs to be addressed as early in the work cycle as possible. This finding would carry different implications for training, and developing strategies for coping with anxiety that are perhaps oriented towards a longer term focus than it would for state anxiety. Moreover, pointing to how or when trait anxiety can lead to higher levels of performance would be an important contribution, as it would lay the groundwork for developing strategies to help trait anxious individuals facilitate their performance that is focused on self-regulatory processing and motivational elements.

Understanding the state anxiety-job performance relation is also important. Specific situations can induce anxiety in the workplace, even for employees who may not generally be anxious. If performance is negatively affected for these individuals, it would have different implications in terms of understanding how to cope with anxiety, as well as any associated training programs for managing anxiety that may be oriented towards shorter-term, context-specific strategies. If performance is facilitated for these individuals, this would suggest that experiencing state anxiety can be beneficial under conditions of high motivation. This finding
would point to a bright side of anxiety and suggest an optimistic outlook for anxious employees. It would promote the development of context-specific strategies to help state anxious employees increase their motivation, and for organizations to motivate their employees. Thus, understanding how both trait and state anxiety affects job performance is critical.

**Distinguishing between Anxiety and Related Constructs**

Anxiety, although related to other constructs such as neuroticism, negative affect, psychological distress, and stress, is distinct from these constructs. Anxiety can be distinguished from *neuroticism*, which reflects the propensity to exhibit poor emotional stability and reflects a disposition towards experiencing a wider net of negative emotions such as fear and anger (Costa & McCrae, 1980, 1988; Goldberg, 1990). Anxiety is only one component of the neuroticism construct (Watson & Clark, 1984), along with depression, impulsiveness, hostility, self-consciousness, and vulnerability (McCrae & Costa, 1987). Importantly, a highly anxious individual is not necessarily high on the other facets of neuroticism. Anxiety can be distinguished from *negative affect*, which is conceptualized as an affective disposition reflecting differences in emotional experiences and feelings about the self (Watson & Clark, 1984). Individuals who are high in negative affectivity tend to experience a wide array of aversive emotional states, tending towards negative mood, and have a negative view of the self. A highly anxious individual is not necessarily plagued by a wider net of negative emotional states. Anxiety can be distinguished from *psychological distress*, which reflects mental anguish or suffering and an inability to cope with a stressor (Newman, 1994). Psychological distress is typically associated within the context of the stress and strain process (e.g., Selye, 1974). Further, psychological distress consists of five defining attributes: a) perceived inability to cope effectively; b) change in emotional status such as the experience of anxiety or irritability; c)
discomfort reflected in sadness or misery; d) communication of discomfort either verbally or physically; and e) harm reflected in pain or decreased self-esteem (Ridner, 2004). Feelings of anxiety are independent of coping ability, do not necessarily involve discomfort, the communication of anxious experiences, or harm.

Anxiety can also be distinguished from stress. Unlike anxiety, there is a wide divergence of opinion on precisely what constitutes stress. Indeed, “The term stress is enshrouded by a thick veil of conceptual confusion and divergence of opinion” (Motowidlo, Packard, & Manning, 1986, p. 618). Stress has been defined as a stimulus, a response, a characteristic of the environment, a characteristic of the individual, or an interaction between an individual and the environment (Parker & DeCotiis, 1983). For example, stress has been defined as “an emotional experience associated with nervousness, tension, and strain” (Hunter & Thatcher, 2007, p. 954). From this definition, it is clear that stress is often considered to be synonymous with anxiety. Certainly, anxiety is related to stress. The two have been found to correlate anywhere from .38 (Motowidlo et al., 1986) to .78 (Mughal et al., 1996). However, the two constructs are far from synonymous. Definitions of stress tend to converge on the notion of “fit”, where stress results from an imbalance between external or environmental challenges and the level of personal resources available to deal with these challenges (Baba et al., 1998; Lazarus & Folkman, 1984). Thus, stress represents a process that reflects how environmental or external stressors lead to subjective interpretations of stress which further leads to subsequent strain reactions (McGrath, 1970). Anxiety does not subsume an evaluation of individual resources available for coping with external stressors and does not consider stress tolerance. Further, the experience of stress and strain reactions (e.g., emotional exhaustion, burnout) is typically a result of present or ongoing stressors that have taken a psychological or emotional toll on an individual. Anxiety, on the other
hand, is future-focused. It reflects “anticipatory worry” (Petrac, Bedwell, Renk, Orem, & Sims, 2009, p. 313) to potential future-oriented threats (Beck & Clark, 1988; Clark, Beck, & Brown, 1989) that are typically unwarranted or disproportionate to actual threat (e.g., “I am presently worrying over possible misfortunes”; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). This future orientation is consistent with the proneness of anxious individuals to constantly scan the environment for signs of threat, as the future signals uncertainty and thus requires constant monitoring.

**Literature Review**

Although anxiety and performance have not been studied extensively in a work context, the literature on anxiety and performance in the broader psychology literature is wide-reaching. In this section, I present a comprehensive literature review. First, I review research examining anxiety and performance in the general psychology literature. Next, I review the limited research on anxiety and performance in work contexts. Finally, I review research on related constructs neuroticism and stress in relation to performance. I end this section with a summary of past research on anxiety and performance, and discuss limitations of past research.

**Anxiety and Performance in the General Psychology Literature**

The dominant perspective of the anxiety-performance relation in a review of the general psychology literature is negative. This perspective has been supported by meta-analytic estimates based on decades of research demonstrating negative relationships between state anxiety and trait anxiety on the one hand, and academic performance (Seipp, 1991), creative performance (Byron & Khazanchi, 2011), and sport performance on the other (Kleine, 1990). This meta-analytic research has found an overall effect size ranging from -.03 to -.21 between state anxiety and trait anxiety on the one hand and performance on the other. This negative relationship has also been
supported in laboratory studies examining performance on simulation tasks (Schell & Grasha, 2000), task switching tasks (Derakshan, Smyth, & Eysenck, 2009), reaction time tasks (Eubank, Collins, & Smith, 2002), and multitasking (Eysenck, Payne, & Derakshan, 2005).

It is important to note that the majority of past studies that have found a negative relationship between state anxiety, trait anxiety, and performance precluded a test of the full range of anxiety. The majority of these studies have focused on maximum-type performance situations, such as taking an exam or performing in a sports competition. These studies inadvertently consider moderate to high levels of anxiety. For the types of situations that were examined in past research, such as a police shooting exercise (Nieuwenhuys & Oudejans, 2010), tests and exams (Seipp, 1991), and performance in sports competitions (Kleine, 1990), it is fitting that high levels of anxiety were considered. However, these studies may fail to capture low levels of anxiety, and in many cases do not explicitly examine high, moderate and low levels. It is important to consider three levels of anxiety in order to provide a comprehensive examination of the anxiety-performance relationship, including a test of the causal nature of the relation between anxiety and performance and the direction of effect.

Although a negative relation between anxiety and performance represents the dominant perspective, there is some suggestion of a positive relation between anxiety and performance. In particular, researchers in educational psychology (Alpert & Haber, 1960) and sports psychology (Carrier, Higson, Klimoski, & Peterson, 1984; Couch, Garber, & Turner, 1983; Jones & Swain, 1992) have noted the possibility for situation-specific anxiety to exert facilitative effects on performance. For example, qualitative research suggests that athletes at times perceive their anxiety to be facilitative to their performance (Hanton & Connaughton, 2002; Hanton & Jones, 1999). These researchers suggest various models of a facilitative side of anxiety that involve
evaluating one’s own experience of anxiety in a positive or healthy challenge state as opposed to a threat state. Athletes who perceive their anxiety as helpful to their performance on a competition are suggested to perform better than those who perceive their anxiety as a decrement or threat to their performance (Jones & Hanton, 2001; Jones, Meijen, McCarthy, & Sheffield, 2009; Mellalieu, Hanton, & Jones, 2003). Importantly, however, a close inspection of these models reveals a confound between construct and outcome. Specifically, participants are asked to make a subjective judgment of whether they interpret their experience of anxiety as debilitate or facilitative, regardless of whether they are aware of its effect and regardless of whether anxiety actually has a positive or negative impact on performance. In other words, rather than objectively assessing whether anxiety leads to performance, participants are asked to interpret their own anxiety in relation to their performance. This leaves open the assessment of how anxiety can be facilitative or debilitative through methods that are not confounded with the outcome of interest.

**Anxiety and Performance in Work Contexts**

Little research has been devoted to studying the relation between anxiety and performance in work contexts. A recent meta-analysis (Ford, Cerasoli, Higgins, & Decesare, 2011) of 14 studies examining the relationship between psychological health, including anxiety, and job performance, found an overall effect size of $\rho = -.18$, which is in line with findings on anxiety and general performance in the psychology realm. However, an examination of the 14 studies included in this meta-analysis reveals that only six studies actually examined anxiety (Barling, Rogers, & Kelloway, 2001; Donaldson & Blanchard, 1995; Grant-Vallone, 1998; Guilford, 1952; Rego & Cunha, 2008; Slaski & Cartwright, 2002). The remaining studies examined distress (Burton, Conti, Chen, Schultz, & Edington, 1999), psychological strain
(Kagan, Kagan, & Watson, 1995; Lang, Thomas, Bliese, & Adler, 2007), stress (Loewenthal, Eysenck, Harris, Lubitsh, & Bicknell, 2000), psychological distress (Nowack, Gibbons, & Hanson, 1985), control of anxiety, tension, and stress reaction (Barnes, 1984), and emotional stress (Rutledge et al., 2009). Although these constructs are related to anxiety, they are not the same thing, as discussed in the previous section. Moreover, this meta-analysis was not comprehensive in including additional studies that have examined anxiety and job performance in a work context.

To that end, a comprehensive list of studies that have examined anxiety and job performance in a work context are reviewed in Table 1. Distinct constructs, such as psychological distress, strain, and stress were not included in this review. Of the 20 studies found, ten examined general levels of state or trait anxiety (Barling et al., 2001; Guilford, 1952; Kagan et al., 1995; Mughal et al., 1996; Perkins & Corr, 2005; Regehr, LeBlanc, Jelley, & Barath, 2008; Reio & Callahan, 2004; Schell & Grasha, 2000; Spector, Dwyer, & Jex, 1988; Steen, Firth, & Bond, 1998). The remaining studies examined specific types of anxiety such as sales call anxiety (Verbeke & Bagozzi, 2000), communication anxiety (Pitt, Berthon, & Robson, 2000), promotional exam anxiety (Chung, Ehrhart, Ehrhart, Hattrup, & Solamon, 2010; McCarthy, Hrbluik, & Jelley, 2009), anxiety from a health or well-being perspective (Donaldson & Blanchard, 1995; Grant-Vallone, 1998; Rego & Cunha, 2008; Slaski & Cartwright, 2002; Steen et al., 1998), or anxiety from a physiological perspective (Murphy, Duxbury, & Higgins, 2006; Nieuwenhuys & Oudejans, 2010; Regehr et al., 2008).

When studies examining general anxiety and performance in a work context are considered, findings reveal either no relation or a low negative relation between anxiety and performance (an exception is a positive relation between anxiety and performance found by
Mughal et al., 1996). When studies examining more specific types of anxiety are considered, findings similarly reveal either no relation or a low to moderate negative relation between anxiety and performance (an exception is a positive relation between anxiety and performance found by Regehr et al., 2008). Overall, this research is mixed – approximately half of the correlations reported in these studies are indicative of no relation between anxiety and performance, with the other half of the correlations reported indicative of a small negative relation between anxiety and performance, and two studies pointing to positive effects of anxiety on performance.

**Neuroticism and Job Performance**

As previously stated, anxiety is one component of the neuroticism construct (Watson & Clark, 1984). Thus, while it is distinct from neuroticism, research on neuroticism and job performance provides some insight into the relation between anxiety and job performance. To date, several meta-analyses on neuroticism and job performance have been conducted (e.g., Barrick & Mount, 1991; Judge & Bono, 2001; Salgado, 1997; Tett, Jackson, & Rothstein, 1991), and findings are inconsistent. A meta-analytic review by Tett and colleagues (1991), as well as a study by Salgado (1997), found that neuroticism exhibited a negative relation with job performance. In contrast, a meta-analysis by Barrick and Mount (1991) found that neuroticism was associated with an increase in job performance, albeit only among professionals, and Judge and Bono (2001) reported a positive meta-analytic relation between neuroticism and job performance. More recently, Le and colleagues (2010) predicted and found that emotional stability (low neuroticism) and task performance are curvilinearly related, although other studies examining the relation between neuroticism and job performance have not found support for a curvilinear relation (e.g., Smillie et al., 2006). These equivocal findings, with some research
finding positive relations between neuroticism and performance, some research finding negative relations between neuroticism and performance, and some research supporting a curvilinear relationship, indirectly support the potentially complex relation between anxiety and performance that spans a bright and dark side.

**Stress and Job Performance**

In order to provide a comprehensive review of the literature with regard to anxiety and performance, it is also important to review the literature assessing the relation between stress and job performance. Demonstrating the disorderliness of the stress literature, Jex, Beehr, and Roberts (1992) reviewed 51 articles from the organizational literature and identified 41% of articles that examined stress as the cause, 22% of articles that examined stress as the effect, and 25% of articles that examined stress as both cause and effect. In 14% of the cases it was unclear how stress was used. Thus, the confusion in the stress literature is mostly a function of how some researchers consider stress to reflect one of the three components in the stress process (stressor/cause, stress/intervening variable, strain/effect), while others consider the stress process in its entirety. In general, meta-analytic stress research has found a negative relationship between various stressors and job performance (Eatough, Chang, Milosavic, & Johnson, 2011; Fried, Shirom, Gilboa, & Cooper, 2008; Shirom, Gilboa, Fried, & Cooper, 2008) and between strain and job performance (Chang, Johnson, & Yang, 2007). Interestingly, early theorizing on stress made the distinction between “negative” and “positive” stress, or distress and eustress, respectively (Selye, 1964, 1987). Eustress was conceptualized to represent an optimal, or moderate, level of stress. Whether stress represents distress or eustress is dependent on an individual’s interpretation and reaction to the external stressor (Selye, 1987). Despite this early theorizing, stress as a negative experience (i.e., “distress”) has dominated the stress literature,
while stress as a positive experience (i.e., “eustress”) has received considerably less empirical examination. Despite the limited empirical research on eustress, early theorizing on a positive side of stress is suggestive of the potential for stress-related constructs to increase performance.

**Anxiety and Job Performance: Summary**

Although there has been no shortage of research on general anxiety and related constructs in relation to performance, a thorough review of the literature indicates that, despite decades of research, findings are inconsistent. Importantly, our theoretical understanding of the anxiety and job performance relationship is still limited in three important ways. First, research has not specified the process through which state and trait anxiety may lead to lower or higher levels of job performance. This is an important limitation, as understanding the mechanisms through which anxiety may increase or decrease performance can provide clarity to past inconsistent findings. It would also provide a more comprehensive picture of how anxiety affects performance. Second, past research has not delineated boundary conditions through which anxiety may be facilitative and/or debilitative. This is important in outlining a comprehensive model of the anxiety and job performance relation, as it would indicate when anxiety has a debilitative or facilitative effect on performance. Third, past research has failed to consider an integrative model of anxiety and performance that considers both negative and positive relationships. This has created confusion in terms of understanding the precise relation between anxiety and performance, evidenced through equivocal findings in the literature.

Below, I present a theoretical model of anxiety that includes both positive and negative relationships with job performance and the condition under which anxiety may facilitate or debilitate performance. In doing so, I answer the following questions: What is the true relationship between anxiety and job performance? Can anxiety both debilitate and facilitate
performance? What is the process through which anxiety leads to performance? When might anxiety facilitate or debilitate performance?

The Current Study: Theory and Hypotheses

To advance and test a theoretically driven model of anxiety that includes the possibility for both a dark and bright side, I first clarify the process through which anxiety may lead to debilitative and facilitative job performance. That anxiety exerts differing effects on performance may be an indicator of contradicting processes. Four cognitive processing theories shed light on the mechanisms underlying the anxiety-performance relationship. These theoretical frameworks include Interference Theory (Wine, 1980), Integrative Resource Model (Kanfer & Ackerman, 1989), Processing Efficiency Theory (Eysenck & Calvo, 1992), and Attentional Control Theory (Eysenck et al., 2007). Drawing from these theories, I suggest that anxiety may lead to debilitative performance through off-task cognition, and may lead to facilitative performance through self-regulatory processing. Past research demonstrating null or weak effects (e.g., Barling et al., 2001; Chung et al., 2010; Spector et al., 1988) may have been an indicator that the positive and negative effects cancelled out in the absence of a test for the mechanisms.

Mechanisms of the Anxiety-Performance Relation

Anxiety Can Debilitate Performance: Off-Task Cognition

Interference Theory (Wine, 1980) suggests how anxiety may lead to debilitating levels of performance. This theory posits that anxiety reflects a cognitive processing style prone to cognitive interference, which refers to “intrusive thoughts – thoughts that are unwanted, undesirable, and perhaps disturbing” (Sarason, Pierce, & Sarason, 1996, p. 139). Cognitive interference, or off-task cognition, is the tendency to spend a disproportionate amount of cognitive processing ruminating on task-irrelevant thoughts. This creates a cognitive bias, such
that anxious individuals spend an excessive amount of cognitive processing capacity on threatening stimuli (Eysenck, 1992). This intrusive thinking prevents full concentration on one task, and causes “cognitive time-sharing overloads” (Sarason, Sarason, Keefe, Hayes, & Shearin, 1986, p. 216). Anxious individuals experience more intrusive thoughts that may be self-deprecating, self-preoccupying, and insecure in nature (Sarason, 1984). For example, anxious individuals may worry about their performance and expect failure, and these feelings of inadequacy take precedence and preoccupy their thoughts. Anxious individuals may also be prone to distraction. As such, they may spend an unreasonable amount of cognitive processing worrying about what others are doing, or thinking about the list of tasks waiting for them to attend to. This interferes with the mental processes required of performing a task, and decreases the amount of cognitive processing capacity available for the task at hand (Matthews, 1993).

This focus on off-task cognition means that anxiety can lead to a less thorough processing of information (Clore, Schwarz, & Conway, 1994; Loewenstein & Lerner, 2003). Diverting attention away from the task leads to fewer resources available to devote to that task, which should decrease performance. Thus, cognitive interference theory suggests a linear positive relationship between anxiety and off-task cognition, and a linear negative relationship between off-task cognition and subsequent performance.

