

The roles of affect and appraisal on creativity in college students

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The Roles of Affect and Appraisal on Creativity in College Students

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The Roles of Affect and Appraisal on Creativity in College Students

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Table of Contents

List of Tables.....	VI
List of Figures	VII
Abstract	VIII
Chapter One Introduction.....	1
Chapter Two Literature review	13
Definition of Creativity and Divergent Thinking	13
Affect Induction	19
Creativity and Affect.....	21
Camp 1: The Facilitation of Positive Affect on Creativity	21
Camp 2: Positive Affect Impairs Creativity.....	28
Camp 3: The Facilitation Effect of Negative Affect on Creativity.....	30
Mechanisms of the Facilitation Effect of Affect on Creativity.....	33
Relationship between Affect and Appraisal	41
Influence of Appraisal on Creativity.....	45
Task Features and Performance	46
Gender Differences	47
The Present Study	50
Chapter Three Pilot study.....	57
Method	58
Participants.....	58
Materials.....	58
Procedure.....	59
Results.....	61
Discussion	64
Chapter Four Study 1	67
Method	70
Participant and Design	70
Instruments	71
Procedure.....	74
Results.....	75
Valence and Intensity Baseline Checking	75
Affect Manipulation Checking.....	76
Appraisal Checking	77
Impact of Affect on Creativity	78

Mediating Role of Self-Appraisal on the Affect-Creativity Link	78
Discussion	82
Chapter Five Study 2	89
The Relationship between Task Features and Performance	90
Method	94
Participants and Design.....	94
Instruments	94
Procedure	96
Results.....	97
Time spent on AUT.....	97
Task Appraisal	98
Task Framing Effect on Creativity and Task Appraisal.....	100
Relationship between task Appraisal and creativity	104
Mediating effect of self-rated importance of task	106
Discussion	107
Chapter Six Study 3	113
Method	118
Participants and Design.....	118
Instruments	118
Procedure	120
Results.....	121
Affect Manipulation Checking.....	121
Intensity of Affect	122
Time Spent on Task	122
Task Motivation	123
Creativity.....	126
Testing Motivational Compatibility	128
Discussion	134
Chapter Seven General Discussion	142
The Conceptual Role of Self-Appraisal	142
Findings and Implications	145
Limitations and Suggestions	149
Conclusion	158
References	160
Appendixes.....	196

Appendix 1: International Positive and Negative Affect Schedule Short Form (I-PANAS-SF; Thompson, 2007).....	196
Appendix 2: Coding Scheme for Uses of Paper.....	196
Appendix 3: Affect Measurement for Study 2	197
Appendix 4: Coding Scheme for Uses of Chair	198
Appendix 5: Task Evaluation Questionnaire (TEQ)	199

List of Tables

Table 1 Summary of Theories for the Facilitation Effect of Positive Affect	41
Table 2 Video Clips Examined in Pilot Study.....	60
Table 3 Mean and Standard Deviation of the Video Clips Tested in Pilot Study. ...	62
Table 4 Descriptive Statistics for Pre- and Post-Induction Affect Scores in Study 1	76
Table 5 Creativity Scores for Each Affect Condition in Study 1	78
Table 6 Descriptive Statistics for Task Appraisal Factors	102
Table 7 Summary of Hierarchical Regression Analyses Predicting Individual's Appraisal From Task Framing and Pre-Task Measured Appraisal	103
Table 8 Summary of Hierarchical Regression Analyses Predicting Creativity From Individual's Appraisal and Self-Rated Importance of Task.	106
Table 9 Correlation between Pre- and Post-task Measured Motivation.....	124
Table 10 Means and Standard Deviations for and Correlations between Creativity Scores	126

List of Figures

<i>Figure 1.</i> Framework of the studies.....	56
<i>Figure 2.</i> Procedure of Study 1.....	75
<i>Figure 3.</i> The mediation effects of positive and negative appraisal on the relationship between negative affect and fluency (A), between negative affect and flexibility (B), and between positive affect and originality (C).....	82
<i>Figure 4.</i> Procedure of Study 2.....	97
<i>Figure 5.</i> The mediation effects of self-perceived importance of task on the relationship between important task framing condition and flexibility. The unstandardized coefficient for the total effect (path c) was shown in parenthesis. *** $p < .001$	107
<i>Figure 6.</i> Procedure of Study 3.....	121
<i>Figure 7.</i> The mediation effects of time on the relationship between task framing and fluency (A), flexibility (B), and originality (C) measured by alternate uses task (AUT). The unstandardized coefficients for the total effect (path c) were shown in parentheses. ** $p < .01$, *** $p < .001$	132
<i>Figure 8.</i> The mediation effects of time on the relationship between task framing and fluency (A), flexibility (B), and originality (C) measured by similarities task (ST).	134

Abstract

Creativity is a vital ability for success. It is controversial whether positive affect is conducive to creativity. The present research proposed and examined a theoretical framework to explain the mixed findings. Based on the assumption that implication of affect is a function of individual appraisal, it was predicted that the subjective interpretation of affective signals and task contexts can influence creative performance.

The present research began with a pilot study to examine and prepare video clips for affect induction in following studies. Study 1 examined the influence of affect on individual's appraisal and creativity. It was found that positive affect is conducive to performance and the influence of affect is mediated by appraisal. Study 2 examined the impact of task framing on creativity and the mediating role of individual's appraisal on the task framing-creativity link. Creativity task was framed as either enjoyable or important. Results showed that when the task is framed as important, participants tended to perceive the task as more important and performed more flexibly compared to when the task is framed as enjoyable. Study 3 examined the interaction effect of affect and task framing on creativity. Results showed that after controlling the effect of self-rated motivation, both positive and negative affect enhanced fluency and flexibility when task is constructed in a manner compatible with the signal the affect conveyed respectively. The findings extend understanding of the affect-creativity link by showing that the facilitation effect depends on how people appraise the affective signals and task. The findings also shed light on the importance of including individual appraisal in future creativity interventions studies.

The Roles of Affect and Appraisal on Creativity in College Students

Chapter One

Introduction

Creativity—the ability to generate new and useful ideas or products (Runco, 2004; Sternberg & Lubart, 1999)—has long been considered an important ability. Studies on individual creativity reveal that creativity is positively associated with psychological well-being (Evans, 2007; Rasulzada & Dackert, 2009), problem-solving ability (Tan & Hashimah, 2009), and academic performance (Bawa & Kaur, 1995; McCabe, 1991; Sen & Hagtvvet, 1993). Furthermore, creative thinking benefits individuals in the crowded and competitive market (Fillis & Rentschler, 2010) and has become an indispensable ability since the economy transformed from knowledge-based to creativity- and innovation-based. Creative individuals are also critical to organizations given that employee performance is the building block of organization development. The importance of creative employees is more obvious in organizations that rely heavily on innovation and are in an urgent need of adapting quickly to changes to remain competitive and viable (Puccio & Cabra, 2010). Indeed, studies have continually shown that employees' creativity is positively associated with organizations' performance and development (Shalley & Gilson, 2004; Yoon, Song, Lim, & Joo, 2010).

The increasing importance of creativity has interested researchers from different disciplines to study factors and mechanisms that promote creativity. Decades of studies have demonstrated that creativity is a dynamic ability. In other words, creativity can be improved over a period of intervention (Beghetto, 2008; Ford & Harris, 1992; Torrance, 1972). Numerous interventions have been examined and found to effectively facilitate creative performance. For example, exposure to multiple

cultures (Leung, Maddux, Galinsky, & Chiu, 2008) and increment of intrinsic motivation (Amabile, 1983) are associated with a superior performance of creativity.

Among the intervention studies, the influence of affect on creativity receives greater attention. Generally speaking, positive affect leads to greater creativity (Davis, 2009; Isen, 2008). For example, using both quantitative and qualitative longitudinal data obtained from 222 employees, Amabile, Barsade, Mueller, and Staw (2005) found that a linear and positive relation between positive affect and creative performance. Some scholars (e.g., Jausovec, 1989; Kaufmann & Vosburg, 1997), however, have suggested that positive affect is detrimental to performance. In fact, individuals display better performance when experiencing negative affect compared to those in positive affect (George & Zhou, 2002; Kaufmann & Vosburg, 1997). The discrepancy implies that the current theories or frameworks are far from mature to account for the role of affect (Kaufmann, 2003). Therefore, a more comprehensive framework is needed to capture the whole picture of the underlying mechanism.

The present research aims to investigate the inconsistency and extend the understanding of the role of affect on creativity. Specifically, based on the mood-as-input model (Martin & Stoner, 1996; Martin, Ward, Achee, & Wyer, 1993), which emphasizes the role of task context in tuning interpretation of affective signals, the current study suggests that self-appraisal may mediate the impact of affect and task context on creativity. The following part of this chapter discusses the rationale for the present study's hypothesis by reviewing the strengths and limitations of the existing theories of the effect of affect. Prior to this, it is essential to briefly describe what affect is and how researchers experimentally elicit affect in laboratory settings to study its effect on performance.

Affect and Its Induction

Mood, emotion, and affect are the most commonly used terms in emotional phenomena studies. Mood is a subjective experience that lasts longer but is less intense than emotion (Schwarz, 2012). Moreover, mood usually lacks of clear referent and appears gradually. Emotion, on the other hand, has limited duration and arises from specific or identifiable stimulus event and appraisal of the stimulus. Mood and emotion also differ from each other in terms of action-specificity. In particular, mood influences cognition and directs people's thinking while emotion influences behaviors and leads to specific course of action (Deckers, 2009; Guerrero, Anderson, & Trost, 1998; Reeve, 2009; Schwarz, 2012). On the contrary, affect comprises tone or valence (positive or negative) and intensity (weak to strong) (Batson, Shaw, & Oleson, 1992). It is a more inclusive concept and general term for subjective feeling states; and thus, it has been suggested that both mood and emotion can be included under the umbrella of affect (Baas, De Dreu, & Nijstad, 2008; Forgas, 1995; Frijda, 1993). Although a number of characteristics distinguish moods from emotions, the two terms are frequently used interchangeably in the literature (e.g., Hutton & Sundar, 2010). To minimize confusion, the term *affect* is used throughout the current research to refer to both mood and emotion. Note that, however, the term *mood* or *emotion* is used as it was originally when citing the literature. The reason is, as mentioned above, mood is somewhat different from emotion; and replacing them with the term affect may distort the researchers' original ideas.

