

THE EFFECT OF TIME PRESSURE ON CREATIVE PERFORMANCE: ROLE OF
INTELLECT & AFFECT

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ABSTRACT

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Organizations often assume that creative performance can unfold under time constraints; however, creative performance literature has tended to theorize time pressure as a stressor that inhibits creativity. The current study was proposed to understand whether or not individuals can be creative under time pressure, and to study the role of affective states as mediators in the relationship between time pressure and creative performance. Intellect, a facet of Openness, was examined as a moderator in this relationship. Results showed that Intellect failed to moderate the relationship between time pressure and affect. Furthermore, when creative performance was studied as creative performance behaviors and creative outcome effectiveness, differential findings emerge for key relationships. Negative affect, but not positive affect, mediated the relationship between time pressure and creative outcome effectiveness, but neither negative nor positive affect mediated the relationship between time pressure and creative performance behaviors. In addition, while high-perceived time pressure was related to negative affective states, it was not related to reduced positive state affect. Additionally, positive affect, as opposed to negative affect, was related to higher quantity and quality of ideas generated. Together these findings show that there is an indication that the effects of time pressure on creative performance vary depending on the type of affective state induced by time pressure. These results further shed light on the mixed findings in affect and creative performance literature and highlight the importance of studying process mechanisms rather than just limiting ourselves to an understanding of main effects.

This work is dedicated to Prithvish Chatterjee who makes it all possible; to my loving grandma, Ved Kaur, who raised me to be courageous in all that I do; and to my lovely cohort – Jessica Webb, Rory Dixon, Morgan Showler, and Marissa Hatch who make graduate school fun.

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INTRODUCTION

In recent years, organizations have had to embrace change like never before. Organizations that exhibited responsiveness to change and treated change as an opportunity have survived, while others that were rooted to conventional wisdom and refused to embrace change often paid a heavy price (Schein, 1993). The macro level pressures such as globalization have led organizations to come up with business systems that function around the clock. Market forces exert a strong push on employees who are required more than ever to contend with increased competition (Gupta, 1992), and are increasingly asked to perform well on ill-defined tasks under high levels of time pressure. As we become more of a knowledge-based economy, and as jobs become more complex, a creative workforce is increasingly central to an organization's competitive advantage (Shalley & Gilson, 2004). Thus, it is no surprise that CEOs identify creativity as one of the most important driving force behind success in businesses today (IBM Global CEO study, 2010).

Two broad factors that impact creative performance in organizations are individual differences (person view) and contexts (press view) (Shalley, Zhou, & Oldham, 2004). This study investigates the role of Intellect, an individual difference variable, and time pressure, an element of context in predicting creative performance (Kaufman et al., 2015; Baer & Oldham, 2006). Furthermore, the study investigates how time pressure creates individuals' affective states (Lundberg, 1993; Maule & Hockey, 1993) that in turn impact creative performance (DeDreu et al., 2008; Martin et al., 1993; Hirt, McDonald, & Melton, 1996). Even though there are calls for taking an interactionist view across individual difference and contextual foci (e.g., Woodman, Sawyer, & Griffin, 1993), and though integrative models of creativity have recognized the importance of contextual, affective, and individual difference variables in predicting creative

performance (Amabile, 1988; Amabile, Barsade, Mueller, & Staw, 2005), less attention has been paid to testing these more comprehensive models.

Time pressure is a key contextual variable that is ubiquitous in organizations (Gupta, 1992), is known to be a stressor (e.g., Lundberg, 1993; Maule & Hockey, 1993; Edland & Svenson, 1993; Svenson & Edland, 1989), and impacts work outputs, yet it has received limited attention in creative performance literature. However, since it has been studied well for its impact on complex problem solving in decision-making, I connect both decision-making and creativity literatures to propose how time pressure can impact creative performance.

Although time pressure has typically been studied from a cognitive perspective, one emerging area of research suggests that we should also be paying attention to the fact that time pressure has an affective impact on people which further impacts performance (e.g., Maule & Hockey, 1993). An individual's affective state can play a key role in creative performance (Baas, De Dreu, & Nijstad, 2008; Bledow, Rosing, Frese, 2013; Amabile et al, 2005). Furthermore, positive and negative affect is differentially related to creative performance behaviors such as idea generation, and creative outcome effectiveness (Martin et al., 1993).

Openness/Intellect has been consistently related to creative achievement in diverse domains such as arts and sciences (e.g., Batey & Furnham, 2006; Feist, 1999). Intellect, an aspect of Openness/Intellect, is an important individual difference variable that has recently been examined for its impact on creative performance (Kaufman et al., 2015; Nusbaum & Silvia, 2011). In line with recent calls to examine more narrow traits to predict criteria of interest, I am exploring how Intellect is related to creative performance (Barrick, Mount, & Judge, 2001; Judge et al., 2013).

The current study expands upon creative performance research in three ways. First, it spans across individual differences and contexts foci and takes an interactionist perspective. It focuses on how individual difference in Intellect interacts with time pressure, a contextual variable, in predicting creative performance.

Second, the study draws on time pressure in decision-making literature, and uses the findings to suggest how time pressure is implicated in performance on complex and novel problem-solving tasks. Since research has shown that time pressure impacts cognitive processing, I will ground the current discussion within DeDreu's Dual Pathway Model (2008) which states that affect impacts people via two different cognitive pathways. While positive affect goes through 'cognitive flexibility' route and allows people to sample diverse ideas and mental schemas, negative affect goes through 'cognitive persistence' route and narrows a person's cognition to focus and persist through the idea at hand. Similarly, Martin et al's (1993) Mood as Information Model states that while positive feelings tell people to stop persisting with goal pursuit, negative feelings push people to persist in a bid to improve their mood. Both Dual Pathway Model and Mood as Information Model suggest that although positive affect spurs idea generation (focus more on number of ideas generated via cognitive playfulness), negative affect can have its own benefits in helping a person critically evaluate an idea (focus more on the quality of an idea, that is, its novelty and usefulness via persistence). Findings from the literatures on time pressure, Intellect, affect, and creative performance will be used to test how time pressure is implicated in creating affective states, and how these affective states in turn impact creative performance behaviors and creative outcome effectiveness differentially.

Third, this study takes a multidimensional view of creative performance. Following Campbell, McHenry, & Wise (1990) and Montag, Maertz, & Baer (2012), the study will measure

both creative performance behaviors (CPB) and creative outcome effectiveness (COE) separately (instead of combining them as a single creative performance indicator). Intellect is positively related to scientific creativity – both CPB and COE (Kaufman et al, 2015). Time pressure and affect both have differential relationships with creative performance behaviors and creative outcome effectiveness (Martin & Stoner, 1993). Creative performance will be explored using two novel and complex tasks in which individuals are asked to generate creative ideas (creative behaviors) and are assessed in terms of novelty and usefulness (creative outcome effectiveness). While the creative performance behaviors task is a widely used divergent thinking task that is used to measure people's facility with fluency or idea generation, the creative outcome effectiveness task is a convergent thinking task that is used to assess how critically people evaluate the novelty and usefulness of their ideas.

RESEARCH FRAMEWORK

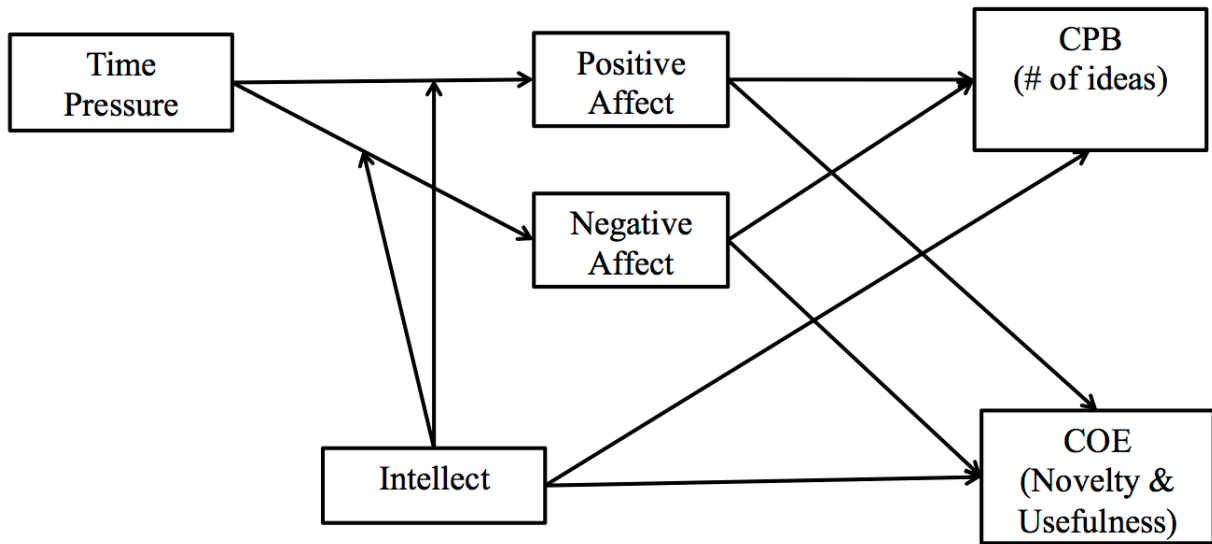
Contexts and individual differences play an important role in predicting creative performance. Several contextual elements such as organizational support, climate, feedback, time pressure, and leadership have been viewed as critical in eliciting creative performance (Anderson et al., 2004). Time pressure is ubiquitous in organizations and has been less studied in relation to its impact on creative behavior and performance. Traditionally, time pressure has been thought of as an inhibitor of creative performance because creative activities demand time (Hennessey & Amabile, 2010). However, research on time pressure in decision-making would suggest that the relationship of time pressure with complex tasks is not as simple. In fact, researchers in decision-making domain have begun to examine how time pressure impacts individual's performance on complex problem solving tasks by taking into account both the role of time pressure in creating affective states, and also individuals' reactions to affect that impact performance.

Individuals' reactions to affective states generated by contextual features like time pressure also depend on their traits (Tett & Burnett, 2003). High levels of time pressure can act as constraints for expression of Intellect-consistent behaviors (Mussel & Spengler, 2015) and thus create negative affect (Cacioppo, Gardner, Berntson, 1999), while mild levels of time pressure act as facilitators for expression of Intellect-consistent behaviors (Mussel & Spengler, 2015) and create positive affect (Cacioppo, Gardner, Berntson, 1999). On the other hand, affective states have been well researched in connection with creative performance and positive affect and negative affect are differentially related to creative performance behaviors and creative outcome effectiveness (Martin & Stoner, 1993; Martin et al., 1993).

The purpose of this study is to examine how individual differences in Intellect are related to creative performance when individuals are under high and mild levels of time pressure and

react to their affective states. In the present study, participants are instructed to work on two complex and novel tasks under time pressure. The model to be examined is presented in Figure 1. The model presents the conceptual linkages among Intellect, Time Pressure, Affect (positive and negative), and creative performance behaviors (number of solutions – fluency) and creative outcome effectiveness (novelty and usefulness). Figure 1 depicts the interactionist approach to creative performance in which both context – i.e., time pressure, and individual differences – i.e., Intellect are related to how participants engage in creative performance behavior and produce outputs that are deemed novel and useful (rated by SMEs). Different levels of time pressure produce different affective states, and affect in turn is related to how individuals engage in creative performance behavior and produce creative outputs that are deemed effective. The following sections detail the empirical research on factors impacting creative behavior and performance in order to move towards specifying the study hypotheses.

Figure 1
The conceptual model



CREATIVITY

Organizational psychologists define creativity as production of novel and useful ideas (Amabile, 1996; Guilford, 1980; Oldham & Cummings, 1994; Zhou & Shalley, 2003). Scholars have tended to ground their study of creativity in one of the four foci: (a) the product view of creativity - a person can be said to have engaged in creative process only when s/he produces a creative product (Amabile, 1996; Guilford, 1980; Oldham & Cummings, 1994; Zhou & Shalley, 2003), (b) the person view of creativity - creativity is an attribute of the person, or certain individual differences are correlated with higher/lower levels of creative performance (Feist, 1998), (c) the process view of creativity - creativity is not about what a person is, but more about what a person does (Mumford, Rieter-Palmon, & Redmond, 1994), and finally (d) the press view of creativity - some contextual conditions might facilitate or inhibit creativity by impacting how traits manifest into behaviors and/or how cognitive processes relevant to creativity might unfold (Shalley, Zhou, & Oldham, 2004).

Creative performance in the current study is measured by evaluating the number of ideas generated, and the novelty and usefulness of these ideas. Since creative performance cannot be directly observed, one way to study if an individual engaged in creative behaviors is by evaluating whether or not the output of those behaviors (i.e., the product) was creative. This assessment is typically made by (a) counting the number of ideas/solutions generated (a measure of fluency), and/or (b) using the Creative Assessment Technique (Amabile, 1982) to obtain SME ratings to judge a product's creativity level. The SME evaluations are made on two key attributes: (a) the product should be novel (also referred to as original) and (b) the product should be useful (Amabile, 1983; Csikszentmihalyi, 1994).

Following Campbell et al's (1990) recommendations in their seminal paper on

performance, Montag, Maertz, & Baer (2012) noted that the definition of creative performance conflates creative performance behaviors with the effectiveness of the outcomes. Thus, they defined creative performance by differentiating it into two components: (a) creative performance behaviors (CPBs) are defined as “the set of interdependent observable and unobservable activities [e.g., cognitive processes] that occur in response to non-algorithmic task or project and that purportedly constitute the creative process”, and (b) creative outcome effectiveness (COE) is defined as “the extent to which the outcomes (idea, prototype, product, etc.) of non-algorithmic task or project completion are judged by relevant stakeholders to be both novel and useful” (p. 1365). Consistent with this view, the current study refers to idea generation (fluency) as creative performance behaviors, and ratings of novelty and usefulness for the generated ideas are operationalized as creative outcome effectiveness.

Woodman, Sawyer, & Griffin (1993) argued that the creativity literature is rife with mixed findings because the field lacks an interactionist approach to creativity, and instead studies it within silos. They proposed a model connecting how the different foci (i.e., individual characteristics, group characteristics, and contextual characteristics) relate to each other. The present study borrows from their approach and investigates a subset of their model by investigating how Intellect, an individual difference factor and time pressure, a contextual variable are related to the two types of creative performance outcomes discussed earlier (i.e., creative performance behaviors and creative outcome effectiveness). First, it examines how time pressure as a context impacts individuals’ performance on complex and novel tasks. Second, it examines how time pressure impacts affect. Finally, it examines how affect impacts creative performance. As mentioned in the introduction, since the focus of this study is on an interaction of the person view (individual differences) and press view (context), I will focus the discussion

on these two foci and how they are related to creative performance.

Person View

The study of creativity has long been grounded in the person view (e.g., Guilford, 1950). The Person view approach seeks to identify personality differences between creative and non-creative individuals. According to this view, since some individuals consistently produce more creative outputs than others, we could study creativity as an individual difference variable. The underlying rationale for this focus is three-fold: (a) creativity is a function of *who people are*—that is, there are latent motivational and temperamental traits that would have an impact on people’s creative potential (Guilford, 1950, p. 444), (b) people high in creative personality engage in more creative behaviors and therefore produce more creative outputs even after accounting for facilitative/inhibitory aspects of contexts (Feist, 1998), and (c) creative people cannot help but be creative, that is, they are guided by their core traits “such as attraction to complexity, intuition, aesthetic sensitivity, toleration of ambiguity, and self-confidence” and these traits express themselves across different situations (Oldham & Cummings, 1996, p. 608).

In fact, creative individuals will, by nature tend to engage in creative behaviors regardless of the domains in which they function, regardless of whether or not creative performance was expected from them (Eysenck, 1997), and regardless of having to incur high costs of engaging in creative behaviors – for example, creative individuals might disturb the status quo in work groups and depending on the organizational context might even be seen as disruptive to work, might be considered rebellious for not following directions of supervisors, might spend longer time on tasks while looking for novel solutions (for a detailed discussion see dark side of creativity; cf. Cropley, Cropley, Kaufman, & Runco, 2010).

The person view of creativity is not without its detractors. Weisberg (2006) asks if we have done a disservice to the field of creativity by looking for broad trait based explanations for a phenomenon as rich as creativity. In fact, creativity unfolds in the most diverse of environments, and to expect a common set of characteristics that could functionally apply, and predict success in all these environments is probably too optimistic. As such, several researchers have questioned this notion of a creative personality (Abuhamdeh & Csikszentmihalyi, 2004; Helson, 1999; Ludwig, 1998; Weisberg, 2006). Getzels & Csikszentmihalyi (1976), in a longitudinal study examined the relationship between subjects' personalities to their career success later on and found that creative personality did not predict career success.

On the other hand, several individual difference variables such as openness to experience, intelligence, cognitive style, and individual differences on motivational variables such as self-efficacy, trait affectivity have been related to differential levels of creativity. However, even with significant findings on the relationship between personality traits and creativity, it was found that at times these traits were opposites of each other. For example, consider how ego strength which entails attributes such as “strong, self-determining, dominant ego, self-reliant, and independent”, is diametrically opposite from introversion, neuroticism, and anxiety, all of which are also associated with creativity (Eysenck, 1997). Given such diverse findings, it has been difficult to meaningfully interpret the literature on creativity-personality link.