Indirect support for off-task cognition as a mechanism comes from past research demonstrating negative relations between state and trait anxiety and performance on a variety of performance tasks, such as in test-taking situations (Alpert & Haber, 1960; Benjamin, McKeachie, Lin, & Holinger, 1981; Chapell et al., 2005; Hembree, 1988; Seipp, 1991; Spielberger, 1966), simulated performance tasks (Schell & Grasha, 2000), performing in sports competitions (Kleine, 1990), and performance in a work context (Murphy, Duxbury, & Higgins,
2006). For example, situation-specific communication anxiety and sales call anxiety have been found to be negatively related to sales performance (Pitt et al., 2000; Verbeke & Bagozzi, 2000). These findings are consistent with an off-task cognition framework, as sales occupations demand persuasion, negotiation, and monitoring conversation flow. During such an interaction, engaging in off-task thoughts would detract from these demands. Indeed, Verbeke and Bagozzi (2000, p. 92) noted that “sales call anxiety intrudes into goal-directed activities” and this resulted in poor performance.

**Anxiety Can Facilitate Performance: Self-Regulatory Processing**

It also makes intuitive sense to think of a facilitative side of anxiety. Research examining a curvilinear relation between anxiety and performance lends indirect support for both a positive and negative effect on performance. A curvilinear (i.e., inverted-U) relation between anxiety and performance suggests that performance is highest at moderate levels of anxiety, while performance is lowest at low and high levels of anxiety. However, two limitations of past research examining a curvilinear relation between anxiety and performance constrain support for predicting a curvilinear relation between anxiety and performance. The first concerns past research erroneously grounding tests of curvilinear relations on the Yerkes-Dodson law (1908). The second issue reflects limited and inconsistent empirical support for a curvilinear relation.

A facilitative side of anxiety and related constructs was made popular by the Yerkes-Dodson law (1908). Specifically, many researchers point to Yerkes and Dodson as demonstrating that arousal may exert facilitative effects on performance. Despite the popularity of the Yerkes-Dodson law (1908), the validity of the proposed curvilinear relation has not been without criticism (see Bäumler, 1994; Neiss, 1988; Teigen, 1994 for reviews). Teigen (1994) argues that the original studies, using mice as subjects, were actually testing the relation between
punishment (administered through electric shock) and learning. However, it remains unclear what the boundaries of each level of shock were, particularly the moderate and high levels (Brown, 1965). It is also unclear whether the original findings should be generalized to human performance in a work context. Certainly, consideration of whether electric shock in mice affects learning is quite distinct from consideration of whether trait and state levels of anxiety affect human performance. Over the years, researchers have cited Yerkes-Dodson (1908) as supporting the positive relations between various concepts (e.g., stimulus strength, drive level, magnitude of reward) and outcomes (e.g., learning, proficiency, performance efficiency, quality of performance). Yet, the original Yerkes-Dodson (1908) experiments were completely dissociated from the terms “arousal”, “stress”, and “anxiety”. Thus, depicting a facilitative relation between anxiety and performance based on Yerkes-Dodson is inaccurate and “the error probably reflects a certain level of misunderstanding in the whole discipline” (Winton, 1987, p. 202). The popularity of the Yerkes-Dodson law (1908) is disproportionate to actual empirical support, causing researchers to conclude that perhaps the Yerkes-Dodson law “never existed” (Teigen, 1994, p. 542).

The point in contention is that the Yerkes-Dodson law (1908) has been incorrectly cited in supporting a curvilinear relationship between anxiety and performance. Notwithstanding these issues, researchers have tested a curvilinear relation between anxiety and performance. Findings are somewhat mixed. Some studies have found support for a curvilinear relation (e.g., AbuAlRub, 2004; Byron, Khazanchi, & Nazarian, 2010; Chamberlain & Hale, 2007; Gould, Petlichkoff, Simons, & Vevera, 1987; Jamal, 1984; Onyemah, 2008; Rocklin, O’Donnell, & Holst, 1995; Rocklin & Thompson, 1985), and others have found no support for a curvilinear relation (e.g., Smillie et al., 2006, Study 1), or opposite findings (e.g., U-shaped relation; Leung,
Huang, Su, & Lu, 2011). Stress research examining curvilinear relationships between stress and job performance parallel the inconsistency found in the anxiety literature (for a review, see Cohen, 1980). Further, research suggesting a curvilinear relation between anxiety and performance has not pinpointed the mediating mechanisms underlying the association between anxiety and performance.

I suggest that two cognitive processing theories provide valuable insight into how anxiety can facilitate performance. First, the Integrative Resource Model (Kanfer & Ackerman, 1989) posits that, in using cognitive resources on a task, individuals can allocate attention off the task (off-task processing) or to self-regulatory processing. Depending on which route is taken, these information-processing strategies can facilitate or debilitate performance. Off-task processing represents attention that is not being directed to the task at hand (Kanfer & Ackerman, 1996), and, as discussed in the previous section, is suggested to debilitate performance. In contrast, self-regulatory processing allows individuals to adjust and strengthen attentional resources according to the demands of the task, for example by increasing goal commitment, decreasing daydreaming, ignoring distractors, and stopping task-irrelevant thoughts (Muraven & Baumeister, 2000). These self-regulatory activities are aimed at redirecting attentional resources back to the task and enables individuals to maintain attention and effort on the task (Kanfer & Ackerman, 1996).

Further, Eysenck recently developed a theory of attentional control that I suggest can shed more insight into how anxiety can facilitate performance. This Attentional Control Theory (ACT; Eysenck et al., 2007) was developed based on past cognitive processing theories such as the Integrative Resource Model (Kanfer & Ackerman, 1989) and Processing Efficiency Theory (PET; Eysenck & Calvo, 1992). PET proposes that anxious individuals spend a disproportionate
amount of cognitive processing worrying about any number of issues that are not task related. Although worry may negatively affect processing efficiency, PET suggests that it may not necessarily affect processing effectiveness. Empirical evidence in support of this notion has come from a number of studies that have found high test anxious participants to perform as well as low test anxious participants on reading comprehension tests (Calvo & Carreiras, 1993; Calvo, Eysenck, Ramos, & Jiménez, 1994, Experiments 2, 3, and 4), verbal reasoning tasks (Darke, 1988, Experiments 2 and 3), and spatial reasoning tasks (Markham & Darke, 1991), albeit with increased reading times. PET suggests that anxious individuals can allocate additional resources such as effort to the task at hand to compensate for their preoccupation tendencies.

ACT further specifies how anxious individuals can use self-regulatory processing to focus attention on the task. ACT posits that anxiety affects performance through its influence on attentional control, a key function of the central executive. The central executive is considered to have three main functions. The inhibition function uses attentional control to keep task-irrelevant stimuli from interfering with the current task; the shifting function uses attentional control for selective attention in order to stay on task; the updating function monitors and updates working memory to keep one’s attention on task (Derakshan & Eysenck, 2009). ACT thus suggests that anxious individuals can use resources such as effortful processing and increased use of attentional control mechanisms to offset negative effects on performance. Worry inherent in anxious individuals should lead to the allocation of additional processing resources directed to the task to improve performance and minimize worry (Derakshan & Eysenck, 2009).

These theories thus have in common the influence of self-regulatory processes as mediating the relation between anxiety and performance. That is, anxious individuals may use self-regulatory resources to monitor their progress in order to make needed adjustments to
facilitate performance. This focus on self-regulatory resources means that anxiety can lead to a more thorough processing of information (Clore et al., 1994; Loewenstein & Lerner, 2003), which can increase performance. Thus, these theories suggest a linear positive relation between anxiety and self-regulatory processing, and a linear positive relation between self-regulatory processing and subsequent performance.

A review of empirical research demonstrating a positive relation between state and trait anxiety and performance on various tasks, such as taking notes during a lecture (Carrier et al., 1984) and performing sports (Hardy & Hutchinson, 2007) indirectly suggests self-regulatory processing as a potential mechanism. For example, Carrier and colleagues (1984) manipulated a high and neutral level of anxiety, wherein participants in the high anxiety condition were told that they will hear a lecture on something unfamiliar and will be presented with a difficult task after. Participants in the neutral condition were told that they will hear a lecture and will be presented with a test after. High anxiety participants who considered their anxiety to be facilitative to their performance had the highest note quality scores. Hardy and Hutchinson (2007) found that state anxiety had a positive relation with performance on a rock climbing route, suggesting that participants who were able to invest their resources focusing on the task and were not distracted by peripheral cues were able to perform effectively. Although these studies are in line with a self-regulatory processing framework, none of these studies have examined self-regulatory processing as a mechanism.

Theoretically, it is possible to be engaged in both self-regulatory and off-task processes simultaneously. For example, one can be focused on coming up with a budget plan for a committee meeting taking place in a half hour while at the same time thinking about what to eat for dinner that evening. A study of police officers in a selection context conducted by McCarthy
et al. (2009) provides empirical support for this proposition. Specifically, behavioral anxiety (i.e., autonomic arousal associated with testing situations) and performance anxiety (i.e., concern over test outcomes), both situation-specific types of anxiety associated with test-taking, were found to debilitate promotional exam performance by leading to off-task cognition, and to facilitate promotional exam performance by leading to self-regulatory processing. Studies that have found no relation between anxiety and performance, or weak relations between anxiety and performance, provide indirect support for both mediating processes operating concurrently. For example, state anxiety was found to have no relation with performance on a promotional exam in a sample of participants from police and fire departments in the United States (Chung et al., 2010). In another study, both state and trait anxiety were found to have no relation with self-ratings of overall job performance (Reio & Callahan, 2004). Interestingly, this latter study consisted of employees from a variety of occupations such as managers, writers, graphic editors, and landscape workers. In some of these occupations, it is possible to think of task-irrelevant issues while continuing to work effectively (e.g., landscaping). For other occupations that demand total focus (e.g., writers), off-task thoughts are likely to negatively affect productivity. Assessing a wide range of occupations likely captured a broad range of performance capabilities and requirements such that certain tasks drew on one cognitive process more so than other tasks, which resulted in a null effect. Thus, in the proposed model, I suggest that the relative strength of one process over the other is what is expected to lead to debilitative or facilitative performance. That is, focusing more self-regulatory processes should facilitate performance. In contrast, being distracted by off-task thoughts such as dinner plans should debilitative performance. Combined, my theoretical model suggests a dual-process model of anxiety, such that anxiety will lead to
debilitative job performance when individuals engage in off-task cognition, and will lead to facilitative job performance when individuals engage in self-regulatory processing. Formally:

*Hypothesis 1:* Off-task cognition will mediate the relation between trait anxiety and job performance.

*Hypothesis 2:* Off-task cognition will mediate the relation between state anxiety and job performance.

*Hypothesis 3:* Self-regulatory processing will mediate the relation between trait anxiety and job performance.

*Hypothesis 4:* Self-regulatory processing will mediate the relation between state anxiety and job performance.

**Motivation as Moderator of the Anxiety-Performance Relation**

Off-task cognition and self-regulatory processing are positioned as the mechanisms through which anxiety may have debilitative and facilitative effects on performance. This raises the question, when might anxiety lead to off-task cognition, and when might anxiety lead to self-regulatory processing? The second objective of this dissertation extends the proposed theoretical model by specifying the condition through which state and trait anxiety may lead to facilitative and debilitative performance. A comprehensive model of anxiety and job performance is informative from a theoretical standpoint, as it provides clarification into the nature of the relation between anxiety and performance that has seen somewhat inconsistent results over decades of past research.

Expectancy, or VIE theory (Vroom, 1964) serves as a fitting theoretical framework to examine when anxiety might facilitate or debilitate performance for three main reasons. First, motivation in past research has been treated as a unidimensional construct, which has limited
more nuanced understanding into how anxiety might facilitate or debilitate performance. Given
the conceptualization of motivation as a multidimensional construct in the expectancy
framework of motivation (Vroom, 1964), adopting this theory as a starting point should draw out
these nuances. Second, as described below, there is a strong conceptual fit between the
constructs highlighted in Expectancy Theory and the anxiety-performance relation that make the
selection of this theory appropriate for examining how anxiety might debilitate or facilitate job
performance in an organizational context. Third, Expectancy Theory has been examined across
decades of research as a key motivational theory (Kanfer, 1990) and has received considerable
support in a wide variety of contexts (Mitchell, 1982; Van Eerde & Thierry, 1996).

Expectancy Theory (Vroom, 1964) is a theory of motivation based on the notion that
individuals invest effort into behaviour that is believed to result in desired outcomes. Motivation
is influenced by three components: valence, instrumentality, and expectancy (i.e., VIE theory).
Valence refers to the attractiveness, desirability, or anticipated satisfaction of an outcome or
reward (Vroom, 1964). In the context of the proposed model, valence refers to any rewards
associated with good performance. In an organizational context, these rewards may range from
monetary incentives to positive feedback. The notion is that anxiety may facilitate performance
to the extent that rewards are valued. Thus, if an employee is experiencing anxiety about a
particular work task, but the reward associated with that task is something that is valued, then the
employee will focus their efforts and monitor their progress in order to achieve this desired
result. On the other hand, if the reward associated with that task is something that is not valued,
then the employee will more likely be distracted by peripheral cues that negatively affect their
performance.
Instrumentality refers to an individual’s belief that they will receive the desired outcome as specified in the valence component if they meet the specified performance requirement (Vroom, 1964). In the context of the proposed model, instrumentality refers to the probability that performance is linked to a certain reward. It is operationalized as the extent to which individuals believe that high levels of performance will secure a valued reward. If an employee is experiencing anxiety about a particular work task, but they believe that high levels of performance on that task will be linked to a valued reward, then they are more likely to focus on the task. On the other hand, if performing well on the task is not believed to be linked to the valued reward, anxiety will be more likely to lead to off-task cognition.

Expectancy refers to the perception that the effort exerted will lead to the desired outcome as specified in the valence and instrumentality components. In the context of the current model, expectancy is operationalized as the individual’s belief that their effort will lead to successful or effective performance. Thus, if an employee is experiencing anxiety about a particular work task, but also feels that their effort will lead to high levels of performance, then anxiety is more likely to facilitate their focus on the task at hand. On the other hand, if effort is not felt to lead to high levels of performance, then anxiety will be more likely to lead to off-task cognition.

Research on Expectancy Theory has overwhelmingly asked respondents to subjectively rate their own instrumentalities, expectancies and valences for a prepared list of outcomes. Instrumentality is typically assessed by asking respondents to rate the degree to which they perceive that obtaining a first-level outcome (e.g., attaining a high level of sales) will lead to a specified list of second-level outcomes (e.g., raise). Expectancies are typically assessed through respondents’ rating of the degree to which they feel exerting effort will lead to these same
outcomes. Valence is typically assessed by asking respondents to rate the desirability of these outcomes. However, using subjective probability measures has “impeded expectancy research” (Eden, 1988, p. 639). A meta-analysis of Expectancy Theory and work-related criteria emphasized the importance of using experimental designs (Van Eerde & Thierry, 1996). Experimental designs provide a controlled environment to observe the effect in which one is interested.

Although past research examining anxiety and performance has not taken motivation into consideration, a review of empirical research demonstrating a negative relation between state and trait anxiety and performance has suggested the presence of low levels of motivation. For example, state anxiety has been found to be negatively related to performance on task switching exercises (i.e., performance is compared on trials where half involve one task and half involve another task; Derakshan et al., 2009), on geometric analogy tasks (Leon & Revelle, 1985), on concept learning tasks (Meyers & Martin, 1974), and on simulated driving tasks (Wilson, Smith, Chattington, Ford, & Marple-Horvat, 2006). Trait anxiety has also been found to be negatively related to skill acquisition (Colquitt, LePine, & Noe, 2000), and performance on the Corsi Block Task (i.e., participants are presented with a tapped sequence of blocks and are required to respond by tapping the same sequence; Eysenck et al., 2005). It is likely that participants were not sufficiently motivated to successfully perform the tasks well, as no incentives for high performance were included in any of these studies.

At the same time, past research that suggested the presence of high levels of motivation point to how anxiety can facilitate performance. For example, researchers in the educational domain have found that high anxiety participants who considered their anxiety to be facilitative to their performance made the highest quality notes in a lecture (Carrier et al., 1984). Although
this research confounds construct and outcome, as discussed previously, it is possible that participants with the highest quality notes were most motivated to achieve a high grade in the course. Thus, a high level of motivation may have guided participants to engage in self-regulatory processing, which in turn facilitated performance. Similarly, with regard to anxiety and performance in work contexts, trait anxiety has been found to lead to positive sales performance in two samples of insurance sales consultants (Mughal et al., 1996). Although the task also involved sales performance similar to Pitt et al. (2000) and Verbeke and Bagozzi (2000), who found a negative relation between anxiety and job performance, sales performance was operationalized in a different manner. Specifically, Verbeke and Bagozzi (2000) focused on subjective perceptions of communication quality during a sales interaction, and Pitt et al. (2000) used a one-item rating of performance. In contrast, the study by Mughal et al. (1996) included objective indicators such as number of appointments made, number of people seen, and number of hours worked. Motivation would likely have more of an impact here, as employees with high levels of motivation would put forth more effort in making a high number of appointments, seeing more clients, and working the most hours.

Motivation, as indicated through valuing a reward associated with the task (valence), believing that attaining the reward is associated with high performance on the task (instrumentality), and believing that effort will lead to high performance (expectancy), is expected to moderate the positive relation between anxiety and off-task cognition. Anxious individuals who are not motivated will not apply the attention necessary for carrying out work tasks, and be more prone to distraction by off-task cognitions. Motivation is also expected to moderate the positive relation between anxiety and self-regulatory processing. Anxious
individuals who are highly motivated will be more likely to monitor their own progress to ensure they are on track to completing the task. Formally:

*Hypothesis 5a:* Motivation will moderate the positive relationship between trait anxiety and off-task cognition. This relation is expected to be stronger for individuals with low levels of motivation and weaker for individuals with high levels of motivation.

*Hypothesis 5b:* Motivation will moderate the positive relationship between state anxiety and off-task cognition. This relation is expected to be stronger for individuals with low levels of motivation and weaker for individuals with high levels of motivation.

*Hypothesis 6a:* Motivation will moderate the positive relationship between trait anxiety and self-regulatory processing. This relation is expected to be weaker for individuals with low levels of motivation and stronger for individuals with high levels of motivation.

*Hypothesis 6b:* Motivation will moderate the positive relationship between state anxiety and self-regulatory processing. This relation is expected to be weaker for individuals with low levels of motivation and stronger for individuals with high levels of motivation.

**Research Strategy**

I conducted two experimental studies to test my propositions. Trait anxiety was assessed through self-report approximately one week prior to the laboratory session, where state anxiety was manipulated. In Experiment 1, I examined *whether* anxiety can debilitate and facilitate performance by considering the dual processes through which anxiety affects job performance (see Figure 1). Specifically, I examined the relation between anxiety and off-task cognition (Hypotheses 1a, 1b) and the relation between anxiety and self-regulatory processing (Hypotheses 3a, 3b), as well as the differential relations between the mechanisms and performance
(Hypotheses 2, 4). Experiment 1 was situated in the context of an in-basket task, which is described in the methodology section below.