Research on affect has shown that affective states have impact on psychological processes and behaviors, such as social judgment (e.g., Forgas, 1990), problematic behaviors (e.g., gambling; Matthews, Farnsworth, & Griffiths, 2009), and task performance (e.g., work performance; Miner & Glomb, 2010; Tsai, Chen, & Liu,

2007). To examine the impact of affective states, researchers have attempted to manipulate an individual's affect through experiments in laboratories over the past two decades. A variety of affect induction techniques have been developed and employed to research the influence of affect. For instance, in psychological laboratories, affect can be induced by the following methods: (a) repeating phrases (e.g., Velten, 1968); (b) imaginations (e.g., Wood, Saltzberg, & Goldsamt, 1990); (c) music (e.g., McKee, Wall, Hinson, Goldstein, & Bissonnette, 2003; Mongrain & Trambakoulos, 2007; Pignatiello, Camp, & Rasar, 1986); (d) film (e.g., Philippot, 1993; Sato, Noguchi, & Yoshikawam, 2007; Von Leupoldt et al., 2007); (e) pictures (e.g., Lang, Greenwald, Bradley, & Hamm, 1993; Schneider, Gur, Gur, & Muenz, 1994); (f) gifts (e.g., Isen & Daubman, 1984); and (g) texts (e.g., Verheyen & Göritz, 2009). Showing film clips that contain specific affective content to elicit particular affect is widely used because film clips have the “desirable properties of being readily standardized, involving no deception, and being dynamic rather than static” (Gross & Levenson, 1995, p. 87). Moreover, film clips have a relatively high degree of ecological validity in evoking affect (Gross & Levenson, 1995). Participants may feel less influenced by the affect induction procedure, even when conducted in a controlled laboratory setting, because of their constant exposure to a wide variety of visual and auditory stimuli in this information age.

The Relationship between Affect and Creativity

The development of affect induction methods enriches the study on the influence of affect. By using a wide array of induction methods, researchers have continuously found that positive affect is more conducive to the generation of creative responses than other types of affect (Baas et al., 2008; Davis, 2009; Gasper, 2004; Greene & Noice, 1988; Hutton & Sundar, 2010; Isen & Daubman, 1984). Compared to individuals in negative or neutral affect, individuals in positive affect are more likely to generate unusual word associations (Hirt, Levine, McDonald, Melton, & Martin, 1997; Hirt, Melton, McDonald, & Harackiewicz, 1996; Isen, Daubman, & Nowicki, 1987), make connections between different concepts (Murray, Sujan, Hirt, & Sujan, 1990), break the mental set of usage of an object (i.e., functional fixedness) and discover alternative ways of using it (Greene & Noice, 1988; Isen et al., 1987), and give more and/or distinctive answers to divergent thinking tasks (Gasper, 2004; Vosburg, 1998b). Theoretical attempts have been made to account for the facilitation effect of positive affect on creative performance. For instance, according to the affect-as-prime perspective (Isen, 1984, 1999), affect influences performance by altering the content and amount of memory materials that come to mind. In particular, positive affect is more likely to cue positive memory materials, which associate with more information than negative materials. Therefore, individuals in positive affect have greater access to more ideas and more connections between ideas resulting in a richer response pool to generate novel responses.

Although individuals in positive affect generally outperform people in other affect conditions on creativity tasks, it is worth noting that a deleterious effect of positive affect has also been documented in empirical studies. Specifically, studies have found that positive affect does not promote but rather hinders creativity (e.g.,

Jausovec, 1989; Kaufmann & Vosburg, 1997). More importantly, other works suggest that negative affect may facilitate creativity as well (Gasper, 2004; Hutton & Sundar, 2010). For instance, Kaufmann and Vosburg (1997) assessed participants' initial affect (Study 1) and experimentally induced their affect with a 10-minute clip (Study 2) and measured their performance on insight problem-solving tasks (e.g., two string problem) and analytical tasks. The researchers found that positive affect was negatively related to problem-solving performance whereas negative affect was positively related to task performance. Moreover, participants in positive affect condition showed the poorest performance. The findings of deleterious effect of positive affect are contradicted to Isen's (1984, 1999) affect-as-prime perspective, which asserts that positive affect cues more positive materials from memory. The findings of facilitation effect of negative affect also point out limitation of the affect-as-prime perspective. The perspective sheds light on the facilitation effect of positive affect but has no prediction on the role of negative affect. Therefore, it remains unclear how positive affect hinders performance and negative affect enhances performance.

Schwarz's (1990, 2012; Schwarz & Clore, 1983, 1988) feelings-as-information theory brings insights into the inconsistent findings by taking into account the function of affect. According to Schwarz, affect has signaling function to indicate condition of the on-going activity. In particular, positive affect implies a secure or satisfactory condition, which indicates that the existing performance is satisfying, whereas negative affect represents a problem or unsatisfied situation and thus signals individuals to work harder to make improvement and to get rid of the problematic situation. The affective signal notion, to a certain degree, explains the facilitation effect found in both positive and negative affect. Individuals in positive affect are more likely to think creatively because the positive affect signals that the current

situation is safe and hence leads them to feel less constraint but more encouragements to explore for alternatives. By contrast, the problematic signals conveyed by negative affect indicate that the existing effort is not effective (or the result is not satisfied) and hence more endeavors are needed to solve the problem. Thus, the threatening feeling leads individuals to work harder and explore for alternatives to improve their performance. In addition to the affective signal, it is important to note that other factors such as time pressure may also contribute to the inconsistent findings. For example, when instructed to solve each task in 5 minutes, participants in positive affect condition showed the poorest performance (Kaufmann & Vosburg, 1997). It is possible that the time pressure may interrupt participants' allocation of cognitive resources (J. Baer & Kaufman, 2008) and further influence their performance, as well as their feeling (e.g., satisfaction) toward the task. The effect of time pressure will be discussed in more detail in the next chapter.

By taking into account the unique meaning carried by affect, the feelings-as-information theory not only extends the understanding of the role of affect but also partly resolves the discrepant findings of influence of the affect on creativity. Similar to other theories, however, the feelings-as-information theory has some limitations as well. In fact, one drawback of the theory devolves from its strength, which is the consideration of the meaning of affect. As mentioned earlier, positive affect indicates that the existing situation is safe or satisfied. Individuals in positive affect, thus, are assumed to be more adventurous to explore for new or creative alternatives in the hassle-free condition. Nevertheless, this is not always the case. Studies have found that individuals in less threatening condition are less likely to take risks to explore for different ideas as positive affect's safe and satisfied signal suggests that further effort is not necessary (Friedman, Förster, & Denzler, 2007). Individuals in positive affect

may think that the current solution is satisfied and thus stop working for improvement. Similarly, the problematic signal conveyed by negative affect may not always motivate individuals to seek for better solutions. Instead, the negative affect also implies that a mistake is not acceptable. The wary of making mistakes imposes constraint on individuals and, in turn, leads to risk-aversion and inhibits the use of creative alternatives (Gasper, 2004). In short, the feelings-as-information theory identifies the underlying mechanism of affective impact by pointing out that affect has different meanings and leads individuals to react differently to the influence of affect. The diversity of signals partly explains the findings of the facilitation of both positive and negative affect. Nonetheless, the theory is not sufficient to affirm the influence of affect because the same type of affect conveys at least two different signals, which may enhance or impair performance.

The ambiguous signals have led impacts of affect on creative performance to be harder to predict, if not impossible. Martin and colleagues (Martin & Stoner, 1996; Martin et al., 1993) proposed the mood-as-input model to minimize the ambiguous meaning embedded in affective signals by taking the role of situational or contextual factors into consideration. According to the model, affect may signal individuals about the current situation and the implementation of strategy; but this function of affect depends on the contextual factor because task contexts may influence how an individual interprets the signal of affect. In other words, the model recognizes the ambiguous meaning of affect. It posits that it is possible to differentiate the dominant signal (of affect) from others when considering the context of task (e.g., fun or serious). Martin and colleagues (Martin & Stoner, 1996; Martin et al., 1993) indicated that whether the positive affect conveys conducive or deleterious signal to the individual is determined by the way the individual appraises the task. Specifically, they suggested

that individuals were more likely to take advantage of the positive affect and feel safe to play with different ideas when the task was enjoyable. In contrast, when performance of the task was critical to the individual, the positive affect might restrain individuals from searching for new ideas and urge them to complete the task with conventional solutions. Evidence for the mood-as-input model has been found in empirical studies on creativity (George & Zhou, 2002), showing that the influences of affect rely on individual appraisal of the condition. Specifically, when employees perceived that creativity is highly emphasized, negative affect was found to promote creativity whereas positive affect was negatively associated with creative performance. These results indicate that context of task should be taken into consideration when assessing the impact of affect on creativity.

In light of the mood-as-input model, the impact of affect is a function of task context. Despite consideration of the role of task context in the affect-creativity link resolves the inconsistent findings of influence of affect on performance that have been found in previous studies, it also gives rise to another question to be answered: how do task contexts influence the impact of affect on creative performance? In other words, the mood-as-input model ascertains the role of task context in tuning interpretation of the affective signals but sheds little light on the mechanism underlying the effect. Understanding the mechanism may not only provide insight to the literature on affect, but also increases the utilization of the facilitation effect of affect to enhance performance. The latter deserves more attention. After all, it is less likely to manipulate task context to fit the affective signals in order to enhance human performance.

Friedman and colleagues' (2007) study on the interaction between affect and task context offers an insight into the mechanism underlying the impact of affect on

creativity. The researchers proposed the motivational compatibility hypothesis, which asserts that “individuals will be more motivated to work on tasks that are compatible with their affective states” (Friedman et al., 2007, p. 155). Consistent with their assumption, affect has been found conducive to creative performance when affect is motivationally compatible with the task. For instance, participants with positive affect were more creative and reported higher motivation in tasks framed as fun compared to tasks framed as serious. Furthermore, motivation was found to mediate the Affect \times Task construal interaction effect, suggesting that motivation plays a key role in the compatibility. Although the motivational compatibility hypothesis sheds light on the inconclusive findings, it is noteworthy that the hypothesis is not without limitation. For example, Friedman and colleagues did not take into account of other possibilities. It could be other factors such as self-appraisal, but not motivation, that mediate the compatibility effect on creativity.

The Current Study

Despite a number of theories that have proposed to explain the influence of affect on creativity, the theories are unable to account for the discrepant findings independently. The current research takes an integrative perspective and proposes a theoretical framework to understand the underlying mechanism of the relationship between affect and creativity. Based on the notion of the mood-as-input model (Martin & Stoner, 1996; Martin et al., 1993) in which the impact of affect on performance is subject to how people interpret the affective signals and task, the current study hypothesizes that an individual’s appraisal plays a significant role on the relationship between affect and creativity. Specifically, self-appraisal guides the interpretation of affective signals and task and, in turn, determines the impact on performance. According to the example of positive affect mentioned above, when dealing with an

enjoyable task, individuals perceive less threat and interpret the positive affect as an indicator of safety. The safe and less restraint signal conveyed by positive affect encourages individuals to search for novel ideas. On the contrary, when dealing with an important task, individuals believe that a mistake is strictly not allowed (i.e., to avoid failure and maintain the current positive feeling) and interpret the positive affect as an indicator of satisfaction. In other words, the wary of making mistakes leads individuals to be risk-averse and believe that additional effort is not necessary. As a result, people tend to stop searching for alternatives or tend to provide less devotion toward a task. Simply put, the different motivational signals (conveyed by affect and task condition) are the result of individual's self-appraisal. The motivational compatibility between affect and task is not important. The key is that the appraisals of affect and task are compatible. This conceptual idea provides a better explanation to the interaction effect of affect and task than motivational compatibility. For example, self-appraisal explains the reason negative affect and serious task lead people to feel that the current situation is problematic and wary of mistakes, respectively.