Creativity researchers are increasingly using the Five Factor Model to bring these scattered findings under one rubric (cf., Batey, Chamorro-Premuzic, & Furnham, 2010; Hirsh & Peterson, 2008; Soldz & Vaillant, 1999; Sung & Choi, 2009), and in fact the latest empirical evidence on the link between creativity and personality paints a more optimistic and interpretable picture (Feist, 1998). Feist (1998) conducted a meta-analysis to test this link using the Five

Factor Model (FFM) for personality dimensions and three different samples: scientists versus nonscientists, more creative versus less creative scientists, artists versus non-artists. They found that openness, conscientiousness, self-acceptance, hostility, and impulsivity produced the largest effect sizes, but creative individuals in arts and sciences differed on their personality profiles (context-specific differences) such that artists were more aloof, cold, and emotionally unstable than scientists. Feist (1998) stated that one of the most interesting outcomes of the meta-analysis was that “regardless of which measure or taxonomy was used to assess personality or creativity, a consistent and clear portrait of the creative personality in science and art has emerged: Creative individuals are more autonomous, introverted, open to new experiences, norm-doubting, self-confident, self-accepting, driven, ambitious, dominant, hostile, and impulsive” (p. 299). Overall, these findings do indeed lend support to the notion that personality characteristics do play a role in explaining variation in creativity.

The current study is grounded under the rubric of the Five Factor Model. I have chosen to investigate creative performance as a function of individuals’ standing on Intellect over other Big Five factors because of two reasons: (a) to address the perplexing findings obtained in Feist’s (1998) meta-analysis, and (b) to address the attenuation in effect sizes caused because of suppression effects of subfactors of global Openness – Intellect and Openness.

Feist (1998) found that of the five factors, Openness, Conscientiousness, and Extraversion have the strongest relationships to creative performance. Surprisingly, Extraversion (median $d = 0.39$) outperforms Openness (median $d = .31$) as a predictor and Conscientiousness predicts creative performance equally as does Openness (median $d = .30$). The findings are particularly perplexing in light of both (a) the factor analytic evidence on Openness that consistently shows that creativity is the core of this factor (Hofstee, DeRaad, & Goldberg, 1992; John, Naumann, &

Soto, 2008) and (b) empirical evidence that has consistently linked Openness as a key predictor of creative performance (e.g., Dollinger & Clancy, 1993; King, Walker, & Broyles, 1996; George & Zhou, 2001; Leung & Chiu, 2008; Soldz & Vaillant, 1999; Feist & Barron, 2003).

Further, note that in their meta-analysis, Feist (1998) divided extraversion into two sub-factors (a) confidence-dominance, and (b) sociability citing that this was the “most obvious factor for which a further division is useful”, but did not divide Openness to Experience into its two sub-factors Intellect and Openness (p. 292). Emerging body of evidence on global factor Openness suggests that the factor splits into Intellect and Openness (DeYoung et al., 2014) and there is preliminary evidence that both these subfactors have suppressor effects that have been implicated in attenuating effect sizes (cf., bandwidth-fidelity trade-off; Hogan & Roberts, 1996; Hurtz & Donovan, 2000; Moon, Kamdar, Mayer, & Takeuchi, 2008; Judge et al., 2013; Griffin & Hesketh, 2004). Thus, in this study, I focus on Intellect over Openness primarily because recent evidence shows that while Openness is predictive of artistic type of creativity, Intellect predicts more day-to-day type of creativity (Kauffman, 2014). Artistic creativity is distinguished from scientific creativity as follows: while artistic creativity is the pursuit of novelty and unfettered expression using form, color, and/or techniques that challenge the rules and norms (Feist, 1999), scientific creativity is about working within the constraints of the scientific method specific to the field of inquiry, working on well-defined problems and tasks that are bound by the paradigms other scholars use in conducting research. Creative performance in scientific domains relies on using rationality, critical and analytical thinking (Feist, 1999). In contrast, artistic creativity is about breaking the boundaries and norms that have become accepted in the field. Since I am interested in creative performance showcased in non-artistic populations, I am choosing Intellect as the focus of this study and posit that given the nature of organizational

tasks, Intellect might be a more valuable predictor of creative performance than Openness. There is preliminary evidence to suggest this relationship and it will be discussed later (e.g., Griffin & Hesketh, 2004; Kauffman, 2014).

INTELLECT

Intellect has been identified as an aspect of the global factor Openness (DeYoung et al., 2014; DeYoung, Peterson, & Higgins, 2005; Johnson, 1994; Saucier, 1992) and it has differentiable facets from those of the Openness facet (cf., DeYoung et al., 2014; DeYoung, Quilty, & Peterson, 2007; Jang et al., 2002). In fact, DeYoung et al (2014) state that while Intellect “encompasses perceived intelligence and intellectual engagement” *such that people with high Intellect are likely to explore abstract information through reasoning*, Openness “encompasses engagement with perceptual and aesthetic domains” such that people with high Openness are likely to explore novel situations by focusing on sensory and aesthetic information (p. 46). Since, Openness and Intellect have been shown to go through different cognitive substrates and mechanisms (cf., DeYoung, Peterson, & Higgins, 2005), it is not only reasonable to expect that both might have differential outcomes, but also that Openness aspect might act as a suppressor for Intellect aspect. Thus, scholars are now beginning to study these aspects in favor of global factor of Openness. In line with the bandwidth-fidelity problem discussed earlier researchers are now aligning specific predictors with outcomes of interest (cf., Judge et al., 2013). Following this rationale, scholars have turned their attention to studying the role of Intellect in creative performance.

Although Intellect aspect and Openness aspect share the core of creativity, Nusbaum & Silvia found that Intellect was not related to creativity while Kaufmann found that Intellect was related to scientific creativity but not to artistic creativity (a detailed analysis is provided later). Furthermore, Griffin & Hesketh found that Intellect was related to job performance while Openness was not. Given these findings two issues emerge: (a) Intellect seems to be connected to job performance and following the bandwidth-fidelity should be assessed as an indicator for

creative performance that can unfold in organizational settings, and (b) the mixed findings on whether or not Intellect is related to creative performance merit more attention.

As highlighted above, two studies have made specific predictions separately looking for effects of Openness and Intellect aspects on creative behaviors, creative achievement, divergent thinking, and fluid intelligence. First, Nusbaum & Silvia (2011) found that Openness and Intellect covaried significantly ($\beta = 0.36$, $p < 0.001$), and while Intellect had a significant effect for fluid intelligence, but not for creativity. However, it is important to note that the creativity measures used in this study were highly skewed against measuring Intellect-driven creativity and instead favored measuring artistic type of creativity, which does indeed rely on high Openness (Kaufmann et al, 2015). In fact Nusbaum & Silvia concede that the Creative Behavior Inventory (CBI; Dollinger, 2007) items that ask people to report their frequency of creative behaviors *emphasize* “visual and performing arts, writing, and crafts”. Similarly, the Biographical Inventory of Creative Behaviors (BICB; Batey, 2007), a 34-item checklist of creative activities has items such as ‘written a novel’, ‘produced a TV/play script’, ‘designed and produced a textile product’, ‘produced a picture, i.e., NOT a doodle (using paint, charcoal, pencils, acrylic, etc), ‘produced your own website’, ‘mentored/coached someone else to improve their performance’, ‘published research’, etc. Although these are broader than CBI items, they are still skewed in favor of artistic type of creativity with 21 of the 34 items referencing artistic-type content (cf., Batey, 2007). Furthermore, IRT analyses on BICB have shown that although it is good at discriminating people at the high end of the scores, it is not as good at discriminating between people at the low end of the scores (Silvia, Wigert, Reiter-Palmon, & Kaufman, 2012). Finally, the Creative Achievement Questionnaire (CAQ; Carson, Peterson, & Higgins, 2005) measures creative accomplishments in ten domains that are once again largely skewed in favor of artistic

type of creativity. For example, visual arts, music, dance, architectural design, creative writing, humor, theater and film, and culinary arts were the domains studied for artistic type of creativity. In contrast, only two domains— inventions and scientific discovery tapped into analytical and critical type of creativity. Given these items, there are concerns for range restriction for Intellect and authors' inference that Intellect does not relate to creativity is suspect at best.

The second study that isolated the effects of Openness and Intellect found that Intellect predicted creative achievement in the sciences (Kaufman et al., 2015). Authors measured achievement of artists and scientists/science professionals by taking into account the works of art produced and publishing/patent outputs respectively. Thus, although the authors look at these outputs as measures of creative achievement, in fact these results are pertinent to the current discussion as types of creative performance for the two different domains. Another notable aspect of these results is that the data came from four demographically diverse samples ($n = 1035$). Furthermore, authors found that Openness predicted creative achievement in the arts ($b = 0.41$), Intellect predicted creative achievement in the sciences ($b = 0.50$). Also, authors found that Intellect was positively associated with divergent thinking (which in the current study is operationalized as number of ideas produced) while Openness was not. Thus, there is some preliminary evidence to suggest that Intellect is not only implicated in predicting creative performance, but can also be a superior predictor if it is well-aligned with relevant outcomes of interest. For example, although organizations can definitely benefit from people who are high on Openness for some tasks, Judge et al. (2013) assert that *most* tasks in organizations require people high on Intellect. There is some preliminary evidence for this view. Griffin & Hesketh (2004) factor analyzed (EFA and CFA) NEO-PI-R ratings, and found that two factors emerged: Openness to Experience consists of two aspects which they defined as Openness to External

Experience (consists of Actions, Ideas, and Values facets of NEO-PI-R – Intellect) and Openness to Internal Experience (consists of Fantasy, Feelings, and Aesthetics facets of NEO-PI-R – Openness). Indeed the two aspects related differentially to adaptability predictors. Although the correlations between these aspects and performance (looked at task, adaptive, etc.) were often small and not significant, authors did find a trend of differential relationships such that openness to internal experience (i.e., Openness) was negatively related to job performance, while openness to external experience (i.e., Intellect) was positively related to job performance.

Based on findings presented so far, it would seem that there is value in exploring the role of Intellect separately from Openness in predicting creative performance. Thus, based on Kaufmann et al's (2015) findings that Intellect is positively related to number of ideas generated (operationalized as divergent thinking in their study), I propose that:

H1a. High Intellect will be related to high creative performance behavior (number of ideas generated) whereas Low Intellect will be related to low creative performance behavior (number of ideas generated)

Also, based on findings that suggest that Intellect is positively related to creative achievement (note that creative achievement is measured by patents and artwork produced – which have to be considered novel and useful in their respective domains) (Kaufman et al., 2015), I propose that:

H1b. High Intellect will be related to high creative outcome effectiveness (novelty and usefulness of ideas generated), whereas Low Intellect will be related to low creative outcome effectiveness (novelty and usefulness of ideas generated)

Press View

The press view of creativity focuses on the influences of the context on how creative processes unfold, and how creative outputs are produced. Several organizational psychologists have used the contextual press to explore how creativity might be inhibited or facilitated in a given situation (Shalley, Zhou, & Oldham, 2004). The underlying rationale is that creativity is as much a function of the context as it is a function of what people do (person view).

Several contextual variables that are implicated in impacting creativity have been identified in the literature. For example, a positive climate for creativity exists when people are involved in complex jobs that provide them challenging work environment, when their supervisors are supportive and allow the employees to set their own goals and deadlines (i.e., supervisors are non-controlling), and when supervisors create a supportive work environment that allows employees to freely express their ideas, and where feedback is provided in a constructive fashion (cf. Shalley, Zhou, & Oldham, 1994, p. 942). In contrast, an authoritarian work culture that stifles autonomy (Agbor, 2008), is overly averse to errors (Amabile, 1998), discourages risk-taking and explorative behaviors (Shalley & Gilson, 2004), and provides slack opportunities for creative expression at work would inhibit creativity (Tierney, Farmer, Graen, 1999).

Hunter, Bedell, & Mumford (2005) combined the commonly studied creative climate dimensions and arrived at a 14-dimension creative climate framework via rational coding process: (1) positive peer group, (2) positive supervisory relationships, (3) resources, (4) challenge, (5) mission clarity, (6) autonomy, (7) positive interpersonal exchange, (8) intellectual stimulation, (9) top management support, (10) reward orientation, (11) flexibility and risk taking, (12) product emphasis, (13) participation, and (14) organizational integration. Hunter, Bedell, & Mumford (2007) used these fourteen dimensions in their meta-analysis to study the relationship

between creative achievement and climate, and found that although all the fourteen dimensions of creative climate (produced sizable effects (ranging from .51 to .91), the dimensions of interpersonal exchange ($\Delta = .91$, $SD = .39$), intellectual stimulation ($\Delta = .88$, $SD = .18$), and challenge ($\Delta = .85$, $SD = .14$) produced the largest effect sizes. A surprising finding from this meta-analysis is that even though autonomy ($\Delta = .48$, $SD = .09$) and resources ($\Delta = .51$, $SD = .19$) are often touted as important for creativity, they produced the smallest effect sizes. Authors also assessed if these effect sizes varied with respect to how criteria were measured and found that effects generalized across subjective (e.g., self, supervisor, peer, subordinate, researchers, and mixed; $\Delta = .78$, $SD = .09$) and objective (e.g., patents, publications; $\Delta = .77$, $SD = .24$) measures. Overall, the preceding evidence suggests that contextual influences on creativity are critical for advancing our understanding of creativity and that focusing on intellectual stimulation, interpersonal exchange, and challenge component of contexts can help facilitate creative performance. The current study explores time pressure as a variable that has been shown to create challenging and intellectually stimulating contexts (e.g., Andrews & Farris, 1972; Ohly, Sonnentag, & Pluntke, 2006; Ohly & Fritz, 2010; Binnewies & Wörnlein, 2011).

Furthermore, since organizations are time-bound contexts where time pressures manifest as assigned deadlines, interference from tasks that are set at differing priorities, and timelines that may be dependent on outputs produced by other stakeholders, time is one of the most fundamental resources in organizations. McGrath & Kelly (1986) echo this view and assert that in organizations individuals are not evaluated merely on whether or not a task was completed, but rather on the amount of time taken to complete a task. As technology has made getting work done easier, current work culture not only necessitates increasing levels of expected output, but also mandates output that is produced round the clock. As such, work today is synonymous with

time pressure (McGrath & Kelly, 1986). Edland & Svenson (1993) are not remiss in noting “decision making under time pressure and stress are parts of many peoples’ daily life and appear to be a chronic state in many professional activities” (p. 37).

The discussion so far on the role of contexts such as time pressure raises a vital question: Can individuals showcase creative performance at work despite paucity of time, or alternatively, are creative performance and time pressure mutually exclusive? This question is explored in the following section.

TIME PRESSURE

Time pressure has been defined as an “imposition of a time horizon or [a] deadline for completing a task” (Maule & Hockey, 1993, p.84). Similarly, Kayaalp (2014) define time pressure as, “difference between time available and time required for performing a task” (p. 69). Time pressure has generally been seen as an inhibitor of creative performance (e.g., Kayaalp, 2014). Ryan & Deci (1985) posit that deadlines or time pressure serve as controlling contexts and act as inhibitors of intrinsic motivation. Intrinsic motivation in turn is considered to be a facilitator of creative performance (e.g., Amabile, 1983, 1986; Simon, 1962; Sternberg & Lubart, 1995, 1996). Thus, scholars of creativity have suggested that since creativity consumes significant amounts of cognitive and motivational resources, one would expect that contexts that are charged with time pressure would choke creative production (Shalley & Gilson, 2004).

Although thinking that time pressure chokes creative performance makes intuitive sense, empirical work has yielded mixed findings such that some studies have found that time pressure hinders creative performance (e.g., Amabile et al., 1996, 2002; Kelly & McGrath, 1985; Andrews & Smith, 1996; Okuda et al., 1990; Kayaalp, 2014), while others have found that although high levels of time pressure do hinder creativity, optimum levels of time pressure facilitate creative performance (e.g., Andrews & Farris, 1972; Baer & Oldham, 2006). For example, Andrews & Farris (1972) investigated how time pressure impacted scientists’ performance over a five-year span, where performance was defined as the degree to which scientists produced innovative outputs that were both novel and useful (creative outcome effectiveness in this study). They operationalized time pressure as the difference between typical time pressure experienced and the optimal time pressure that respondents felt would facilitate their work. Authors found that experienced time pressure was positively related to increased

usefulness ($r = 0.49$), while relaxed environments (or mild time pressure) were related to decreased usefulness. Also, time pressure was positively related to innovativeness (i.e., novel outcomes; $r = 0.25$) but as time pressure increased beyond moderate levels, it reduced innovativeness. In fact, authors found that high performing scientists *wanted* higher levels of time pressure. Similarly, Baer & Oldham (2006) found curvilinear effects of time pressure such that both no time pressure and too much time pressure inhibit creativity even in organizations that have high support for time pressure, while optimum levels of time pressure facilitated creativity.

The above mixed findings could be a function of the fact that bulk of the studies on creative performance and time pressure are self-report, field studies that ask participants to reflect on their retrospective experiences of time pressure (e.g., Baer & Oldham, 2006; Andrews & Farris, 1972; Kayaalp, 2014; Kelly & McGrath, 1985; Andrews & Smith, 1996). There are problems with this methodology: (a) people might easily conflate typical time pressures encountered in organizations with time pressure on specific creative activities, (b) people who consider themselves creative might feel more time-pressured because they have a higher need for producing creative outcomes than those who consider themselves as not creative (there's evidence that creative individuals are more susceptible to contextual influences; Oldham & Cummings, 1996), and (c) although people high on trait anxiety tend to get stressed more easily and therefore might report higher levels of time pressure than those who are low on these traits (Byron, Khazanchi, & Nazarian, 2010), none of these studies controlled for trait anxiety. Overall, since time pressure and creative performance link is in its nascent stages, laboratory studies are probably a better methodology to first establish basic principles in a more controlled setting where time pressure can be induced and extraneous variables can be controlled for.

Furthermore, several experiments from decision-making research have studied the effects of time pressure. Since creative performance may be conceptualized as a specialized sub-set of problem solving and decision-making, these findings can help us investigate the pattern of relationships between time pressure and creative performance discussed so far. Findings on time pressure and its effects on decision making find that high levels of time pressure leads individuals to (a) use fewer decision making attributes (e.g., Wright, 1974), (b) focus on negative aspects of the problem at hand such that they weight negative information more heavily (e.g., Svenson, Edland, & Karlsson, 1985; Wright, 1974), (c) make less risky choices (e.g., Ben Zur & Breznitz, 1981), and (d) focus on scanning more alternatives but at the cost of gleaning detailed understanding of the presented alternatives (e.g., Janis & Mann, 1977).