In Experiment 2, I examined a potential boundary condition specifying when anxiety may lead to facilitative and debilitative performance (see Figure 2). Specifically, I examined the extent to which motivation moderates the relation between anxiety and off-task cognition (Hypotheses 5a, 5b), and the relation between anxiety and self-regulatory processing (Hypotheses 6a, 6b). Consistent with Experiment 1, Experiment 2 was situated in the context of an in-basket task. I extended Experiment 1 by also manipulating motivation, consistent with an expectancy framework (Vroom, 1964).

Although job performance served as the criterion of interest, tests of study hypotheses are best conducted through experimental studies in a laboratory setting for several reasons. First, laboratory studies provide adequate control to isolate the variables of interest without the confound of extraneous variables inherent in a field setting. Second, laboratory studies allow for the manipulation of state anxiety, which provides a more internally valid context through which to derive causal conclusions that a field study does not provide. Third, experimental studies allow all participants to uniformly perform a standardized job-based performance task. Given the range of performance tasks that have been examined in past research in relation to anxiety and performance, it is important to examine the relation between anxiety and job performance in a standard task across participants to provide a sound test of the proposed theoretical model. This will strengthen the conclusions made with regard to the effect of anxiety on job performance.

Moreover, in order to provide a stronger test of the model, several steps were taken to improve the generalizability of the laboratory studies. First, a sample of working adults and young adults was obtained. In essence, workers were taken out of their respective workplaces
and given the same standardized task in the same environment where the variables of interest are controlled. Second, to provide a high fidelity context to both experiments, participants were told to act as if they were at a typical day on the job. This was facilitated by the set up in the laboratory, which took place in a room with a desk that participants worked on, complete with a computer that served as their employee work space for the duration of the task. Third, with respect to the task, participants completed a standardized in-basket task that required them to make decisions as if they were on the job. Participants were told that their performance will be evaluated by a supervisor. Standardizing the performance task allows for a more accurate measure of the performance criterion that is easily comparable across participants.

**Experiment 1 Method**

**Participants**

Experiment 1 consisted of 360 undergraduate students. Participants were recruited at a large North American university from the management department credit pool. Participants completed the study in exchange for 1.0 course credit in their corresponding management course. Fifty-four participants were excluded from the analysis due to substantial missing data (e.g., 24 did not attend the laboratory portion of the study) or failing to listen and co-operate with experimental instructions and procedures, leaving a total of 306 participants in the final sample (55% female). Participants ranged in age from 17 to 28 years ($M = 19.69, SD = 1.76$). Of the participants who reported their ethnicity, 193 (63%) participants were Chinese, 47 (15%) were South Asian, 15 (5%) were South East Asian, 14 (5%) were Other, 12 (4%) were White, 6 (2%) were Arab/West Asian, 4 (1%) were Filipino, 3 (1%) were Korean, 2 (1%) were Latin American, 1 (< 1%) was Japanese, 1 (< 1%) was Black, and 8 (3%) were unreported. The majority (93%) of participants were enrolled in full-time studies at the University. On average, participants worked
13.31 hours per week ($SD = 9.92$) at a variety of industries ranging from service to healthcare to financial. Twenty-seven percent of participants indicated having had previous managerial or leadership experience such as publicity director, program co-ordinator, president of student unions, and lead sales associates.

**Experimental Design**

The experimental design consisted of randomly assigning participants to one of three conditions. These conditions corresponded to the manipulation of state anxiety (low, moderate, high). Job performance on an in-basket task served as the dependent variable. Participants in in-basket studies are provided with materials that represent the content of a hypothetical manager’s “in” basket, such as letters that represent various issues or problems faced by the manager. Participants are required to assume the role of the manager and perform the tasks in the in-basket. These tasks require interpreting and reacting to the provided information and involve a wide range of skill such as analytic thinking and problem-solving (Dukerich, Milliken, & Cowan, 1990). An in-basket task was selected based on past research that has demonstrated adequate validity as a management assessment technique (Gill, 1979), and its close approximation to reality that requires behaviours similar to those required on the job (Kesselman, Lopez, & Lopez, 1982). In-basket exercises have high face validity (Gill, 1979), and participants often become so involved in the tasks they tend to forget they are participants in an experiment (Dukerich et al., 1990).

**Procedure**

There were three parts to the study. In the first part, participants were emailed a link and asked to complete a series of short online questionnaires assessing demographics, their trait levels of anxiety, and stress. The second part took place approximately one week later at the
laboratory. Upon arrival, the experimenter informed participants that they have entered a work environment. Participants received one of the three state anxiety manipulations, completed a manipulation check assessing state levels of anxiety, and performed the in-basket task as if they were operating on the job. In the final part, immediately following the in-basket task, participants completed a series of short questionnaires that consisted of measures assessing their self-regulatory processing and off-task cognition.

Manipulations of state anxiety were based on past research in clinical and educational psychology literature that have used evaluative conditions, distribution of scores to peers, ego-involving instructions, and videotaping as a basis of manipulating anxiety (e.g., Darke, 1988; Deffenbacher, 1986; Herman, Polivy, Lank, & Heatherton, 1987; Markham & Darke, 1991; Wine, 1971, 1982). In the high state anxiety condition, participants received three manipulations to induce anxiety. First, participants were told that the tasks are highly similar to those used as selection tools by organizations seeking to hire new employees, and as such, are highly predictive of actual performance on the job. Participants were told that their performance on the tasks would paint an accurate reflection of their actual job performance. Second, participants were told that their performance would be evaluated by a supervisor, and their scores on the tasks would be displayed in the laboratory and compared to other participants in the study. Their performance score would thus be made available for all participants to see. Finally, participants were told that the duration of their performance on the in-basket task will be videotaped and subsequently viewed by a committee to be considered for an instructional video to be used in future management courses at the University.

In the moderate state anxiety condition, participants received two of the three manipulations that were received by participants in the high state anxiety condition. Thus,
participants: a) were informed that the tasks are highly reflective of how organizations typically recruit new employees, and received instructions that their performance on the tasks are an accurate depiction of their actual job performance; and b) were told that their performance would be evaluated by a supervisor and their scores would be made available to other participants in the study. However, participants in this condition were not videotaped.

In the low state anxiety condition, participants: a) did not receive instructions regarding the predictive accuracy of their performance; b) did not receive instructions that their scores would be displayed in the lab; and c) were not videotaped. Low state anxiety participants were instead made to feel relaxed by receiving instructions that the tasks are fun, easy, and give participants a chance to see what a “typical” day at work is like.1

The in-basket task was adapted from past research that has used these types of tasks to assess performance (e.g., Jimmieson & Terry, 1997; Tett, Guterman, Bleier, & Murphy, 2000; Trevino & Youngblood, 1990). In the in-basket task, participants learned that they will be assuming the role of a middle manager at a hypothetical organization, OneShore Groups. To provide a feeling of high fidelity, participants were seated at a desk with a computer and were told that this was their workstation for the duration of the study. Participants were told that they will be required to deal with tasks which cover the range of problems representative of what a manager typically deals with on a daily basis. The task is for participants to respond to each in-basket exercise as though they were on the job. There were two tasks. The order in which the tasks were presented was counterbalanced to minimize confounding order of task presentation. The in-basket exercises do not require technical expertise or specialized knowledge.

In the first task (Task 1), participants were presented with an email regarding low productivity in a sales team (see Appendix A). Participants were required to respond to the
email, detailing the course of action required to appropriately, effectively, and efficiently deal with the issue identified in the email. This task deals with decision-making and requires critical thinking, sorting through various alternatives, and selecting the best alternative for the issue. In the second task (Task 2), participants were presented with a photograph of a “prototype of equipment model that your company has been developing over the last year to launch throughout the different branches of the company”. Participants were required to build the model replica exactly as shown in the photographs, including color and size, using a box of parts at their workstation (see Appendix B for full task instructions). Participants were given a time limit to build the model in order to regulate the length of the study. This time limit was consistent with anxiety manipulations. Based on the initial pilot study, the average time it took participants to complete the model was 11 minutes. Thus, participants in the moderate anxiety condition were given 11 minutes to build the model; participants in the high anxiety condition were given 8 minutes to build the model; and participants in the low anxiety condition were given 14 minutes to build the model.

**Measures**

Participants were asked to indicate their degree of agreement with each item for all of the following scales using a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), with higher scores corresponding to more agreement with the items. Appendix D lists full items for each scale.

**Trait anxiety.** Trait anxiety was assessed using the 20-item trait portion of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Participants were asked to indicate how often they generally experience feelings of anxiety. A sample item is “I feel nervous and restless”. The STAI has been used extensively in anxiety research and demonstrates good validity.
Stress. Stress was assessed using seven items from a widely used stress measure, the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). Participants indicated how often they experienced each of the items on a scale ranging from 0 (never) to 7 (daily). A sample item is “In the last month, how often have you found that you could not cope with all the things that you had to do?”

State anxiety. State anxiety was assessed as a manipulation check for manipulated anxiety using 10 items from the state portion of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Participants were asked to indicate the extent to which they experienced feelings of anxiety “right now”. A sample item is “I am tense”.

Off-task cognitions. Off-task cognitions were assessed using four items from the Cognitive Interference Questionnaire (Sarason et al., 1986). Consistent with research suggesting that cognitive interference is most commonly assessed using retrospective self-report of thoughts post-task (Sarason et al., 1986), participants were instructed to indicate the extent to which they engaged in a series of items during the tasks. A sample item is “During the tasks, I thought about personal worries unrelated to the tasks.” Psychometric properties of this scale have been demonstrated to be high (see Sarason et al., 1986).

Self-regulatory processing. Self-regulatory processing was assessed using six performance monitoring based items adapted from Kanfer and Ackerman (1989). Participants were instructed to indicate the extent to which they engaged in a series of items during the tasks. A sample item is “During the tasks, I kept track of my progress.” Psychometric properties of this scale have been demonstrated to be high (see Kanfer & Ackerman, 1989).

Job performance. Performance on Task 1 (email task) was coded independently by two trained raters, blind to condition, for quality of response, which was operationalized as the
number of unique solutions generated to adequately and feasibly address the problem presented in the scenario (score 1) and professionalism of the email (score 2). Each response received a score ranging from 1 (lowest effective response) to 5 (highest effective response). Following independent ratings, coders met to discuss any discrepancies. If raters were still in disagreement following discussion, an average score was taken. The two ratings were aggregated to form a composite performance score for the email task. Performance on Task 2 (model task) was assessed by counting the number of correct pieces in the model, for a maximum score of 17.

**Experiment 1 Results**

Table 2 presents descriptive statistics and inter-correlations for all variables. Predictor variables were mean-centered. As illustrated in Table 2, trait and state anxiety (manipulation check) exhibited a positive correlation ($r = .29$) while off-task cognition and self-regulatory processing exhibited a negative correlation ($r = -.23$). This lends support for the distinctiveness of these constructs. Further, while trait anxiety was not significantly related to performance, state anxiety (condition) was negatively related to performance (Task 2).

**Inter-Rater Reliability for Performance Task**

The intra-class correlation coefficient indicated an inter-rater reliability of .98 for the first rating of the email task (unique solutions generated) and .98 for the second rating of the email task (professionalism). The two ratings were aggregated to form a composite performance score for the email task.

**Manipulation Check**

As expected, participants in the high state anxiety condition reported feeling more anxious ($M = 3.57$, $SD = 1.06$) than did those in the moderate state anxiety condition ($M = 3.11$, $SD = 1.08$), $t_{(186)} = 2.90$, $p < .01$. In addition, as expected, participants in the low state anxiety
condition reported feeling less anxious \((M = 2.47, SD = .87)\) than did those in the moderate state anxiety condition, \(t_{(169)} = -4.27, p < .001\). The mean for the high anxiety condition was near the midpoint of the scale and did not reach the upper limits of the 7-point scale, although it was higher than the moderate anxiety condition. Thus, below, I refer to the conditions in relative rather than absolute terms (i.e., I refer to the higher and moderate anxiety conditions).

**Hypothesis Testing**

I tested my proposed models with structural equation modeling (SEM) using Amos 19 software (Arbuckle, 2010). Structural equation modeling is a good strategy for testing mediation (Brown, 1997), as it provides an estimate of the full model while simultaneously dealing with measurement error and nonrecursive parts of the model (Frese, Garst, & Fay, 2007). Maximum likelihood estimation was used to test each model. I used the Chi-Square Index, Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), and the Root Mean Square Error of Approximation (RMSEA) to assess model fit (Hu & Bentler, 1999). The CFI and NNFI range from 0-1, such that higher values indicate better fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004), while lower RMSEA values indicate better fit (i.e., values between .05 and .08 indicate a reasonable fit, while values lower than .05 indicate better fit).

**Trait anxiety.** I tested two full measurement models corresponding to the two performance tasks. The measurement models included all of the manifest indicators to establish the structure of the variables, as recommended by Anderson and Gerbing (1988). Items from each scale were randomly grouped into parcels that represented indicators of the latent constructs (Williams & Anderson, 1994), with three parcels to each latent construct. The first measurement model consisted of trait anxiety, off-task cognition, self-regulatory processing, and performance Task 1 (email task) as the outcome. This model was found to provide a good fit to the data \((\chi^2_{(30)}\)
= 54.0; CFI = .97, NNFI = .97, RMSEA = .05). Item parcel loadings were significant (.49 to .78, p < .001). The second measurement model consisted of trait anxiety, off-task cognition, self-regulatory processing, and performance Task 2 (model task) as the outcome. It was also found to provide a good fit to the data ($\chi^2_{(30)} = 58.3; \text{CFI} = .97, \text{NNFI} = .97, \text{RMSEA} = .06$). Item parcel loadings were significant (.49 to .79, p < .001). Taken together, the measurement models indicated that the scale items represented the appropriate constructs (Bagozzi & Yi, 1988).

Next, I tested my proposed structural models. To examine whether the effects hold when controlling for constructs most theoretically relevant to the focal variables, I controlled for state anxiety, stress, and gender in all trait anxiety models. State anxiety was controlled to examine the unique variance due to trait anxiety, stress was controlled given the confusion in the literature over the constructs of anxiety and stress, and gender was controlled as there may be gender differences that could account for performance outcomes.

As indicated in Figures 3 and 4, these models yielded acceptable fit to the data (Task 1 model fit: $\chi^2_{(52)} = 125.5; \text{CFI} = .92, \text{NNFI} = .93, \text{RMSEA} = .07$; Task 2 model fit: $\chi^2_{(52)} = 136.1; \text{CFI} = .92, \text{NNFI} = .92, \text{RMSEA} = .07$). The models and indices are presented in Figures 3 and 4. Findings demonstrated that, as predicted, trait anxiety had a significant positive effect on off-task cognition. Off-task cognition in turn had a significant negative effect on both performance tasks. Trait anxiety had a significant negative effect on self-regulatory processing. Self-regulatory processing was not related to performance Task 1 but had a significant positive effect on performance Task 2.

I next performed bootstrap analyses using 5000 resamples to test for direct and indirect effects of trait anxiety on both performance tasks through off-task cognition and self-regulatory processing (Preacher & Hayes, 2008; Shrout & Bolger, 2002). Given that the model consists of
two mediating variables, I followed Macho and Ledermann (2011) and tested a ‘phantom’ model. Phantom models reduce the full model to examine one mediation effect at a time. The first phantom model consisted of off-task cognition as the mediator. The model fits were good (Task 1: $\chi^2_{(24)} = 59.8; \text{CFI} = .96, \text{NNFI} = .96, \text{RMSEA} = .07$; Task 2: $\chi^2_{(24)} = 71.6; \text{CFI} = .94, \text{NNFI} = .95, \text{RMSEA} = .08$). Analyses indicated that trait anxiety did not have a significant direct effect on either performance tasks (Task 1: $.02, p > .05$; Task 2: $.08, p > .05$). Consistent with the larger model, trait anxiety had a significant positive relation with off-task cognition (.17, $p < .05$), which had a negative effect with performance (Task 1: -.19, $p < .01$; Task 2: -.43, $p < .001$). Importantly, the coefficient for the indirect effect of trait anxiety on Task 1 through off-task cognition was -.03 ($p < .01$), and the 95% bias-corrected confidence interval ranged from -.07 to -.01. The coefficient for the indirect effect of trait anxiety on Task 2 through off-task cognition was -.07 ($p < .05$), and the 95% bias-corrected confidence interval ranged from -.14 to -.02. These findings indicate that the relationship between trait anxiety and job performance was mediated by off-task cognition, supporting Hypothesis 1.

The second phantom model consisted of self-regulatory processing as the mediator. The model fits were good (Task 1: $\chi^2_{(24)} = 34.6; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .04$; Task 2: $\chi^2_{(24)} = 45.3; \text{CFI} = .97, \text{NNFI} = .97, \text{RMSEA} = .06$). Analyses indicated that trait anxiety did not have a significant direct effect on either performance tasks (Task 1: $.01, p > .05$; Task 2: $.06, p > .05$). Consistent with the larger model, trait anxiety had a significant negative relation with self-regulatory processing (-.18, $p < .05$), which had a positive effect with performance (Task 1: .13, $p < .10$; Task 2: .27, $p < .001$). Importantly, the coefficient for the indirect effect of trait anxiety on Task 1 through self-regulatory processing was -.02 ($p < .05$), and the 95% bias-corrected confidence interval ranged from -.07 to -.00. The coefficient for the indirect effect of trait anxiety...
on Task 2 through self-regulatory processing was \(-.05 (p < .05)\), and the 95\% bias-corrected confidence interval ranged from \(-.11\) to \(-.01\). These findings indicate that the relationship between trait anxiety and job performance was mediated by self-regulatory processing.\(^2\) However, the direction of effect between trait anxiety and self-regulatory processing was opposite to that hypothesized. Thus, Hypothesis 3 is not supported.

**State anxiety.** I first tested two full measurement models corresponding to the two performance tasks. The measurement models included all of the manifest indicators to establish the structure of the variables. The first measurement model consisted of state anxiety (condition), off-task cognition, self-regulatory processing, and performance Task 1 (email task) as the outcome. It was found to provide a good fit to the data ($\chi^2_{(16)} = 34.7; \text{CFI} = .95, \text{NNFI} = .95, \text{RMSEA} = .06$). Item parcel loadings were significant ($0.48$ to $0.79, p < .001$). The second measurement model consisted of state anxiety (condition), off-task cognition, self-regulatory processing, and performance Task 2 (model task) as the outcome. It was also found to provide a good fit to the data ($\chi^2_{(16)} = 35.3; \text{CFI} = .95, \text{NNFI} = .95, \text{RMSEA} = .06$). Item parcel loadings were significant ($0.48$ to $0.80, p < .001$). Taken together, these measurement models indicated that the scale items represented the appropriate construct (Bagozzi & Yi, 1988).