The inclusion of individual appraisal into the affect-creativity link may provide further explanation toward the discrepancies of the influence of affect. However, empirical evidence is urgently needed to validate the conceptual role of self-appraisal. In addition to investigating the influence of self-appraisal, it is also important to take a step further to understand how self-appraisal influences the effect of affect on performance. Hence, three studies were conducted to examine the conceptual role of self-appraisal on the affect-creativity link and to explore the process of self-appraisal in determining the impact of affect on creativity. The first study (Chapter 4) examined the impact of induced positive affect on creative performance and individual's appraisal. The second study (Chapter 5) examined the impact of task features on

performance and self-appraisal. In particular, this study focused on task construal—an individual's interpretation of a task. Participants' interpretation was manipulated by framing the creativity task either as important or as enjoyable. On the basis of the two studies, the third study (Chapter 6) manipulated both affect and task demands to evaluate their interaction on creative performance.

In the next chapter, the literature about creativity and affect induction as well as the existing findings of the influence of affect on creativity is reviewed. Chapters 3 to 6 investigate the impacts of affect, task context, and their interaction on creative performance and the hypothesized mediating role of self-appraisal in those relationships. Finally, Chapter 7 discusses limitations and implications of the current research as well as possible future research directions.

Chapter Two

Literature review

Definition of Creativity and Divergent Thinking

Creativity is a relatively abstract and multidimensional construct (Caroff & Lubart, 2012; Kim, 2006; Unsworth, 2001). Researchers describe creativity differently in terms of their discipline or research approach and thus, there is no consensus on the definition of creativity. Nevertheless, creativity generally comprises two criteria: originality and appropriateness (Sternberg & Lubart, 1999; Walczyk, Runco, Tripp, & Smith, 2008). Originality or novelty refers to the uniqueness of the product. A novel product is either a completely new product or a combination of existing products that has never been revealed in the current form. However, originality is an essential but not sufficient feature of creativity. It is possible that an original or uncommon product is not adaptive to reality or unable to solve existing problem (Runco & Jaeger, 2012). Therefore, aside from being unique, a creative product also has to meet the second criterion—appropriateness. Appropriateness or usefulness refers to the effectiveness of a product to fulfill the demand of the current situation, such as solving the problems at hand or improving the unsatisfied condition. Based on these two criteria, Sternberg and Lubart (1999) defined creativity as an “ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)” (p. 3). In particular, Sternberg and Lubart defined creativity as the capability to generate a product that meets the two essential criteria. Additionally, it is worth noting that *product* is not limited to substantial things but also includes abstract outputs, such as solutions or music.

Creativity can be measured in many different ways. In general, there are eight categories of assessment: personality inventories, biographical inventories, divergent

thinking tests, attitudes and interest inventories, ratings by others (e.g., peers, supervisors), judgments of products, ratings of eminence, and self-reported creative activities (Batey, 2012). Among these measurements, divergent thinking tests are extensively used in creativity research (Diakidoy & Spanoudis, 2002; Kaufman, Plucker, & Baer, 2008; Plucker, Qian, & Wang, 2011). The reason divergent thinking tests have become the dominant measurement of creativity is, in part, due to its historical impact. Kaufman and colleagues (2008) indicated that divergent thinking tests are advocated by the pioneers in the field (e.g., J. P. Guilford) as the initial tool and have been used since the beginning of creativity research. A number of divergent thinking tests have been developed since Guilford (Christensen, Guilford, Merrifield, & Wilson, 1960; 1950, 1967) proposed and applied divergent thinking tasks to creativity research, such as Torrance Tests of Creative Thinking (TTCT; Torrance, 1966), Wallach and Kogan Creativity Tests (WKCT; Wallach & Kogan, 1965), and Abbreviated Torrance Test for Adults (ATTA; Goff & Torrance, 2002), just to name a few. These tests generally require individuals to generate as many responses as possible to verbal or figural prompts. For instance, in the alternate uses task, a typical verbal divergent thinking task, respondents are asked to generate as many unusual uses of a common object, such as brick or paper, as possible. There are also divergent thinking tests that focus on a specific domain (e.g., domain of science; Hu, Shi, Han, Wang, & Adey, 2010) or are presented in alternative form. Urban and Jellen (1996), for example, developed the Test for Creative Thinking-Drawing (TCT-DP) to measure divergent thinking through drawing while Abedi (Abedi, 2002; Auzmendi, Villa, & Abedi, 1996) developed the Abedi-Schumaker Creativity Test to assess divergent thinking with multiple choice in paper-and-pencil form.

The question remains: why divergent thinking tests continue to be the dominant creativity measurement after several decades since they have been developed? One way to address this question is to consider the two essential characteristics of a measurement: reliability and validity. Divergent thinking tests have been reported to have good psychometric properties. Researchers (e.g., Urban & Jellen, 1996; Vosburg, 1998b; Wallach & Kogan, 1965) examined inter-rater reliability of divergent thinking tests and reported coefficients of well above .90, suggesting that inter-judges agreement on scoring was rather consistent. Moreover, Cropley (2000) also found moderate and acceptable internal consistency coefficient for most divergent thinking tests. A high inter-rater reliability is important for divergent thinking tests because reliability is the prerequisite of validity and scoring of divergent thinking tests commonly relies on multiple-raters assessment method to evaluate originality and flexibility of ideas generated by examinees. Despite the critics on validity, a number of studies supported divergent thinking tests are, at least, as valid as other measurements. In examining the psychometrics of their own measurement Creative Achievement Questionnaire (CAQ), Carson, Peterson, and Higgins (2005) reported a predictive validity coefficient of .47 between divergent thinking and CAO. Given that longitudinal studies may provide a more comprehensive assessment of predictive validity, Plucker (1999) used the longitudinal data from Torrance's study that was started in 1958 and reanalyzed them with structural-equation modeling to evaluate predictive validity of the divergent thinking tests. He found that divergent thinking test scores were able to predict nearly half of the variance in adult creative achievement and participation in creative activities. Runco, Millar, Acar, and Cramond (2010) also conducted a study on the same longitudinal data. Specifically, the researchers correlated the initial divergent thinking data of the longitudinal study with the criterion

data collected 50 years later. Results supported the validity of TTCT as indicated by the coefficients in an excess of .30. Similarly, WKCT has been found to have a moderate capability to predict actual behaviors on arts and ideas generation (Bartlett & Davis, 1974). Moreover, Silvia (2008) applied latent-variable analysis on data from Wallach and Kogan's (1965) study to examine discriminant validity of WKCT. Although his study revealed a slightly higher correlation (approximately .20) between measures of intelligence and creativity than the initial value, the results still indicated that intelligence and creativity were two distinct constructs and further supported the discriminant validity of WKCT.

In addition to the historical and psychometrical strength, divergent thinking tests provide a relatively objective measure of creativity, compared to other measurements such as attitudes and interest inventories and self-reported creative activities. This is because divergent thinking tests, similar to judgments of products method, focus on the evaluation of product. Despite the argument that some sort of creativity may not display in a product form, the product-based assessment is still widely accepted as product is relatively concrete evidence of creativity and thus, making objective assessment possible. Furthermore, scoring of divergent thinking tests, as mentioned above, involves multi-raters' judgments; and studies have found that raters' agreements on ideas are rather consistent. Amabile (1988) indicated that recognition from others was critical for the judgment of creativity. In other words, to be judged as creative, a product should be examined and recognized by others, more specifically, the experts of the given field as layperson and experts of the field may have different perspectives on uniqueness. For example, finding out the component of oxygen in a chemical experiment may seem creative to a primary school student but is definitely considered as ordinary by the experts. The rationale behind this notion is

that it is relatively easy to generate new works but not all of them are useful. Meanwhile, in contrast to self-evaluation of creativity (e.g., personality inventories & self-reported creative activities), which has been criticized for lacking of objectivity and is prone to biases (e.g., positive impression management & inaccurate responding due to cognitive biases), divergent thinking tests allow for relatively reliable assessment of creative potential. In most of the divergent thinking tests, examinees are instructed to generate responses, rather than report their self-perception or past behaviors, to the given task and this can minimize the influence of memory bias on performance. The immediate respond feature of the divergent thinking tests also enables researchers to assess the effect of intervention on creativity, which could not be done with measurements that rely on past behaviors or achievements (e.g., personality inventories, biographical inventories, rating of eminence). Additionally, the generated ideas are more meaningful than the numerical responses obtained from self-report. Although both types of responses can be used for statistical comparison, self-report only shows the degree of differences whereas the responses of divergent thinking tests convey more information such as process and product facet of creativity (Runco, 2010).

Divergent thinking tests also allow researchers to tap on different facets of creativity. The four indices that are widely used in most divergent thinking tests are fluency, flexibility, originality, and elaboration (Runco & Acar, 2012). Fluency refers to the number of responses generated. A fluent individual tends to provide a large number of ideas. Flexibility indicates to what extent individuals switch among different types of ideas. Individuals who can generate more distinct categories of ideas are considered as more flexible than those who generated more ideas but limited to few categories. Originality refers to novelty or uniqueness and is usually defined in

terms of statistical infrequency within a sample. That is, original ideas are ideas generated by few individuals. Elaboration refers to the ability of expanding details of an idea. Compared to other indices, elaboration is the least common due to its complexity of scoring and subjective interpretation (Runco & Acar, 2012). These indices allow researchers to capture a more comprehensive picture of creativity. For instance, fluency score, which is the number of ideas generated by respondents, is a substantial indicator of individual creative potential, while the scoring of flexibility and originality represents the quality of ideas and allows for rating by other people, such as the experts of the field. Furthermore, the diversity of scoring is ideal for research on the intervention and development of creativity. Researchers are able to investigate the unique relationship between the intervention (or factor) and each dimension of creativity. This is critical as intervention may only be beneficial to a particular, but not all, facet of creativity. Lacking the consideration of each facet may lead researchers to misinterpret the effect of intervention.

Although divergent thinking tests possess several strengths over other measurements and are dominant in the creativity measurement, they have some limitations as well. The major critic of divergent thinking tests is that divergent thinking is not equivalent to creativity. This is possibly due to the fact that divergent thinking only moderately predicts actual creative performance; and hence, divergent thinking is an essential but not sufficient ability for creativity. Cropley (2006) explained that the moderate predictive validity of divergent thinking tests could be due to two reasons. One is that there are some discrepancies between tests and real-life creative behavior; another is that, besides divergent thinking, other psychological factors (e.g., convergent thinking; see Cropley, 2006) are also required for real-life creative achievement. Despite the critique that divergent thinking is not the same as

creative thinking, divergent thinking allows the estimation of potential for creative thinking and is useful for the investigation of creative potential (Runco, 2010; Runco & Acar, 2012). For that reason, divergent thinking is theoretically and practically important to the research on creativity. In addition, divergent thinking also plays a role on education and enhancement methods of creativity (Runco, 2010).