Scanning more alternatives at the cost of gleaning relevant details can have deleterious impact on individuals' ability to produce novel and useful ideas for one of the experimental tasks in the current study (operationalized as creative outcome effectiveness). Sternberg (1985a) asserts that for individuals to effectively solve a complex problem, they have to first structure, redefine, and organize the problem such that problem itself becomes a problem-solving heuristic. This becomes even more critical when individuals are presented with complex, abstract, and/or novel problems (Jay & Perkins, 1997; Shalley, 1991) such as the one in the current study. Further, if high time pressure triggers participants' risk-avoidance strategy then it would be hard for them to produce novel solutions. To the extent that creativity entails taking risks (Simmons & Ren, 2009; Dewett, 2007), high levels of time pressure can thus be expected to reduce novelty dimension of creative outcome effectiveness. Kelly & McGrath (1985) found that individuals in a team produced higher quality of solutions when they had more time (i.e., less time pressure) than when they had less time (i.e., high time pressure). Furthermore, Andrews & Smith (1996)

found that as time pressure increased beyond moderate levels participants' creativity (defined in their study as ideas generated, and the novelty and usefulness of the ideas) on developing marketing plans decreased ($\beta = -0.12$) because participants tended to fall back on using tried-and-tested approaches in problem solving when under time pressure.

Creative performance behaviors such as idea generation are contingent on an individual's ability to sample ideas and associations from wide domains (Kaufman et al. 2015). The finding that individuals use fewer attributes under time pressure (Wright, 1974) might also lead to lowered idea generation on the divergent thinking task in the current study. Also, Kelly & McGrath (1985) found that individuals in a team produced higher number of solutions when they had more time (i.e., less time pressure) than when they had less time (i.e., high time pressure). In line with the preponderance of findings from both creative performance and decision-making literatures, it is reasonable to expect that high-perceived time pressure could potentially undermine the number of ideas generated (i.e., creative performance behavior). Thus:

H2a. Time pressure will be inversely related to CPB (number of ideas generated) such that increase in time pressure will lead to decrease in CPB (number of ideas generated)

H2b. Time pressure will be inversely related to COE (novelty and usefulness of ideas generated) such that increase in time pressure will lead to decrease in COE (novelty and usefulness of ideas generated)

AFFECT

Literature on affect often uses variable terms such as ‘affect’, ‘mood’, and ‘emotions’. While emotions are defined as being “specific feelings that have a particular focus and a relatively short duration”, moods on the other hand are defined as “feelings that are more diffused in focus, intensity, and (sometimes) duration than emotions” (James, Brodersen, & Eisenberg, 2004; p. 173), and affect is defined as a “subjective feeling state that incorporates long-lasting mood states, such as cheerfulness or depression, as well as more specific ones, such as happiness or anger” (Baas, Dreu, & Nijstad, 2008, p. 781). Both moods and emotions are subtypes of affect and researchers typically use affect as a general term to also reference both moods and emotions (James, Brodersen, & Eisenberg, 2004; Brief & Weiss, 2002; Fineman, 1993; Weiss & Cropanzano, 1996; Frijda, 1993). Affect can be studied both as a trait and as a state (Watson, Clark, & Tellegen, 1988), however the current study is focused on exploring affect as a psychological state.

Affect is composed of two distinct dimensions that can be represented as orthogonal dimensions— positive affect (PA) and negative affect (NA) (Watson, Clark, & Tellegen, 1988), and both positive and negative affect are implicated in influencing behavior by impacting cognitive mechanisms differentially (Isen, Daubman, & Nowicki, 1987, Watson et al., 1999). Individuals high on positive affect are characterized by “high energy, full concentration, and pleasurable engagement” while individuals low on positive affect are characterized by “sadness and lethargy” (Watson, Clark, & Tellegen, 1988, p. 1063). In contrast, individuals high on negative affect are characterized by “distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness”

while individuals low on negative affect are characterized by “a state of calmness and serenity” (Watson, Clark, & Tellegen, 1988, p. 1063).

Factor analyzing self-rated mood descriptors consistently reveals a two-factor solution – NA and PA (e.g., Watson, Clark, & Tellegen, 1984; Watson et al., 1999; Mackinnon et al., 1999; Crawford & Henry, 2004). Watson, Clark, & Tellegen (1988) found that NA and PA typically have small correlations ranging from $-.12$ (when people are asked to rate their affect at this moment) to -0.23 (when people are asked to provide affect ratings over a year), and thus concluded that PA and NA have “quasi-independence” (p. 1065). However, some researchers have debated if PA and NA are in fact bipolar dimensions (cf., Green, Goldman, & Salovey, 1993; Costa & McCrae, 1980). Crawford & Henry (2004) used CFA analyses to explore competing models of latent structure of PA and NA and found that the most optimal CFA model was achieved when PA and NA were allowed to covary, thus showing that PA and NA scales do “index two distinct, but moderately negatively correlated factors” (p. 260). They also found that the latent factors of PA and NA shared only 9% variance, while the observed scales shared only 5.8% variance, thus supporting Watson et al’s (1988) finding that PA and NA scales are quasi-independent.

TIME PRESSURE AND AFFECT

Findings from empirical studies across decision-making and creativity literatures tend to converge on identifying time pressure as a stressor that leads to affective changes (e.g., Ohly & Fritz, 2010; Binnewies & Wörnlein, 2011; Lundberg, 1993; Maule & Hockey, 1993; Edland & Svenson, 1993; Svenson & Edland, 1989). Two different theories provide explanation for how experiencing task/situational pressure induces these affective states. First, transactional theory of stress (Lazarus & Folkman, 1984, Lazarus, 1999) states that individuals actively appraise situations in response to stressful stimuli, which in turn relates to the type of coping strategies they choose. In work performance situations, individuals can appraise the stressful situations as threatening, challenging, or difficult to control (Matthews & Campbell, 2009). Matthews & Campbell (2009) tested how individuals appraised work pressure on Rapid Information Processing task (RIP) and found that when a situation is appraised as threatening it produced a distress reaction accompanied by negative moods (as measured by Dundee Stress State Questionnaire comprised of 11 scales for mood states), whereas when a situation was appraised as challenging it invoked task engagement (defined by energy, motivation, and concentration). Although authors did not test time pressure or creative performance, this study sheds light on how individuals generally react to task pressures and how these reactions in turn produce affective states.

Second, following rationale of the activation theory (Gardner, 1986), high time pressure will lead to negative affect because high levels of time pressure are stressful (Heinstrom, 2003) and therefore considered ‘aversive stimuli’. Aversive stimuli in turn create negative affect (cf., Cacioppo, Gardner, Berntson, 1999). In contrast, mild time pressure has been shown to facilitate positive performance outcomes by providing individuals with stimulation and challenge (e.g.,

Andrews & Farris, 1972; Ohly, Sonnentag, & Pluntke, 2006; Ohly & Fritz, 2010; Binnewies & Wörnlein, 2011) and is thus considered to be an ‘appetitive stimuli’. Appetitive stimuli in turn create positive affect (cf., Cacioppo, Gardner, Berntson, 1999). Thus:

H3a. Time pressure will be positively related to negative affect such that as time pressure increases negative affect also increases

H3b. Time pressure will be inversely related to positive affect such that as time pressure reduces positive affect increases

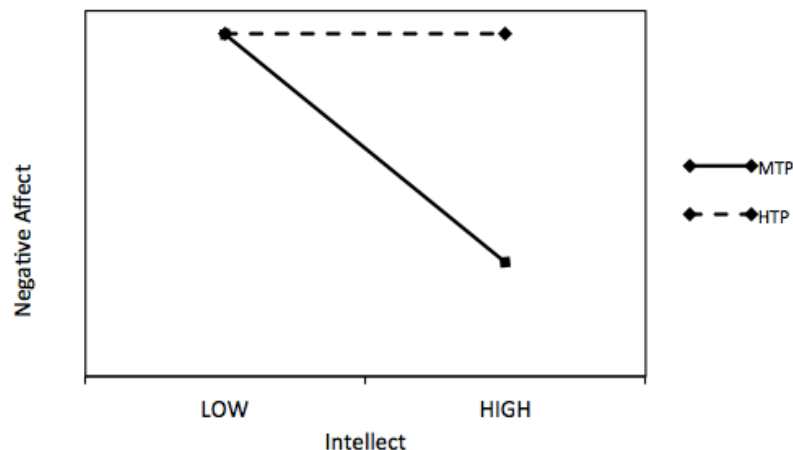
Further, the Trait Activation Theory (Tett & Burnett, 2003) states that although traits describe our propensities to engage in certain behaviors, situations provide cues that might inhibit/promote the expression of trait-consistent behaviors. Time pressure in this study can be viewed as a situation created at the task level (cf., Tett & Burnett, 2003). Among the various situational cues discussed by the authors, ‘constraints’ and ‘facilitators’ are pertinent to the current discussion – while constraints are cues that ensure that trait-consistent behaviors cannot occur due to the situational press, facilitators are cues that make trait-relevant situations even more salient thereby increasing the likelihood of trait-consistent behaviors to emerge. Given the curvilinear relationship of time pressure with creative performance (e.g., Baer & Oldham, 2006; Ohly et al., 2006; Binnewies & Wörnlein, 2011) where both low and high levels of time pressure decrease creative performance, while moderate levels of time pressure increase creative performance, it is apparent that depending on its level, time pressure can act as both a constraint and a facilitator.

This view of time pressure helps us understand how different levels of time pressure might interact with personality traits such as Intellect thereby producing differential outcomes. For example, under high levels of time pressure, the most salient cue to people is one of

constraints (Mussel & Spengler, 2015). Although typically, high Intellect individuals enjoy working on challenging problems (Heinstrom, 2003; Mussel & Spengler, 2015), when they encounter high time pressure their trait-consistent behaviors will be constrained (Mussel & Spengler, 2015). Following both activation theory and transactional stress theory, encountering constraints that restrict trait-relevant behaviors can be appraised as (a) an aversive stimulus (cf., Cacioppo, Gardner, Berntson, 1999) and (b) threatening (Matthews & Campbell, 2009), therefore producing negative affect. Thus:

H3c. Time pressure and intellect will interact to significantly impact negative affective response. High time pressure will lead to greater negative affect compared to mild time pressure for individuals high on intellect while low intellect will lead to high negative affect regardless of time pressure condition

Figure 2
Interaction between negative affect and Intellect

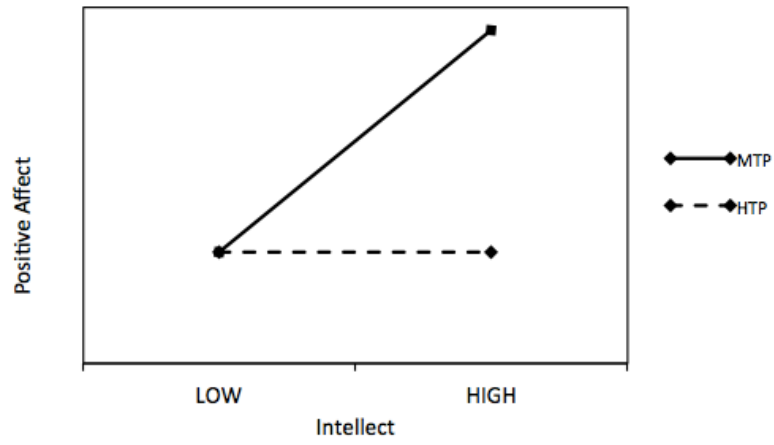


In contrast, mild levels of time pressure act as facilitators of Intellect-consistent behaviors because (a) mild time pressure creates challenging and engaging situation (refer previous discussion on Activation theory; cf., Cacioppo, Gardner, Berntson, 1999; Ohly, Sonnentag, & Pluntke, 2006), and (b) high Intellect individuals enjoy challenges (Heinstrom, 2003; Mussel & Spengler, 2015). Furthermore, personality traits influence how much effort is allocated to task

performance under stressful conditions (Szalma, 2008) and some personality traits such as Intellect have been shown to act as resources against the deleterious effects of stress on performance. For example, individuals with high Intellect reported less distress on a shooting task under time pressure than their low Intellect counterparts (Szalma, 2008). Furthermore, a study on physiological and affective reactivity to stressors found that individuals high on Openness were more resilient to stressors (participants were asked to rank order the most important stressors experienced by college students, and then participated in a Social Competence Interview to discuss their top choice) than individuals low on Openness (Williams, Rau, Cribbet, Gunn, 2009). If individuals have the resources to cope with time pressure as a stressor, then they might feel “eustress, a positive responsive state involving effort and challenge...but no negative affect” while individuals with perceived/actual deficits in coping with stress might feel “distress” which is “associated with anxiety and helplessness” (Maule & Hockey, p. 91). Furthermore, as hypothesized earlier, mild time pressure creates positive affect. Thus:

H3d. Time pressure and intellect will interact to significantly impact positive affective response. Mild time pressure will lead to greater positive affect compared to high time pressure for individuals high on intellect while low intellect will lead to low positive affect regardless of time pressure condition

Figure 3
Interaction between positive affect and Intellect



AFFECT AS A MEDIATOR

So far, I have posited that when individuals attempt novel and complex problems under time pressure, it has a bearing on their affective states. Also, it is widely accepted that affect plays a key role in determining creativity at work (Baas, De Dreu, & Nijstad, 2008; Bledow, Rosing, Frese, 2013; Amabile et al, 2005). This is not surprising considering the fact that “organizations are affectively laden environments” and creative activity itself is “an affectively charged event, one in which complex cognitive processes are shaped by, co-occur with, and shape emotional experience” (Amabile et al, 2005, p. 367). In fact, scholars have called for exploring affect as a mediator to better understand how creative performance unfolds (Shalley, Zhou, & Oldham, 2004; James, Brodersen, & Eisenberg, 2004). Studies have shown that affect impacts creative performance because it frees up cognitive resources and therefore individuals are able to make more associations between schemas thus increasing the number of solutions generated (Isen, 1999; Amabile et al., 2005). I will use DeDreu et al’s (2008) Dual Pathway Model that proposed that affect impacts people via two different cognitive pathways. While positive affect goes through ‘cognitive flexibility’ route and allows people to sample diverse ideas and mental schemas, negative affect goes through ‘cognitive persistence’ route and narrows a person’s cognition to focus and persist through the idea at hand. Since affect goes through cognitive components, I am not testing additional cognitive mediators to creativity.

Cropley (2006) state that for an individual to be successful at creative tasks both divergent thinking (i.e., generation of new ideas) and convergent thinking (i.e., evaluating whether or not the ideas produced are novel and useful enough) are needed. While divergent outcomes such as idea generation (CPB in the current study) can benefit from taking risks (Shalley & Gilson, 2004; McLean, 2005) and branching out across different boundaries to

produce as many solutions as possible, convergent outcomes such as ensuring that the ideas generated are indeed novel and useful (creative outcome effectiveness, COE, in the current study) can benefit from more risk-averse strategies, and staying within the boundaries of the task at hand (Cropley, 2006). Schwartz & Bless (1991) theorized that while positive emotions lead individuals to take more risks when problem solving, negative emotions lead individuals to be more risk-averse and more careful when problem-solving. Furthermore, when positive affect promotes either risk-taking, or playful divergent thinking (Martin et al., 1993; George & Zhou, 2007; Hirt, McDonald, & Melton, 1996) in individuals, their evaluation of the ideas might suffer because they are not being critical enough (Martin et al., 1993; George & Zhou, 2002). Similarly, when individuals are either risk averse due to negative affect, or when negative affect provides them a signal to resolve the experienced dissatisfaction they tend to be critical and might not produce many ideas on idea generation task (Martin et al., 1993). Similarly, Vosberg (1998) found that positive affect was positively related to quantity of ideas generated, but it was negatively related to quality of ideas generated (operationalized as novelty and usefulness). In contrast, negative affect discourages divergent thinking and individuals are unable to produce many ideas (Isen & Barron, 1991; George & Zhou, 2002), and negative affect also leads individuals to be more critical and precise (Martin et al., 1993; Hirt, McDonald, & Melton) which in turn should enhance creative outcome effectiveness. Thus:

H4a. Positive affect will be positively related to CPB (number of ideas generated)

H4b. Positive affect will be negatively related to COE (novelty and usefulness of ideas generated)

H4c. Negative affect will be positively related to COE (novelty and usefulness of ideas generated)

H4d. Negative affect will be negatively related to CPB (number of ideas generated)

Although I was not able to find studies examining affect as a mediator for the overall time pressure, Intellect, and creative performance link, there is some indirect evidence for why affect should be investigated as a mediator (cf., Ohly & Fritz, 2010). Specifically, Ohly & Fritz (2010) found that challenge appraisal mediates the link between time pressure and employee creativity, where challenge appraisal is associated with positive affect. The following hypotheses flow from the discussion so far connecting time pressure, intellect, and affect such that:

H5a. Affect will mediate the relationship between time pressure and creative performance such that feeling high time pressure will lead to greater negative affect, which in turn will lead to (i) higher COE (novelty and usefulness of ideas generated) and (ii) lower CPB (number of ideas generated)

H5b. Affect will mediate the relationship between time pressure and creative performance such that feeling mild time pressure will lead to higher positive affect, and will in turn lead to (i) lower COE (novelty and usefulness of ideas generated) but (ii) higher CPB (number of ideas generated)

H6a. Intellect will moderate the effect of time pressure on CPB (number of ideas generated) through affect. Specifically, high intellect individuals under mild time pressure will have higher positive affect than low intellect individuals, which in turn will lead to higher CPB than for low intellect individuals

H6b. Intellect will moderate the effect of time pressure on COE (novelty and usefulness of ideas generated) through affect. Specifically, high intellect individuals under mild time pressure will have lower negative affect than low intellect individuals, which in turn will lead to higher COE than for low intellect individuals

METHOD

Participants

339 Psychology students at a large North American public university were recruited via university's Human Participation in Research (HPR) system and received course credit for their participation. The sample was 25.6% male and 73.4% female, and ranged between ages 18 years to 30 years ($M = 19.5$, $SD = 1.5$). Among the participants, 11.5% were African American, 63.13% were Caucasian, and 14.2% were Pacific Asians, and 11.2% were from other racial/ethnic groups.