Next, I tested my proposed structural models. To examine whether the effects hold when controlling for constructs most theoretically relevant to the focal variables, I controlled for trait anxiety and stress. As indicated in Figures 5 and 6, these models yielded acceptable fit to the data (Task 1 model fit: $\chi^2_{(71)} = 155.8; \text{CFI} = .93, \text{NNFI} = .93, \text{RMSEA} = .06$; Task 2 model fit: $\chi^2_{(71)} = 152.4; \text{CFI} = .94, \text{NNFI} = .94, \text{RMSEA} = .06$). The models and indices are presented in Figures 5 and 6. Findings demonstrated that, as predicted, state anxiety (condition) had a significant positive effect on off-task cognition. Off-task cognition in turn had a significant
negative effect on both performance tasks. State anxiety (condition) had a significant negative effect on self-regulatory processing. Self-regulatory processing was not related to performance Task 1 but had a significant positive effect on performance Task 2.

I next performed bootstrap analyses using 5000 resamples to test for direct and indirect effects of state anxiety (condition) on both performance tasks through off-task cognition and self-regulatory processing (Preacher & Hayes, 2008; Shrout & Bolger, 2002). Consistent with the tests for trait anxiety, I tested phantom models examining one mediation effect at a time (Macho & Ledermann, 2011). The first phantom model consisted of off-task cognition as the mediator. The model fits were good (Task 1: $\chi^2_{(40)} = 86.8; \text{CFI} = .96, \text{NNFI} = .96, \text{RMSEA} = .07$; Task 2: $\chi^2_{(40)} = 86.5; \text{CFI} = .96, \text{NNFI} = .96, \text{RMSEA} = .06$). Analyses indicated that state anxiety (condition) had a significant direct effect on performance Task 2 (Task 1: -.10, $p > .05$; Task 2: -.16, $p < .01$). Consistent with the larger model, state anxiety (condition) had a significant positive relation with off-task cognition (.14, $p < .05$), which had a negative effect with job performance (Task 1: -.20, $p < .01$; Task 2: -.39, $p < .001$). Importantly, the coefficient for the indirect effect of state anxiety (condition) on Task 1 through off-task cognition was -.00 ($p < .05$), and the 95% bias-corrected confidence interval ranged from -.07 to -.01. The coefficient for the indirect effect of state anxiety (condition) on Task 2 through off-task cognition was -.05 ($p < .05$), and the 95% bias-corrected confidence interval ranged from -.11 to -.01. These findings indicate that the relationship between state anxiety (condition) and job performance was mediated by off-task cognition, supporting Hypothesis 2.

The second phantom model consisted of self-regulatory processing as the mediator. The model fits were good (Task 1: $\chi^2_{(40)} = 62.9; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .05$; Task 2: $\chi^2_{(40)} = 59.2; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .04$). Analyses indicated that state anxiety (condition)
had a direct effect on performance Task 2 (Task 1: .10, p > .05; Task 2: -.17, p < .01). Consistent with the larger model, state anxiety (condition) had a significant negative relation with self-regulatory processing (-.19, p < .01), which had a significant positive effect with job performance (Task 1: .15, p < .05; Task 2: .23, p < .01). Importantly, the coefficient for the indirect effect of state anxiety (condition) on Task 1 through self-regulatory processing was -.03 (p < .05), and the 95% bias-corrected confidence interval ranged from -.07 to -.01. The coefficient for the indirect effect of state anxiety (condition) on Task 2 through self-regulatory processing was -.05 (p < .01), and the 95% bias-corrected confidence interval ranged from -.10 to -.02. These findings indicate that the relationship between state anxiety (condition) and job performance was mediated by self-regulatory processing. However, the direction of effect between state anxiety and self-regulatory processing was opposite to that hypothesized. Thus, Hypothesis 4 is not supported.

In summary, the overall pattern of results for Experiment 1, while not all consistent with predictions, was generally the same for trait anxiety and state anxiety, as well as for the two performance outcomes. This provides empirical support for the similarities of trait and state anxiety.

**Supplementary Analyses**

**Interaction between state and trait anxiety.** To provide comprehensive tests of the relation between anxiety and performance, I conducted analyses using the interaction between state anxiety (condition) and trait anxiety as the predictor of off-task cognition and self-regulatory processing. Given that trait anxiety was a continuous variable and state anxiety (condition) was a manipulated categorical variable, I used moderated multiple regression to test the interaction between state and trait anxiety. Main effect variables were standardized, and an
interaction term was created based on standardized variables. I entered the control variables (gender, stress) in Step 1. The main effects of trait anxiety and state anxiety (condition) were entered in Step 2. The interaction between trait anxiety and state anxiety (condition) was entered in Step 3. Results indicated that the interaction between trait anxiety and state anxiety (condition) was not significant in predicting off-task cognition ($\beta = .19, p > .05$). Further, the interaction between trait anxiety and state anxiety (condition) was not significant in predicting self-regulatory processing ($\beta = .17, p > .05$).4

I also conducted analyses using the interaction between state anxiety (condition) and trait anxiety as the predictor of performance. I entered the control variables (gender, stress) in Step 1. The main effects of trait anxiety and state anxiety (condition) were entered in Step 2. The interaction between trait anxiety and state anxiety (condition) was entered in Step 3. Results indicated that the interaction between trait anxiety and state anxiety (condition) was not significant in predicting performance Task 1 ($\beta = .09, p > .05$). Further, the interaction between trait anxiety and state anxiety (condition) was not significant in predicting performance Task 2 ($\beta = -.29, p > .05$).5

**Curvilinear relationships.** To further provide comprehensive tests of the relation between anxiety and performance, curvilinear relationships between trait anxiety and performance, and state anxiety and performance, were tested. Polynomial regression analyses for quadratic trends were conducted. Results indicated that there were no curvilinear relationships between trait anxiety and performance (Task 1: $\beta = .01, SE = .08, p > .05$; Task 2: $\beta = -.02, SE = .22, p > .05$), and between state anxiety (condition) and performance (Task 1: $\beta = -.46, SE = .25, p > .05$; Task 2: $\beta = -.38, SE = .68, p > .05$).

**Experiment 1 Discussion**
Experiment 1 examined whether trait and state anxiety can both debilitate and facilitate performance by considering dual processes. Results of this experiment indicate that, consistent with predictions, trait and state anxiety lead to high levels of off-task cognition, while, contrary to predictions, trait and state anxiety lead to low levels of self-regulatory processing. In turn, these mechanisms exert differential effects on job performance – individuals engaging in high levels of off-task cognition were less likely to perform well, while individuals engaging in high levels of self-regulatory processing were more likely to perform well. These models were found to hold for both trait and state anxiety using two different performance tasks, above and beyond the effects of stress, trait anxiety (in the case of state anxiety), state anxiety (in the case of trait anxiety), and gender (in the case of trait anxiety). These results provide robust tests of the theoretical model and provide empirical clarification on the distinction between stress and anxiety.

As stated, anxiety was found to have a negative relation with self-regulatory processing, contrary to predictions. It seems that anxious individuals, both those who are anxious by disposition, as well as those who are made to feel momentarily anxious, were less able to engage in self-regulatory processes. This is contrary to my hypotheses, which were drawn from theoretical frameworks (e.g., Eysenck et al., 2007; Kanfer & Ackerman, 1989) suggesting that anxious individuals can compensate for poor performance by investing more effort in self-regulatory processes. However, self-regulatory processing requires a considerable amount of resources to adequately monitor progress and focus on a task. Engaging in these behaviors relies on the “expenditure of a limited resource (akin to energy or strength), and so when that resource has been depleted by recent use, people are less effective at self-regulating” (Tice, Baumeister, Shmueli, & Muraven, 2007, p. 383). It may be that in the context of a laboratory experiment,
participants were not interested or motivated enough to invest the resources required into tasks that have no real-world consequence. Thus, it is not that participants are unable to engage in self-regulatory processing behaviors, but they were unmotivated to do so.

Although not explicitly hypothesized, I also examined the direct relations between anxiety and performance. Results indicate a negative relation between state anxiety and performance on the model task, which is consistent with past work. Noteworthy of the non-significant direct relations between state anxiety and performance (email task) and trait anxiety and both performance tasks is the positive direction of effect, hinting at a bright side of anxiety. Notably, the mechanisms off-task cognition and self-regulatory processing had differential relations with performance, such that off-task cognition was negatively related to performance, and self-regulatory processing was positively related to performance, consistent with predictions. This suggests that these mechanisms account for more variance over the direct relations between anxiety and performance.

This is the first experimental study to examine self-regulatory processing as a possible mechanism for a bright side of anxiety. Given the observed findings, and the amount of cognitive resources that are required to self-regulate, a natural follow-up question concerns when anxious individuals might invest additional effort required to self-regulate. Experiment 2 extends the findings of Experiment 1 to examine whether motivation serves as a boundary condition that may push anxious individuals to engage in self-regulatory processing and thus facilitate their performance. Anxious individuals who are also motivated to perform well should be more likely to engage in these burdensome cognitive behaviors.

**Experiment 2 Method**

**Participants**
The sample for Experiment 2 consisted of 363 undergraduate students. Participants were recruited campus-wide from a large North American university. Participants completed the study in exchange for either a 1.0 course credit in their corresponding management course or were compensated $10. Thirty-six participants were excluded from the analysis due to failing to listen and co-operate with experimental instructions and procedures, leaving a total of 327 participants in the final sample (69% female). Participants ranged in age from 17 to 35 years ($M = 20.59, SD = 2.09$). Of the participants who reported their ethnicity, 113 (35%) participants were Chinese, 95 (29%) were South Asian, 21 (6%) were South East Asian, 19 (6%) were White, 17 (5%) were Arab/West Asian, 15 (5%) were Filipino, 11 (3%) were Korean, 11 (3%) were Other, 6 (2%) were Black, 3 (1%) were Latin American, 2 (1%) were Japanese, 1 (<1%) was Aboriginal/First Nations, and 13 (4%) were unreported. The majority (78%) of participants were enrolled in full-time studies at the University. On average, participants worked 13.35 hours per week ($SD = 9.12$) at a variety of industries ranging from service to healthcare to financial. Thirty-two percent of participants indicated having had previous managerial or leadership experience such as assistant manager, team leader, supervisor, and event manager.

**Experimental Design**

The experimental design was a 3 (state anxiety: low, moderate, high) x 2 (motivation: low, high) design. Participants were randomly assigned to experimental conditions. Job performance on an in-basket task served as the dependent variable. Participants were required to assume the role of a manager and perform two in-basket tasks. The first was adapted from Grant and Hofmann (2011). Participants were asked to create a two-minute marketing speech to persuade clients to switch from using the company’s traditional face-to-face pharmacy to the company’s new mail-order pharmacy. Participants were asked to highlight the benefits of
switching to this mail-order pharmacy, appealing to new clients while retaining existing clients (see Appendix C). The second task was the email task from Experiment 1.

Procedure

There were three parts to the study. In the first part, participants were emailed a link and asked to complete a series of short online questionnaires assessing demographics, their trait levels of anxiety, and stress. The second part took place approximately one week later at the laboratory. Upon arrival, the experimenter informed participants that they have entered a work environment. Participants received one of the three state anxiety manipulations consistent with Experiment 1. In addition, the following changes were made to the high state anxiety condition: a) a more realistic working environment was created such that there were two experimenters in professional attire circulating the room with clipboards, not unlike an organization where supervisors are frequently monitoring their employees; and b) participants in this high anxiety condition were told that, not only were they creating a speech, they would be presenting the speech (Task 1). Following this, all participants received one of two motivation manipulations. Participants next completed a manipulation check assessing motivation and state levels of anxiety, and performed the in-basket tasks as if they were operating on the job. In the final part, immediately following the in-basket tasks, participants completed a series of short questionnaires assessing their self-regulatory processing and off-task cognition.

To manipulate motivation, participants received a manipulation of each of the three components of motivation as specified in VIE theory (i.e., valence, instrumentality, expectancy; Vroom, 1964), such that participants in the high (low) motivation condition received high (low) levels of the three components of motivation. Specifically, participants randomly assigned to the high (low) motivation condition were told: a) that they will receive $20 ($5) for completing the
task (valence); b) that receiving this amount is (is not) linked to how well they perform (instrumentality); and c) if they put effort into the task, they should (should not) perform well (expectancy).

Measures

Participants were asked to indicate their degree of agreement with each item for all of the following scales using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with higher scores corresponding to more agreement with the items. Appendix D lists full items for each scale.

**Trait anxiety.** Same measure as in Experiment 1.

**Stress.** Same measure as in Experiment 1.

**State anxiety.** Same measure as in Experiment 1.

**Off-task cognitions.** Extending the four items used in Experiment 1, off-task cognitions in Experiment 2 were assessed using 10 items from the Cognitive Interference Questionnaire (Sarason et al., 1986). Participants were instructed to indicate the extent to which they engaged in a series of items during the task. A sample item is “During the tasks, my mind wandered to other things unrelated to the tasks.” Psychometric properties of this scale have been demonstrated to be high (see Sarason et al., 1986).

**Self-regulatory processing.** Extending the six items used in Experiment 1, self-regulatory processing in Experiment 2 was assessed using 14 performance monitoring based items adapted from Kanfer and Ackerman (1989). Participants were instructed to indicate the extent to which they engaged in a series of items during the task. A sample item is “During the task, I focused my attention on making few errors.” Psychometric properties of this scale have been demonstrated to be high (see Kanfer & Ackerman, 1989).
**Motivation manipulation check.** The motivation manipulation check included three questions asking participants about each of the three components of motivation. To assess understanding of the valence component, participants were asked how much they will earn for completing the task ($5 or $20); to assess understanding of the instrumentality component, participants were asked whether receiving this amount is linked to their performance on the tasks (no or yes); to assess understanding of the expectancy component, participants were asked whether effort put into the tasks would have an effect on their performance (no or yes).

**Job performance.** Performance on the speech task was coded independently by two trained raters, blind to condition, for quality of response, which was operationalized as the number of unique statements that highlight the benefits of switching to a mail-order pharmacy (score 1) and the number of catchy marketing phrases generated (score 2). Each response received a score ranging from 1 (*lowest effective response*) to 5 (*highest effective response*). Following independent ratings, coders met to discuss any discrepancies. If raters were still in disagreement following discussion, an average score was taken. The two ratings were aggregated to form a composite performance score for the speech task. Performance on the email task was coded consistent with Experiment 1.

**Experiment 2 Results**

Table 3 presents descriptive statistics and inter-correlations for all variables. Predictor variables were mean-centered to reduce multicollinearity (Aiken & West, 1991). Noteworthy in the correlation table is the positive correlation \( r = .23 \) between trait anxiety and state anxiety (manipulation check), consistent with Experiment 1, and the negative correlation \( r = -.32 \) between off-task cognition and self-regulatory processing, lending support for the distinctiveness of the two constructs and replicating correlations from Experiment 1.
**Inter-Rater Reliability for Performance Tasks**

The intra-class correlation coefficient indicated an inter-rater reliability of .99 for the first rating of the speech task and .97 for the second rating of the speech task. The two ratings per task were aggregated to form a composite performance score for the speech task.

The intra-class correlation coefficient indicated an inter-rater reliability of .98 for the first rating of the email task and .98 for the second rating of the email task. The two ratings per task were aggregated to form a composite performance score for the email task.

**Manipulation Checks**

**State anxiety.** As expected, participants in the high state anxiety condition reported feeling more anxious \(M = 3.53, SD = 1.33\) than did those in the moderate state anxiety condition \(M = 3.10, SD = 1.18\), \(t(221) = -2.53, p < .01\). In addition, as expected, participants in the low state anxiety condition reported feeling less anxious \(M = 1.99, SD = 1.05\) than did those in the moderate state anxiety condition, \(t(204) = -7.13, p < .001\). The mean for the high anxiety condition was near the midpoint of the scale and did not reach the upper limits of the 7-point scale, although it was higher than the moderate anxiety condition. Thus, below, I refer to the conditions in relative rather than absolute terms (i.e., I refer to the higher and moderate anxiety conditions).

**Motivation.** As expected, there were significant differences between the high and low motivation conditions in valence \(t(324) = -64.20, p < .001\), instrumentality \(t(324) = 37.67, p < .001\), and expectancy \(t(324) = 34.24, p < .001\), suggesting that those in the high motivation condition were more motivated than those in the low motivation condition.

**Hypothesis Testing**
**Trait anxiety.** I tested full measurement models that included all of the manifest indicators to establish the structure of the variables, as recommended by Anderson and Gerbing (1988). Items from each scale were randomly grouped into parcels that represented indicators of the latent constructs (Williams & Anderson, 1994), with three parcels to each latent construct. The first measurement model consisted of trait anxiety, off-task cognition, self-regulatory processing, and performance Task 1 (speech task) as the outcome. It was found to provide a good fit to the data ($\chi^2_{(30)} = 64.0; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .06$). Item parcel loadings were significant (.68 to .93, $p < .001$). The second measurement model consisted of trait anxiety, off-task cognition, self-regulatory processing, and performance Task 2 (email task) as the outcome. It was also found to provide a good fit to the data ($\chi^2_{(30)} = 66.4; \text{CFI} = .97, \text{NNFI} = .97, \text{RMSEA} = .06$). Item parcel loadings were significant (.68 to .93, $p < .001$). Taken together, the measurement models indicated that the scale items represented the appropriate constructs (Bagozzi & Yi, 1988).

Next, I tested my proposed structural models consistent with Experiment 1. To examine whether the effects hold when controlling for constructs most theoretically relevant to the focal variables, I controlled for state anxiety, stress, and gender. As indicated in Figures 7 and 8, these models yielded acceptable fit to the data (Task 1 model fit: $\chi^2_{(52)} = 148.9; \text{CFI} = .94, \text{NNFI} = .94, \text{RMSEA} = .08$; Task 2 model fit: $\chi^2_{(52)} = 145.6; \text{CFI} = .94, \text{NNFI} = .94, \text{RMSEA} = .07$). The models and indices are presented in Figures 7 and 8. Results indicated that, as predicted, trait anxiety had a significant positive effect on off-task cognition. Off-task cognition was not significantly related to either performance task. Trait anxiety had a significant negative effect on self-regulatory processing. Self-regulatory processing was not related to performance Task 1 but had a significant positive effect on performance Task 2.
I next performed bootstrap analyses using 5000 resamples to test for direct and indirect effects of trait anxiety on both performance tasks through off-task cognition and self-regulatory processing (Preacher & Hayes, 2008; Shrout & Bolger, 2002). Given that the model consists of two mediating variables, I followed Macho and Ledermann (2011) and tested a ‘phantom’ model. These are consistent with the models tested in Experiment 1. The first phantom model consisted of off-task cognition as the mediator. The model fits were good (Task 1: $\chi^2_{(24)} = 58.6; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .07$; Task 2: $\chi^2_{(24)} = 57.4; \text{CFI} = .98, \text{NNFI} = .98, \text{RMSEA} = .07$). Analyses indicated that trait anxiety did not have a significant direct effect on either performance tasks (Task 1: -.07, $p > .05$; Task 2: .02, $p > .05$). Consistent with the larger model, trait anxiety had a significant positive relation with off-task cognition (.30, $p < .001$), which was not significantly related to job performance (Task 1: -.09, $p > .05$; Task 2: -.05, $p > .05$). Importantly, the coefficient for the indirect effect of trait anxiety on Task 1 through off-task cognition was -.03 ($p < .10$), and the 95% bias-corrected confidence interval ranged from -.06 to -.00. The coefficient for the indirect effect of trait anxiety on Task 2 through off-task cognition was -.03 ($p > .05$), and the 95% bias-corrected confidence interval ranged from -.05 to .01. These findings indicate that the relationship between trait anxiety and job performance was not mediated by off-task cognition. Thus, Hypothesis 1 was not supported.