Affect Induction

Affect can be experimentally elicited via different methods in laboratories, including imagination, receiving feedback, watching films, and listening to music. Broadly speaking, affect induction procedures can be classified into five categories in terms of the stimuli used in the procedure and whether the participants are being informed of the purpose of the elicitation (Gerrards-Hesse, Spies, & Hesse, 1994). The first group consists of affect induction procedures that are based on the free mental generation of the emotional states, such as hypnosis and imagination. In these induction procedures, participants do not receive any stimuli but are instructed to imagine or recall situations or events to elicit the intended affect. Affect induction procedures that are based on the guided mental generation of the emotional states are classified into the second group. In particular, not only stimuli but also instructions are presented to participants in these affect induction procedures. For instance, experimenters show a film, story, or music to participants and explicitly instruct them to experience the suggested feelings. In contrast to the second group, only the emotion-inducing materials are presented to participants (i.e., without explicit instructions) in the third group of affect induction procedures. In these induction procedures, participants either watch a film or listen to a story or music, on the basis of those materials will affect individuals' mood spontaneously. Based on the assumption that satisfaction or frustration of needs may influence and evoke emotions, the need-

related emotional situations are given to participants in the fourth group of affect induction procedures. Success/failure affect induction procedure, for instance, elicits affect by telling individuals a false-positive or false-negative feedback. The last group of affect induction procedures composes the use of materials or procedures (e.g., drugs or facial expression) that may influence physiological states to induce emotions.

Among the various affect induction procedures, film affect induction procedure is one of the most commonly used methods in experimental studies as this technique is effective in inducing both positive and negative affect. Gerrads-Hesse and colleagues (1994) compared the effectiveness of different affect induction procedures in inducing elation and depression. They found that film/story affect induction procedure is the only method that is highly effective in inducing both elation and depression mood. Compared to other affect induction procedures, film affect induction procedure possesses several advantages, leading it to be one of the best techniques for affect induction. For example, video clips used in the induction procedure are comprised of visual and auditory stimulation which is relatively stronger than other materials for affect induction (Lewis, Dontcheva, & Gerber, 2011). Furthermore, film affect induction procedure can be standardized easily, involves less deception, and has high ecological validity because it is common for most people to experience emotions from visual stimuli (Gross & Levenson, 1995; Hewig et al., 2005; Rottenberg, Ray, & Gross, 2007; Sato et al., 2007; Von Leupoldt et al., 2007). More importantly, film affect induction procedure elicits mild but not extreme positive affect. Thus, it is appropriate for the studies of the impact of affect on behavioral and cognitive outcomes as intense positive feeling may impair performance (Cohn & Fredrickson, 2009; Isen, 2008).

Creativity and Affect

It is still under debate how affect can influence creativity. Generally speaking, there are three camps researching the impact of affect on creativity. One group led by Isen (e.g., Ashby et al., 1999; Isen, 1987; Isen & Daubman, 1984; Isen et al., 1987; Isen, Johnson, Mertz, & Robinson, 1985; Isen, Niedenthal, & Cantor, 1992), asserts that positive affect enhances cognitive flexibility, which in turn facilitates creativity. The other group argues that positive affect reduces creativity (George & Zhou, 2002; Kaufmann & Vosburg, 2002) while the third group argues that negative affect fosters creative performance (George & Zhou, 2002; Hutton & Sundar, 2010). A growing number of researchers suggest that the influence of affect depends on various factors, such as task, context, and the dynamics of the affective states (Martin et al., 1993; Pessoa, 2009; Pessoa & Engelmann, 2010; Van Dijk & Kluger, 2011). Numerous theories or frameworks have been proposed and received empirical evidence to account for the three arguments, respectively. To have a comprehensive understanding of the inconsistent relationship between affect and creativity, the following sections review literature about the influence of both positive and negative affect on creativity as well as the theories that account for the effects.

Camp 1: The Facilitation of Positive Affect on Creativity

Decades of study have continually documented that positive affect increases creativity. According to Isen (1987, 2008), positive affect can cue more positive materials in memory which is more extensive and diverse as compared to negative affect. The diverse materials enable people to take into account multiple aspects of situations and discover more associations among them, and thus interpret and organize materials beyond the conventional manner.

Isen and colleagues' early works inspired the study of the impact of positive affect. Isen and Daubman (1984) induced individual's affect by means of seeing films, receiving free gifts, or serving refreshments, and examined the influence of affect on categorization. Participants were instructed to either rate the extent to which the items (i.e., words) belong to a given category or sort out the colors into different categories. Isen and Daubman found that participants who were induced with positive affect were more likely to group more stimuli together in the rating task, compared to participants who were induced with negative and neutral affect. Moreover, participants in positive affect created fewer categories in the sorting task by grouping more low-prototypic exemplars of a category together.

To further examine the effect of positive affect, Isen and colleagues (1985) investigated the influence of positive affect on unusual word associations. Participants were given a word-association booklet, which was composed of 20 words (Study 1). The first 10 words contained positive, negative, or neutral words for the purpose of inducing the corresponding type of affect, whereas the second 10 words were all neutral. Participants were asked to read the words and then write down the first word that came to their mind. Results showed that individuals in a positive feeling state tended to rate the second 10 neutral words as more positive and generated more unusual associations to those words. A separate study was conducted to rule out the possibility that the word association was influenced by the direct priming effect of the first set of positive words, rather than the positive affect. Positive affect was induced in different ways to examine participants' word-associations to positive, negative, or neutral words. Similarly, people who were induced with positive affect by either receiving candy or watching comedy film generated more unusual word associations to neutral words. Additionally, participants in the neutral condition generated more

unusual responses to positive-word stimuli, than to negative and neutral words. These convergent results further indicate that positive affect broadens cognitive flexibility and results in a change in cognitive organization to increase the relatedness or the integration of cognitive material. In addition, the effect of positive affect on unusualness word association found in this study indirectly manifests the facilitation role of positive affect on creativity because the unusual word association was found to be related to creativity (M. T. Mednick, Mednick, & Mednick, 1964; S. Mednick, 1962).

The relationship between positive affect and word association is further manifested in Greene and Noice's (1988) study. Participants were presented a category name and were instructed to generate as many exemplars as possible to assess the influence of positive affect on creativity. Consistent with previous studies (e.g., Isen et al., 1985), participants who received compliments and gifts, relative to those who received nothing, produced not only more answers but also more unusual exemplars. At the same time, their study also found that more participants in the positive affect condition successfully solved the Duncker's (1945) candle task, which is a classic task in assessing creative problem solving.

Furthermore, Isen and colleagues (1987) extended the investigation of the relationship between positive affect and creativity by manipulating the mood induction procedure (i.e., seeing comedy film or receiving candy) and adding a control group, as well as using more than one creativity test: either candle task (Duncker, 1945) or Remote Associates Test (RAT; M. T. Mednick et al., 1964). Similarly, the researchers found that participants who were feeling positive were more likely to correctly solve the candle task and had better performance on (the moderately difficult items of) the RAT than those participants in the comparison groups. Yet, arousal was found to have

no impact on creativity. This result indirectly rules out the possibility that the influence of affect on creativity is mediated by arousal or, at least, indicates that arousal alone is unable to influence creativity. Inconsistent results, however, were found between two positive-condition groups (i.e., gift and comedy-film condition) in Study 2. The participants in the gift condition on the candle task did not perform significantly better than the participants in the no-manipulation condition as expected. After revising the way to deliver the gift, the positive affect induced by receiving gift did facilitate performance on the RAT in Study 3. However, it is important to note that the question was not fully resolved. After all, the facilitation was only found in the RAT, but not the candle task used in Study 2.

Murray, Sujan, Hirt, and Sujan (1990) also found that positive mood may facilitate flexibility in categorization. However, Murray and colleagues argue that the facilitation effect of positive mood not only leads people to perceive the similarities, but also allows them to recognize the distinctions between concepts. In other words, flexibility in categorization should promote the ability to notice the interrelationships between diverse items and the ability to see critical variations between similar items. To test their argument, Murray and colleagues examined the performance of undergraduate students on sorting television programs based on the similarities or differences between the programs, after reading a series of positive, negative, or neutral statements. No explicit processing instructions were given to participants in the control group. The results were consistent with their hypotheses. Participants in positive mood formed broader categories (i.e., generate fewer groups) when instructed to focus on similarities and narrower categories (i.e., generate more groups) when focusing on differences, as compared to participants in other mood states. Similar results were replicated in their Study 2. They further found that, compared to

participants in neutral mood, participants in positive mood generated more various types of similarities and differences of the TV shows. Also, the similarities and differences given by participants in positive mood were more unique and creative, as compared to those in neutral mood. The researchers took a step further in their Study 3 to examine the role of intrinsic interest and the nature of stimuli (i.e., positive or neutral TV shows) on the relationship between positive mood and categorization. Results showed that, regardless of the type of stimuli, participants in positive mood generated more creative and diverse types of similarities and differences of the TV shows. At the same time, participants in positive mood, but not participants in neutral mood, showed greater interest in the tasks, and this interest was significantly associated with their performance. The researchers concluded that “intrinsic interest in a task may mediate the effects of positive mood on cognitive flexibility” (Murray et al., 1990, p. 421) although they were unable to exclude the alternate possibility that good performance or being creative increased individual’s interest in the task.

Similarly, Vosburg (1998a) found that positive mood was positively related to performance. In her study, Vosburg measured university students’ mood at arrival and examined the influence of mood on their performance on real-life divergent thinking task, which requires the application of satisficing strategy to think of as many ideas as possible. Results showed that students in positive mood were more likely to generate more solutions than their counterparts in negative mood. More importantly, the results demonstrated that positive mood promotes performance under satisficing conditions, but negative mood inhibits performance. These suggest that the impact of positive and negative moods on performance, whether conducive or detrimental, is moderated by other factors. In another study, Vosburg (1998b) replicated the facilitation effect of positive mood and further demonstrated that positive mood only influences particular

aspects of creativity. Participants reported their mood at arrival and were instructed to generate as many ideas as possible to a divergent thinking task, which comprised of two real-life divergent thinking items and two items from WKCT (i.e., alternate uses for shoe and potential representation to an ambiguous visual figure). Participants' responses were scored for fluency, flexibility, originality, and usefulness (functionality of idea). Consistent with past research, Vosburg (1998b) found that positive mood is conducive to creativity, as opposed to negative mood and arousal. More importantly, it was found that positive mood promotes only quantity (indexed by fluency and flexibility), but not quality (indexed by originality and usefulness), of creativity.