A power analysis for a priori structural equation models (SEM) was conducted (using <http://www.danielsoper.com/statcalc3/calc.aspx?id=89>) for an effect size of .15 and alpha of .05. The power analysis calculator recommended a minimum sample size of 288 participants. Since the issue of power in SEM is not straightforward (Quintana & Maxwell, 1999), a power analysis may not yield the best sample size estimates. Thus, two other strategies were used to address this issue. MacCallum, Browne, & Sugawara's (1996) guidelines on calculating power based on Root Mean Square Error of Approximation (RMSEA) fit index yield an estimated 421 participants to achieve a power of 0.8 for 20 degrees of freedom. Per authors' analysis, the current study would require at least 400 participants (for 21 degrees of freedom) (cf., MacCallum et al., 1996; table 5, p. 145). However, according to the rule of thumb of 10 participants per estimate (Bentler & Chou, 1987) the current study should have 200 participants (for 16 paths and four endogenous variables). This estimate qualifies the minimum sample size criterion suggested for SEM (Weston & Gore, 2006; Quintana & Maxwell, 1999) and has also been assessed as adequate in simulations studies (e.g., Chou & Bentler, 1995). Thus, the sample size of 288 participants suggested by the power analysis calculator seems adequate for the current study. To account for

possible attrition 339 participants were recruited for the study. Additional 38 participants were recruited for the pilot study.

Pilot Study

A pilot study (N= 38) was conducted to achieve four key goals: (a) to find the average time it would take to solve the experimental tasks, (b) to establish objective time frames that would make participants feel highly pressed for time, mildly pressed for time, and slightly pressed for time, (c) to test whether or not the experimental tasks could capture enough variability in responses, and whether or not the instructions provided to participants were understood and had the intended effect on time pressure manipulation, and finally (d) to train the raters on using the benchmarks scale reliably.

To decide high, moderate, and slight levels of time pressure, I followed the approach used in time pressure studies (e.g., Svenson & Maule, 1993; Antes & Mumford, 2010). First, I used the pilot study to establish a baseline of the mean time required to solve the tasks. According to the protocol followed in time pressure studies, this time frame is used as moderate time pressure condition (Maule & Hockey, 1993; Payne, Bettman, & Johnson, 1988; Zakay, 1985). Subjects took an average of 6 minutes to complete the idea generation task (CPB), and took an average of 9 minutes to complete the policy problem (COE). Then I reduced the mean time taken by testing if participants were able to complete the experimental tasks when the mean time was reduced by 30 percent (Antes & Mumford, 2010). Thus, for high time pressure condition participants were given 4 minutes to complete the idea generation task, and 6 minutes to complete the policy problem. Finally, I increased the mean time taken on the tasks by a factor of 30 percent and treated this as slight time pressure. Thus, for slight time pressure condition participants were given 8 minutes to complete the idea generation task, and 12 minutes to

complete the policy problem. The criterion for establishing whether or not these time pressure levels were effective was to see whether or not participants were able to perform the tasks in the allotted time.

Procedure

Six to eight subjects participated in each lab session. Subjects worked individually on the experimental tasks at a computer. A typical lab session proceeded as follows: first trained experimenters set up the room by ensuring that all the computer terminals loaded the correct time pressure condition. Three Qualtrics surveys were designed to map on to the slight time pressure, moderate time pressure, and high time pressure conditions. All the measures were consistent across these three surveys with the exception of the amount of time allocated to work on the two tasks (described later). The three conditions were color coded to allow experimenters an easy visual check to ensure that all the computer terminals loaded the same condition. Experimenters greeted the participants at the door, and asked each participant to take a seat at a computer terminal. Next, experimenters announced that the experiment was to understand mechanisms underlying creative performance, and then asked participants to read and sign their consent forms. Participants were also instructed to maintain order and quiet at all times while others were working on their tasks.

Qualtrics surveys were designed such that the personality measure was presented first, followed by either the Torrance task (used to measure creative performance behavior) or the policy problem (used to measure creative outcome effectiveness). The two tasks were randomized. Immediately after each experimental task, the PANAS and the time pressure manipulation check were administered. Finally, the participants were asked to answer the BICB to assess their past experience with creative activities, the STAI-T to address trait measure of

anxiety, and the demographic details such as race and ethnicity and also cognitive ability measures such as the ACT/SAT scores and college GPA were collected last to avoid cuing any stereotype threats. At the end of the experiment, participants were debriefed on the purpose of the study.

Design

A between-subjects, basic randomized design was used for this study. Participants were randomly assigned to either ‘high time pressure’ condition, or to ‘moderate time pressure’ condition, or to ‘slight time pressure’ condition. As mentioned before the experimental tasks were counterbalanced to avoid any order effects.

Manipulation

Participants from different treatment conditions were not allowed to work on the experimental tasks at the same time in the lab to avoid confounds. Specifically, participants were isolated in different conditions to avoid issues of resentful demoralization and compensatory rivalry, and to also avoid diffusion of treatment that might have impacted participants’ affect (Shadish, Cook, & Campbell, 2002). Participants in the first session received high time pressure condition, while participants in second session received moderate time pressure condition, and participants in third session received slight time pressure condition. The conditions were counterbalanced on subsequent days to avoid order effects.

Tasks

To avoid mono-method bias, subjects participated in two tasks for this experiment that were completed using computers. The first task was a widely used divergent thinking task (Torrance, 1974). Participants were asked to generate as many new and unusual uses for familiar

objects (i.e., brick, newspaper, tire, junk auto, and hanger). Thus, this task taps into participants' fluency behaviors by eliciting divergent thinking. In addition to instructing participants to be as creative as possible, I also followed Shalley & Oldham's (1997) instructions to participants: (a) participants should not repeat a function, and (b) uses should be logical and make sense (p. 340). This task is used to gauge subjects' creative performance behaviors (CPBs) by counting the number of ideas generated.

The second task was a six-paragraph managerial and policy problem that has been derived from published case studies and used to evaluate subjects' creative outcome effectiveness (cf., Mumford et al. 1993). This task was selected for its fidelity to novel problems that one might encounter in organizational settings that often necessitate people to engage in critical thinking to evaluate the quality of their own ideas. The policy problem is a well-defined, bounded problem that requires participants to engage in convergent thinking and critical thinking. Not only does the problem present a concrete prompt that participants have to address, it also clearly articulates the expected performance criteria. Thus this task aligns more with scientific creativity domain than it does with the artistic creativity domain. After reading the case study, participants were instructed to write a creative, two-paragraph solution to the prompt. Participants were instructed that creative responses are those that are novel and useful (definitions of novelty and usefulness were provided). The two-paragraph condition of performance on this task was to ensure that participants felt pressed for time. The instructions for this task were as follows:

- (1) "You have X minutes in which to both read the case study below and write a two-paragraph response to the case study. You may scroll down to read the prompt

instructing you to write the response. Also note that the case study will be available to you throughout the experimental task”.

- (2) Now that you have read the case study, please write at least two paragraphs (at least 150 words each) answering the following prompt: How would YOU respond to this situation? Please justify your response by detailing WHY your response is suitable given the situation. Please be detailed in describing your ideas and **be creative!** Remember, creative responses are those that are both novel (i.e., unique) and useful (i.e., appropriately answer the prompt, and present coherent and complete ideas).

Measures

Intellect. 44-item Big Five Inventory (BFI; John, Donahue, & Kentel, 1991) that measures each of the Big Five domains was used. The Intellect facet is measured by five following items: “is curious about many different things”; “is ingenious, a deep thinker”; “is inventive”; “prefers work that is routine”; and “likes to reflect, play with ideas”. These items were rated on a five-point Likert scale from strongly disagree to strongly agree. In the current sample, internal consistency was $\alpha = 0.573$.

Affect. The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess participants’ affective state ‘in the moment’ after having gone through each of the experimental tasks under different levels of time pressure (i.e., The PANAS was administered again after each task). The PANAS is composed of the following 10 items for negative affect “distressed”; “upset”; “guilty”; “scared”; “hostile”; “irritable”; “ashamed”; “nervous”; “jittery”; “afraid”, and the following 10 items for positive affect “interested”; “excited”; “strong”; “enthusiastic”; “proud”; “alert”; “inspired”; “determined”; “attentive”; and “active”. In the current sample, internal consistency reliability for positive affect after task 1 was

$\alpha = 0.92$, and positive affect after task 2 was $\alpha = 0.93$. Reliability for negative affect after task 1 was $\alpha = 0.87$, and reliability for negative affect after task 2 was $\alpha = 0.90$. Note, these internal consistency reliabilities are for the ‘in the moment’ time frame (Watson, Clark, & Tellegen, 1988).

Manipulation Check. In the current study, time pressure is objectively manipulated as described previously. Baer & Oldham (2006) used items derived from the Innovation Climate Questionnaire (Innovation Center Europe, 2000) and from those suggested by Basadur, Taggar, & Pringle (1999) for assessing time pressure in organizational settings. Their items were adapted (minimal changes) so that they could be used in a laboratory setting. Sample items included, “Thinking of new ideas took time that I didn’t have”, “I didn’t have much time for thinking up wild ideas – I was busy just getting my work done” (p. 965). I also adapted items from Edland (1993) to assess time pressure: (a) I felt time pressure during the experiment, (c) I was able to think about the experimental tasks, and (d) I am content with my solutions. The items were rated on a Likert-type scale ranging from “Strongly disagree” (1) to “Strongly agree” (5) and were averaged to form a single index. The reliability for this scale was subpar, $\alpha = 0.06$.

The manipulation check items failed in the current study. In several instances people in high time pressure conditions stated that they did not feel pressed for time, while people in low time pressure conditions stated that they felt inundated with time pressure. These effects were seen after controlling for trait anxiety. This issue was so pervasive that these items could not be used as manipulation check. For example, 54.5% people in low time pressure condition agreed or strongly agreed to having felt pressed for time during the experimental tasks. Similarly, 31.3% people in high time pressure condition disagreed or strongly disagreed to having felt time pressure during the experiment. In the moderate time pressure condition, 58.7% people agreed or

strongly agreed to having felt pressed for time during the experimental tasks, while 30.7% people in the same condition also disagreed or strongly disagreed to having felt time pressure.

Creative Performance. Creative performance (CP) was measured to include both (a) creative performance behaviors (CPBs) operationalized as the number of ideas produced on the divergent thinking task, and (b) creative outcome effectiveness (COE) which was measured by assessing whether or not solutions produced on the managerial and policy problem were both novel and useful. Four SMEs were trained to work on scoring both the CPB and the COE tasks. The training protocol is described below:

Four undergraduate raters (SMEs) were trained on how to use Mumford et al's (1996) benchmarks scale effectively using pilot study data. The training for SMEs was designed to be similar to the training used by Antes & Mumford (2010). SMEs were blind to the specific hypotheses and time pressure manipulation. First, SMEs were introduced to the experimental tasks. SMEs read the task prompts, and got an opportunity to discuss what these tasks entailed with the principle investigator. Examples of responses from pilot data were shared with SMEs to further enhance their understanding of the tasks. Next, SMEs were trained on the rating scales for these tasks. They were instructed that while the Torrance task (idea generation task) was rated by counting the numbers of ideas generated, the policy problem was rated on novelty and usefulness. The Benchmarks scale was described by using examples of responses from pilot data. The principle investigator showed how different responses could be mapped to the scale (see appendix for the scale). Finally, to ensure reliable ratings SMEs were provided definitions of the dimensions of creative outcome effectiveness in a discussion. The principle investigator encouraged questions about the dimensions before presenting the exact written definitions. Novel solutions were defined as those that are unique, and engender a subjective feeling of surprise or

delight; while useful solutions were defined as those that address task prompts, are appropriate, coherent, and complete (cf., Mumford et al., 1996).

Once SMEs showed a basic grasp of these concepts, they were instructed to independently rate three solutions for novelty and usefulness. SMEs then compared their ratings. There were cases where SMEs disagreed on their ratings. In these cases, SMEs were instructed to discuss the rationale for their ratings and see if they could come to a consensus. This process was repeated for the remaining pilot data until SMEs were able to produce convergent ratings. Once SME ratings converged within two points on the five-point scale, they were considered proficient in rating creative outcomes.

To measure creative performance behaviors and creative outcome effectiveness for the final study data, the dataset was split into halves and two SMEs were asked to score CPB and COE for the first half, and the other pair of SMEs were asked to score the second half of the data set on CPB and COE tasks. SMEs were instructed to work independently on all their coding and were asked to keep their ratings confidential under all circumstances. The primary investigator ensured that responses were not being shared by ensuring the following: first, all the coding on SME-specific Google spreadsheet was tracked in real-time, and second SMEs were asked to provide rationale for their scores.

All responses for creative performance behaviors task were counted by SMEs. SMEs were instructed to not disqualify any idea on the basis of quality because this was a purely quantitative dimension. After coding for the entire dataset was done, the primary investigator checked to ensure if there was consistency in the numbers of ideas counted. With the exception of rare errors, the SMEs were able to report accurate counts of the numbers of ideas generated.

All responses for creative outcome effectiveness task were analyzed using Amabile's (1983) Consensual Assessment Technique. SMEs independently rated solutions produced on novelty and usefulness dimensions. As described earlier, novel solutions are those that are unique, and engender a subjective feeling of surprise or delight; while useful solutions are those that address task prompts, are appropriate, coherent, and complete (Benchmark Rating Scale, Mumford et al., 1996, see appendix). If the ratings differed by two points on the five-point rating scale, I retained that variation and considered the ratings to converge. Of the 678 solutions rated (339 solutions on usefulness dimension and 339 solutions on novelty dimension), 289 ratings were an exact match, 286 ratings had a one-point difference, and 90 ratings had a two-point difference. However, 19 solutions were identified as having a three-point or higher difference in SME ratings. Since this number was fairly small (only 0.03%) of the overall data, the primary investigator addressed the divergence and rated the solutions. The interrater reliability was calculated by using the kappa estimates for each set of raters. The interrater analysis for usefulness between rater A and rater B is $Kappa = 0.421$ with $p < 0.001$, while the interrater agreement for novelty dimension between rater A and rater B is $Kappa = 0.364$ with $p < 0.001$. The interrater analysis for usefulness between rater C and rater D is $Kappa = 0.408$ with $p < 0.001$, while the interrater agreement for novelty dimension between rater C and rater D is $Kappa = 0.441$ with $p < 0.001$. Overall, as a rule of thumb, values of Kappa from 0.4 to 0.59 are considered moderate agreement, while values of Kappa from 0.2 to 0.39 are considered fair agreement (Landis & Koch, 1977).

Finally, although the benchmark scale assessed both novelty and usefulness dimensions of creative outcome effectiveness separately, these two dimensions were highly correlated ($r = 0.945$). This suggested that both the dimensions did indeed share significant overlap and should

therefore be combined into an overall score. The task goals instructed participants to ensure that their solutions were novel and useful. Those participants who took the task goals seriously and were motivated to produce creative outputs tended to focus on producing both novel and useful ideas, while the participants who did not approach the task seriously and were not motivated to perform in the experiment tended to produce ideas that were neither novel nor useful. This may have led to the high correlation between novelty and usefulness scores. Thus, the final creative outcome effectiveness score for further analyses was an averaged index of novelty and usefulness dimensions.

Control variables. Cognitive ability was used as a control variable because it has been consistently found to explain both problem-solving in general, and also creative problem solving. Participants provided SAT or ACT scores; the standardized scores were used as indicators of participants' general cognitive ability (Kozlowski & Bell, 2006). SAT scores were converted to ACT scores using the concordance tables provided by ACT. Sixteen participants did not provide either their ACT or the SAT scores, and instead provided their GPAs. I imputed their ACT scores from their GPA as follows: first, I extracted cognitive ability data from all the subjects in the sample who were in the same GPA bracket as the subject who did not provide the standardized scores. Next, I computed the mean ACT score for this GPA bracket and used this score as a measure of cognitive ability.

Trait anxiety was also used as a control variable because a recent meta-analysis on stressors and creativity found that participants high in trait anxiety reacted more strongly to stressors and their creative performance was lower, while people low in trait anxiety were able to not only weather the stressors, but also had higher levels of creative performance (Byron,

Khazanchi, & Nazarian, 2010). I used the State-Trait Anxiety Inventory, Trait Version, Form Y (STAI-T; Spielberger, 1983; see appendix for items). The reliability for the scale was $\alpha = 0.8$.

Finally, self-rated Biographical Inventory of Creative Behaviors (BICB; Batey, 2007) was used to control for subjects' prior experience with creative activities. This measure has been used as an indicator of past creative achievement (e.g., Nusbaum & Silvia, 2011; Furnham, Batey, Anand, & Manfield, 2008). Participants were asked to endorse all the creative activities that they had engaged in over the past year. The scale provides a wide range of activities such as "written a short story"; "organized an event, show, performance or activity"; "drawn a cartoon"; "selected to lead/manage others" (See appendix for full measure). The scale had adequate reliability in the current sample, $\alpha = 0.75$.

Analytic strategy

Path analysis was used to test the hypothesized moderated mediation model (Figure 4) using MPlus version 7.31 (Muthén & Muthén, 2015). Positive affect and negative affect were tested as mediators of the association between time pressure and creative performance behaviors and creative outcome effectiveness. The empirical model included paths from each of the time pressure conditions to state affect variables, and then from each of the four state affect mediators (i.e., positive affect and negative affect after task 1, and positive affect and negative affect after task 2) to creative performance behaviors and creative outcome effectiveness respectively. Direct paths between time pressure and each of the two dependent variables, i.e. creative performance behaviors and creative outcome effectiveness were also tested. In addition, Intellect was tested as a moderator between time pressure and positive affect and negative affect. Direct paths from Intellect to creative performance behaviors and creative outcome effectiveness were also tested. Before conducting any analyses for interaction effects, the continuous variables were mean-centered.