The second phantom model consisted of self-regulatory processing as the mediator. The model fits were good (Task 1: $\chi^2_{(24)} = 38.6; \text{CFI} = .99, \text{NNFI} = .99, \text{RMSEA} = .04$; Task 2: $\chi^2_{(24)} = 36.3; \text{CFI} = .99, \text{NNFI} = .99, \text{RMSEA} = .04$). Analyses indicated that trait anxiety did not have a significant direct effect on either performance tasks (Task 1: -.14, $p > .05$; Task 2: .06, $p > .05$). Consistent with the larger model, trait anxiety had a significant negative relation with self-regulatory processing (-.32, $p < .001$), which had a significant positive effect with job
performance (Task 1: $0.13, p = 0.06$; Task 2: $0.16, p < 0.05$). Importantly, the coefficient for the indirect effect of trait anxiety on Task 1 through self-regulatory processing was $-0.10 (p < 0.05)$, and the 95% bias-corrected confidence interval ranged from $-0.10$ to $-0.01$. The coefficient for the indirect effect of trait anxiety on Task 2 through self-regulatory processing was $-0.11 (p < 0.05)$, and the 95% bias-corrected confidence interval ranged from $-0.10$ to $-0.02$. These findings indicate that the relationship between trait anxiety and job performance was mediated by self-regulatory processing.\(^6\) However, the direction of effect between trait anxiety and self-regulatory processing was opposite to that hypothesized. Thus, Hypothesis 3 is not supported.

Next, I tested my proposed models with motivation included as the moderator. Best practices for modeling moderation in SEM is based on multi-item scales to account for reliability in scale measurement (Algina & Moulder, 2001; Jaccard & Wan, 1995; Jöreskog & Yang, 1996; Ping, 1995). Given that trait anxiety was a continuous variable and motivation was a manipulated categorical variable, I ran moderation for the trait anxiety models using moderated multiple regression. I entered the control variables (gender, state anxiety, stress) in Step 1. The main effects of trait anxiety and motivation were entered in Step 2. The interaction between trait anxiety and motivation was entered in Step 3. Table 4 presents the regression analyses for the relationship between trait anxiety, motivation, and off-task cognition and between trait anxiety, motivation, and self-regulatory processing. Results indicated that, while there were significant main effects of trait anxiety and motivation on off-task cognition and self-regulatory processing, the interaction between trait anxiety and motivation was not significant in predicting either off-task cognition or self-regulatory processing. Thus, Hypothesis 5a and 6a were not supported.\(^7\)

Off-task cognition had a negative effect on performance (Task 1: $\beta = -0.15, p < 0.01$; Task 2: $\beta = -$
.04, p > .05), while self-regulatory processing had a positive effect on performance (Task 1: β = .14, p < .05; Task 2: β = .10, p < .10).

**State anxiety.** I tested full measurement models for the proposed model with manipulated state anxiety. The first measurement model consisted of state anxiety (condition), off-task cognition, self-regulatory processing, and performance Task 1 (speech task) as the outcome. It was found to provide a good fit to the data ($\chi^2_{(16)} = 54.7; \text{CFI} = .95, \text{NNFI} = .95, \text{RMSEA} = .09$). Item parcel loadings were significant (.68 to .93, p < .001). The second measurement model consisted of state anxiety (condition), off-task cognition, self-regulatory processing, and performance Task 2 (email task) as the outcome. It was also found to provide a good fit to the data ($\chi^2_{(16)} = 58.2; \text{CFI} = .95, \text{NNFI} = .95, \text{RMSEA} = .09$). Item parcel loadings were significant (.68 to .93, p < .001). Taken together, these measurement models indicated that the scale items represented the appropriate construct (Bagozzi & Yi, 1988).

Next, I tested my proposed structural models consistent with Experiment 1. To examine whether the effects hold when controlling for constructs most theoretically relevant to the focal variables, I controlled for trait anxiety and stress. As indicated in Figures 9 and 10, these models yielded acceptable fit to the data (Task 1 model fit: $\chi^2_{(71)} = 185.0; \text{CFI} = .94, \text{NNFI} = .94, \text{RMSEA} = .07$; Task 2 model fit: $\chi^2_{(71)} = 189.5; \text{CFI} = .94, \text{NNFI} = .94, \text{RMSEA} = .07$). The models and indices are presented in Figures 9 and 10. Results indicated, first, that state anxiety (condition) was not significantly related to either off-task cognition or self-regulatory processing. Off-task cognition was not significant in predicting either performance tasks. Self-regulatory processing had a significant positive effect on both performance tasks.

I next performed bootstrap analyses using 5000 resamples to test for direct and indirect effects of state anxiety (condition) on both performance tasks through off-task cognition and
self-regulatory processing (Preacher & Hayes, 2008; Shrout & Bolger, 2002). Consistent with the tests for trait anxiety, I tested phantom models examining one mediation effect at a time (Macho & Ledermann, 2011). The first phantom model consisted of off-task cognition as the mediator. The model fits were good (Task 1: $\chi^2_{(40)} = 63.2$; CFI = .99, NNFI = .99, RMSEA = .04; Task 2: $\chi^2_{(40)} = 68.2$; CFI = .98, NNFI = .98, RMSEA = .05). Analyses indicated that state anxiety (condition) had a significant direct effect on both performance tasks (Task 1: .15, $p < .01$; Task 2: .15, $p < .01$). Consistent with the larger model, state anxiety (condition) had a non-significant relation with off-task cognition (-.08, $p > .05$), which had a negative effect with job performance (Task 1: -.10, $p < .10$; Task 2: -.03, $p > .05$). Importantly, the coefficient for the indirect effect of state anxiety (condition) on Task 1 through off-task cognition was .02 ($p > .05$), and the 95% bias-corrected confidence interval ranged from .03 to .00. The coefficient for the indirect effect of state anxiety (condition) on Task 2 through off-task cognition was .01 ($p > .05$), and the 95% bias-corrected confidence interval ranged from -.02 to .00. These findings indicate that the relationship between state anxiety (condition) and job performance was not mediated by off-task cognition. Thus, Hypothesis 2 was not supported.

The second phantom model consisted of self-regulatory processing as the mediator. The model fits were good (Task 1: $\chi^2_{(40)} = 63.3$; CFI = .98, NNFI = .98, RMSEA = .04; Task 2: $\chi^2_{(40)} = 65.0$; CFI = .98, NNFI = .98, RMSEA = .04). Analyses indicated that state anxiety (condition) had a significant direct effect on both performance tasks (Task 1: .17, $p < .01$; Task 2: .16, $p < .01$). Consistent with the larger model, state anxiety (condition) had a non-significant relation with self-regulatory processing (-.09, $p > .05$), which had a significant positive effect with job performance (Task 1: .16, $p < .01$; Task 2: .15, $p < .05$). Importantly, the coefficient for the indirect effect of state anxiety (condition) on Task 1 through self-regulatory processing was -.03
(p < .10), and the 95% bias-corrected confidence interval ranged from -.04 to .00. The coefficient for the indirect effect of state anxiety (condition) on Task 2 through self-regulatory processing was -.08 (p > .05), and the 95% bias-corrected confidence interval ranged from -.04 to .00. These findings indicate that the relationship between state anxiety (condition) and job performance was not mediated by self-regulatory processing. Thus, Hypothesis 4 is not supported.

Next, I tested my proposed models with motivation included as the moderator. Given that I manipulated both my independent variable (state anxiety) and moderator variable (motivation), I ran moderation for the state anxiety (condition) models using multivariate analysis of variance (MANOVA). Manipulated state anxiety (condition) and manipulated motivation were entered as fixed factors in the model, and off-task cognition and self-regulatory processing were entered as the dependent variables. Table 5 displays the descriptive statistics at each level of state anxiety (condition) and motivation. Notably, participants in the high motivation condition engaged in lower levels of off-task cognition at each level of manipulated state anxiety. In contrast, participants in the high motivation condition engaged in higher levels of self-regulatory processing at each level of manipulated state anxiety.

Multivariate tests indicated that there was no main effect of manipulated state anxiety (condition) in predicting either off-task cognition, $F(2, 317) = 1.86, p > .05$, or self-regulatory processing, $F(2, 317) = 1.01, p > .05$. There was, however, a main effect of manipulated motivation in predicting both off-task cognition and self-regulatory processing, indicating that individuals are significantly less likely to engage in off-task cognition as motivation increases, $F(1, 317) = 22.66, p < .001, \eta^2 = .07$, observed power = .99, and that individuals are significantly more likely to engage in self-regulatory processing as motivation increases, $F(1, 317) = 27.44, p < .001, \eta^2 = .08$, observed power = .99. Next, results indicated that the interaction between
manipulated state anxiety and manipulated motivation was significant, $F(4, 634) = 3.22, p < .01, \eta^2 = .02$, observed power = .83. Tests of between-subjects effects further indicated that the interaction between manipulated state anxiety and manipulated motivation was significant in predicting both off-task cognition, $F(2, 317) = 4.34, p < .01$, and self-regulatory processing, $F(2, 317) = 3.87, p < .05$. These interactions are displayed in Figures 11 and 12.

A series of simple effects were conducted to examine each level of motivation at each level of anxiety. Results for off-task cognition demonstrated a significant effect of motivation at low levels of anxiety, $F(1, 317) = 22.24, p < .001$, a significant effect of motivation at moderate levels of anxiety, $F(1, 317) = 5.48, p < .05$, and a non-significant effect of motivation at high levels of anxiety, $F(1, 317) = .863, p > .05$. Results for self-regulatory processing demonstrated a significant effect of motivation at low levels of anxiety, $F(1, 317) = 21.77, p < .001$, a significant effect of motivation at moderate levels of anxiety, $F(1, 317) = 10.30, p < .001$, and a non-significant effect of motivation at high levels of anxiety, $F(1, 317) = 1.07, p > .05$. Combined, these results provide partial support for Hypothesis 5b and 6b.

**Supplementary Analyses**

**Interaction between trait and state anxiety.** To provide comprehensive tests of the relation between anxiety and performance, I conducted analyses using the interaction between state anxiety (condition) and trait anxiety as the predictor of off-task cognition and self-regulatory processing. Given that trait anxiety was a continuous variable and state anxiety (condition) was a manipulated categorical variable, I used moderated multiple regression to test the interaction between state and trait anxiety. Main effect variables were standardized, and an interaction term was created based on standardized variables. I entered the control variables (gender, stress) in Step 1. The main effects of trait anxiety and state anxiety (condition) were
entered in Step 2. The interaction between trait anxiety and state anxiety (condition) was entered in Step 3. Results indicated that the interaction between trait anxiety and state anxiety (condition) was not significant in predicting off-task cognition ($\beta = -.14, p > .05$). Further, the interaction between trait anxiety and state anxiety (condition) was not significant in predicting self-regulatory processing ($\beta = .04, p > .05$).  

I also conducted analyses using the interaction between state anxiety (condition) and trait anxiety as the predictor of performance. I entered the control variables (gender, stress) in Step 1. The main effects of trait anxiety and state anxiety (condition) were entered in Step 2. The interaction between trait anxiety and state anxiety (condition) was entered in Step 3. Results indicated that the interaction between trait anxiety and state anxiety (condition) was significant in predicting performance Task 1 ($\beta = .31, p < .05$). Simple slopes analyses revealed that trait anxiety was significantly and negatively related to performance Task 1 at low levels of state anxiety (condition), $b = -.28, t(309) = -2.12, p < .05$, but not at moderate levels of state anxiety (condition), $b = -.08, t(309) = -.83, p > .05$, or high levels of state anxiety (condition), $b = .12, t(309) = -.84, p > .05$. The interaction between trait anxiety and state anxiety (condition) was not significant in predicting performance Task 2 ($\beta = -.02, p > .05$).

Curvilinear relationships. To provide comprehensive tests of the relation between anxiety and performance, curvilinear relationships between trait anxiety and performance, and state anxiety and performance, were tested. Polynomial regression analyses for quadratic trends were conducted. Results indicated that there were no curvilinear relationships between trait anxiety and performance (Task 1: $\beta = .02, SE = .08, p > .05$; Task 2: $\beta = .05, SE = .07, p > .05$). There were no curvilinear relationships between state anxiety (condition) and performance (Task 1: $\beta = -.24, SE = .21, p > .05$), with one exception (Task 2: $\beta = .90, SE = .18, p < .05$). This U-
shaped curvilinear relationship was such that performance was highest at low and high levels of state anxiety (condition).

**Experiment 2 Discussion**

Experiment 2 replicated and extended the results of Experiment 1 by considering when trait and state anxiety might lead to facilitative and debilitative job performance. Results indicate, first, that trait anxiety had a positive effect on off-task cognition and a negative effect on self-regulatory processing, consistent with the results of Experiment 1. However, state anxiety did not have an effect on off-task cognition or self-regulatory processing. Interestingly, although the overall relation between state anxiety and off-task cognition was non-significant, it was negative in direction, which is contrary to predictions and findings between trait anxiety. Also consistent with Experiment 1, off-task cognition had a negative effect on performance, and self-regulatory processing had a positive effect on performance. With respect to the moderation hypotheses, motivation did not help trait anxious individuals engage in more self-regulatory processing, and motivation did not help trait anxious individuals engage in less off-task cognition, a finding I discuss in the Discussion section. Finally, trait anxiety did not have a direct effect on either performance tasks, consistent with Experiment 1 results. In contrast, state anxiety had a significant positive direct effect on both performance tasks (speech and email task). Experiment 1 indicated a significant negative relation between state anxiety and the model task and a positive, although non-significant effect, on the email task. Thus, findings varied depending on task; findings were consistent with respect to the email task, while the model task and speech task had different effects. These differential relationships between state anxiety and performance provide some support for the possibility of a bright side of anxiety. Further, although not hypothesized, supplementary analyses revealed that the interaction between trait
and state anxiety (condition) had a direct relation with performance Task 1, such that performance was lowest on this task for those with high trait anxiety and low state anxiety. Tests of curvilinear relationships also revealed a U-shaped relation between state anxiety (condition) and performance Task 2. These findings need replication but are potentially interesting because it suggests that the presence of high levels of state anxiety may be facilitative for performance.

As indicated, results indicate that state anxiety was not related to either off-task cognition or self-regulatory processing. However, motivation moderated the relationship between state anxiety and off-task cognition. Consistent with expectations, individuals with low state anxiety and low motivation engaged in higher levels of off-task cognition, whereas individuals with low state anxiety and high motivation engaged in lower levels of off-task cognition. Individuals with moderate state anxiety and low motivation were also more likely to engage in off-task cognition, whereas individuals with moderate state anxiety and high motivation engaged in less off-task cognition. For high state anxious individuals, however, motivation did not have an effect on off-task cognition.

Motivation also moderated the relationship between state anxiety and self-regulatory processing. Consistent with expectations, individuals with low state anxiety and low motivation engaged in lower levels of self-regulatory processing, whereas individuals with low state anxiety and high motivation engaged in higher levels of self-regulatory processing. Individuals with moderate state anxiety and low motivation also engaged in lower levels of self-regulatory processing, whereas individuals with moderate state anxiety and high motivation engaged in higher levels of self-regulatory processing. For high state anxious individuals, however, motivation had no effect on self-regulatory processing. Finally, off-task cognition and self-regulatory processing exerted differential effects on job performance – individuals engaging in
high levels of off-task cognition were less likely to perform well (although this did not reach statistical significance), while individuals engaging in high levels of self-regulatory processing were more likely to perform well.

In sum, Experiment 2 demonstrated a similar overall pattern to Experiment 1, with anxiety having a positive relation with off-task cognition and a negative relation with self-regulatory processing. Results of Experiment 2 also extend those obtained in Experiment 1 by examining motivation as a potential moderator of the relationships between anxiety (trait and state) and off-task cognition, as well as between anxiety (trait and state) and self-regulatory processing. The results were found to hold beyond the effects of stress, trait anxiety (in the case of state anxiety), state anxiety (in the case of trait anxiety), and gender (in the case of trait anxiety), providing a robust test of the theoretical model and providing further empirical clarification on the distinction between stress and anxiety.

**General Discussion**

“Anxiety's like a rocking chair. It gives you something to do, but it doesn't get you very far.”

– Jodi Picoult, Award-Winning American Author

Anxiety has consistently been positioned as a maladaptive experience to be avoided, a sentiment that has been shared in both theoretical and empirical research. Yet, inconsistent findings in the literature, combined with intuitive thought that anxiety must at some point facilitate performance, suggests that this is not a complete representation of anxiety. To that end, in this dissertation research, I set out to examine whether anxiety can have a bright side. Conclusions drawn from this dissertation suggest that anxiety does not have a bright side and moreover, its dark side is quite robust. In fact, many of my predictions pertaining to a bright side
of anxiety were not supported. Results were consistent across two experimental studies, enhancing confidence placed in these findings.

Experiment 1 found that individuals with high trait and state anxiety were more likely to engage in off-task cognition while working on the in-basket tasks. Off-task cognition, in turn resulted in lower levels of performance. Experiment 1 also found that individuals with high trait and state anxiety were less likely to engage in self-regulatory processing. Engaging in self-regulatory processing resulted in higher levels of performance. Experiment 2 in general replicated these results, with in-basket speech and email job tasks. Further, Experiment 2 extended these results by considering motivation as a boundary condition. For low and moderate state anxious individuals, high levels of motivation led to higher levels of self-regulatory processing, which in turn raised performance. High motivation for these individuals also led to lower levels of off-task cognition. For high state anxious individuals, motivation had no effect on the extent to which these individuals were more or less likely to engage in off-task cognition or self-regulatory processing. Further, motivation did not have any effect for trait anxious individuals.

Combined, these results reinforce a dark side of anxiety, as in no condition did anxiety act to facilitate performance. Although motivation was an effective buffer for low and moderate state anxious individuals, motivation had no effect on high state anxious or trait anxious individuals. Below, I discuss my findings and outline the theoretical and practical implications of this research.