The facilitation effect of positive mood has also been found in group context. To examine whether creative performance and the process of a temporary workgroup is influenced by members' mood state, Grawitch, Munz, and Kramer (2003) instructed groups which were consisted of three undergraduate students to imagine a past event to experience positive, negative, or neutral mood. Each group was given a creative production task (lunar hotel task) in which every member was assigned a specific role and worked with other members to design a hotel that could be remained at the surface of the moon. Grawitch and colleagues found that groups in positive mood significantly outperformed groups in neutral and negative mood. Moreover, it was found that groups in positive mood also outperformed another two groups in the implementation of efficiency (ratio of number of ideas to total time spent for constructing). Based on these results, the researchers claimed that positive mood was conducive to group creative performance because members in happy mood were more efficient in integrating information than their counterparts in negative and neutral moods.

In addition, Hirt, Devers, and McCrea (2008, Study2) not only revealed the facilitation effect of positive mood, but also found that the facilitation effect was not

influenced by the affective state of task. Hirt and colleagues experimentally induced participants' mood by showing them video clips and examined their performance on a creativity task in which they were instructed to think about and list members of a given category. Valence of the creativity task, however, was manipulated. In particular, half of the participants were given a negatively valenced task to generate the causes of death, and the other half were instructed to list the examples of transportation (neutral valence). Consistent with the previous findings of the facilitation effect of positive mood, participants in positive mood were more fluent, flexible, and original than their counterparts in other mood states. Furthermore, the same trend was also found in a negatively valenced task. In other words, happy individuals were still more creative when given a negatively valenced task that contrasts (or even threatens) their mood state, albeit they reported less task interest as indicated by measure before the task. The researchers explained that the continual demonstration of creative performance in a threatening task by happy individuals was possibly due to "their enhanced creativity served to sustain their positive mood and interest in performing the task" (p. 224).

De Dreu, Baas, and Nijstad (2008) attempted to examine the facilitation effect of positive moods and to resolve the discrepant findings of past research in a more comprehensive way. De Dreu and colleagues emphasized that mood is a two-dimensional construct and creativity is a function of cognitive flexibility and cognitive persistence. To test their assumption, the researchers proposed a dual pathway that considers both hedonic tone (positive vs. negative) and activation (activating vs. deactivating) level of mood and the way the mood states exert the influence on creativity. In a series of studies, De Dreu and colleagues not only affirmed the facilitation role of positive mood on creativity, but also revealed the underlying mechanism. Specifically, the researchers illustrated that positive and activating moods

enhance fluency and originality through cognitive flexibility. Additionally, their results support that negative and activating moods are also conducive to creativity and this facilitation is mediated by increased cognitive persistence.

In a nut shell, the findings consistently show that there is a positive relationship between positive affect and creativity. Individuals who are induced with positive affect by different methods (e.g., watching film, receiving gift) show better performance on creativity tasks (e.g., word association, candle task) than those in negative and neutral affect. Moreover, it is suggested that study of the impact of affect on creativity should not be limited to positive affect only. Indeed, expansion to take into account of negative affect is necessary. This is because negative effect has also been found to facilitate creative performance. The following section reviews the role of negative affect on creativity.

Camp 2: Positive Affect Impairs Creativity

Despite the substantial studies showing evidence for the facilitation effect of positive affect on creative performance, other works have also found the opposite. In contrast to the proposition that positive affect is conducive to cognitive processes associated with creativity, positive affect is found to have either no effect or a negative impact on cognitive tasks (e.g., creativity tasks) by reducing processing efforts or capacity (Clapham, 2000-2001; Jausovec, 1989). In line with this claim, Mackie and Worth (1989) demonstrated that participants in positive mood showed less systematic processing than their counterparts in neutral mood when time exposure to stimuli (i.e., messages) was limited. In the unlimited time condition, individuals in both mood conditions showed equivalent system processing level, but individuals in positive mood took more time to complete the task than their counterparts in neutral mood. The researchers indicated that these results “support the idea that these subjects wanted,

needed, and used increased exposure time to compensate for reduced capacity” (Mackie & Worth, 1989, p. 32). Similar results had also been found in Melton’s (1995) study in which participants were asked to solve syllogisms in limited time. Results showed that the participants in positive mood not only performed significantly worse, but also were more prone to select unqualified conclusion and spend less time than participants in the comparison group.

Jausovec (1989) found inconsistent results when investigating the influence of positive, negative, and neutral affect on analogical transfer. Specifically, more participants who viewed a comedy film in the first experiment solved the insight problem successfully as compared to those who viewed a neutral film. In the second experiment, participants in neutral mood significantly outperformed participants in both positive and negative affect. In the third experiment, no significant differences were found between positive and neutral affect in both visual and verbal presentation of base analogy. However, participants with positive affect who were presented visual presentation performed better than participants with negative affect. Jausovec concluded that the influence of positive affect depended on the characteristics of the problem (i.e., ill- or well-defined) and the form of presentation.

The contradiction has also been found in Kaufmann and Vosburg’s (1997) study, which examined the mood effects on creative problem-solving. In their study, participants were given two insight tasks (i.e., Two string problem & Hatrack problem; Maier, 1970) and two analytical tasks (control tasks) after reporting their mood (Study 1) or going through mood induction procedure (Study 2). Kaufmann and Vosburg found that positive mood was negatively related to problem solving performance. The result was replicated in the second study. Above all, negative mood was found positively related to creative problem-solving performance, and participants in the

positive mood condition showed the poorest performance. Similarly, Kaufmann and Vosburg (2002) found a complex relationship between moods and idea generation in a follow-up study. Participants' mood was experimentally induced by watching film clips. They were then required to answer four different idea production tasks (e.g., alternate uses task). Participants were instructed to complete each task within 4 minutes and were asked to follow experimenter's signal to move from one quadrant to another at every minute. Results showed that participants in positive mood scored significantly higher in early production but scored lowest in late production, as compared to participants in negative and neutral mood. These results not only point out that the facilitation of positive affect on creativity is not simple and reliable but also imply that negative mood may foster creativity as well.

Camp 3: The Facilitation Effect of Negative Affect on Creativity

The contradictory findings of the role affect plays on creativity and other cognitive tasks have drawn attention of researchers and have led them to expand their scope of investigation. George and Zhou (2002), for example, examined the relationship between positive and negative mood and employees' creativity. Unlike past research that focused on the unitary and direct effect of mood, George and Zhou postulated that the effect of mood is context dependent. That is, whether a mood is conducive (or detrimental) to creative performance in the workplace depends on the extent to which creativity is recognized as a core competence in the organization and the extent to which individuals are aware of their feelings and understand how they feel. By analyzing data from employees' self-report of mood, clarity of feelings, and perceived rewards for creative performance, the researchers revealed a three-way interaction effect on creativity, which was derived from supervisor ratings. It was found that, depending on context, both positive and negative mood facilitate (or impair)

creative performance, respectively. In particular, when the importance of creativity is highly recognized and employees are clear about their feelings, negative mood is conducive to creativity whereas positive mood is negatively related to creative performance. Instead, the facilitation effect of positive mood is only found when recognition of creativity is high and clarity of feeling is low or when recognition of creativity is low and clarity of feeling is high. The findings suggest that mood does not influence creativity in a particular direction as previous research assumed but relies on other factors. In line with this notion, Charyton, Hutchison, Snow, Rahman, and Elliott (2009) found that both positive and negative affect significantly predicted university students' score on creative thinking.

Based on the findings of clinical, empirical, and biographical studies that eminent people in art are more likely to suffer from a mood disorder, Akinola and Mendes (2008) examined the role of individual differences and situational factors in the relationship between negative emotions and creative performance. In particular, Akinola and Mendes hypothesized that people who are biologically vulnerable to experiencing negative affect may exhibit higher creativity than others when they are exposed to situation that elicits negative emotion. To test their assumption, the researchers assessed biological vulnerability (indexed by the level of dehydroepiandrosterone-sulfate) of young adults and manipulated their emotion by randomly assigning them to social rejection, social approval, or a control group. Following the manipulation, participants were given a collage making task to measure their artistic creativity. Consistent with literature, results revealed that people in the negative emotion condition (i.e., receiving social rejection) created collages that were judged by raters as more creative than people in the other two conditions. More importantly, as the researches predicted, there was an interaction between biological

vulnerability and condition. In other words, people who are more sensitive to negative affect display high creativity only when they are exposed to a situation that leads to negative feelings. The findings not only suggest that negative emotions facilitate creativity but also indicate the facilitation effect may depend on other factors.

In the same vein, Hutton and Sundar (2010) also postulated that emotions interact with other factors and exert their influence on creativity. To test their assumption, Hutton and Sundar examined valence and arousal of mood and measured the impact of their interaction on university students' performance on a divergent thinking test (ATTA; Goff & Torrance, 2002). For valence manipulation, participants were given an emotion identification task. Half of the participants were told that they succeeded in the task to induce positive valence while the other half received a failure feedback to induce negative valence. Arousal level (low, moderate, and high), in contrast, was manipulated by asking participants to play a dancing video game in different level of difficulty. Consistent with their prediction, results showed that the impact of emotion on creativity was a function of the interaction between valence and arousal. Specifically, the researchers found that negative mood was conducive to creativity, but the facilitation effect was moderated by low arousal level. By contrast, positive mood resulted in higher creative performance when interacting with high level of arousal.

Pessoa (2009; Pessoa & Engelmann, 2010) proposed a dual competition framework to explain the effect of affect in terms of an interaction between cognition and emotion. According to the model, affect can influence the allocation of the limited cognitive resources via stimulus-driven and state-dependent manners. More specifically, the model also affirms that the impact of affect depends on specific situational demands. For instance, affect is assumed to impair performance when it is

irrelevant with the task. This is because part of the resources needed for the task is now diverted to process the conflict resulted from the affective stimulus.

With the consideration of the above past research, it is believed that the effect of positive affect on creativity is not as robust and unconditional as previously assumed (Kaufmann, 2003). Indeed, under certain conditions, positive affect impairs performance while negative affect promotes performance. The inconsistent results indicate that the influence of positive and negative affect may vary depend on other factors, such as characteristics of task and time. Thus, it is worth considering those factors in the investigation of the affect-creativity link. The next section reviewed the theories and frameworks that have been proposed to explain the mechanisms underlying facilitation mood effect.

Mechanisms of the Facilitation Effect of Affect on Creativity

Filipowicz (2006) summarized that positive affect has been found to lead to broader categorization (Mikulincer & Sheffi, 2000), more unusual associations in listing tasks (Hirt et al., 1997; Hirt et al., 1996; Ziv, 1976, 1980, 1983), and better performance on insight tasks (Estrada, Isen, & Young, 1994; Mikulincer & Sheffi, 2000). Several mechanisms or hypotheses have been proposed to explain the facilitation effect of positive affect. Among those hypotheses, the flexibility hypothesis offered by Isen and colleagues and supported by other studies (e.g., Derryberry, 1993) deserves more attention. According to the flexibility hypothesis, positive feelings may serve as a cue to foster the retrieving of positive materials in memory (Isen, Shaker, Clark, & Karp, 1978; Laird, Wagener, Halal, & Szegda, 1982; Nasby & Yando, 1982; Teasdale & Fogarty, 1979; Teasdale & Russell, 1983). Given that positive materials are more extensive and diverse than negative materials in memory (Isen, 1987, 2008), people in positive affect are capable of accessing more

information, considering multiple aspects, and switching attention among them. Hence, they are more likely to generate a more unusual combination of ideas or take into account the alternate possibilities. In other words, individuals who are feeling happy tend to have more information and a broader view, which allows them to generate more associations of those resources.