Chi-square, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were used to test overall model fit. Results indicated poor model fit with observed data ($\chi^2(10) = 384.14$, $p < 0.001$, CFI = 0.422, TLI = -2.639, RMSEA = 0.332, SRMR = 0.088). In general, nonsignificant chi-squares, $CFI \geq .95$, $RMSEA \leq .05$, and $SRMR \leq .05$ suggest good model fit with the observed data (Hu & Bentler, 1999; Kline, 2005). In the current sample, none of the fit indices met the recommended criteria. Since positive affect after task 1 and positive affect after task 2 were correlated ($r = 0.673$) and negative affect after task 1 and negative affect after task 2 were also correlated ($r = 0.626$), each of the two sets of affect scores were averaged for parsimony sake. Thus, a single

index of averaged positive affect and a single index of averaged negative affect was created. Again, Chi-square, comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were used to test overall model fit. Results still indicated poor model fit with observed data ($\chi^2(1) = 52.812$, $p < .000$, CFI = .801, TLI = -6.544, RMSEA = .391, SRMR = .037). Although there was little to no difference in the final path estimates produced as a result of using this averaged index, the parsimonious approach did improve the model fit as compared to the model with four affect mediators used in the first analysis. There was an improvement in both SRMR and the CFI, although only the SRMR met the recommended criteria presented earlier. Thus, for further analyses the averaged index of positive and negative affect was used. See path model and coefficients below (Figure 4).

Given the poor fit statistics for the hypothesized model, four other alternative models were tested post-hoc. First, as is standard practice the hypothesized model was tested without including the control variables – cognitive ability, trait anxiety (STAI-T), and past experience with creativity (BICB). This alternative model was rejected because although it yielded similar parameter estimates as the hypothesized model, it had poor fit statistics ($\chi^2(1) = 35.951$, $p = .000$, CFI = .783, TLI = -4.640, RMSEA = .321, SRMR = .044).

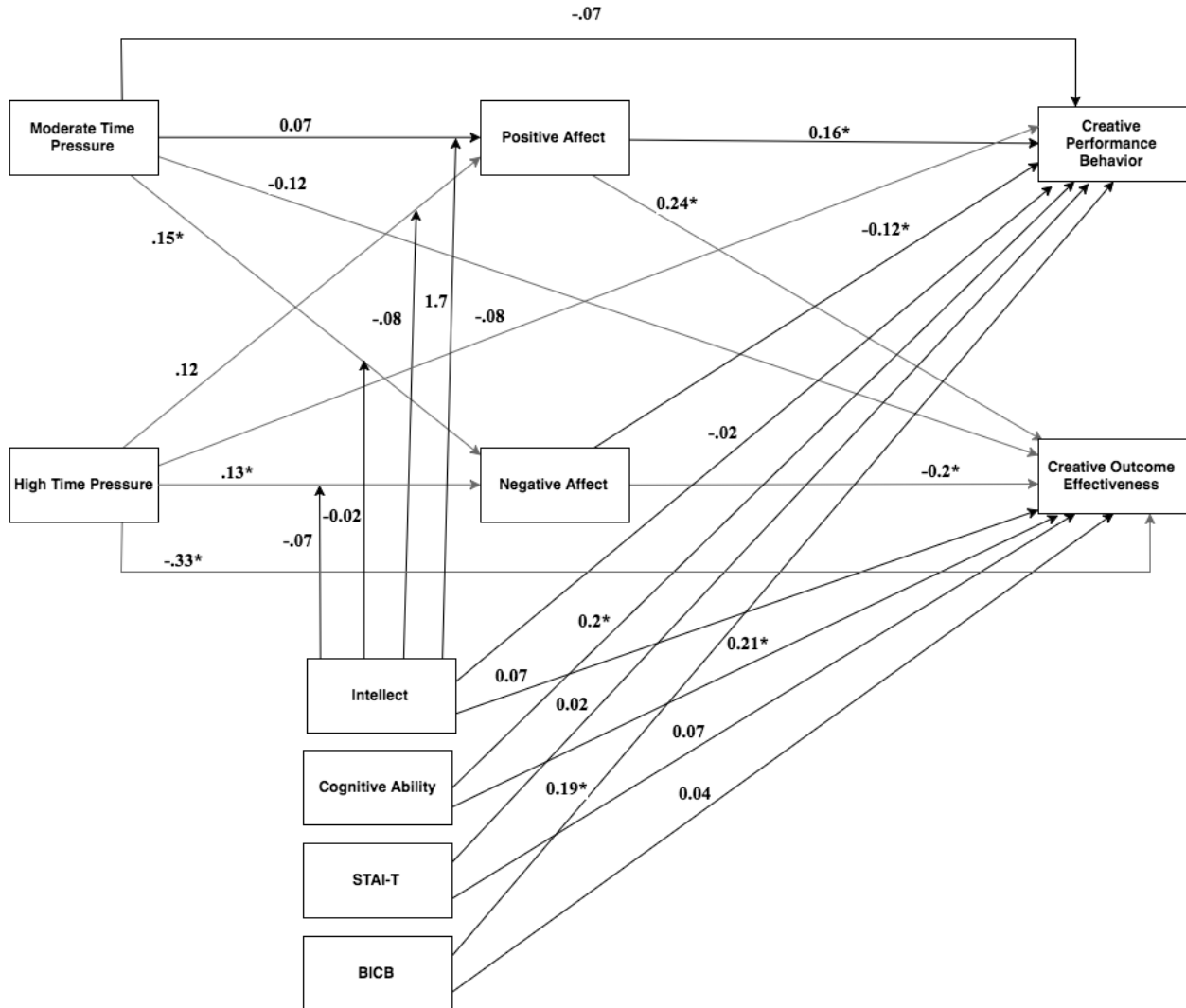
In the second alternative model a path was added between positive and negative affect in the hypothesized model based on three key pieces of evidence: (a) literature on affect shows that both positive and negative affect correlated at -.23 (Watson, Tellegen, & Clark, 1993), and thus adding a path between these two variables would be consistent with findings in the literature; (b) the current sample, both positive and negative affect were correlated at .29 (see table 1); and (c) finally, modification indices for the hypothesized model also indicated that adding a path between negative and positive affect would improve the fit of the model. However, adding the

path led to a just-identified model with zero degrees of freedom. The fit statistics from this model could not be interpreted and this model was rejected as an alternative model.

The third alternative model was tested using subjective time pressure instead of using the objective time pressure conditions mentioned earlier. The manipulation-check item “I felt time pressure during the experiment” was used as an indicator of subjective time pressure. As was described earlier, a path was added between positive and negative affect variables. Using subjective time pressure and adding the path between positive and negative affect yielded a well fitting model ($\chi^2(4) = 5.183, p = .27, CFI = .995, TLI = 0.957, RMSEA = .03, SRMR = .01$). All the fit indices met the recommended criteria and suggest good model fit with the observed data (i.e., nonsignificant chi-squares, $CFI \geq .95$, $RMSEA \leq .05$, and $SRMR \leq .05$).

The three control variables were deleted from the subjective time pressure model and this model served as the final alternative model. The fit statistics for this model were also good ($\chi^2(4) = 5.035, p = .28, CFI = .994, TLI = 0.963, RMSEA = .028, SRMR = .015$). Since all the fit indices met the recommended criteria and suggest good fit with the observed data, the results from this model will be compared to those of subjective time pressure model with controls in the results section.

Figure 4
Hypothesized Path Model With Objective Time Pressure Conditions



Next, bootstrapped confidence intervals were computed to test mediation in MPlus by using the CINTERVAL command in conjunction with Bootstrap option (Muthen & Muthen, 1998-2012). Research shows that this approach is not only computationally stronger at finding indirect effects, but it is also better than significance testing based on normal distribution because it makes no assumptions about the sampling distribution (Hayes, 2013; Hayes & Preacher, 2014). Furthermore, the bootstrap approach is also the most accurate in terms of power (i.e., ability of

finding mediation when there is mediation) and also results in lowest Type I error rates. Thus, it provides the most accurate estimate of mediation over other methods like Barron & Kenny causal steps approach or the Sobel test of mediation (MacKinnon, 2002). Confidence intervals that did not include zero indicate significant mediation.

Although Muthen & Muthen suggest using Bayesian estimator for moderated-mediated analyses, in the current study Maximum Likelihood Estimation was used. There are three key reasons why Maximum Likelihood Estimation was preferred. First, there was little to no difference between the parameters produced using the Bayesian estimator versus the Maximum Likelihood estimator in the current sample. A review of Muthen & Muthen's discussion board also suggested that several other researchers had observed this similarity and had used MLE instead (Muthen, 2005). Second, Chumney (2012) found that Bayesian estimation and Maximum Likelihood estimation performed equally well in producing model fit values. Finally, given the relative similarity of parameters produced by the two estimators, and the relative similarity of fit statistics, I chose to pick MLE over Bayesian estimation because the fit statistics produced by MLE are more researched and easier to interpret than those produced by Bayesian estimation.

RESULTS

Preliminary Analyses

Prior to performing hypothesis testing analyses, all data were examined for accuracy, missing values, normality, and assumptions of multivariate analysis using SPSS 22.0. Analyses indicated that skew and kurtosis were within an acceptable range (i.e., absolute value of skew < 2, absolute value of kurtosis < 7; West, Finch, & Curran, 1995); therefore, transformations were not necessary. Both creative performance behaviors (CPB) – one of the two dependent variables and BICB – a control variable which was an index of past creative behaviors were count variables. The skew and kurtosis on CPB was estimated and was found to be within acceptable range (skew = 0.746, kurtosis = 0.781); similarly skew and kurtosis for BICB was also found to be within acceptable range (i.e., skew = .426, kurtosis = -.432). The distribution for CPB and BICB respectively were also normal (see figures 5 and 6). Thus, both CPB and BICB were treated as continuous variables for further analyses.

Note, time pressure was treated as a categorical variable and dummy coded for all analyses. Following Hayes & Preachers' (2014) recommendations on creating dummy codes, two dummy variables, namely high time pressure (HTP) and moderate time pressure (MTP) were created to dummy code three time pressure groups - high time pressure (HTP), moderate time pressure (MTP), and slight time pressure (STP). Slight time pressure group was used as the reference category. Table 1 presents all the means, standard deviations, and inter-correlations of all the variables included in the study.

To examine individual difference factors as potential covariates, associations between outcome variables and cognitive ability, trait anxiety as measured by STAI-T, and past experiences with creative activities as measured by the BICB were examined. All three variables had significant

and expected correlations with several outcome variables of interest – cognitive ability was positively correlated with both numbers of ideas produced ($r = .24, p < .01$) and positively correlated with the creative outcome effectiveness ($r = .22, p < .01$); trait anxiety was negatively correlated with positive affect ($r = -.17, p < .01$) and positively correlated with negative affect ($r = .30, p < .01$); and past experience with creative activities was positively correlated with numbers of ideas produced ($r = .26, p < .01$), creative outcome effectiveness ($r = .14, p < .05$), and positive affect ($r = .25, p < .01$). Given the significant correlations, all three variables were included as covariates in subsequent analyses.

	Vars.	M	SD	1	2	3	4	5	6	7	8	9	10
1	HTP	-	-	1									
2	MTP	-	-	-	1								
3	CPB	13.56	6.61	-.45	.02	1							
4	COE	2.82	1.17	-.26**	.06	.29**	1						
5	PA	26.08	8.25	.03	.07	.19**	.19**	1					
6	NA	15.92	5.68	.04	.08	-.10	-.16**	.29**	1				
7	BICB	7.27	4.13	.01	.00	-	.14*	.25**	-.03	1			
8	Cog	25.30	3.36	.08	.02	.26**	.22**	.05	-.12*	.10	1		
9	STAI	44.02	9.04	.06	-.03	-.08	-.07	-.17**	.30**	-.04	-.06	1	
10	Intel	0.27	0.54	-0.06	.10	.17**	.17**	.30**	-.08	.30**	.17**	-.22**	1

Note. * p < .05. ** p < .01.

HTP = High Time Pressure (1); MTP = Moderate Time Pressure (2); CPB = Creative Performance Behaviors (3); COE = Creative Outcome Effectiveness (4); PA = Positive Affect (5); NA = Negative Affect (6); BICB = Biographical Inventory of Creative Behaviors (7); Cog = Cognitive Ability (8); STAI = State-Trait Anxiety Inventory (9); Intel = Intellect (10)

Figure 5
CPB Distribution

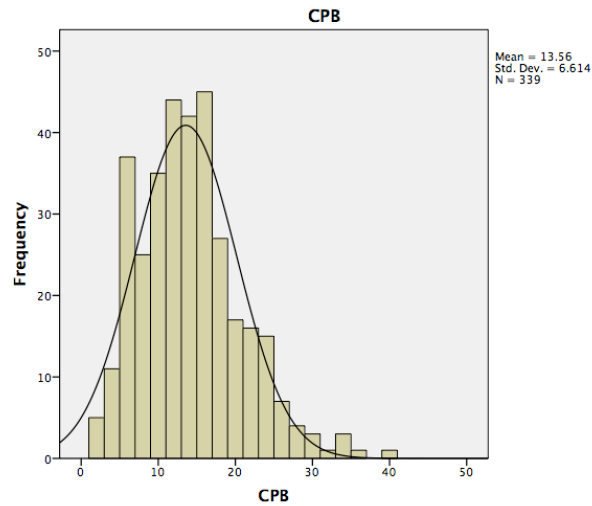
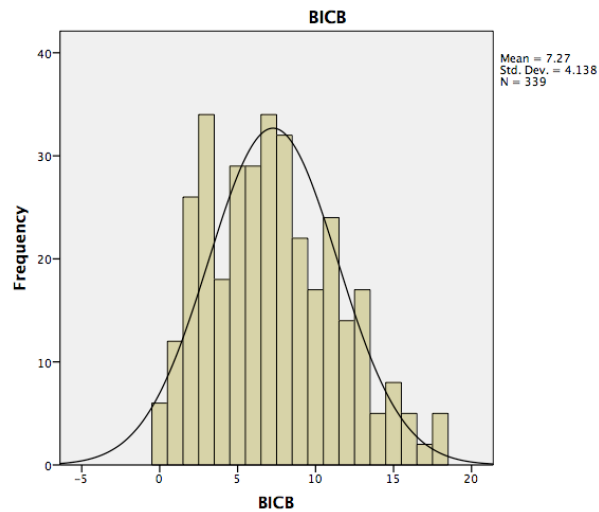


Figure 6
CPB Distribution



Main Effects and Moderated Mediation

Although a mediated effect may exist whether or not there is a statistically significant direct effect of the independent variables on the dependent variables (MacKinnon, 2008), the direct effects of Intellect and time pressure conditions were of interest in the current study. The direct effect is defined as the effect of X on Y, adjusted for the effects of the mediators (i.e., c' ; MacKinnon, 2008). Hypothesis 1a predicted that high Intellect, as opposed to low Intellect, would be positively related to high creative performance behaviors. Results indicated that this hypothesis was not supported. It was found that in fact, high Intellect was negatively related to the numbers of ideas generated; this relationship was not statistically significant ($\beta = -.024, p = .74$). Hypothesis 1b predicted that high Intellect, as opposed to low Intellect, would be positively related to creative outcome effectiveness. Although the effect was not statistically significant, it was in the expected direction – that is, high Intellect was positively related to higher ratings of creative outcome effectiveness ($\beta = .065, p = .48$).

In addition, the amount of time pressure on participants was hypothesized to predict creative performance behaviors and creative outcome effectiveness. Specifically, hypothesis 2a predicted that increase in time pressure would be inversely related to creative performance behaviors. Although the effect was not statistically significant, it was found that as compared to low time pressure condition, both high time pressure ($\beta = -.078, p = .17$) and moderate time pressure ($\beta = -.068, p = .28$) were inversely related to creative performance behaviors (i.e., number of ideas generated). Hypothesis 2b predicted that increase in time pressure would be inversely related to creative outcome effectiveness. This hypothesis was partially supported as it was found that while high time pressure significantly predicted lower creative outcome

effectiveness ratings ($\beta = -0.326, p = .00$), moderate time pressure though still inversely related to creative outcome effectiveness ratings, was not statistically significant ($\beta = -.121, p = .06$).

Time pressure was also hypothesized to predict subjects' affective states. Specifically, hypothesis 3a predicted that time pressure would be positively related to affect such that increase in time pressure would correspond to increase in negative affect. This hypothesis was fully supported. Results show a positive and statistically significant relationship between moderate time pressure and negative affect ($\beta = .147, p = .03$) and between high time pressure and negative affect ($\beta = .132, p = .04$). Hypothesis 3b predicted that time pressure would be negatively related to affect such that as time pressure decreases positive affect would increase. This hypothesis was not supported. Results show the opposite pattern such that there was a positive relationship between moderate time pressure and positive affect ($\beta = 0.057, p = .39$) and between high time pressure and positive affect ($\beta = .120, p = .06$) although both these effects were not statistically significant.

The next set of hypotheses predicted moderation. Two interaction terms were created in Mplus, one each for high time pressure and Intellect and for moderate time pressure and Intellect to test moderation (Muthen & Muthen, 2015). Hypothesis 3c predicted the interaction between time pressure and Intellect such that high time pressure would lead to greater negative affect compared to mild time pressure for individuals high on Intellect while low Intellect will lead to high negative affect regardless of time pressure condition. This hypothesis was rejected ($\beta = -.069, p = .31$). Hypothesis 3d predicted that moderate time pressure would lead to greater positive affect compared to high time pressure for individuals high on Intellect while low Intellect will lead to low positive affect regardless of time pressure condition. This hypothesis was also rejected ($\beta = -.082, p = .27$).