**Anxiety Increases Off-Task Cognition and Lowers Self-Regulatory Processing**

Findings across both Experiment 1 and 2 in general indicated that, consistent with predictions, individuals with high trait or state anxiety are more likely to engage in off-task
cognition, which lowers performance. This finding adds support to the limited research that has examined off-task cognition as the mechanism underlying the anxiety and performance relationship and extends this research to include trait and state anxiety in relation to task-based job performance.

Findings across both Experiment 1 and 2 indicated that, contrary to predictions, individuals with high trait anxiety are less likely to engage in self-regulatory processing. This negative relationship between trait anxiety and self-regulatory processing may be a function of two main issues. First, trait anxious individuals, by nature, experience higher levels of anxiety than non-trait anxious individuals. Anxiety is comprised of both cognitive and somatic components, such that cognitive anxiety reflects relentless worrying and self-doubt, while somatic anxiety reflects physiological indicators such as increased autonomic arousal, heart rate, and shortness of breath (Liebert & Morris, 1967). This high arousal state puts anxious individuals in high alert, and they tend to react with a “freeze” response (i.e., “stop, look, and listen”; Bracha, Ralston, & Matsukawa, 2004) that is characterized by increased hypervigilance (Gray, 1988). This freeze response has obvious survival advantage, as ethological research has demonstrated that prey remaining in this “frozen” state during situations of threat manage to successfully escape detection over prey who run. Trait anxious individuals have likely adopted this “freeze” response as a survival function. Trait anxious individuals may have come to appraise feelings of arousal as a sign of impending threat that requires them to react by “freezing”, constantly scanning and monitoring the environment. This immobilization state may prevent trait anxious individuals from engaging in self-regulatory behaviors and focusing on the task at hand.
Second, engaging in self-regulatory behaviors requires the expenditure of limited resources (Tice et al., 2007). These behaviors require effortful processing to compensate for anxious individuals’ natural tendency to disengage from a goal or task (e.g., Carver & Scheier, 1998). Several theories suggest that trait anxious individuals would be particularly challenged in this regard. For example, theories of learned helplessness suggest that individuals become so adapted to unavoidable situations that they come to accept their situation and not bother trying to change it (e.g., Seligman & Maier, 1967). In the case of trait anxious individuals, failure feedback from past performance experiences may have modified future expectations of success and indoctrinated in them expectations of failure. This becomes a perpetuating self-fulfilling prophecy that can set trait anxious individuals up for failure. Consistent with this, trait anxious individuals carry self-deprecating attitudes (Spielberger, 1972), feel more negative and pessimistic about their own abilities and carry lower expectations of success (e.g., Räikkönen, Matthews, Flory, Owens, & Gump, 1999). Further, trait congruency theory suggests that individuals are motivated to “experience and maintain trait-congruent moods” (Ng & Diener, 2009). This suggests that trait anxious individuals may actually be more comfortable in situations where they expect failure and do not attempt to change these situations. In fact, research has demonstrated that neurotic individuals experience lower inclinations to alleviate their negative emotions (Ng & Diener, 2009). Moreover, trait anxious individuals operate on a behavioral inhibition system (Huang et al., 2009), which is associated with a natural tendency to avoid environments that will prevent negative experiences.

State anxiety, while also negatively related to self-regulatory processing in Experiment 1, had a non-significant relation with self-regulatory processing in Experiment 2. The weaker relation between state anxiety and self-regulatory processing, in contrast to the strong negative
relation between trait anxiety and self-regulatory processing, is consistent with the fact that state anxiety is momentary. Thus, while some of the inferences ascribed to trait anxiety may similarly describe the findings for state anxiety, the weaker relations between state anxiety and self-regulatory processing (i.e., low negative correlation in Experiment 1, non-significant in Experiment 2) provides some evidence that the momentary nature of state anxiety acts as a form of buffer.

**Motivation is Insufficient in Guiding Anxiety to a Bright Side**

The results for trait anxiety thus far suggest that trait anxious individuals are at a severe disadvantage and that human resource managers should be screening applicants out based on levels of trait anxiety. Yet, this is inconsistent with intuitive notions and observations that anxious individuals can be high performers!

Results of Experiment 2 found that motivation did not help trait anxious individuals engage in self-regulatory behaviors. I suggest that this may be reflective of how trait anxious individuals are interpreting motivation, and how trait anxious individuals may require an additional “push” to override their typical response to disengage. First, motivation was induced in participants through manipulating high and low levels of valence, instrumentality, and expectancy, consistent with Expectancy Theory (Vroom, 1964). Specifically, individuals in the high motivation manipulation were told that they will receive $20 for completing the tasks, that receiving this amount is linked to how well they perform on the tasks, and effort put into the tasks should lead to high performance. The manipulation check demonstrated that this manipulation of motivation was successful – individuals in the high motivation condition were more motivated than individuals in the low motivation condition. However, it is possible that for trait anxious individuals, this manipulation of motivation was not motivating, but served as
additional pressure that may have heightened or exacerbated their anxiety. In fact, post-hoc analyses indicated a marginally significant difference in motivation for high and low trait anxious individuals ($t(307) = 1.91, p = .06$), such that high trait anxious individuals actually felt less motivated ($M = 5.76; SD = .93$) than low trait anxious individuals ($M = 5.96; SD = .83$). Thus, trait anxious individuals may have interpreted the manipulation of motivation as a high pressure situation, which did not facilitate their performance. The implication of this finding is that trait anxious individuals may perceive motivation situations to be stress-inducing rather than stimulating.

It also may be the case that it takes more for trait anxious individuals to “get going”, to override their typical response in a high arousal situation to disengage and engage in self-regulatory behaviors. Consistent with this suggestion, disjunctive motivation models (Carver & Scheier, 1998; Kukla, 1972; Vancouver, More, & Yoder, 2008; Wright, 2008) suggest that individuals perform tasks either by engaging (investing effort) or disengaging (giving up). Importantly, individuals engage if they carry a deep feeling of task absorption that is accompanied by confidence in one’s competence (Carver & Scheier, 1998). Trait congruency theory would suggest that trait anxious individuals have developed their own routine or system of handling high arousal situations in a way that works for them (Ng & Diener, 2009), which is the tendency to disengage. Thus, factors such as confidence and competence may be additional factors that may help trait anxious individuals to engage in self-regulatory processing behaviors. I elaborate on this suggestion below.

Motivation buffered the relationship between state anxiety and self-regulatory processing in Experiment 2. For low and moderate state anxious individuals, motivation helped these individuals engage in more self-regulatory processing, and less off-task cognition. In other
words, individuals who were made to feel low or moderate levels of state anxiety, but who were also made to feel motivated, were able to exert the effort required to focus and concentrate on the tasks at hand. This is an important and valuable contribution – it points to motivation as a key factor for individuals with low and moderate state anxiety. However, for high state anxious individuals, motivation did not make a difference. This finding is consistent with research for trait anxiety, in that inducing high levels of state anxiety may have created a pressure situation where motivation served to be more stressful than it was motivating.

**Theoretical Contributions**

This dissertation makes several significant theoretical contributions to the literature. First, I proposed a comprehensive framework for understanding the multifaceted relationships between trait and state anxiety and task-based job performance. I empirically tested my propositions in two carefully designed experimental studies. This is a significant extension of past research that has focused primarily on direct effects between anxiety and performance, as it considered the process through which anxiety debilitates performance, and the process through which anxiety might facilitate performance. The positive direct effect between state anxiety and performance found in Experiment 2 provides indirect support for the fact that anxiety can facilitate performance, although not through self-regulatory processing. This research also extends past research in various domains of psychology that has only considered a “dark side” of anxiety by presenting a first step at uncovering the process through which anxiety might facilitate performance. Combined, results from both experiments suggest that there is a complex relationship underlying anxiety and performance such that it is no longer informative to consider the relationship between anxiety and job performance without also considering the mechanisms through which this relationship occurs.
Second, I identified motivation as a potential condition through which anxiety might lead to debilitating and facilitative performance. I manipulated each component of Expectancy Theory (Vroom, 1964), and found that motivation guides low and moderate state anxious individuals to engage in higher levels of self-regulatory processing and lower levels of off-task cognition. In doing so, I extend past research by identifying motivation as an important condition through which low and moderate state anxiety can facilitate performance. This is informative and lays the foundation for a program of research that examines additional factors that can more readily paint a bright side of anxiety, particularly for highly anxious individuals.

This is the first study to present a complete theoretical model incorporating both trait and state anxiety, while accounting for related constructs such as stress. In addition, I experimentally manipulated three levels of state anxiety, a significant contribution over past research that has assessed only two levels of anxiety. In doing so, I was able to point to the nuances in anxiety; results indicated that motivation has a significant effect on low and moderate levels of state anxiety, not on high levels. This research also provides insight into existing scattered research on trait and state anxiety and performance in various domains of psychology. The similarities between trait anxiety and state anxiety become evident in considering the mechanisms of off-task cognition and self-regulatory processing. Both trait anxiety and state anxiety were more likely to lead to off-task cognition and less likely to lead to self-regulatory processing. This adds support for the conceptual definitions of trait and state anxiety, in that trait anxiety represents the tendency to experience state anxiety in stressful situations. The distinctiveness across trait and state anxiety becomes evident when motivation is added to the model. For low and moderate state anxious individuals, motivation helped these individuals engage in higher levels of self-regulation and lower levels of off-task cognition. However, for trait anxious individuals,
motivation did not have an effect. This finding provides insight into the robustness of anxiety, in that motivation may not be sufficient for trait anxious individuals and for high state anxious individuals to engage in self-regulatory processing. The distinctiveness between trait and state anxiety is also evident in the direct relations exhibited with performance. Trait anxiety did not have a direct effect on performance, while state anxiety had positive and negative effects on performance across experiments. Combined, these results suggest that considering anxiety as a general construct overlooks nuanced relationships that exist between trait and state anxiety and job performance.

Finally, I considered anxiety in relation to job performance, arguably the most important outcome in organizational behavior research, as well as in the corporate world (Motowidlo, 2003). I used rigorous methods that included a simulation of the workplace and the assessment of various performance tasks comparable to real-world scenarios. In doing so, I provided clarification into the limited and inconsistent research examining the anxiety and job performance relation. Given the ubiquity of anxiety among employees, and its serious consequences on both employees and organizations, examining its effect on the bottom line is of critical importance. This provides a notable advancement of past research, as few organizational behavior studies have focused on anxiety.

Practical Implications

This dissertation research also has notable implications for both employees and organizations. First, this research suggests that anxious individuals are more likely to engage in off-task cognition. It is thus important to help anxious individuals minimize distractions. Given that anxious individuals tend to be more distracted by noises in the workplace or co-worker conversations taking place around them, ergonomic devices such as noise-cancelling headphones
or a more private workspace may help these individuals focus on their tasks. In addition, disengagement strategies drawn from the coping and work recovery literatures that are focused on mentally distancing from thoughts of work so as to give your mind a “break” have been demonstrated to help individuals manage the challenges of balancing multiple roles (Cheng & McCarthy, in press). This strategy may have similar beneficial effects for anxious individuals who are constantly worrying about multiple issues. Anxious individuals may find it beneficial to allocate a certain length of time (e.g., 10 minutes) to clear their mind completely, then return to their work task with full concentration. This cognitive disengagement strategy, drawn from the coping literature, may prove effective for trait anxious individuals as coping strategies tends to have a longer-term focus. It may also prove effective for high state anxious individuals given that the concept of giving your mind a “rest” or “break” implies a shorter-term strategy that may prove functional for these individuals.

Additional strategies may be adapted from clinical psychology such as positive self-talk (Meichenbaum, 1975). Positive self-talk involves changing negative, dysfunctional self-statements (e.g., “I worry I am making too many mistakes on this task”) to positive, functional self-statements (e.g., “I can break the task into smaller components and work on them one by one”). Focusing attention on one component of the task at a time would allow anxious individuals to see the task as more manageable instead of catastrophizing the whole task. Finally, the clinical approach of mindfulness therapy and meditation is focused on self-regulation in that it allows individuals to recognize their thought patterns and over time, develop habits of awareness that are focused on acceptance of thoughts. Mindfulness mediation is suggestive of increasing personal resources (Fredrickson & Cohn, 2008). This might be a particularly useful strategy for anxious individuals to adapt their thoughts in a way that allows them to continue to
perform their tasks without disruptive thoughts. Research has demonstrated this type of training to be successful in reducing stress and anxiety (Hofmann, Sawyer, Witt, & Oh, 2010).

This research also suggests that anxious individuals are less likely to engage in self-regulatory processing behaviors. It is thus also important to find strategies that can help anxious individuals engage in self-regulatory processing. I elaborate on suggestions in the Future Research Directions section below. Findings suggest that low and moderate state anxious individuals who are also motivated are less likely to engage in off-task cognition, and more likely to engage in self-regulatory processing. This is encouraging for employees who experience low to moderate levels of state anxiety in the workplace, as this research suggests that being motivated will help them focus on the task at hand. This highlights the possibility for not avoiding the experience of tension or apprehension for moderately state anxious individuals, but increasing motivation to perform. It would be worthwhile for organizations and supervisors to motivate employees to perform on the job. In that regard, the current research demonstrates that motivation can be manipulated in accordance with Expectancy Theory (Vroom, 1964) in a series of three simple steps that are easily implemented. First, it involves associating performance with a valued reward, recognizing that different outcomes are appealing for different employees. Second, it links performance directly with the reward. Third, it encourages employees that effort will lead to high performance. Combined, the expectancy framework of motivation can be translated to the workplace in situations where employees experience low to moderate levels of state anxiety such as promotion situations or when a work deadline is approaching.

**Strengths and Limitations**

This dissertation research contains several notable strengths, as well as corresponding limitations. A particular strength of the proposed studies is the use of experimental manipulations
of three levels of state anxiety to examine the precise nature of the relation between anxiety and standardized task-based job performance. Motivation was also manipulated consistent with an Expectancy Theory perspective (Vroom, 1964). As a first step in developing a comprehensive model of how trait and state anxiety affects performance, this experimental design facilitated stronger conclusions on the causal ordering of model variables. Moreover, I used different procedures and measures to reduce effects of methodological artifacts and alternative explanations. I extended the manipulation of state anxiety in Experiment 2; further, the dependent measures of job performance in both experiments were objectively measureable behaviors that included a model task (Experiment 1), an email task (Experiments 1 and 2) and a speech task (Experiment 2).

A corresponding limitation concerns how closely participant performance on an in-basket task represents actual performance on the job. However, great care was taken to make the tasks as realistic as possible. Specifically, I used three in-basket tasks across two experimental studies that captured performance on a range of tasks assessing different dimensions of performance. The tasks were also developed to increase generalization to real-world contexts. For example, the job of a middle manager in an organizational context requires writing (e.g., answering emails, drafting speeches to present in committee meetings or to present to clients). These tasks require skills comparable to those that were presented in the in-basket tasks. Further, typical in-basket tasks use scenarios requiring participants to answer multiple choice questions pertaining to their most likely course of action in a particular situation. In both experimental studies, participants were required to perform objectively observable behaviors.

Finally, experimental studies have the added advantage of providing a controlled context in which performance occurs (Dukerich et al., 1990). Experimental studies also provide internal
validity by which to isolate the variables of interest in order to provide a first glimpse into the process behind the anxiety-performance relation that can inform future research on anxiety and job performance. The associated trade-off is that experimental studies limit external validity. Given that the purpose of the proposed studies was to determine the process through which anxiety may exert debilitative and facilitative effects on performance, and to determine a moderator affecting these relations, a controlled experimental study served as the appropriate methodology by which to test these predictions. However, future research should examine the effect of trait and state anxiety on job performance in a field study. This would validate the results of these experimental studies. It would be valuable to determine whether self-regulatory processing serves as the process through which anxiety facilitates performance in a real-world context with significant costs for performance (cf. McCarthy et al., 2009). Such research could make use of experience-sampling methodology such as diary studies that allow for the capture of specific episodes of anxiety during the work day.

A limitation of both experiments was that the mean of the high state anxiety condition was in the moderate range, raising questions as to whether a high level of state anxiety was adequately captured. Several modifications were made to Experiment 2 in an attempt to strengthen the high state anxiety manipulation, however, this did not significantly raise the mean. Nevertheless, the initial pilot test as well as both experiments found significant differences between the high, moderate, and low anxiety conditions, providing some reassurance that three levels of anxiety were being examined. Further, my theoretical models held while controlling for trait anxiety (when examining state anxiety), state anxiety (when examining trait anxiety), and stress. One possibility for future research would be to use physiological indicators of anxiety, although research has demonstrated that self-reports of anxiety are accurate representations of
physiological measures of anxiety (i.e., heart rate; Kantor, Endler, Heslegrave, & Kocovski, 2001).

Further, motivation was manipulated such that the high motivation condition consisted of high levels of each of the components of Expectancy Theory (Vroom, 1964), and the low motivation condition consisted of low levels of each of the three components. This did not allow for the examination of potentially differential weights of each component, such that expectancy may play a larger role than valence and or instrumentality. However, the manipulation of motivation was consistent with the central tenet of Expectancy Theory specifying that motivation is a combined effect among each of the three components (Vroom, 1964). This suggests that it is an interaction of each of the three motivation components, rather than separate contributions or differential weights of each component, that combine to exert an effect on performance. Nevertheless, future research should tease apart these components of Expectancy Theory to examine whether there is a certain component that is pulling more weight in outlining the bright side of anxiety.

A final limitation concerns the possibility that self-regulatory processing cannot accurately be assessed through retrospective self-report. It is possible that anxious individuals are underestimating the extent to which they are engaging in these cognitive behaviors. Given research suggesting that anxious individuals are more pessimistic and negative about their own abilities (e.g., Norem, 2008), this would be a reasonable assumption. Future research should consider other methods of assessing self-regulation. For example, Baumeister, Tice, and colleagues (e.g., 1994, 2007, 2009) use self-regulation tasks which require participants to override responses. Specifically, participants are required to engage in an initial behavior requiring self-regulation, and self-regulation on another seemingly unrelated task is assessed.
Future Research Directions

Although results of this dissertation did not point to a bright side of anxiety, this does not serve as conclusive evidence that a bright side does not exist, as this is the first study to consider whether state and trait anxiety can debilitate and facilitate job performance. There are several reasons why a bright side of anxiety may not have been found in this research. First, as discussed above, the context of a laboratory study using student participants precludes the examination of actual employees where consequences for performance are real. Thus, future research should examine the proposed model in a field study using actual employees.