Another theory that holds the same idea is that of Fredrickson. Fredrickson's (1998, 2001) broaden-and-build theory postulates that individuals in positive emotion may have a broader range of atypical thoughts and actions. This is because positive emotions may widen their instantaneous thought-action repertoires. Based on the theory, Fredrickson hypothesized that "positive emotions broaden the scopes of attention, cognition, and action, widening the array of percepts, thoughts, and actions presently in mind" (Fredrickson & Branigan, 2005, p. 315). Moreover, according to Fredrickson (1998; 2001; Fredrickson & Branigan, 2005), the broadened thought-action repertoires promote the building of different kinds of personal resources, for example, physical resources (e.g., health), social resources (e.g., social support network), intellectual resources (e.g., knowledge), and psychological resources (e.g., resilience, creativity).

One study examining the relationship between mildly positive mood and attention shed some light on the increased cognitive flexibility. Rowe, Hirsh, and Anderson (2007) induced positive, negative, and neutral moods in 24 university students through music and thought imagination to examine the effect of those moods on semantic search (i.e., RAT) and visual selective attention (i.e., Eriksen flanker task), respectively. Participants in positive mood, as opposed to those in negative and neutral mood, were found to solve more RAT problems correctly but reacted slower in flanker task, especially when flankers were incompatible and at a far distance. Rowe and

colleagues claimed that this is because positive affect may result in the relaxation of the inhibitory control and increase the attentional breadth. The broader attentional breadth in turn reduces the capacity to filter out irrelevant information and decreases the tendency to focus narrowly. Therefore, positive mood improves performance in RAT that requires broad attention to seek for more alternatives but impairs performance in flanker task that requires high visual selective attention.

Besides, theoretical support for positive affect's role in facilitating cognitive flexibility or wider thoughts and actions has been proposed in a neuropsychological perspective. Ashby and colleagues (1999) proposed the dopamine hypothesis to further explain the mechanism behind the function of positive affect by associating positive affect with dopamine levels. The hypothesis postulates that dopamine, which is released when reward stimuli presents, enhances cognitive flexibility by facilitating the selection process and switching process. More specifically, they claimed that positive affect, which is associated with reward, would increase the release of dopamine. Dopamine projects from the ventral tegmental area into anterior cingulate and facilitates selection process in the prefrontal cortex. Similarly, dopamine projection from substantia nigra into striatum facilitates the switching process. The improvement in selection and switching processes further promote execution attention and cognitive flexibility and, in turn, leads individuals to go beyond the dominant cognitive sets and discover more alternatives. Supportive results have been found for the dopaminergic theory of positive affect (see Ashby, Valentin, & Turken, 2002). The theory, however, is not without limitation. Ashby et al. (1999) mentioned that contrary results were found and there are always other explanations for the supportive results. For example, in addition to dopamine, other neurotransmitters and neuromodulators

such as norepinephrine and serotonin also have impact on mood and emotion (Ashby et al., 2002), and may further influence creativity.

As stated earlier, the findings of the impact of affect on creative performance are inconsistent. Although the cognitive flexibility hypothesis explains the facilitation effect of positive affect, the theory fails to explain why positive affect inhibits performance whereas negative affect promotes performance under certain conditions. Other theories, therefore, have been proposed to account for the limitation of the flexibility hypothesis. For example, Schwarz's (1990; 2012; Schwarz & Clore, 1983, 1988) feelings-as-information theory, also known as cognitive tuning theory in some studies, argues that affect has a signaling function. In other words, affect conveys important information about the current environment. According to the theory, positive affect is an indicator of safe and satisfactory state, whereas negative affect warns people that the current situation is problematic (e.g., dangerous or stressful). These signals may influence people's reactions. For instance, people in positive affect are prone to feeling relax, using heuristic style of information processing (Hirt, Devers, & McCrea, 2008), exploring alternatives and novel ideas (Fiedler, 1988; Ruder & Bless, 2003), and adapting a playful approach. Negative affect, in contrast, leads individuals to adopt more effortful and detailed information-processing style and to narrowly focus their attention on the problem as well as the external information. It is assumed that these cognitive and behavioral differences result in the discrepancy of the findings of the influence of affect. Accordingly, individuals in positive affect, who are feeling secure and broadly focused, are being advantageous in dealing with tasks that require flexibility. Negative affect that promotes problematic feelings and narrow-oriented processing strategy facilitates performance in tasks in which optimized solutions are needed (e.g., insight problem solving tasks). Thus, it is not surprising that

Kaufmann and Vosburg (1997) found positive relationship between negative mood and creative problem-solving performance, and positive mood inhibited creative performance, according to this model.

The notion of the informational function of affect to a certain extent has successfully explained the mechanism of the impact of affect and the inconsistent findings. Nonetheless, researchers claim that contextual information also plays an important role on the interpretation of affect signal and further suggest that context should be taken into consideration. Martin and colleagues (Martin & Stoner, 1996; Martin et al., 1993) proposed the mood-as-input model and posited that the effects of affective states vary as a function of the situation or context. In other words, this special case of the more general feelings-as-information model (Davis, 2009) emphasizes that the particular context influences the way individuals interpret the information provided by their current affective state (Martin & Stoner, 1996). Similarly, this model argues that positive affect elicits safety signal and the signal, in turn, encourages people to explore for alternations. Problem signal elicited by negative affect leads individuals to work harder to avoid problems. Moreover, on the basis of context-dependent and signaling function of affect, this model further indicates that “positive relative to negative moods should bolster creative performance on tasks viewed as ‘fun’ and ‘silly’ and in situations in which the enjoyment of a task is being emphasized” (Baas et al., 2008, p. 783). In contrast, negative affect is beneficial to tasks that are viewed as serious and important and in a situation where the top priority is meeting performance standards. Empirical evidence has been found for this line of reasoning. Martin and Stoner (1996), for instance, examined the context-dependent notion in a laboratory study. Participants were given a word association task and were instructed to give the response that first came to their mind after seeing a common

word. The researchers' main interest, however, was participants' further performance when the decision rules in how to respond were manipulated. Specifically, participants were instructed to ask themselves either "Is my initial response a good one?" or "Can I come up with a better response?", when given a second attempt to generate a different response. In the latter condition, participants in positive affect were more likely to give a second response than those in negative mood. This finding conforms to the mood-as-input model's prediction that contexts of task (i.e., condition), which encourage the enjoyment of participation exaggerate the effect of positive moods that lead people to be more confident and more optimistic about their ability to engender a more creative response. Conversely, in the "Is my initial response a good one?" condition which is more performance-based, participants in positive affect were less likely to generate a second response than participants in negative affect. The results are not unusual because, as hypothesized, positive affect leads individuals to be more confident of and satisfied with their first response. These findings suggest that the effect of affective states simply depends on the contextual influence, individuals' focus of attention (enjoyment or goal attainment), and "how do I feel about it" heuristic (Schwarz & Clore, 1988).

In their meta-analysis of mood-creativity research, Baas and colleagues (2008) pointed out that a new perspective has been offered in recent research to explore the mood-creativity link in terms of the characteristics of moods. Although the impact of specific moods is beyond the scope and the interest of the present study, it is worth noting that this is a new trend in the study on the relationship between mood and creativity. Researchers who are holding this new perspective assert that it is not enough to examine the effect of moods on creativity by merely considering whether the moods are positive or negative, that is, categorizing moods in terms of their

hedonic tone. The reason is that the moods can be identified or recognized by various methods. For instance, some studies suggest that affective space can be “decomposed” into pleasure and activation (Barrett, 2006; Heller & Nitschke, 1997). In other words, mood states can be differentiated into four categories: positive and activating (e.g., happy, elated), positive and deactivating (e.g., calm, relaxed), negative and activating (e.g., anger, fear), and negative and deactivating (e.g., sad, depressed). Moreover, activation has also been found to be associated with the release of dopamine, which is related to the improvement of certain cognitive activities. On the basis of its influence, an activation hypothesis is offered and suggests that activating moods states, in relation to deactivating moods states, are more likely to promote creativity.

In addition to hedonic tone and activation, self-regulation that derives from the regulatory focus theory (Higgins, 1997; Idson, Liberman, & Higgins, 2000) is another criterion that has been suggested for distinguishing mood states. In particular, according to this theory, mood states can be distinguished into promotion focus and prevention focus. Some studies found that promotion focus is related to creative performance by expanding memory search for new responses (Friedman et al., 2007). Thus, the regulatory focus hypothesis, which takes into account of self-regulation and the impact of activation, predicts that promotion-focused moods that are in activating states promotes creativity whereas the prevention-focused and activating moods impair creativity. Conversely, deactivating mood states have little impact on creativity, regardless of self-regulation.

As discussed earlier, researchers have also proposed a more comprehensive dual pathway approach to account for the facilitation effect of positive affect. De Dreu and colleagues (2008) found that positive and activating moods enhance fluency and originality through cognitive flexibility. In the same vein, Pessoa’s (2009; Pessoa &

Engelmann, 2010) dual competition framework asserts that the effect of affect on performance is context-dependent. Specifically, affect influences the allocation of the limited cognitive resources through stimulus-driven and state-dependent manners, and affect may promote performance when it is relevant to certain tasks. Qu, Finestone, Loh, and Leong's (2012) study on the influence of the expectation of external rewards provides empirical evidence to this approach. Qu and colleagues demonstrated that the anticipation of rewards increases preschoolers' attention and inhibitory but decreases their flexibility. Their results suggest that the same stimuli (e.g., affect, motivation) can have different impacts on performance through different pathways.

Compared to other theories, this dual-pathway approach provides a deeper understanding of the facilitation effect of positive affect by pointing out the specific mechanism or condition in which positive affect is conducive to performance.

Table 1

Summary of Theories for the Facilitation Effect of Positive Affect

Theory/Approach		Argument
Flexibility hypothesis	(Isen, 1987, 2008)	Positive affect fosters retrieval of positive materials in memory. The abundance of positive materials leads people to generate more associations between ideas.
Broaden-and-build theory	(Fredrickson, 1998, 2001; Fredrickson & Branigan, 2005)	Positive affect broadens cognitive abilities and enhances thought-action repertoires.
Increased cognitive flexibility	(Rowe et al., 2007)	Positive affect broadens people attentional breadth and allow them to seek for more alternatives.
Dopamine hypothesis	(Ashby et al., 1999)	Positive affect is associated with dopamine level and mildly high dopamine enhances cognitive flexibility.
Feeling-as-information	(Schwarz, 1990, 2012)	Affect convey different signals and these signals influence people reactions to the affect and their performance.
Mood-as-input	(Martin & Stoner, 1996; Martin et al., 1993)	The signals conveyed by affect are context-dependent. Individual differences in interpreting the signals determine impact of the affect.
Activation hypothesis	(Baas et al., 2008)	Regardless of the hedonic tone, activating affect promotes creativity.
Regulatory focus hypothesis	(Higgins, 1997; Idson et al., 2000)	Promotion-focused and activating affect promotes creativity, whereas prevention-focused and activating affect impair creativity.
Dual pathway approach	(Baas et al., 2008)	Positive and activating moods enhance fluency and originality through cognitive flexibility.
	(Pessoa, 2009; Pessoa & Engelmann, 2010)	Affect influences allocation of cognitive resources in two different manners and, in turn, influences performance.