The next set of hypotheses predicted that an individual's affect would predict creative performance behaviors and creative outcome effectiveness ratings. Specifically, hypothesis 4a predicted that positive affect would be positively related to creative performance behavior (number of ideas generated). Results show that high positive affect was significantly related to higher numbers of ideas produced ($\beta = .163, p = .005$). Hypothesis 4b predicted that positive affect would be negatively related to creative outcome effectiveness ratings (i.e., quality of ideas produced). Results show a statistically significant effect such that positive affect was in fact positively related to creative outcome effectiveness ($\beta = .241, p = .00$). Thus, this hypothesis was not supported. Hypothesis 4c predicted that negative affect would be positively related to creative outcome effectiveness ratings. Again, results show the opposite effect such that negative affect was significantly associated with lower creative outcome effectiveness ratings ($\beta = -0.198, p = .00$). Finally, hypothesis 4d predicted that negative affect would be negatively related to creative performance behaviors. Results fully support this hypothesis such that as negative affect increased the number of creative ideas produced decreased ($\beta = -0.116, p = .05$).

Next, confidence limits for specific indirect effects were estimated based on 10,000 bootstrap samples (95% CIs) in order to evaluate the significance of mediated effects (Muthen & Muthen, 1998 -2012). Results show that confidence intervals did not include the value zero for the association between moderate time pressure and creative outcome effectiveness via negative affect (LCL = -0.134, UCL = -0.013). This finding shows that negative affect mediated the relationship between moderate time pressure and creative outcome effectiveness. However, association between moderate time pressure and creative outcome effectiveness via positive affect did include zero and suggests that positive affect did not mediate this relationship (LCL = -0.034, UCL = 0.103).

Results for high time pressure to creative outcome effectiveness showed mediation effects for negative affect – i.e., confidence intervals for negative affect (LCL = -0.126, UCL = -0.005) did not include zero. In contrast, confidence intervals for positive affect (LCL = 0.004, UCL = 0.141) included zero and therefore this mediation was not supported. In sum, negative affect mediates the relationship between high time pressure and creative outcome effectiveness and also mediates the relationship between moderate time pressure and creative outcome effectiveness. Positive affect did not emerge as a mediator between any of the time pressure conditions and creative performance behaviors.

Table 2 presents results from the alternative model with subjective time pressure and compares the findings to those of the hypothesized, objective time pressure model. This table is included because the objective time pressure model fit the observed data poorly so interpreting the findings is an issue. In contrast, the subjective time pressure model fit the observed data well and therefore allows for interpreting the findings. Note that while the subjective time pressure model shows superior fit statistics, the path estimates obtained from this model are largely similar to those obtained from the hypothesized objective time pressure.

Per the standard practice, I have included the results comparing the subjective time pressure model with the three control variables used (i.e., cognitive ability, past experience with creative activities (BICB), and trait anxiety (STAI-T)) and the subjective time pressure model without including the control variables (see table 3). As is evident the findings are largely similar across the two models, with the exception of relationship between affect and time pressure. When control variables are not included the results are inconsistent with theory on affect and time pressure. Therefore, retaining the control variables in the subjective time pressure model is justified.

Table 2
Hypothesis testing and results across objective and subjective time pressure models

Hypothesis	Objective time pressure model estimates (Hypothesized model)	Subjective time pressure model estimates (Alternative model)	Findings
1a.	High Intellect was negatively related to CPB ($\beta = -.024, p = .74$)	High Intellect was positively related to CPB ($\beta = .032, p = .85$)	Not supported in both models
1b.	High Intellect was positively related to COE ($\beta = .065, p = .48$)	High Intellect was positively related to COE ($\beta = .00, p = .99$)	Not supported in both models
2a.	High time pressure and CPB were negatively related ($\beta = -.078, p = .17$) Moderate time pressure and CPB were negatively related ($\beta = -.068, p = .28$)	Higher levels of perceived time pressure were negatively related to CPB ($\beta = -.094, p = .08$)	Not supported in both models
2b.	High time pressure was inversely related to COE ($\beta = -0.326, p = .00$) Moderate time pressure was inversely related to COE ($\beta = -.121, p = .06$)	Higher levels of perceived time pressure had a negative relationship with COE but it was not significant ($\beta = -.016, p = .77$)	Partially supported in hypothesized Not supported in subjective time pressure model
3a.	Moderate time pressure and negative affect had a positive relationship ($\beta = .147, p = .03$) High time pressure and negative affect also had a positive relationship ($\beta = .132, p = .04$)	Higher levels of perceived time pressure when working on the CPB task was positively related to negative affect ($\beta = .169, p = .00$) Higher levels of perceived time pressure when working on the COE task was positively related to negative affect ($\beta = .226, p = .00$)	Both models support this hypothesis

Table 2 (cont'd)

3b.	Moderate time pressure and positive affect ($\beta = 0.057, p = .39$) High time pressure and positive affect ($\beta = .120, p = .06$)	Higher level of perceived time pressure was positively related to positive affect for both CPB ($\beta = .006, p = .91$) and COE ($\beta = .022, p = .69$) tasks	Not supported in both models
3c.	High time pressure and Intellect, compared to moderate time pressure, did not significantly predict greater negative affect ($\beta = -.069, p = .31$)	As perceived time pressure increased when working on COE task, people with high intellect had less negative affect than people with low intellect ($\beta = -.028, p = .83$). As time pressure increased when working on CPB task, people with high intellect had more negative affect than people with low intellect ($\beta = .046, p = .72$)	Not supported in both models
3d.	Moderate time pressure would lead to greater positive affect compared to high time pressure for individuals high on Intellect ($\beta = -.082, p = .27$)	As perceived time pressure increased when working on the COE task, people with high intellect had less positive affect than people with low intellect ($\beta = -.265, p = .06$). As time pressure increased when working on CPB task, people with high intellect had higher positive affect than people with low intellect ($\beta = .028, p = .85$)	Not supported in both models
4a.	High positive affect was significantly related to CPB ($\beta = .163, p = .005$)	High positive affect was significantly related to CPB ($\beta = .168, p = .00$)	Supported in both models
4b.	Positive affect and COE ($\beta = .241, p = .00$)	Positive affect and creative outcome effectiveness ($\beta = .232, p = .00$)	Not supported in both models
4c.	Negative affect and creative outcome effectiveness ratings ($\beta = -.0198, p = .00$)	Negative affect and creative outcome effectiveness ratings ($\beta = -.218, p = .001$)	Supported in both models

Table 2 (cont'd)

4d.	Negative affect and CPB ($\beta = -0.116$, $p = .05$)	Negative affect and CPB ($\beta = -.099$, $p = .09$)	Not supported in both models
5a – 6b	Neither positive nor negative affect mediated the relationship between time pressure and creative performance behaviors	Neither positive nor negative affect mediated the relationship between time pressure and creative performance behaviors	Not supported in both models
5a – 6b	Negative affect mediates the relationship between MTP and COE Negative affect mediates the relationship between HTP and COE Positive affect did not mediate relationship between MTP and COE or between HTP and COE	Negative affect mediates the relationship between perceived high time pressure and COE Positive affect did not mediate the relationship between perceived high time pressure and COE	Supported in both models

Table 3 Results across subjective time pressure models with and without control variables.		
Hypothesis	Model with Control Variables	Model without Control Variables
1a.	High Intellect was positively related to CPB ($\beta = .032, p = .85$)	High Intellect was positively related to CPB ($\beta = .07, p = .67$)
1b.	High Intellect was not related to COE ($\beta = .00, p = .99$)	High Intellect was positively related to COE ($\beta = .005, p = .974$)
2a.	Higher levels of perceived time pressure were negatively related to CPB ($\beta = -.094, p = .08$)	Higher levels of perceived time pressure were negatively related to CPB ($\beta = -.091, p = .09$)
2b.	Higher levels of perceived time pressure had a negative relationship with COE but it was not significant ($\beta = -.016, p = .77$)	Higher levels of perceived time pressure had a negative relationship with COE but it was not significant ($\beta = -.025, p = .67$)
3a.	Higher levels of perceived time pressure when working on the CPB task was positively related to negative affect ($\beta = .169, p = .00$)	Higher levels of perceived time pressure when working on the CPB task was positively related to negative affect ($\beta = -.126, p = .00$)
	Higher levels of perceived time pressure when working on the COE task was positively related to negative affect ($\beta = .226, p = .00$)	Higher levels of perceived time pressure when working on the COE task was positively related to negative affect ($\beta = -.217, p = .04$)
3b.	Higher level of perceived time pressure was positively related to positive affect for both CPB ($\beta = .006, p = .91$) and COE ($\beta = .022, p = .69$) tasks	Higher level of perceived time pressure was positively related to positive affect for both CPB ($\beta = .208, p = .00$) and COE ($\beta = .232, p = .00$) tasks
3c.	As perceived time pressure increased when working on COE task, people with high intellect had less negative affect than people with low intellect ($\beta = -.028, p = .83$). As time pressure increased when working on CPB task, people with high intellect had more negative affect than people with low intellect ($\beta = .046, p = .72$)	As perceived time pressure increased when working on COE task, people with high intellect had less negative affect than people with low intellect ($\beta = -.025, p = .852$). As time pressure increased when working on CPB task, people with high intellect had more negative affect than people with low intellect ($\beta = .027, p = .831$)

Table 3 (cont'd)

3d.	As perceived time pressure increased when working on the COE task, people with high intellect had less positive affect than people with low intellect ($\beta = -.265, p = .06$). As time pressure increased when working on CPB task, people with high intellect had higher positive affect than people with low intellect ($\beta = .028, p = .85$)	As perceived time pressure increased when working on the COE task, people with high intellect had less positive affect than people with low intellect ($\beta = -.313, p = .03$). As time pressure increased when working on CPB task, people with high intellect had higher positive affect than people with low intellect ($\beta = .074, p = .633$)
4a.	High positive affect was significantly related to CPB ($\beta = .168, p = .003$)	High positive affect was significantly related to CPB ($\beta = .208, p = .00$)
4b.	Positive affect and creative outcome effectiveness ($\beta = .232, p = .00$)	Positive affect and creative outcome effectiveness ($\beta = .232, p = .00$)
4c.	Negative affect and creative outcome effectiveness ratings ($\beta = -.218, p = .001$)	Negative affect and creative outcome effectiveness ratings ($\beta = -.217, p = .00$)
4d.	Negative affect and CPB ($\beta = -.099, p = .09$)	Negative affect and CPB ($\beta = -.126, p = .04$)
5a – 6b.	Neither positive nor negative affect mediated the relationship between time pressure and creative performance behaviors	Neither positive nor negative affect mediated the relationship between time pressure and creative performance behaviors
5a – 6b.	Negative affect mediates the relationship between perceived high time pressure and COE Positive affect did not mediate the relationship between perceived high time pressure and COE	Negative affect mediates the relationship between perceived high time pressure and COE Positive affect did not mediate the relationship between perceived high time pressure and COE

DISCUSSION

Extensive research shows that creative performance is impacted by both individual differences and contextual variables (Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993). In the current study, I investigated the role of time pressure and Intellect in predicting creative performance. Research has shown that time pressure can lead to deficits in creative performance (Hennessey & Amabile, 2010). Much of this existing work, however, has focused on direct effects of time pressure on creative performance with less attention to understanding the underlying processes. Rather than conceptualizing the relationship between time pressure and creative performance as direct and deterministic, the aim was to elucidate the various pathways by which time pressure might either inhibit or facilitate creative performance. Similarly, work on the role of Intellect and creative performance has also focused on direct effects (Batey & Furnham, 2006; Feist, 1999) without taking into account the role of contextual variables such as time pressure. Thus, in the current study, I took the interactionist view (Woodman, Sawyer, & Griffin, 1993) and examined how Intellect might interact with time pressure to impact creative performance through affective responses.

Specific goals were to (a) examine individuals' performance on creative tasks at different levels of time pressure; (b) identify how time pressure is implicated in creating affective states, and how these affective states in turn mediate the link between time pressure and creative performance; (c) investigate whether or not the mediational mechanisms differ as a function of interaction between time pressure and individual differences in Intellect; and (d) investigate whether or not there is value in treating the two dimensions of creative performance – creative

outcome effectiveness (quality of ideas generated) and creative performance behaviors (quantity of ideas generated) as distinct constructs.

Given that the model fit for objective time pressure model (the hypothesized model) limits the ability to interpret the findings, the discussion section is based on the alternative subjective time pressure model that showed good fit with the observed data. As shown in table 2 the path estimates across both the objective and the subjective time pressure models are largely similar with only minor differences. The findings from both these models will be compared and contrasted in the discussion below.

Time Pressure & Affect

As expected, subjects who perceived higher time pressure had significantly higher levels of negative affect (Ohly & Fritz, 2010; Binnewies & Wörnlein, 2011; Lundberg, 1993; Maule & Hockey, 1993; Edland & Svenson, 1993; Svenson & Edland, 1989). This finding is in line with both activation theory and transactional stress theory that suggests that when people encounter constraints such as time pressure they not only view the constraints as aversive stimuli (cf., Cacioppo, Gardner, Berntson, 1999), but also view them as threatening stimuli (Matthews & Campbell, 2009) and these interpretations in turn predispose individuals to negative state affect. This finding is also well aligned with the predominant view across decision-making and creativity literatures that increases in time pressure are related to increases in negative affect because time pressure is viewed as a stressor (e.g., Matthews & Campbell, 2009; Ohly & Fritz, 2010; Binnewies & Wörnlein, 2011; Lundberg, 1993; Maule & Hockey, 1993; Edland & Svenson, 1993; Svenson & Edland, 1989). Note these findings were consistent when time pressure was treated as a subjective variable and when time pressure was treated as an objective variable. Participants in both high and moderate objectively manipulated time pressure conditions, as opposed to those in low time pressure condition, had significantly higher levels of negative affect.

However, results did not support the hypothesis that participants who perceived higher time pressure would endorse lower positive affect. Instead, results show the opposite effect such that the relationship between perceiving high time pressure and positive affect was positive. However, this relationship was not statistically significant. Note that this trend held even when time pressure was assessed using the objective manipulation. For participants in both high time pressure condition, and moderate time pressure condition as compared to low time pressure the

effects of increasing time pressure were positive on positive affect (Note – the high time pressure condition approached significance ($p = 0.065$)). Furthermore, the effect was stronger for participants in the high time pressure condition than it was for participants in the moderate time pressure condition. At first glance, this finding from both the subjective and objective time pressure models might seem counterintuitive, but it aligns well with the view that time pressure is not always interpreted as a negative attribute (Maule, Hockey, & Bdzola, 2000). People can also be energized by higher time pressure thereby creating positive affective state (e.g., Baer & Oldham, 2006; Binnewies & Wornlein, 2011). Studies have shown that if individuals have the psychological resources to cope with time pressure as a stressor, then they might feel eustress because they interpret time pressure as a stimulus that challenges and energizes them (Maule & Hockey, 1993). Research also shows that moderate levels of time pressure, as compared to low levels of time pressure, facilitate performance outcomes and are seen as appetitive stimuli that create positive affect (cf., Cacioppo, Gardner, Berntson, 1999).

Taken together, the aforementioned findings suggest that while perceived high time pressure does increase negative affect, we cannot assume that perceived low time pressure will necessarily be related to positive affect. Similarly, for objective time pressure the findings suggest that while high levels of time pressure do increase negative affect, we cannot assume that giving people more time to work on tasks is necessarily related to positive affect. Although activation theory and transactional stress theory present possible mechanisms that might lead individuals to interpret stimuli as appetitive or aversive, further research is needed to understand (a) how people perceive time pressure, and (b) explore why high levels of time pressure might be associated with both negative and positive affect simultaneously.

Affect & Creative Performance

Creative performance was differentiated into creative performance behaviors (operationalized as numbers of ideas generated) and creative outcome effectiveness (operationalized as SME ratings of quality of creative responses measured on novelty and usefulness dimensions) (Campbell et al., 1990). Overall it was found that not only was the correlation between creative performance behaviors and creative outcome effectiveness small ($r = 0.29$), both were also differentially related to variables of interest.

As expected, participants in a positive affect state produced a higher number of creative ideas on the idea generation task. This finding is in line with literature on affect and creative performance that suggests that positive affect broadens people's cognition and this in turn allows for higher idea generation (George & Zhou, 2007; Shalley & Gilson, 2004; McLean, 2005; Hirt, McDonald, & Melton, 1996; Vosberg, 1998; Martin et al., 1993). The hypothesis that participants' negative affect would be related to them producing fewer creative ideas was also supported. This finding is also supported by previous research that shows that negative affect narrows people's cognition and therefore restricts divergent thinking (DeDreu et al., 2008; Martin et al., 1993). Overall, results across both the objective time pressure model (hypothesized model) and subjective time pressure model (alternative model) support the idea that while positive affect is beneficial for coming up with diverse ideas, negative affect impedes people's ability to associate new and different attributes and therefore restricts idea generation.

However, contrary to what was expected, results show that positive affect was significantly related to higher ratings of creative outcome effectiveness. That is to say, when SMEs judged the quality of creative ideas produced in response to the policy problem, participants who had higher positive state affect were also the ones whose outputs were deemed

more novel and useful. Contrary to DeDreu et al.'s (2008) dual pathway model, it seems that positive affect does not restrict people's ability to think critically and produce high quality solutions. Following the dual pathway model, it was also hypothesized that individuals' with higher negative affect would produce higher quality solutions. This hypothesis was also not supported. Results were statistically significant and show that as people's negative affect increased, SMEs rated their solutions lower on creative outcome effectiveness. Again, these findings were consistent across both objective and subjective time pressure models.