Second, Experiment 2 indicated that motivation did not help high trait anxious or high state anxious individuals engage in self-regulatory processing. Given that anxious individuals use a significant amount of resources constantly scanning the environment, it may be that motivation alone is insufficient in helping anxious individuals engage in self-regulatory processes. Future research should continue to examine boundary conditions that point to a bright side of anxiety. Ability is one potential factor that may help anxious individuals increase their self-regulatory processing. Past research examining anxiety and performance has not taken ability into consideration, yet a review of empirical research demonstrating a negative relation between state and trait anxiety and performance suggests the presence of low levels of ability. For example, in the work domain, anxiety has been found to interact with cognitive ability, such that worrying was negatively related to performance for managers with low cognitive ability, and positively related to performance for managers with high cognitive ability (Perkins & Corr, 2005). On the other hand, past research demonstrating a positive relation between anxiety and performance suggests the presence of high levels of ability. For example, state anxiety has been found to have a positive relation with performance on a rock climbing route for experienced rock climbers.
(Hardy & Hutchinson, 2007, Studies 1 and 3). Initial experimental support for this proposition comes from recent work (Lang & Lang, 2010) demonstrating that priming competence reduces the effect of test anxiety on test performance. Employees who have a higher level of ability should be more able to complete the responsibilities required of them on the job. Future research can examine ability in an experimental setting by manipulating levels of training. Those who receive training on a task should perform better on the task than those who do not receive training, as training has been consistently demonstrated to enhance an individual’s self-efficacy (Gist, 1989; Gist, Stevens, & Bavetta, 1991; Morin & Latham, 2000; Stevens & Gist, 1997).

Third, the type of tasks used in the current research may not have been perceived as a stressful situation for participants. Responding to an email, building a model replica, and creating a speech may draw on behaviors and skills that are familiar to participants such that anxiety was not a factor during performance. Future research should use performance tasks that are anxiety-provoking. For example, highly complex tasks that assess acute levels of performance, or group tasks where competition is likely to be a factor may serve to heighten anxiety in employees that may serve to draw out the dark and bright sides of anxiety. Importantly, the current research can inform future work by serving as a foundational model for considering the possibility of debilitative and facilitative effects of varying types of anxiety on performance in a variety of tasks and occupations. Specifically, future research can examine whether specific forms of anxiety affect corresponding performance outcomes, consistent with the predictor-criterion matching framework advanced by Ajzen and Fishbein (1977). For example, perhaps social anxiety or communication anxiety (McCarthy & Goffin, 2004) affects sales performance more strongly, while performance anxiety (McCarthy & Goffin, 2004) affects maximum type performance outcomes more strongly.
Fourth, there may be certain occupations for which this research may be most relevant. That is, job type may have a significant impact on drawing out a bright side of anxiety. For example, employees that are working in stressful occupations by nature, such as stock traders, police officers, and airline traffic operators, would serve as valuable populations by which to examine whether heightened levels of anxiety would facilitate stress-based job performance. This research would also have important implications for occupations that are more prone to inciting specific types of anxieties, for example, sales and communication anxiety would be relevant for sales organizations where employees are compensated through sales and commission, while performance anxiety would be relevant for firefighters or surgeons where the cost of one mistake is a life or death matter.

There are also other important avenues for future research. For example, there may be other personality traits that compensate for anxiety. One possibility for future research is to examine whether anxious individuals with high levels of learning goal orientations would be more motivated to engage in self-regulatory processing. Goal orientations in general reflect a motivational variable for performance, which can be trait-based (DeShon & Gillespie, 2005) and also domain-specific (VandeWalle, Cron, & Slocum, 2001). A learning goal orientation is characterized by the desire to acquire and master new skills and develop one’s competence (Dweck, 1986; VandeWalle, 1997). People with learning goal orientations are focused on improving skills and gaining new understanding and knowledge, and are not concerned with making mistakes. Anxious individuals with a high learning goal orientation may be more likely to exert the effort and focus needed to engage in self-regulatory processing behaviors. Learning goal orientations develop intrinsic motivation, which contrasts with the current experimental studies which manipulated an extrinsic motivator. Meta-analytic research has found that learning
goal orientations lead to increased self-efficacy, and predicts job performance over and above cognitive ability (Payne, Youngcourt, & Beaubien, 2007). Moreover, metacognition may also help anxious individuals engage in self-regulatory processing. Individuals with heightened metacognitive awareness are skilled at monitoring progress towards goals and adjusting their learning strategies to facilitate their performance (Ford, Smith, Weissbein, Gully, & Salas, 1998). Metacognitive activity has been found to be related to a learning goal orientation as well as skill-based learning outcomes (Schmidt & Ford, 2003).

Future research should also consider implications for managing trait and state anxiety based on the current research. This research points to the importance of examining potential strategies that can help anxious individuals improve their self-regulatory processing or decrease off-task cognition. Tice and colleagues (2007) noted that: “Anything that might counteract the tendency to fail at self-regulation during ego depletion would therefore have both practical and theoretical importance” (p. 383). This dissertation found motivation to be one important factor that can counteract this tendency in low and moderate state anxious individuals. Future research may include strategies that are touted as longer-term strategies to address trait anxiety such as coping strategies geared towards problem-focused coping, which orients individuals towards facing a stressor head on (Lazarus & Folkman, 1984). Further, defensive pessimism may be a strategy that can help trait anxious individuals manage their anxiety so that it can help to facilitate their efforts to reach their goals (Norem, 2008). Defensive pessimism is a “strategy of setting low expectations (being pessimistic) and then thinking through, in concrete and vivid detail, all the things that might go wrong as one prepares for an upcoming situation or task” (Norem, 2008, p. 123). It provides anxious individuals with a strategy of managing their anxiety by confronting their worries, then thinking through each worry to develop a concrete, step-by-
step action plan that can help to mitigate each worry. This is consistent with research on goal pursuit which emphasizes the importance of breaking abstract goals into small, concrete steps (Gollwitzer, 1999). Preliminary research has demonstrated that defensive pessimists are adept at managing distractions (Garcia, 1995), and show significant improvements in self-esteem (Norem & Andreas, 2007).

**Conclusion**

W. H. Auden stated: “Now is the age of anxiety” decades ago. More than ever, the experience of anxiety in the workplace is a problem that carries significant consequences for employees and organizations. Despite extensive research examining the effect of anxiety on performance in other domains of psychology, research on state and trait anxiety in the general work context has been sparse. This dissertation research contributes to the literature by providing a comprehensive theoretical model outlining a dual-process model of anxiety, pinpointing the mechanisms through which both trait and state anxiety may lead to debilitative and facilitative job performance, and considering motivation as a boundary condition through which anxiety may exert a debilitative or facilitative effect on job performance. Results of two experimental studies found support mainly for a dark side of anxiety. Anxious individuals are more likely to engage in off-task cognitions and less likely to engage in self-regulatory processing. Anxiety, it seems, “gives you something to do, but it doesn’t get you very far”. The bright side of anxiety is only evident in low to moderate state anxious individuals, who were found to engage in less off-task cognition and more self-regulatory processing under conditions of high motivation. This is a promising start to identifying a bright side of anxiety. It is hoped that this dissertation research serves as the groundwork for additional research on anxiety in the workplace, and its complex relation with job performance.
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intervention on the acquisition and maintenance of complex interpersonal skills.


Heaney, C. A., Price, R. H., & Rafferty, J. (1995). Increasing coping resources at work: A field experiment to increase social support, improve work team functioning, and enhance


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*Organizational Behavior and Human Performance, 32*(2), 160-177. doi:10.1016/0030-5073(83)90145-9


The state anxiety manipulation was pilot tested to ensure appropriate variance among high, moderate, and low anxiety conditions. In this pilot test, a separate sample of 65 undergraduate students were recruited to participate. To provide a comprehensive test of the anxiety manipulation, four levels of state anxiety (high, moderate, low, really low) were induced in participants. Participants were randomly assigned to condition. High, moderate, and low anxiety manipulations were consistent with those described above. Participants in the really low anxiety condition received the same manipulation as participants in the low anxiety condition, with the addition that they were also provided with a small treat on their desk and told to help themselves to it at any point of the study. Following the manipulation of anxiety, participants completed a manipulation check using the 20-item state portion of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). The manipulation check indicated that participants in the high anxiety condition experienced significantly higher levels of state anxiety than participants in the moderate anxiety condition ($t_{33} = 2.28, p < .05$), and participants in the moderate anxiety condition experienced significantly higher levels of state anxiety than participants in the low anxiety condition ($t_{37} = 2.15, p < .05$) and marginally higher levels of state anxiety than participants in the really low anxiety condition ($t_{45} = 1.93, p = .07$). Finally, the low and really low anxiety conditions were not significantly different from each other ($t_{30} = .25, p = .80$). Based on this pilot study, three levels of state anxiety (high, moderate, low) were used for the final experiment.

The trait anxiety model holds without the control variables.

The state anxiety model holds without the control variables.

The interaction model holds without the control variables.
The interaction model holds without the control variables.

The trait anxiety model holds without the control variables.

The trait anxiety x motivation model holds without the control variables.

The state anxiety model holds without the control variables.

The interaction model holds without the control variables.
Table 1

Empirical Studies Examining Anxiety and Performance in a Work Context

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Sample</th>
<th>Operationalization of anxiety</th>
<th>Operationalization of performance</th>
<th>Correlation between anxiety and performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barling, Rogers, &amp; Kelloway, 2001</td>
<td>292</td>
<td>Female employees working with clients in-home in Canada (nurses, social workers, child management specialists, behavior management specialists)</td>
<td>Self-report 12-item mood scale (Nowlis, 1965) assessing how often participants experienced anxiety over the past 6 months</td>
<td>Self-reported interpersonal job performance using 20-item measure (Stewart &amp; Barling, 1996)</td>
<td>Anxiety not significantly related to interpersonal job performance (-.05)</td>
</tr>
<tr>
<td>Chung, Ehrhart, Hattrup, &amp; Solamon, 2010</td>
<td>150</td>
<td>Police and fire departments in U.S. undergoing promotion exam</td>
<td>Self-report 4-item scale of state anxiety in context of promotional exams. Based on scale by Veit and Ware (1983; “During the written test, I felt tense or high strung”)</td>
<td>Written job knowledge test with between 97 and 117 multiple choice items (depending on job)</td>
<td>State anxiety not significantly related to test performance (-.09)</td>
</tr>
<tr>
<td>Donaldson &amp; Blanchard, 1995</td>
<td>345</td>
<td>Employees from four organizations in southern California</td>
<td>Self-report 4-item anxiety subscale from the General Well-Being Schedule (no sample item provided)</td>
<td>Supervisors evaluated employee performance on 5 items (quantity, quality, cooperation, initiative, overall performance) over past 6 months</td>
<td>Anxiety not significantly related to job performance (.03)</td>
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<tr>
<td>Study</td>
<td>N</td>
<td>Sample</td>
<td>Operationalization of anxiety</td>
<td>Operationalization of performance</td>
<td>Correlation between anxiety and performance</td>
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<tr>
<td>Grant-Vallone, 1998 dissertation</td>
<td>342</td>
<td>Employees from range of companies in Los Angeles</td>
<td>Self-report 4-item anxiety subscale from the General Well-Being Schedule (“Have you been anxious worried or upset during the past month?”)</td>
<td>Self-report and co-worker reports of performance (quantity, quality, overall performance) using 3-item scale (Donaldson, 1991, 1993)</td>
<td>Anxiety not significantly related to self-rated job performance (-.06); anxiety significantly related to co-worker reports of employee job performance (-.24)</td>
</tr>
<tr>
<td>Guilford, 1952</td>
<td>208</td>
<td>Executives (208) and supervisors (143) of large grocery chain</td>
<td>Guilford personality inventories assessing nervousness (no sample item provided)</td>
<td>Overall job performance assessed by training staff and superintendents</td>
<td>For executives, nervousness not significantly related to performance (.02); for supervisors, nervousness significantly related to performance (-.18)</td>
</tr>
<tr>
<td>Kagan, Kagan, &amp; Watson, 1995</td>
<td>367</td>
<td>Employees of the Emergency Medical Service (approximately 20% of total EMS) of the Houston Fire Department</td>
<td>Self-report state anxiety using 21-item State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, &amp; Jacobs, 1983; no sample item provided)</td>
<td>Letters of commendation from the public</td>
<td>State anxiety not significantly related to number of letters of commendation from the public (-.10)</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Sample</td>
<td>Operationalization of anxiety</td>
<td>Operationalization of performance</td>
<td>Correlation between anxiety and performance</td>
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<tr>
<td>McCarthy, Hrabluk, &amp; Jelley, 2009</td>
<td>Study 1: 490</td>
<td>Study 1: Police officers undergoing standardized promotional exams</td>
<td>Study 1: Self-report 5-item behavioral (“While taking the exam, my hands shook”) and 4-item performance anxiety (“I was overwhelmed by thoughts of doing poorly when I was in the exam room”) subscales adapted from Measure of Anxiety in Selection Interviews (McCarthy &amp; Goffin, 2004)</td>
<td>Study 1: Exam performance on standardized, multiple-choice promotional exam with over 100 items; self-rated performance using a 4-item scale developed for the study</td>
<td>Study 1: Behavioral and performance anxiety not significantly related to exam performance (.04 and -.03); behavioral and performance anxiety significantly related to self-rated performance (-.21 and -.38)</td>
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<td></td>
<td>Study 2: 182</td>
<td>Study 2: Police officers who had completed promotional exams</td>
<td>Study 2: Same as Study 1</td>
<td>Study 2: Same as Study 1</td>
<td>Study 2: Behavioral and performance anxiety not significantly related to exam performance (.04 and .04); behavioral anxiety not related to self-rated performance (-.10), performance anxiety significantly related to self-rated performance (-.29)</td>
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<td>Study 2: Same as Study 1</td>
<td>Study 2: Same as Study 1</td>
<td>Study 2: Behavioral and performance anxiety not significantly related to exam performance (.04 and .04); behavioral anxiety not related to self-rated performance (-.10), performance anxiety significantly related to self-rated performance (-.29)</td>
</tr>
<tr>
<td>Mughal, Walsh, &amp; Wilding, 1996</td>
<td>Study 1: 48</td>
<td>Study 1: Insurance sales consultants in London</td>
<td>Study 1: Self-report trait anxiety using State-Trait Anxiety Inventory (Spielberger, Gorsuch, &amp; Lushene, 1970; no sample item provided)</td>
<td>Study 1: Objective indicators recorded in diary records: Commission volume, number of sales closed, appointments made, number of people seen, number of hours worked</td>
<td>Study 1: Trait anxiety significantly related to all five assessments of performance (rs ranged from .28 to .32)</td>
</tr>
<tr>
<td></td>
<td>Study 2: 51</td>
<td>Study 2: Employees from six offices of different companies from Romford to Southampton</td>
<td>Study 2: Same as Study 1</td>
<td>Study 2: Objective indicators: Commission volume, number of sales closed, appointments</td>
<td>Study 2: Trait anxiety significantly related to all four assessments of performance (rs ranged from .30 to .40)</td>
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<td></td>
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<td>Study 2: Same as Study 1</td>
<td>Study 2: Trait anxiety significantly related to all four assessments of performance (rs ranged from .30 to .40)</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Sample</td>
<td>Operationalization of anxiety</td>
<td>Operationalization of performance</td>
<td>Correlation between anxiety and performance</td>
</tr>
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<tr>
<td>Murphy, Duxbury, &amp; Higgins, 2006</td>
<td>2507</td>
<td>Large financial service organization across Canada</td>
<td>Self-report 8-item symptom scale (Heaney, Price, &amp; Rafferty, 1995) assessing how often participants report specific physical symptoms over 3 month period</td>
<td>Self-report 9-item measure (Pierce, Newstrom, Dunham, &amp; Barber, 1989) of positive productivity (“Did you feel encouraged to come up with new/better ways of doing things?”) and negative productivity (“Did the stresses and strains from working long hours reduce your productivity?”)</td>
<td>Anxiety significantly related to positive productivity (-.10) Anxiety significantly related to negative productivity (.35)</td>
</tr>
<tr>
<td>Nieuwenhuys &amp; Oudejans, 2010</td>
<td>7</td>
<td>Police officers</td>
<td>Low and high anxiety condition: Low anxiety condition consisted of mannequin as opponent; High anxiety condition consisted of experienced firearms instructor who fired back as opponent. Assessed anxiety with anxiety thermometer (Houtman &amp; Bakker, 1989) and heart rate recorder</td>
<td>Performance on a shooting exercise: Performance evaluated by number of hits on each of designated target areas</td>
<td>Anxiety significantly related to performance (M of shooting accuracy (%) for high anxiety = 47.63; for low anxiety = 70.36)</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Sample</td>
<td>Operationalization of anxiety</td>
<td>Operationalization of performance</td>
<td>Correlation between anxiety and performance</td>
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<tr>
<td>Perkins &amp; Corr, 2005</td>
<td>367</td>
<td>Managers from a global securities company from U.K.</td>
<td>Self-report using Occupational Personality Questionnaire Concept Model 4.2 (Saville &amp; Holdsworth Ltd., 1993a; “Is nervous about doing well” and “Is anxious to get things right”)</td>
<td>Line manager ratings using two 6-item subscales developed by authors (current job performance: “This manager achieves the objectives of the job”; overall promotability: “This manager meets the criteria for promotion”), and 160-item management competency questionnaire (Saville &amp; Holdsworth Ltd., 1993b)</td>
<td>Significant interaction between cognitive ability and worrying; worrying negatively related to performance for managers with low cognitive ability scores, positively related to performance for managers with high cognitive ability scores</td>
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<tr>
<td>Pitt, Berthon, &amp; Robson, 2000</td>
<td>113</td>
<td>Industrial salespeople recruited from offices of European vehicle manufacturer in six countries in Europe and Asia</td>
<td>Self-report communication apprehension using Personal Report of Communication Apprehension-24 scale (McCroskey, 1982; no sample item provided)</td>
<td>Sales manager rating using 1-item measure of salesperson’s performance</td>
<td>Communication apprehension significantly related with performance (-.44)</td>
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<tr>
<td>Study</td>
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<td>Sample</td>
<td>Operationalization of anxiety</td>
<td>Operationalization of performance</td>
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<tr>
<td>Regehr, LeBlanc, Jelley, &amp; Barath, 2008</td>
<td>84</td>
<td>Police recruits enrolled in the basic constable training program at the Ontario Police College (OPC)</td>
<td>Self-report state anxiety using 20-item State-Trait Anxiety Inventory (Spielberger, 1983; “I am tense”); heart rate response using a Polar heart rate monitor; salivary cortisol levels</td>
<td>Recruits participated and responded in a simulation scenario representing a life-like work environment. Three expert raters at the OPC rated each recruit on checklist of specific actions taken during a videotaped simulation on a scale of 1(very poor) to 5(very good); performance was total score; recruits also received a relative ranking (0-100%) of global performance as compared with a group of recruits at a similar level of training</td>
<td>State anxiety was not significantly related to any aspect of performance; heart rate was not significantly related to any aspect of performance; cortisol level 20 minutes after the event was significantly related to performance (.19) and the relative ranking (.18)</td>
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<td>Rego &amp; Cunha, 2008</td>
<td>199</td>
<td>Employees from 118 organizations</td>
<td>Bi-polar 3-item self-report scale assessing anxiety-comfort (Daniels, 2000) over the last three months in the organization</td>
<td>Self-report 4-item questionnaire (three items from Staples et al., 1999, one item developed by authors)</td>
<td>Comfort significantly related to performance (.24)</td>
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<tr>
<td>Study</td>
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<td>Sample</td>
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<td>Correlation between anxiety and performance</td>
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<tr>
<td>Reio &amp; Callahan, 2004</td>
<td>233</td>
<td>Employees in service industry</td>
<td>Self-report state and trait anxiety using 10-item State-Trait Personality Inventory (Spielberger, Barker, Russell, De Crane, Westberry, Knight, &amp; Marks, 1980; no sample item provided)</td>
<td>Self-report 6-item questionnaire developed by authors (“How would you rate your overall job performance?”)</td>
<td>State anxiety not significantly related to job performance (-.07) Trait anxiety not significantly related to job performance (-.12)</td>
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<tr>
<td>Schell &amp; Grasha, 2000</td>
<td>75</td>
<td>Undergraduate students</td>
<td>Self-report state anxiety assessed posttask only using 20-item State-Trait Personality Inventory, Form Y (Spielberger, 1983; “I am nervous”)</td>
<td>Simulated pharmacy dispensing task, filling mock orders for simulated pharmacy items</td>
<td>State anxiety significantly related to performance (more errors, $\beta = .33$)</td>
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<td>Slaski &amp; Cartwright, 2002</td>
<td>224</td>
<td>Middle managers working for a major UK retailer</td>
<td>Self-report 28-item General health questionnaire (Goldberg &amp; Williams, 1988; no sample item provided) including anxiety subscale</td>
<td>Participants’ immediate line-manager rated overall job performance using host organizations’ own 64-item competency framework</td>
<td>General health significantly related to overall job performance (-.37) [Distress significantly related to overall job performance (-.42)]</td>
</tr>
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Table 1 (cont.)