Relationship between Affect and Appraisal

The feeling-as-information model (Schwarz, 1990, 2012; Schwarz & Clore, 1983, 1988) indicates that affect conveys different signals and the signals in turn direct individuals' behavioral responses. The mood-as-input model (Friedman et al., 2007) further expands this idea and shows that the signals conveyed by affect are not unitary

and may change in terms of contexts. As a result, the effects of affect vary from one to another. These two models provide a good explanation for the discrepant findings of the influence of affect on creativity. Nevertheless, the underlying mechanism of the fluctuation of signals interpretation is not clear.

Why individuals are subject to contextual influences and perceive affect signals differently? One of the potential explanations is that individuals change their appraisal to the contextual stimuli as well as the signals conveyed by affect. Appraisal refers to evaluation of what is happening in the environment and interpretation of the personal significance of this evaluation (Lazarus, 2001). These evaluations and interpretations result from the desire to realistically understand the situation. The result, however, may vary from one to another because these processes are subject to subtle cues in the environment, previous experience, and personality variables (e.g., goals, situational intentions) (Lazarus, 2001). Studies have found that appraisal plays a significant role in behavioral reactions, such as the involvement in risky behaviors (Copeland, Kulesza, Patterson, & Terlecki, 2009; Lasenby-Lessard, Morrongiello, & Barrie, 2011) and the perception of stress (Lazarus & Folkman, 1984). Indeed, Lazarus and Folkman argued that stresses arise whenever individual appraises the situation as highly demanding and exceeding their resources. The literature on emotion suggests that emotion and appraisal are closely related to each other. Specifically, it is believed that emotions result from individual's assessment of antecedent events (Fredrickson, 2001; Ray, McRae, Ochsner, & Gross, 2010; Tong, 2010). Moreover, studies on identifying emotions have found that each type of emotion has different cognitive dimensions of appraisal (Frijda, 1987; C. A. Smith & Ellsworth, 1985; Weiner, 1985). Smith and Ellsworth (1985), for instance, found that emotions can be differentiated by six cognitive dimensions: certainty, pleasantness, attentional activity, control,

anticipated effort, and responsibility. In other words, the way how individuals interpret and evaluate events not only can determine the emotion they will be experiencing but also can differentiate a specific emotion from others (Roseman, Spindel, & Jose, 1990).

Furthermore, emotions may exert influence on appraisal as well. The unique pattern of each emotion (i.e., relatively high or low) in cognitive dimensions may influence subsequent responses, which is called an appraisal tendency. According to the appraisal tendency, it is assumed that “each emotion activates a cognitive predisposition to appraise future events in line with the central-appraisal dimensions that triggered the emotion” (Lerner & Keltner, 2000, p. 477). In addition, empirical studies have shown the influence of affective state on individual’s evaluation (Lynn, Zhang, & Barrett, 2012). Locher, Frens, and Overbeeke (2008), for instance, examined whether positive affect and training in principles of design theory have an influence on the ratings of the visual appeal of digital cameras given by the university students from design or non-design courses. Locher et al. predicted that, regardless of their experience in design products, students who had been induced with positive affect by receiving a small bag of gift (i.e., candy) will tend to give higher rating than their counterparts who did not receive candy. At the same time, the researchers postulated that positive affect will exert different influences on participants’ assessment.

Specifically, participants from design course tended to use substantive processing style whereas those from non-design courses were more likely to use heuristic processing style in evaluation. In other words, design-trained students are more likely to use their existing knowledge to deal with the evaluation task, whereas the untrained students interpret the information (of task) in terms of the affect they are experiencing. In line with their predictions, both trained and untrained students who received candy rated the cameras significantly more appealing, in relative to the students in the control

group. Moreover, Locher and colleagues (2008) found that, compared to their counterparts in the neutral condition, students in positive affect generated more evaluations. The facilitation effect of positive affect, however, has different influences on students' performance depending on their knowledge of design. Specifically, participants who had no design experience generated more positive though less verbal evaluation, whereas those who had design experience generated more evaluations to the cameras. The researchers claimed that this is because "positive affect can influence the way stimulus properties are perceived and cognitively organized" (p. 6), and thus leads the participant to discover more features of the cameras. Given that positive affect represents the fulfillment of goal, untrained participants who used affect as their source of information are more likely to stop responding if they ask themselves "Have I reached my goal?" These findings suggest that affect influences not only individual's evaluation and processing style but also the extent to which the information conveyed by affect is being processed.

In line with other researchers, Schwarz (1990, 2012; Schwarz & Clore, 1983) indicated that appraisal is essential for understanding emotions and their impacts. He indicated that individual's appraisal of a specific event is the cause of emotions and therefore, a specific emotion occurs when a particular set of appraisal criteria is met. More importantly, Schwarz also contended that the impact of affect is a function of appraisal. In particular, affect will only influence the person when he or she perceives that the informational value (of affect) is relevant to the task and attributes the value to the experiencing affect. In other words, affect may not have impact on behavioral and cognitive performance if the person questions the relevance of the affect or attributes the affect to incidental source. Consistent with this notion, Beer, Knight, and D'Esposito (2006) indicated that the impact of affect on task performance depends on

the extent to which affect is relevant to the task. More importantly, Beer and colleagues (2006) found that the activation of inferior frontal gyrus/lateral orbitofrontal cortex is responsible for the computing of the contextual relevance of affect. In their study, participants were asked to indicate the amount they would bet in a gamble game with different risk and payoff levels after watching a negative or neutral picture prime. The researchers found that, when they were instructed to ignore the negative emotional primes (i.e., emotion is irrelevant to task), participants who reported to have the activation of the areas were found to inhibit the influence of the negative emotion on betting. In contrast, when they were asked to use the emotional primes as a cue for determining the amount of betting, the activation of the areas was positively associated with incorporating the emotion into decision making (i.e., bet less in negative priming condition than neutral condition). The results indicate that the frontal cortex plays a role in determining the impact of affect by judging how relevant the affect is. People tend to incorporate the affect when it is relevant and ignore the affect when it is not relevant.

Influence of Appraisal on Creativity

As stated above, emotion and appraisal exert influence on each other in the following sequence: appraisal-emotion-appraisal (Lerner & Keltner, 2000). The way individuals evaluate events may lead to the occurrence of emotions. The elicited emotion in turn leads to the reinterpretation of the meaning of emotional stimuli. Based on this relationship, it is assumed that the impact of affect on creative performance found in past studies could be due to individual's appraisal of the task. Indeed, empirical studies have shown that appraisal is associated with performance (Amabile et al., 1996; Lepine, Podsakoff, & Lepine, 2005). For instance, Ohly and Fritz's (2010) study on the effects of work characteristics (time pressure, job control)

and challenge appraisal showed that workers who reported more time pressure and job control were more likely to display creativity and proactive behavior than those who experienced lower level of work characteristics. More importantly, the relationship between work characteristic and creativity and proactive behavior is mediated by individual's appraisal of challenge. That is, individual's subjective interpretation on the time pressure and job control leads to the enhancement of creativity by converting the negative effect of those work characteristics (e.g., time pressure) to a positive factor. In line with this notion, Silvia and Philips (2004) found that individuals' expectation of improving performance may change the negative effect of self-evaluation on creative performance. According to Silvia and Philips, self-evaluation is detrimental to creativity because focusing on self-performance may constrict the range of thought and hence interfere with the divergent thinking process. The researchers, however, argued that self-evaluation may not always hinder creativity; but rather, it depends on other situational factors, such as individual's expectation of improvement of performance. Silvia and Philips (2004) manipulated participants' level of self-evaluation as well as ability to improve performance and examined their influence on creativity tests (RAT & unusual uses task). Consistent with their hypothesis, self-evaluation reduced creativity when participants did not believe they could improve their performance. Self-evaluation, however, did not influence participants who believed they could improve. The results, again, suggest that individual's subjective appraisal may convert the initial negative or neutral effect of the stimuli to positive and, in turn, enhances creativity.

Task Features and Performance

If individuals' appraisal plays a role in performance, the task contextual factors that may influence appraisal, such as task type, are hypothesized to have an impact on

performance. Indeed, it has been found that individuals' performance is a function of the type of task they are dealing with. Based on previous findings that individual's regulatory focus—a kind of motivational appraisal that influences people to pursue goals through achieving rewards or avoiding punishments tendency —moderates the effects of the sign of feedback on both motivation and performance, Van Dijk and Kluger (2010) hypothesized that the type of task that can induce regulatory focus may moderate the feedback effects on motivation and performance. Their assumption was supported in two studies. In particular, Van Dijk and Kluger found that participants who received positive feedback were more likely to have a higher level of motivation and performance than those who received negative feedback when dealing with the task that requires eagerness and creativity. Compared to individuals who received positive feedback, those who received negative feedback in the tasks that require vigilance and adherence to rules demonstrated higher level of motivation and performance. Similar effect of task characteristics on performance has also been found in the study with creative tasks. Zenasni and Lubart (2010), for instance, found that individual's performance was associated with perceived pleasantness of task. In particular, participants generated more responses for a divergent thinking task when they perceived the task as more pleasant. Kaufmann (2003) reviewed the impact of positive and negative moods on different creative tasks (e.g., storytelling, insight task, mental synthesis task) and summarized that “tasks of creative thinking may be particularly mood sensitive” (p. 131).

Gender Differences

Research on gender differences in creativity has shown mixed findings. Baer and Kaufman (2008) reviewed past studies on gender differences in creativity measured by the divergent thinking tests, such as Wallach-Kogan ideational fluency

test (2004) and TTCT (Torrance, 1966), and summarized the findings into four categories: men outperform women in verbal (Chan et al., 2001) and in figural (Fichnová, 2002), women score higher than men in figural (Campos, Lopez, Gonzalez, & Perez-Fabello, 2000) and in verbal (Fichnová, 2002), mixed results (e.g., Chan et al., 2001; Kaufman, 2006), and no differences (e.g., Campos et al., 2000; Chan et al., 2001; Cheung, Lau, Chan, & Wu, 2004). Similar trends have also been found in the studies using other evaluation methods, including self-assessment (e.g., Chan, 2005; Costa, Terracciano, & McCrae, 2001), assessment by others (e.g., Lau & Li, 1996), and assessments of creative achievements or production (e.g., J. Baer, 1993; Kaufman, Baer, & Gentile, 2004). Given these, Baer and Kaufman (2008) suggested that there is no systematic (i.e., lack of consistency) difference in creativity ability between genders (see also Kogan, 1974).