Overall, the results suggest that individuals in positive affective state not only produced higher number of ideas, but also produced higher quality of creative ideas. In contrast, individuals with negative affective state not only produced lower quantity of ideas, but also produced lower quality of ideas. As mentioned earlier, the literature on creative performance tends to show mixed findings for affect and creative performance such that some studies have found that positive affect is associated with creative performance while others have found that negative affect is associated with creative performance. In the current study, a concerted attempt was made to explore the reason behind these mixed findings by decomposing creative performance into two dimensions. The results converge with the body of literature that proposes that positive affect is an important factor in facilitating creative performance (Isen, 1999; Amabile et al., 2005), while negative affect is implicated in inhibiting creative performance (Schwartz & Bless (1991).

Time Pressure & Creative Performance, and Role of Affect as Mediators

Another key goal of this study was to investigate the underlying affective mechanisms that relate time pressure to creative performance. While the main effects for affect on creative performance supported previous findings that positive affect is implicated in creative

performance (see previous section), when affect was examined as a mediating mechanism in the association between time pressure and creative performance surprising results were found. Specifically, while negative affect is implicated in the association between time pressure and creative outcome effectiveness, neither positive nor negative affect mediates the association between time pressure and creative performance behaviors. This effect held across both subjective and objective time pressure models. These results further shed light on the mixed findings discussed previously and highlight the importance of studying process mechanisms rather than just limiting ourselves to an understanding of main effects in affect and creative performance research.

Time Pressure, Affect, & Creative Performance Behaviors

First, main effects of time pressure on creative performance behaviors show that as perceived time pressure increased, participants generated lower number of creative ideas.. Although this effect was not significant, the trend was consistent across both perceived time pressure and objectively manipulated time pressure models. For objective time pressure model this trend held for not only high time pressure relative to slight time pressure, but also for moderate time pressure relative to slight time pressure. Also, as would be expected, this inverse effect of time pressure on creative performance behavior was stronger at higher levels of time pressure than it was at moderate levels of time pressure. The results from both the subjective and objective time pressure model align and are supported by literature on creativity that views time as a valuable resource (McGrath & Kelly, 1986) and shows that lack of time is detrimental to idea generation (Hunter, Bedell, & Mumford, 2005; Shalley & Gilson, 2004). Thus, overall results seem to indicate that time pressure is implicated in reducing the numbers of ideas generated. Furthermore, there was a strongly significant effect between positive affect and

creative performance behaviors such that as positive affect increased the numbers of creative ideas produced also increased. Also, there was a strongly significant effect between negative affect and creative performance behaviors such that as negative affect increased the numbers of creative ideas produced also decreased. Thus, it was surprising to see that despite the direct effect of time pressure on creative performance behaviors in expected direction, and the strongly significant main effects between positive affect, negative affect, and creative performance behaviors, we failed to find mediation effects for state affect. Specifically, not only was the mediation not supported for subjective time pressure model, but it also failed for objective time pressure model (i.e., we failed to find that positive affect mediates the relationship between moderate time pressure and creative performance behaviors, and failed to find support for the hypothesis that negative affect would mediate the relationship between high time pressure and creative performance behaviors).

Although it is not necessary to have a significant direct effect between independent and dependent variables for mediation effect to exist (Rucker, Preacher, Tormala, & Petty, 2011), it is likely that because the direct effect of time pressure on creative performance behaviors was low, there was not enough strength in the current data to detect mediation. It may also be the case that either the dependent and/or the independent variables were imperfectly measured, in which case the ability to detect mediation would be attenuated (MacKinnon, Fairchild, & Fritz, 2007). However, since creative performance behaviors were measured as an index of the numbers of ideas generated, the concern about measurement issues on the dependent variable (at least for this operationalization) is slim. It is, however, likely that because the participants were not provided performance goals that asked them to generate “at least X number of creative ideas” they might have shown a satisficing tendency on this task. Instead the participants were asked to

generate ‘as many creative (novel and useful) ideas as possible’. While the protocol followed to elicit creative ideas was consistent with that used in the literature, this protocol needs to be revisited specifically in light of the fact that for the policy problem the performance goals did help in eliciting creative performance (discussed later).

Another potential explanation for the lack of effect is that even after objectively manipulating time pressure, participants may have perceived the time constraint differently in relation to the different tasks performed during the experiment (e.g., Durham, Locke, Poon, & McLeod, 2000). This possibility seems likely given that mediation was found for creative outcome effectiveness (described later); perhaps the time pressure manipulation worked better for the creative outcome effectiveness task than it did for creative performance behavior task. However, this explanation is not merited given the data on perceived time pressure when working on the two tasks. Specifically, data show that participants working on creative performance behavior task reported almost similar perceived time pressure ($M = 3.41$, $SD = 1.14$) as compared to participants working on creative outcome effectiveness task ($M = 3.48$, $SD = 1.20$). Overall, the finding that neither positive state affect nor negative state affect mediated the relationship between time pressure and creative performance behaviors is consistent across both subjective time pressure model and objective time pressure model, but it should be treated cautiously. State affect should not be dismissed as a potential mechanism linking time pressure with creative performance behaviors because research does support it as a key mechanism underlying creative performance (DeDreu et al., 2008).

Time Pressure, Affect, & Creative Outcome Effectiveness

As expected, results show that SMEs rated essays that were written by participants who reported higher perceived time pressure as significantly lower quality than those that were

written by participants who reported lower perceived time pressure. Findings from the objective time pressure model also align with the effects for subjective time pressure model. Specifically, in the objective time pressure model the deleterious effects of time pressure on creative outcome effectiveness were stronger at higher levels of objective time pressure than at moderate levels of time pressure. Again, this finding is supported by literature on creativity that views time as a valuable resource and shows that lack of time is detrimental to generating novel and useful ideas (Hunter, Bedell, & Mumford, 2005; McGrath & Kelly, 1986). Thus, overall results seem to indicate that under time pressure participants produce lower quality of ideas. Furthermore, as previously discussed, both subjective and objective time pressure models show that there was a significant effect of positive affect on creative outcome effectiveness such that as participants' positive affect increased, SMEs rated their solutions as more novel and useful. Results also show a significant effect of negative affect on creative outcome effectiveness such that as participants' negative affect increased, SMEs rated their solutions as less novel and useful.

However, in contrast to affect as a mediator of the association between time pressure and creative performance behaviors, the picture was quite different when state affect was examined as a mediator between time pressure and creative outcome effectiveness. In this case, negative state affect emerged as a mediator of the relationship between time pressure and creative outcome effectiveness. Specifically, negative affect mediated the association between perceived time pressure and creative outcome effectiveness, but positive affect did not mediate the association between perceived time pressure and creative outcome effectiveness. These relationships were also consistent with the findings from the objective time pressure model. Specifically, negative affect mediates the association between high time pressure and creative outcome effectiveness, and also mediates the association between moderate time pressure and

creative outcome effectiveness. Thus, higher levels of time pressure were associated with negative state affect, which in turn was associated with subjects' generating lower quality solutions. Together, both subjective and objective time pressure models contradict our hypothesis and failed to support both DeDreu's (2008) model and Martin et al.'s (1993) 'Mood as Input' model that posited that negative affect would be implicated in generation of higher quality solutions. Both models theorized that negative affect goes through a "cognitive persistence" route and therefore pushes individuals to persist with the task at hand by being more careful and risk averse. The authors posited that a narrowed cognition would allow individuals to focus on the task at hand, avoid wildly divergent thinking, and therefore produce higher quality solutions. However, there are several other studies that have shown that negative affect is deleterious to creative performance and the current findings are in line with those studies (Isen & Barron, 1991; Schwartz & Bless, 1991; Vosberg, 1998; George & Zhou, 2002).

The role of positive affect as it is related to time pressure also needs to be revisited. Creativity literature for the most part tends to categorize time as a resource, and has assumed that lack of time depletes creative performance. Although the results support the predominant view that time is a valuable resource for creativity, the counterintuitive finding that even under perceived time pressure individuals can exhibit positive affect merits more attention. Results therefore suggest that we need to look beyond a deterministic view of time pressure on creative performance and also study how time pressure impacts affective states. While positive affect did not emerge as a mediator, positive affect should be included in future studies as an important meditational variable especially given its positive main effects on creative outcome effectiveness. It is likely that positive affect can act as a buffer against time pressure thereby facilitating creative performance. Thus, future research needs to take a process approach in

studying time to allow a more complex and nuanced understanding of time in the production of creative outputs.

Thus overall findings from the current study suggest that we need to re-examine the role of time in creative performance. While the study supports the idea that main effects of time pressure on generating novel and useful solutions are indeed negative, if individuals react to time pressure with negative affect, then negative affect is also implicated in exacerbating the deleterious effects of time pressure on quality of ideas generated (i.e., low novel and useful products). Although not significant, there is an indication that the effects of time pressure on creative outcome effectiveness vary depending on the type of affective state induced by time pressure. In particular, the results show a trend such that even high levels of perceived time pressure were related to positive state affect. Furthermore, individuals who had a positive affective response to higher levels of time pressure tended to also do well in producing higher quality creative ideas (i.e., creative outcome effectiveness). This is in contrast to the significant effect whereby individuals who had a negative affective response to higher time pressure tended to produce lower quality creative ideas (i.e., creative outcome effectiveness).

Intellect as a Moderator Between Time Pressure & Affect

Per Tett & Burnett's (2012) Trait Activation Theory, time pressure was hypothesized as a task-level situation that could both constrain and facilitate trait-consistent behaviors. Thus, it was expected that under high levels of time pressure, high Intellect individuals would have higher levels of negative affect. Further, under moderate levels of time pressure, high Intellect individuals were expected to have higher levels of positive affect. However, results did not support any of our moderation and moderated-mediated hypotheses. While the exact hypotheses could not be tested for the subjective time pressure model because there were no high or

moderate levels of time pressure to test the hypotheses, the moderation with overall perceived time pressure and Intellect predicting differential affective states was examined. Note, for subjective time pressure, the time pressure responses were collected after participants completed work on each of the two tasks (i.e., creative performance behavior task and creative outcome effectiveness task). Thus, when looking at the interaction of time pressure and Intellect, the effects were broken down by task. While people with high Intellect did show lower negative affect than people with low Intellect as they worked on creative outcome effectiveness task under high-perceived time pressure, the effect was non-significant. Similarly, when participants endorsed high-perceived time pressure and worked on the creative performance behavior task, those with high Intellect had more negative affect than people with low Intellect, but the effect was non-significant. In contrast, while people with high Intellect did show lower positive affect than people with low Intellect as they worked under high-perceived time pressure on the creative outcome effectiveness task, the effect was non-significant. Similarly, when participants endorsed high perceived time pressure and worked on the creative performance behavior task, those with high Intellect had higher positive affect than people with low Intellect, but the effect was non-significant. Thus, overall the moderation hypotheses failed to find effects across both the subjective time pressure model and the objective time pressure model.

The ability to find moderation and/or moderated-mediation depends upon the reliability of the moderating and mediation variables. Even though the five-item Intellect facet was measured using a well-established measure (Big Five Inventory), the reliability obtained in the current sample is much lower ($\alpha = 0.57$) than that reported in literature elsewhere ($\alpha = 0.83$; John, Naumann, & Soto, 2008) and could have attenuated the ability to find effects. In fact, Intellect failed to predict creative performance behaviors and creative outcome effectiveness

even though there are studies that show that Intellect is implicated in creative performance (Kaufman et al., 2015; Nusbaum & Silvia, 2011; Batey & Furnham, 2006; Feist, 1999).

Although, the current study did not use the other facets from the BFI, it seems that in this sample the reliability for BFI facets was poor or marginal at best. For example, while Openness' facet Aesthetics had $\alpha = 0.65$, Conscientiousness' facets such as Order had $\alpha = 0.45$ and Compliance had $\alpha = 0.45$. In contrast, the global factors had better reliability estimates. For example, while Openness had $\alpha = 0.77$, Conscientiousness had $\alpha = 0.81$. It seems that in the current sample the BFI was unable to assess facets with the same precision as it measured the global traits. This could possibly explain the non-significant findings for moderated-mediated hypotheses.

Limitations

Although this investigation provides new information about the processes by which time pressure impacts creative performance, there are several limitations that should be addressed in future research. First, with the exception of SRMR that indicated good model fit, most other fit statistics suggested a poor model fit for the objective time pressure model (hypothesized model). One reason for significant Chi-square could be non-normality in data, but the data were checked for non-normality and skew and kurtosis were within acceptable range. Chi-square also tends to be adversely impacted by both the sample size and the model complexity. It is likely that the sample size ($N = 339$) and the complexity of the moderated-mediated model with eleven variables might have led to a significant Chi-square in this study. While the Root mean square error of approximation (RMSEA) is a transformation of Chi-square that corrects for sample size and model complexity, in the current study RMSEA was still higher than the recommended value. The CFI and the TLI, which also rely on chi-square transformations, were also less than

satisfactory. Standardized Root Mean Square Error of Approximation (SRMR) index did, however, show good fit.

One clear difference between SRMR and other indices reported is that while other indices rely on transformation of chi-square index, the SRMR takes the average of all residuals in the model from the correlation matrix. Overall, it is unclear why the chi-square based estimates indicate poor fit in the current model (however, the CFI of 0.8 did approach recommended value ($CFI > 0.95$)). One of the known limitations of path models is the assumption that all indicators measuring the latent variables are measured without errors. This assumption, if flouted, can reduce the model fit. The low reliability of Intellect scale is a clear example where this assumption was flouted. The limitation of poor fitting model was addressed by using the alternative model with subjective time pressure. Although the perceived time pressure model yielded a good fit with the observed data, and the path estimates were largely similar across both the objective and subjective time pressure models, it is important to reiterate that subjective time pressure model was selected post-hoc.

Second, when designing the study time pressure was treated as an objective indicator, even though research shows that time pressure is a subjective phenomenon (Wessman, 1973; Svenson & Benson, 1993; Roxburgh, 2004). I restricted the scope to taking an objective view of time pressure because research on time pressure and creative performance is still in its infancy and there were no concrete recommendations in the literature on assessing time pressure subjectively in lab settings. In the field settings time pressure has been measured from a self-report, retrospective account perspective. Although the strategies could have been imported to the lab setting – the self-report method is not free from limitations either. For example, in the current study, I used one of the time pressure manipulation check items as an indicator for

perceived time pressure. In line with research on time pressure, it seems that people are unable to accurately deduce the extent of time pressure on them (Svenson & Benson, 1993; Rastegary & Landy, 1993). In several instances people in high time pressure conditions stated that they did not feel pressed for time, while people in low time pressure conditions stated that they felt inundated with time pressure (refer pervasiveness in methods section). These effects were seen after controlling for trait anxiety. This does not however imply that time pressure failed as a manipulation – on the contrary, findings indicate effects of time pressure on participants' affective states. The fact that people under different levels of time pressure had incorrect perceptions of the amount of time pressure on them, and yet endorsed state affect items that were consistent with the experimental condition further bolsters the argument that people might be bad at evaluating the extent of time pressure on them. From a cognitive resources perspective, when people are working on complex, ambiguous tasks, perhaps it is difficult for them to also keep track of time because of finite attentional resources. Furthermore, when the subjective time pressure model was tested the findings using the objective time pressure manipulation still held. This further increases the confidence in the results.

However, the objective time pressure model did not fit the data well and a post-hoc decision was made to test the subjective time pressure model. The rationale for using the subjective time pressure model was that perhaps it does not matter whether or not people felt the objective time pressure imposed on them in accordance to the different objective time pressure conditions. Instead what matters more is individuals' subjective perceptions of the time pressure imposed as these would be implicated in impacting their affect. Although the fit statistics of the subjective time pressure model are good, and the findings are consistent across both objective and subjective time pressure models, it is nonetheless still important to concede that because the

subjective time pressure model was tested post-hoc, there is some degree of misalignment between initial experimental design decisions and the alternative model used.

One clear example of this misalignment is in testing the interaction hypotheses. The hypotheses were drafted to address how high and moderate levels of objectively manipulated time pressure would interact with Intellect to predict differential affective states. However, with subjective time pressure variable, we lost the ability to test these exact hypotheses and instead had to fall back on evaluating whether or not higher levels of perceived time pressure interacted with Intellect to predict differential affective states. Empirically, the difference is minor such that while the objectively manipulated time pressure condition relied on using categorical variables, the subjective perceptions of time pressure was a continuous variable. However, the inability to compare different levels of objectively manipulated time pressure did impact the interpretation and the presentation of the findings for the initial hypotheses proposed.

Another example of this misalignment is evident in the fact that only one item was used to measure subjective time pressure. Once again, because the focus of this study was to experimentally manipulate time pressure, the perceived time pressure item was used as a manipulation check. Of the five manipulation check items, this was the clearest, most concise, and easy to interpret item that could be used to assess subjective time pressure. The reliability of the manipulation check items was extremely poor (mention reliability) and this could not be addressed even after attempts to parcel the items were made. Future studies should anticipate the outlined issues of measuring time pressure and embed both objective time pressure and subjective time pressure conceptualizations at the experiment design phase to avoid the aforementioned alignment issues.