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Sample</th>
<th>Operationalization of anxiety</th>
<th>Operationalization of performance</th>
<th>Correlation between anxiety and performance</th>
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<tbody>
<tr>
<td>Spector, Dwyer, &amp; Jex, 1988</td>
<td>181</td>
<td>Female secretaries from University of South Florida</td>
<td>Self-report state anxiety using 10-item State-Trait Personality Inventory (Spielberger, 1979; no sample item provided)</td>
<td>Supervisor ratings of secretary’s level of performance relative to other secretaries on typing speed, typing accuracy, receptionist duties, administrative business, and maintaining workload (“She does her job better than [what percentage] of other secretaries?”)</td>
<td>State anxiety significantly related to overall job performance (-.16)</td>
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<tr>
<td>Steen, Firth, &amp; Bond, 1998</td>
<td>362</td>
<td>Nurses from 12 hospitals in England</td>
<td>Self-report using anxiety section of the Hospital Anxiety and Depression scale (Zigmond &amp; Snaith, 1983) and 6-item short form of Spielberger State Anxiety Inventory (Marteau &amp; Bekker, 1992); no sample item provided</td>
<td>Head nurse ratings of performance: Performance errors, motivational effectiveness (Motowidlo et al., 1986), lack of tolerance with patients (Motowidlo et al., 1986), interpersonal behaviour in interactions with other staff</td>
<td>Anxiety not significantly related to any component of performance (correlation not provided)</td>
</tr>
<tr>
<td>Verbeke &amp; Bagozzi, 2000</td>
<td>189</td>
<td>Mortgage sellers from a subdivision of a large Dutch bank</td>
<td>Self-report sales call anxiety (comprised of negative self-evaluation, perceived negative evaluation from customers, physiological symptoms, protective actions) using scale developed by authors</td>
<td>Self-report 5-item sales volume (Behrman &amp; Perreault, 1984; “Exceeding all sales targets and objectives”), 4-item communication quality during sales interaction (Behrman &amp; Perreault, 1984; “Convincing customers that you understand their unique problems and concerns”)</td>
<td>All four components of sales call anxiety significantly and negatively related to communication quality and sales volume (correlations not provided)</td>
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Table 2

Experiment 1 Means, Standard Deviations, Internal Consistency Reliabilities and Correlations

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<th>6</th>
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<td>1. Sex(^a)</td>
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<td>8. Performance Task 1(^c)</td>
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<td>-.38***</td>
<td>.20***</td>
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</table>

Note. N ranged from 265 to 302. \(^a\)Sex (1 = Female, 2 = Male). \(^b\)Reflects three levels of manipulated state anxiety (1 = Low; 2 = Moderate; 3 = High). \(^c\)Reflects email task. \(^d\)Reflects model task. Internal consistency reliabilities appear across the diagonal in bold, except for Sex, Condition, Performance Task 1 and 2, where internal consistency was not assessed.

\(* p < .05; ** p < .01; *** p < .001.\)
<table>
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<tr>
<th>Variable</th>
<th>M</th>
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<td>7. Valence&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>8. Instrumentality&lt;sup&gt;d&lt;/sup&gt;</td>
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Note. N ranged from 313 to 327. *Sex (1 = Female, 2 = Male). Reflects three levels of manipulated state anxiety (1 = Low; 2 = Moderate; 3 = High). Reflects two levels of manipulated motivation (1 = Low; 2 = High). Reflects manipulation checks for motivation, with each component reflecting two levels (Valence: 1 = $5; 2 = $20; Instrumentality: 1 = No; 2 = Yes; Expectancy: 1 = No; 2 = Yes). Reflects speech writing task. Reflects email writing task. Internal consistency reliabilities appear across the diagonal in bold, except for Sex, Condition Anxiety, Condition Motivation, Valence, Instrumentality, Expectancy, Performance Task 1 and 2, where internal consistency was not assessed.

* p < .05; ** p < .01; *** p < .001.
Table 4

Experiment 2 Regression Analyses for Trait Anxiety and Motivation

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<th></th>
<th>Off-Task Cognition</th>
<th>Self-Regulatory Processing</th>
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<td></td>
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<td>SE₂</td>
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<td><strong>Step 2: Main Effects</strong></td>
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*Note. N = 310.*

**p < .01; ***p < .001.
Table 5

*Experiment 2 MANOVA Cell Means for State Anxiety (Condition) and Motivation*

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Figure 1. Objective of Experiment 1.

Note. Objective of Experiment 1 is to examine whether anxiety can exert debilitating and facilitative effects on job performance. In the proposed dual-process model of anxiety, it is expected that anxiety will have a positive relationship with off-task cognition, and off-task cognition will be negatively related to job performance. It is expected that anxiety will have a positive relationship with self-regulatory processing, and self-regulatory processing will be positively related to job performance.
Figure 2. Objective of Experiment 2.

Note. Objective of Experiment 2 is to examine when anxiety might lead to debilitative and facilitative performance. Motivation is predicted to be the moderator of the relation between anxiety and off-task cognition, and between anxiety and self-regulatory processing.
Figure 3. Experiment 1 model of trait anxiety, off-task cognition, self-regulatory processing, and job performance (Task 1). $\chi^2_{(52)} = 125.5$; CFI = .92, NNFI = .93, RMSEA = .07.

*Note.* Performance Task 1 = Email task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation.

Also included in the model, although not illustrated, are control variables state anxiety, stress, and gender.

** $p < .01$; *** $p < .001$. 
Figure 4. Experiment 1 model of trait anxiety, off-task cognition, self-regulatory processing, and job performance (Task 2). $\chi^2_{(52)} = 136.1; \text{CFI} = .92, \text{NNFI} = .92, \text{RMSEA} = .07$.

Note. Performance Task 2 = Model task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation.

Also included in the model, although not illustrated, are control variables state anxiety, stress, and gender.

** $p < .01$; *** $p < .001$. 
Figure 5. Experiment 1 model of state anxiety (condition), off-task cognition, self-regulatory processing, and job performance (Task 1). $\chi^2(71) = 155.8$; CFI = .93, NNFI = .93, RMSEA = .06.

Note. Performance Task 1 = Email task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation.

Also included in the model, although not illustrated, are control variables trait anxiety and stress.

* $p < .05$; ** $p < .01$. 
**Figure 6.** Experiment 1 model of state anxiety (condition), off-task cognition, self-regulatory processing, and job performance (Task 2). $\chi^2(71) = 152.4$; CFI = .94, NNFI = .94, RMSEA = .06.

*Note.* Performance Task 2 = Model task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation.

Also included in the model, although not illustrated, are control variables trait anxiety and stress.

* $p < .05$; ** $p < .01$; *** $p < .001$. 
Figure 7. Experiment 2 model of trait anxiety, motivation, off-task cognition, self-regulatory processing, and job performance (Task 1). $\chi^2_{(52)} = 148.9$; CFI = .94, NNFI = .94, RMSEA = .08

Note. Performance Task 1 = Speech task. Units reflect standardized path coefficients. Dashed lines denotes un hypothesized relations.

Also included in the model, although not illustrated, are control variables state anxiety, stress, and gender.

*** $p < .001$. 
Figure 8. Experiment 2 model of trait anxiety, motivation, off-task cognition, self-regulatory processing, and job performance (Task 2). $\chi^2_{(52)} = 145.6$; CFI = .94, NNFI = .94, RMSEA = .07

*Note.* Performance Task 2 = Email task. Units reflect standardized path coefficients. Dashed lines denotes unhypothesized relations.

Also included in the model, although not illustrated, are control variables state anxiety, stress, and gender.

* $p < .05$; *** $p < .001$. 
Figure 9. Experiment 2 model of state anxiety (condition), off-task cognition, self-regulatory processing, and job performance (Task 1). $\chi^2(71) = 185.0$; CFI = .94, NNFI = .94, RMSEA = .07

Note. Performance Task 1 = Speech task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation. Also included in the model, although not illustrated, are control variables trait anxiety and stress.

* $p < .05$; ** $p < .01$. 
Figure 10. Experiment 2 model of state anxiety (condition), off-task cognition, self-regulatory processing, and job performance (Task 2). $\chi^2(71) = 189.5$; CFI = .94, NNFI = .94, RMSEA = .07

Note. Performance Task 2 = Email task. Units reflect standardized path coefficients. Dashed line denotes unhypothesized relation.

Also included in the model, although not illustrated, are control variables trait anxiety and stress.

* $p < .05$; ** $p < .01$; *** $p < .001$. 
Figure 11. Motivation as moderator of the relationship between state anxiety and off-task cognition.
Figure 12. Motivation as moderator of the relationship between state anxiety and self-regulatory processing.
Dear Dr. McCarthy and Ms. Bonnie Cheng,

Re: Your research protocol entitled, "The Dark and Bright Sides of Anxiety: A Comprehensive Examination of the Relation between State Anxiety, Trait Anxiety, and Job Performance"

ETHICS APPROVAL

Original Approval Date: November 1, 2011
Expiry Date: October 31, 2012
Continuing Review Level: 1

We are writing to advise you that the Social Sciences and Humanities Research Ethics Board (REB) has granted approval to the above-named research protocol under the REB’s delegated review process. Your protocol has been approved for a period of one year and ongoing research under this protocol must be renewed prior to the expiry date.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events in the research should be reported to the Office of Research Ethics as soon as possible.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your current ethics approval. Note that annual renewals for studies cannot be accepted more than 30 days prior to the date of expiry.

If your research is funded by a third party, please contact the assigned Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your research.

Yours sincerely,
Appendix B

Experiment 1 and 2 Task

You have an email that has been waiting for your response since the beginning of the workday today, at 8am.

You must respond to the email detailing the procedure you want the person contacting you to take in order to appropriately, effectively, and efficiently deal with the issue identified in the email.

You will be evaluated on your ability to:
- a) recognize the problem
- b) sort through possible alternatives
- c) make quality decisions in selecting the best alternative
- d) demonstrate professionalism
- e) clearly communicate your intentions to the person who has contacted you in your responses to them

E-Mail Message
To: Middle Manager of OneShore Groups Eastern Region  
From: Hugh Kine  
Re: Productivity level down in sales of medical equipment

I have a concern I want to bring to your attention. Specifically, I need advice on how to handle a particular situation. I have noticed that productivity levels among our sales team have been low as of the last quarter. Sales have been down 5%, which is not normal for such a strong team. I’m not sure if it’s the weather, the recent exit of a strong member of the team, or whether it’s just low morale. I tried to assign bonuses to boost productivity. So far nothing is doing the trick. We need to get sales back up or we risk suffering a huge loss. Please advise.

Sincerely,
Hugh
Appendix C

Experiment 1 Task

You will now be presented with a photograph of a prototype of equipment models that your company has been developing over the last year to launch throughout the different branches of the company. This high-tech equipment will allow your system to run more efficiently in terms of receiving and processing orders.

It is your task to build this model using the parts in the box on your workstation labeled “OneShore Groups prototypes".

You will have exactly 8 minutes [11 for moderate anxiety condition; 14 for low anxiety condition] to build this model. You must try to finish building the model in this time. After this time, you will automatically be directed to your next task, and you will be scored based on what you have built in this time.

It is important to build the replica exactly as shown in the photographs, including colour and size, as any error will result in serious malfunction of the equipment, and may cost the company millions of dollars. You will be evaluated on your accuracy in building the model.

When you have opened the box of parts, have it in front of you, and are ready to see the model, please click on "Next". Please do not destroy the model after making it.

Front view:  
Back view:
Appendix D

Experiment 2 Task

As manager of OneShore Groups, you have recently decided to partner with a different health care company. As such, you are making the big switch from traditional face-to-face pharmacies to the health care company’s mail-order pharmacy.

Your task is to market this switch to persuade all existing clients to use this mail-order pharmacy instead of going to another competitor’s face-to-face pharmacy, and also to convince new clients to use your services.

Specifically, your task is to create a marketing campaign speech (2 minutes in duration) to present to the marketing committee today. In this speech, you should have a number of catchy but informative marketing statements or phrases that highlights the benefits of switching to the company’s mail-order pharmacy. These statements and phrases will help the marketing committee market the mail-order pharmacy to new, existing, and potential clients.

You will be evaluated on your ability to generate a speech that:

- a) consists of a number of quality statements and phrases that highlight the benefits of switching to a mail-order pharmacy
- b) appeals to new clients while retaining existing clients
- c) consists of creative ideas
Appendix E

Measures

Trait Anxiety: Experiment 1 and 2

For use by Bonnie Cheng only. Received from Mind Garden, Inc. on October 5, 2011
www.mindgarden.com

To whom it may concern,

This letter is to grant permission for the above named person to use the following copyright
text;

Instrument: State-Trait Anxiety Inventory for Adults
Authors: Charles D. Spielberger, in collaboration with R.L. Gorsuch, G.A. Jacobs, R. Lushene,
and P.R. Vagg
Copyright: 1968, 1977 by Charles D. Spielberger

for his/her thesis research.
Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or
dissertation.
The entire instrument may not be included or reproduced at any time in any other published
material.

Sincerely,
Robert Most
Mind Garden, Inc.
www.mindgarden.com

A number of statements which people have used to describe themselves are given below. Read
each statement and indicate how you generally feel.

I feel pleasant. (R)
I feel nervous and restless.
I feel satisfied with myself. (R)
I wish I could be as happy as others seem to be.
I feel like a failure.
(R) = Reverse-coded
Stress: Experiment 1 and 2

The following questions ask you about your feelings & thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don’t try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

In the last month, how often have you...
...been upset because of something that happened unexpectedly?
...felt that you were unable to control the important things in your life?
...felt nervous and "stressed"?
...found that you could not cope with all the things that you had to do?
...been angered because of things that happened that were outside of your control?
...found yourself thinking about things that you have to accomplish?
...felt difficulties were piling up so high that you could not overcome them?

Manipulation Check for State Anxiety: Experiment 1 and 2

For use by Bonnie Cheng only. Received from Mind Garden, Inc. on October 5, 2011
www.mindgarden.com

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Instrument: State-Trait Anxiety Inventory for Adults
Authors: Charles D. Spielberger, in collaboration with R.L. Gorsuch, G.A. Jacobs, R. Lushene, and P.R. Vagg
Copyright: 1968, 1977 by Charles D. Spielberger

for his/her thesis research.
Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or dissertation.
The entire instrument may not be included or reproduced at any time in any other published material.

Sincerely,
A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you feel right now, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

I feel calm. (R)
I feel secure. (R)
I am tense.
I feel strained.
I feel at ease. (R)
(R) = Reverse-coded

**Off-Task Cognitions: Experiment 1**

The following is a list of thoughts, some of which you might have had while working on the tasks you have just completed. Please indicate the extent to which you agree or disagree with the following statements.

During the tasks…
…I thought about how often I got confused.
…I thought about members of my family and/or friends.
…I thought about personal worries unrelated to the tasks.
Please indicate the number that best represents the degree to which you were distracted in the tasks you have just completed

**Off-Task Cognitions: Experiment 2**

The following is a list of thoughts, some of which you might have had while working on the tasks you have just completed. Please indicate the extent to which you agree or disagree with the following statements.

During the tasks…
*…I thought about how often I got confused.
…I had a tendency to daydream.
…I thought about other things that I have to do.
…my mind wandered to other things unrelated to the tasks.
…I thought about my plans after the tasks.
*…I thought about members of my family and/or friends.
*…I thought about personal worries unrelated to the tasks.
…my mind was focusing on things other than the tasks.
*Please indicate the number that best represents the degree to which you were distracted in the
distracted in the tasks you have just completed.
Please indicate the number that best represents the degree to which you felt your mind wandered
in the tasks you have just completed.
* = Items used in Experiment 1

**Self-Regulatory Processing: Experiment 1**

The following is a list of thoughts, some of which you might have had while working on the
tasks you have just completed. Please indicate the extent to which you agree or disagree with the
following statements.

During the tasks…
…I kept track of my progress.
…I monitored my performance to make sure that I was meeting my objectives.
…I made note of my mistakes so as to learn from them.
…I monitored my level of ability.
Please indicate the number that best represents the extent to which you kept track of how well
you were doing during the tasks.
Please indicate the number that best represents the degree to which you focused on the tasks you
have just completed.

**Self-Regulatory Processing: Experiment 2**

During the tasks…
*…I kept track of my progress.
*…I monitored my performance to make sure that I was meeting my objectives.
*…I made note of my mistakes so as to learn from them.
*…I monitored my level of ability.
…I focused my attention on making few errors.
…I thought carefully about what I was doing.
…I concentrated on the tasks.
…nothing could shake my concentration.
…I kept track of how well I was doing.
…I made note of how I was performing compared to other participants.
…I thought about my level of ability.
...I thought about how dissatisfied with my performance I was. (R)
*Please indicate the number that best represents the extent to which you kept track of how well you were doing during the tasks.
*Please indicate the number that best represents the degree to which you focused on the tasks you have just completed.
* = Items used in Experiment 1
(R) = Reverse-coded