A third limitation of the current study was that while designing the study, I did not take into account the following: (a) if the two tasks used provided similar levels of stimulation for time pressure effects to emerge, and (b) could the interaction between the task demands and time pressure create differential conditions for eliciting creative performance. On one hand, the means and standard deviation on the subjective time pressure in both creative performance behavior and creative outcome effectiveness tasks ($M_{CPB} = 3.41$, $SD_{CPB} = 1.14$ and $M_{COE} = 3.48$, $SD_{COE} = 1.20$) would suggest that participants perceived similar level of time pressure across the two tasks. On the other hand, it is still possible that when the perceived time pressure interacted with the task demands it had a differential effect on eliciting creative performance. That is, could the idea generation task do better or worse than the task used to assess quality of ideas in eliciting creative performance under time pressure? Studies have found that the type of task used could interact with time pressure and impact outcomes of interest (e.g., Payne & Bettman, 1996; Maule, Hockey, & Bdzola, 2000). Although the results identified a trend that higher time pressure, both subjective and objective, was related to lower numbers of ideas generated, this effect was not significant. In contrast, higher levels of time pressure were strongly negatively related to task that aimed to assess the quality of ideas generated in the objective time pressure model, but this relationship while in the same direction was not significant for the subjective time pressure model. Similarly, while the link between time pressure and creative outcome effectiveness – i.e., the quality of ideas generated was significant via negative state affect mediator; the mediation failed for creative performance behaviors. Because the research on time pressure and creative performance is still in its infancy, it is unclear if these differential effects are indicative of true effects, or if there was a task effect such that creative outcome effectiveness task elicited higher affective response to perceived time pressure or to objective time pressure

than the creative performance behavior task. Specifically, when studying time pressure's effects on creative performance, it is important to test whether or not the task provides enough of stimulation for the time pressure effects to manifest and to also test whether or not the task used differentially elicits creative performance. As alluded to earlier in the discussion, one improvement in future studies could come from ensuring that clear performance goals are specified for all the creativity tasks used to ensure that the effects of time pressure can be elicited.

Finally, there are two issues of causality that cannot be addressed in the current study: (a) it is conceivable that state affect impacted perceptions of time pressure, instead of time pressure impacting state affect, and (b) it is also conceivable that performance on creative tasks impacted affect, instead of affect impacting creative performance. First, even though time pressure was objectively manipulated in the laboratory setting, it is likely that participants' affect after task 1 may have impacted their sensitivity to time pressure manipulation at task 2, thereby impacting their affective states. This is particularly important to consider given the previous discussion on how people's interpretation of time pressure is a subjective phenomenon. For example, studies show that people's motivational state when working on experimental tasks impacts how they view time pressure and how time pressure impacts the outcomes (Suri & Monroe, 2003). Similarly, studies also show that depending on people's task goals they adapt to time pressure differentially (Payne & Bettman, 1996). It is likely that people who were motivated to do well on the experimental tasks perceived the objective time pressure manipulation differently, and had differential affective responses than those who were not motivated. Alternatively, it is also possible that people who were motivated to do well and had performance-prove goals could have had a more positive affective state and either perceived time pressure as an energizing stimulus,

or adapted to time pressure. In contrast, unmotivated individuals might have shown virtual indifference to different time pressure conditions. Similarly, it is also conceivable that performance on first task in the experiment created affective states that then impacted performance on second task. Note that the experimental task was presented first and participants' affect was measured after working on the task and then asking them to report their perceived level of time pressure. While in the experiment design an attempt was made to avoid this issue of causality by randomizing the order in which the two tasks appeared, and by controlling for trait anxiety, both these steps do not fully help address the limitation.

Unfortunately, both the above issues of causality could not be addressed in the current study because of the manner in which the data was collected. In the experiment, tasks were presented randomly to avoid order effects. However, once the data came in counterbalancing constrained our ability to identify whether the creative performance behavior task appeared first for a participant, or whether the creative outcome effectiveness task appeared first. Since both the subjective time pressure items and affect measures were administered after each task, it is difficult for us to disentangle which measures correspond to which task. Future studies should attempt to specifically address the causality issues outlined here.

Future Directions

Although the current study sought to address calls to take an interactionist view (Woodman, Sawyer, & Griffin, 1993) of creativity by including both contextual and individual difference variables, the conceptual model was by no means a comprehensive interactionist framework. It only examined one contextual variable - time pressure and one individual difference variable - Intellect in examining creative performance. As the literature review noted, there are a whole host of contextual and individual difference variables that could be examined.

Although there have been attempts to create comprehensive frameworks (e.g., Woodman, Sawyer, & Griffin, 1993), future research should attempt to create comprehensive frameworks that clearly specify how different contextual, individual difference, and affective variables might predict creative performance.

The conceptual model also highlighted that while we know that creative performance is inherently affective (Amabile et al, 2005), research should also focus on the role of contextual variables such as time pressure because these have implications on the affective component. While time pressure is often studied from a purely “cold”, cognitive perspective (Maule & Edland, 1997), the study shows that attention to time pressure from a “warm”, affective perspective is also warranted. Furthermore, as mentioned earlier, it is vital to study how to manipulate time pressure in lab settings. Although the current study relied on previous research to manipulate time pressure levels, it is difficult to tell whether or not a 30 percent decrement from mean time will be interpreted as high time pressure or merely moderate time pressure? How might one account for subjective perceptions of time pressure? As the findings for the subjective time pressure model show, the mean perceived time pressure was on the higher end ($M_{CPB} = 3.41$ and $M_{COE} = 3.48$), participants in low and high time pressure conditions when answering the subjective time pressure items did not always align with the objective conditions they were placed in. Although activation theory and transactional stress theory present possible mechanisms that might lead individuals to interpret stimuli as appetitive or aversive, further research is needed to understand (a) how people perceive different levels of time pressure, and (b) explore why high levels of time pressure might be associated with both negative and positive affect simultaneously.

In line with above, research needs to focus on exploring the role of environment in our experiments better. For example, there was some indication that the perceived time pressure varied in response to the different kinds of tasks. This is an understudied topic in creativity literature and merits further attention. It is simplistic to assume that participants will interpret objective time pressure on an ambiguous, unique task that calls for idea generation in the same way as they would when working on a policy problem task which is more bounded, and also reminiscent of the essay-writing prompts. That is to say participants can have different subjective appraisals of the same amount of time pressure as they work on differential tasks because of task demands and time pressure interaction effects. Also, overall creativity literature would do better to consolidate recommendations on effective tasks used to elicit creative performance. In regards to studying creativity as a function of contexts, it would also help to identify boundary conditions that might render some tasks more effective than others under different conditions.

Finally, it was proposed that affective states serve as mediators that differentially impact creative performance. It was found that both negative affect mediated the relationship between time pressure and creative outcome effectiveness, but neither positive nor negative affect mediated the relationship between time pressure and creative performance behaviors. These findings merit more attention because it is clear that while state affect does play a role in creative performance, there are no studies to my knowledge that have tested affective mechanisms by differentiating creative performance behaviors and creative outcome effectiveness as two separate criteria.

Practical Implications

The current study attempted to answer a fundamental question: Can creative performance unfold when participants are required to produce creative outputs under time pressure? Although

it is true that generally high levels of time pressure tend to curb creativity, the study offers some nuanced and counter-intuitive findings that are helpful in answering this question. The findings suggest that while time pressure does relate to lower creative performance in general, it does not always diminish creative performance. People who know how to work under pressure seem to enjoy time pressure and exhibit positive affect. This positive affective state is also implicated in enhancing both the quantity of ideas generated and the quality of ideas produced. However, people who either do not enjoy working under time pressure, or cannot adapt to time pressure exhibit negative affect and this negative affective state is implicated in diminishing both the quantity and quality of ideas produced.

Thus, counter to the predominant view in creativity literature that posits that time pressure necessarily chokes creative performance (Amabile, 1998), current findings suggest that this may not always be the case. If time pressure were always implicated in choking creative performance, then how could we explain remarkably novel and creative outputs generated in the fast paced industries such as start-ups, technology firms, design industry, high-end fashion retail? The findings from the current study show that people can and do produce creative outputs under time pressure, but that creative performance is contingent on the kind of affective states induced by time pressure. Perhaps the fast-paced contexts such as start-ups tend to attract and retain individuals who feel energized by time pressure and are therefore able to produce creative and innovative ideas at work.

However, this is not to say that organizations should not be concerned about the amount of time pressure they impose on employees. On the contrary, the findings suggest that leaders should be mindful about how time pressure impacts their employees. Leaders would do well to ensure that they provide the material, social, and psychological resources necessary to help

people cope with sustained demands of time pressure. Access to such resources can not only help enhance positive state affect thereby potentially enhancing creative performance, but can also help avoid circumstances that may lead to sustained negative affect and thereby diminishing creative performance.

Since affect emerged as a critical mechanism that may facilitate or inhibit creative performance, the current investigation also helps practitioners understand the role of affect in their day-to-day work contexts. The study reinforces the idea that environments that are marked by consistent and sustained job stressors such as time pressure create job demands (Karasek, 1979) that have negative consequences for creative performance. Thus, the findings point practitioners to becoming more sensitive to how the overall organizational climate influences peoples' affective responses. If organizations are looking to harness employees' creativity as a strategic competitive advantage, then it is critical to create harmonious, engaging, and positive environments to drive creativity, while simultaneously minimizing the negative stimuli that suppress creativity.

Finally, the findings may also help supervisors in rating creative performance at work more effectively. Many performance management systems ask the question about whether or not people generate new, innovative ideas at work. However, the results show that it is not enough to simply keep track of the number of ideas generated at work in the form of number of patents filed, number of ideas logged on knowledge portals, or number of ideas discussed in meetings. It is equally important to also assess and track the quality of the ideas presented. Although it may be simpler to keep track of counts of ideas, it is akin to taking an impoverished view of creative performance.

APPENDICES

APPENDIX A: BFI (John, Donahue, & Kentel, 1991)

APPENDIX 4.1. BIG FIVE INVENTORY RESPONSE FORM AND INSTRUCTIONS TO PARTICIPANTS

Instructions: Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1	2	3	4	5
Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly

I see myself as someone who ..

- | | |
|---|--|
| 1. ____ Is talkative | 24. ____ Is emotionally stable, not easily upset |
| 2. ____ Tends to find fault with others | 25. ____ Is inventive |
| 3. ____ Does a thorough job | 26. ____ Has an assertive personality |
| 4. ____ Is depressed, blue | 27. ____ Can be cold and aloof |
| 5. ____ Is original, comes up with new ideas | 28. ____ Perseveres until the task is finished |
| 6. ____ Is reserved | 29. ____ Can be moody |
| 7. ____ Is helpful and unselfish with others | 30. ____ Values artistic, aesthetic experiences |
| 8. ____ Can be somewhat careless | 31. ____ Is sometimes shy, inhibited |
| 9. ____ Is relaxed, handles stress well | 32. ____ Is considerate and kind to almost everyone |
| 10. ____ Is curious about many different things | 33. ____ Does things efficiently |
| 11. ____ Is full of energy | 34. ____ Remains calm in tense situations |
| 12. ____ Starts quarrels with others | 35. ____ Prefers work that is routine |
| 13. ____ Is a reliable worker | 36. ____ Is outgoing, sociable |
| 14. ____ Can be tense | 37. ____ Is sometimes rude to others |
| 15. ____ Is ingenious, a deep thinker | 38. ____ Makes plans and follows through with them |
| 16. ____ Generates a lot of enthusiasm | 39. ____ Gets nervous easily |
| 17. ____ Has a forgiving nature | 40. ____ Likes to reflect, play with ideas |
| 18. ____ Tends to be disorganized | 41. ____ Has few artistic interests |
| 19. ____ Worries a lot | 42. ____ Likes to cooperate with others |
| 20. ____ Has an active imagination | 43. ____ Is easily distracted |
| 21. ____ Tends to be quiet | 44. ____ Is sophisticated in art, music, or literature |
| 22. ____ Is generally trusting | |
| 23. ____ Tends to be lazy | |

Please check: Did you write a number in front of each statement?

Retrieved from: John, Naumann, & Soto (2008)

APPENDIX B: Affect - PANAS (Watson, Clark, & Tellegen, 1988)

The PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent [INSERT APPROPRIATE TIME INSTRUCTIONS HERE]. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested	_____ irritable
_____ distressed	_____ alert
_____ excited	_____ ashamed
_____ upset	_____ inspired
_____ strong	_____ nervous
_____ guilty	_____ determined
_____ scared	_____ attentive
_____ hostile	_____ jittery
_____ enthusiastic	_____ active
_____ proud	_____ afraid

APPENDIX C: Managerial & Policy Problem (Mumford et al., 1996)

Scenario presented to participants:

Ken Kirk and fifty other Polar Star Beverage Co. had just settled down in Kirk's office for a meeting. Suddenly, Kirk heard the sound of bottles falling on the sidewalk below. When he looked out of the window, he saw a group of 75-80 young people carrying signs and sacks of bottles and cans. He could also see TV cameras and what seemed to be news reporters on the street.

The signs indicated that the kids were from a near-by town; and they were wearing faded jeans and all seemed to have long hair. Kirk asked another manager to invite the group into the plant for a "Polar Star," but the manager returned to say that the students demanded to talk "the top man in the company". As manager of the Bay Area bottling plant, Kirk was the 'top man.' The students were probably protesting PolarStar's non-returnable glass and plastic containers. He knew, however, that it was a practical impossibility for Polar Star to survive in the Bay Area market and offer returnable containers, since consumers preferred nonreturnable bottles and cans, and all the large grocery chains did not like the extra work that processing returnable entailed.

Yet, thought Kirk, Polar Star relied heavily on the Bay Area youth market; college and high school students were an important part of this market. The company also had a reputation for producing an honest, quality product that had been basic to its success and expansion. It was crucial not to have the company's image damaged by this confrontation.

Kirk knew that his employees had little sympathy for the protesters, and that there was a chance for a physical confrontation. A manager's meeting would be breaking up within half an hour, and delivery trucks were beginning to return for the day. Kirk heard the students chanting "recycle NOW," and could sense the uneasiness of his employees.

Kirk stepped outside into the large crowd. They had begun to empty their sacks of bottles and cans, and the TV cameras and recorders were close. The students piled the cans and bottles (from national and private brands, as well as Polar Star) against the plant wall. Kirk looked into the crowd and wondered what to do. What would YOU do?

APPENDIX D: Benchmark Scale; Mumford et al. (1996)

Quality Considerations: Answers to the problems should be rated on a five-point scale using the following criteria:	Originality Considerations: Answers to the problems should be rated on a five-point scale using the following criteria:
Completeness: <i>Did they understand the instructions, use a broad range of information and find several relevant points to discuss?</i>	Novelty: <i>Does the solution represent a relatively unique approach to the problem?</i>
Effectiveness: <i>Is the problem solution viable, i.e., practical and appropriate?</i>	Surprise: <i>Does the solution engender a subjective response of surprise or delight?</i>
Quality Scale Points:	Originality Scale Points:
(1) Incomplete; simplistic; minimum apparent effort: "Tell them they can return the stuff."	(1) Incomplete; simplistic; minimum apparent effort: "Talk to them."
(2) Two or more points, but simplistic; no elaboration: "Set up an appointment; recycling is better than losing business."	(2) Simple, but complete solution, two or more points addressed: "Sit down with protesters and explain company position."
(3) Two or more points, but only fair elaboration: "Tell them you will do your best, then follow through. Find a store that will carry recyclable plastics."	(3) Several points integrated into solution; some elaboration: "Agree to meet with protesters to explain situation and solicit suggested solutions."
(4) Two or more related points targeting mostly short-term considerations: "Tell the crowd Put a recycling operation in the plant for those who want to use it."	(4) Multiple ideas combined into a unique solution: "Talk to expand, express company position and offer to open a company-sponsored recycling center on-site."
(5) Two or more related points reflecting understanding of both short and long-term considerations: "Tell employees to cool it, and negotiate with the students; play also to the press and find a way to recycle."	(5) Multiple complex points, well-integrated and elaborated into a very unique solution: "Find out if schools the students attend would be willing to open recycling centers, and promise to talk to local stores about favorable economics of recycling."

**APPENDIX E: State-Trait Anxiety Inventory, Trait Version, Form Y (STAI-T;
Spielberger, 1983)**

I am happy (30)
I am content (36)
I feel satisfied with myself (23)
I feel pleasant (21)
I feel secure (33)
I lack self-confidence (32)
I feel inadequate (35)
I feel like a failure (25)
I am a steady person (39)
I wish I could be as happy as others seem to be (24)
I make decisions easily (34)
I am 'calm, cool, and collected' (27)
I feel rested (26)
Some unimportant thought runs through my mind and bothers me (37)
I worry too much over something that really doesn't matter (29)
I get in a state of tension or turmoil as I think over my recent concerns and
interests (40)
I have disturbing thoughts (31)
I take disappointments so keenly that I can't put them out of my mind (38)
I feel that difficulties are piling up so that I can't overcome them (28)
I feel nervous and restless (22)

APPENDIX F: The Biographical Inventory of Creative Behaviors (BICB; Batey, 2007)

9.2 The Biographical Inventory of Creative Behaviours

Please answer as truthfully as you can. Place a cross (X) in the box next to the activities you have been actively involved in. In the past 12 months have you...

1	Written a short story	
2	Written a novel	
3	Organised an event, show, performance or activity	
4	Produced a TV/Play script	
5	Designed and produced a textile product (e.g. made an item of clothing or household object)	
6	Redesigned and redecorated a bedroom, kitchen, personal space, etc.,	
7	Invented and made a product that can be used	
8	Drawn a cartoon	
9	Started a club, association or group	
10	Produced a picture, i.e. NOT a doodle (using paint, pencils, charcoal, acrylic, etc.,)	
11	Had an article published	
12	Formed a sculpture using any suitable materials	
13	Recognised where an accepted scientific theory/approach does not explain what it purports to	
14	Produced your own food recipes	
15	Produced a short film	
16	Produced your own website	
17	Produced a theory to explain a phenomenon	
18	Invented a Game or other form of entertainment	
19	Selected to lead/manage others	
20	Made someone a present	
21	Composed a poem	
22	Adapted an item and used it in a way that it was not designed to be, in what you consider to be an ingenious way	
23	Published research	
24	Choreographed a dance	
25	Designed and planted a garden	
26	Produced a portfolio of photographs (NOT photographs of a holiday, party, etc.,)	
27	Acted in a dramatic production	
28	Delivered a speech	
29	Mentored/Coached someone else to improve their performance	
30	Devised an experiment to help understand something	
31	Made up a joke	

32	Been made a leader/captain of a team/group (e.g. Debating society chairperson, Captain of the Hockey team, etc.,)	
33	Composed a piece of music	
34	Made a collage	

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