Inconsistent findings have also been found in the study on gender differences in motivation. On one hand, gender did not make a difference in motivation (Kaushik & Rani, 2005; McGeown, Goodwin, Henderson, & Wright, 2012; Yau, Kan, & Cheng, 2012). On the other hand, other studies (e.g., Shekhar & Devi, 2012; Skaalvik & Skaalvik, 2004) have reported gender differences in motivation. Meece, Glienke, and Burg (2006) conducted a comprehensive review of gender differences in motivation-related constructs, including self-efficacy judgments, expectations for success, causal attribution, and value beliefs (e.g., perceived importance, interest) in the context of academic achievement. Meece and colleagues found that boys and girls performed differently in motivation and the differences were consistent with the conventional view of gender norms and stereotypes. In particular, boys were more confident than girls in mathematics, science, and sports, while girls were more confident about verbal and language-related domains compared to boys. In a study on the academic

achievement motivation and the general achievement motivation, van der Sluis, Vinkhuyzen, Boomsma, and Posthuma (2010) found that, compared to men, women reported more dedication to their academic work but scored lower in future orientation and competition. In addition, the studies also indicated that the mixed findings could be due to socioeconomic status, ethnicity, and the actual ability level (Meece et al., 2006) or the domain for which motivation is measured and the measurement differences (van der Sluis et al., 2010). For instance, van der Sluis and colleagues found four of the 18 general achievement motivation items (i.e., item 4, 5, 9, 12) were biased toward gender. The researchers indicated that the evaluation of gender differences and the results were problematic before affirming that the items measured exactly the same constructs in both genders.

The inconclusive findings of gender differences in creativity and motivation indicate that it is premature to conclude males and females are systematically different from each other in these two constructs. It is worth noting that, however, differences in reaction to motivation may impact creative performance. Baer (2001) examined the gender differences on the impact of extrinsic (vs. intrinsic) motivation on creativity of middle school students and found a significant interaction between gender and motivational condition. Specifically, girls wrote more creative poetry and stories (evaluated by experts) in an intrinsic motivational condition than in an extrinsic motivational (characterized by expected evaluation) condition. No effect was found on boys. Similar findings were also found in follow-up studies. Baer (1998) assessed the effect of different kinds of extrinsic motivation (e.g., expectation of evaluation, doing work for reward, and expecting ungraded feedback) on performance at collage making task. Results of these experiments generally showed that extrinsic motivation negatively impacts creativity of girls, but not boys, though the effect was marginally

significant in expecting ungraded feedback condition ($p = .051$, Study 3) and was not found in younger (second grade) female students (Study 4). The researcher explained that the differences in the effect of extrinsic motivation could be due to early adolescent girls reacting more sensitively and differently to cue from their social environment and respond more to differences in their motivational set than do boys.

Taken together, the findings suggest that there may be gender differences in reaction to the effect of motivation and these differences may in turn influence creative performance. However, it remains unclear whether such differences and impact continue to emerge in adults. Moreover, reviews of the effect of gender differences indicate that the findings are inconclusive. Therefore, the present research has no intention of focusing on gender differences in creativity and motivation.

The Present Study

Studies of the impact of affect have repeatedly found that positive affect is conducive to creativity (Baas et al., 2008; Davis, 2009). Compared to those in negative or neutral affect, individuals in positive affect are more likely to generate creative ideas. Above all, other studies have shown that negative affect may also promote creativity. Specifically, these studies reveal that, under certain circumstances, positive affect is detrimental to performance whereas negative affect may enhance performance. A number of theoretical frameworks have been proposed by researchers from different disciplines to account for the facilitation effect of both positive and negative affect. For instance, feeling-as-information model (Schwarz, 1990, 2012; Schwarz & Clore, 1983, 1988) contends that affect conveys various meanings to individuals, while the mood-as-input model (Friedman et al., 2007) emphasizes the role of individual differences in interpreting the signal of mood. In other words, the mood-as-input model posits that whether affect promotes or impairs performance depends on the way

individual perceives the meaning of affect. These two models together provide good insight to the discrepant findings of the effect of affect on creative performance. Nevertheless, the mechanisms of these two models on the interpretation of affect are different. In particular, the mood-as-input model (Friedman et al., 2007) reveals individual differences in perceiving signal of affect but pays less attention to the factors that lead to the distinctions. Based on the literature, the current study hypothesizes that individuals evaluate both affect and tasks based on their experience (see Figure 1). The self-appraisals modify the way people perceive moods and tasks and, in turn, determine the efforts they devote to and strategies they use in the task. In other words, the facilitation of performance happens when the individual perceives affect and task congruously (e.g., dealing an important task with negative feeling). In contrast, incongruent appraisal of mood and task (e.g., dealing an important task with happy feeling) results in competing cognitive resources that are needed for the task and thus, impairs individual's task performance. With the above consideration, three hypotheses are proposed in the current study. These are the relationship between affect and appraisal, and the mediating role of appraisal on the affect-creativity link (Study 1), the relationship between task framing and appraisal, and the mediating role of appraisal on the effect of task framing on creativity (Study 2), and the interaction effect of affect and task framing on creativity (Study 3). To examine this hypothetical framework, the present research investigated the relationship among affect, task, and appraisal and the interaction between affect and task on creativity in three studies. Details of the studies are discussed below.

To ensure the effectiveness of film affect induction procedure in eliciting participants' affect, a pilot study was conducted prior to Study 1 to prepare for the adequate stimulus (i.e., video clips) for affect induction. Although past studies (e.g.,

Gross & Levenson, 1995) have examined and found video clips that are valid in eliciting affect. Those clips, however, are mainly used and examined in the Western, but not the Eastern, studies. And studies conducted in the Eastern context using those video clips are found to have cultural differences (Sato et al., 2007). In addition, some of the clips examined by Gross and Levenson were produced more than three decades ago. Under the consideration that the contexts of the clips may impact the effectiveness of inducing affect and some of the video clips are difficult to obtain, new video clips were explored, examined, and used in the present study. The potential clips, which do not contain sensitive issues (e.g., religion) or require prior knowledge to understand, were obtained from searching through internet and Youtube. The new video clips were examined and compared with some of those validated video clips. Six video clips in total were selected for the present study in terms of its capability of inducing positive, negative, and neutral affect.

The first part of Study 1 aims to evaluate the relationship between (induced) affect and creative performance and the role of individual's appraisal on this relationship. Replication of the facilitation effect of positive affect on creative performance (Hypothesis 1a) serves as a cornerstone for following studies by confirming the affect induction and the effect of affect. Since the literature on emotion demonstrates that individual's evaluation of event leads to the occurrence of emotion and the emotion subsequently influences individual's interpretation, Study 1 also attempts to investigate the latent mechanism behind the facilitation effect of affect by assessing the role of individuals' self-appraisal in the affect-creativity link (Hypothesis 1b). The second part of Study 1 aims to validate the effectiveness of the six video clips in affect induction. Replication of the relationship between affect and creative

performance may further examine the video clips and provide convergent validity to the effectiveness of the video clips in eliciting affect.

Study 2 attempts to further examine the role of individual's appraisal on the relationship between task construal (characterized by task framing manipulation) and creativity. According to the literature on task characteristics, people are more likely to spend more effort on tasks that are perceived as important (Hypothesis 2a). To test this direct effect of task construal on performance, the task was framed as important, unimportant, and neutral. Individuals' performance in these different task conditions was then compared. In addition, given that the characteristics of task may influence individual's perception and the subjective interpretation may influence a person's willingness to work on the task, the mediating role of self-appraisal on performance is also considered in Study 2. In particular, it is assumed that task framing influences individual's self-appraisal and the subject interpretations, in turn, play a vital role on creativity (Hypothesis 2b).

If both affect and task are found to exert influence on creative performance directly or via appraisal, respectively, it is worth knowing how the two factors might influence creativity when they are considered simultaneously. Specifically, the aim of the current study is to investigate whether individual's self-appraisals of affect and task interact with each other and the interaction, in turn, exerts impact on creative performance. Thus, Study 3 attempts to answer this question by manipulating participants' affect (watching video clip) and appraisal (via task framing) and to examine their interaction effect on creativity. According to the mood-as-input model (Martin & Stoner, 1996; Martin et al., 1993), it is hypothesized that people may show better performance on creativity tasks when appraisals of affect and task are congruent (e.g., individual in negative mood deals with a task that she or he perceives as

important), whereas incongruent condition may lead people to experience conflict and further impairs performance (Hypothesis 3).

Figure 1 shows the framework of the current research and the path of the hypotheses tested in the three studies.

The modified alternate uses task (AUT) of Wallach and Kogan's (2004) creativity tests (WKCT; see *materials* of pilot study for details) was employed in the current research to measure participants' creativity. AUT is a kind of divergent thinking test, which has no single correct answer. Respondents are encouraged to give as many answers as they could. Similar to other creativity assessments (e.g., word associations, RAT), AUT also requires respondents to break their existing mind set or understanding of the question and explore alternatives to have a better performance. Furthermore, there are several rationales for using WKCT. For example, the WKCT have good psychometric properties (Runco, 1991; Runco & Albert, 1986; Runco, Okuda, & Thurston, 1987; Rushton, 1990; Wallach, 1985) as well as reliability and validity, and no training is required for administering the WKCT.

Given that creativity is multifaceted, it is not sufficient to capture the whole picture if only part of creativity is measured. Studies have shown that the impact of affect may vary depending on the dimension of creativity, that is, quantity or quality. For instance, Weisberg (1994, as cited in Kaufmann, 2003) showed that positive mood may increase the quantity of products (i.e., productivity) but not the quality of creativity (e.g., uniqueness, usability). Similarly, Vosburg (1998b) found that, compared to negative affect, positive affect promoted (ideational) fluency, but there was no difference between positive affect and negative affect on originality and usefulness. As a result, unlike previous studies that focused only on fluency (total

number of responses) and/or flexibility (categories of responses), the present research also examined the influence of affect on the quality of creativity (i.e., originality).

The aim of the present study is to examine the hypothetical mediating role of appraisal in the affect-creativity link. Gender differences are not of interest in the present study for two reasons. First, there is no clear pattern of one gender showing greater performance on creativity and motivation than another gender. Second, gender differences may or may not occur in self-appraisal (van Vliet, Kletke, & Chakraborty, 1994). Moreover, it is impractical to examine the influence of gender differences on self-appraisal when the effect of self-appraisal is not affirmed yet. Nevertheless, gender differences will be controlled for the two major constructs of the present study—affect and creativity. Past studies on affect have consistently found that women are more expressive than men (Asthana & Mandal, 1998; Fischer & Manstead, 2000; Fischer, Rodriguez Mosquera, van Vianen, & Manstead, 2004; Grossman & Wood, 1993). To control for gender differences, film clips that are equally effective in evoking the corresponding affect in both genders are selected, and AUT, which is a subtest of Wallach-Kogan creativity test (2004) that does not show gender differences, is used.

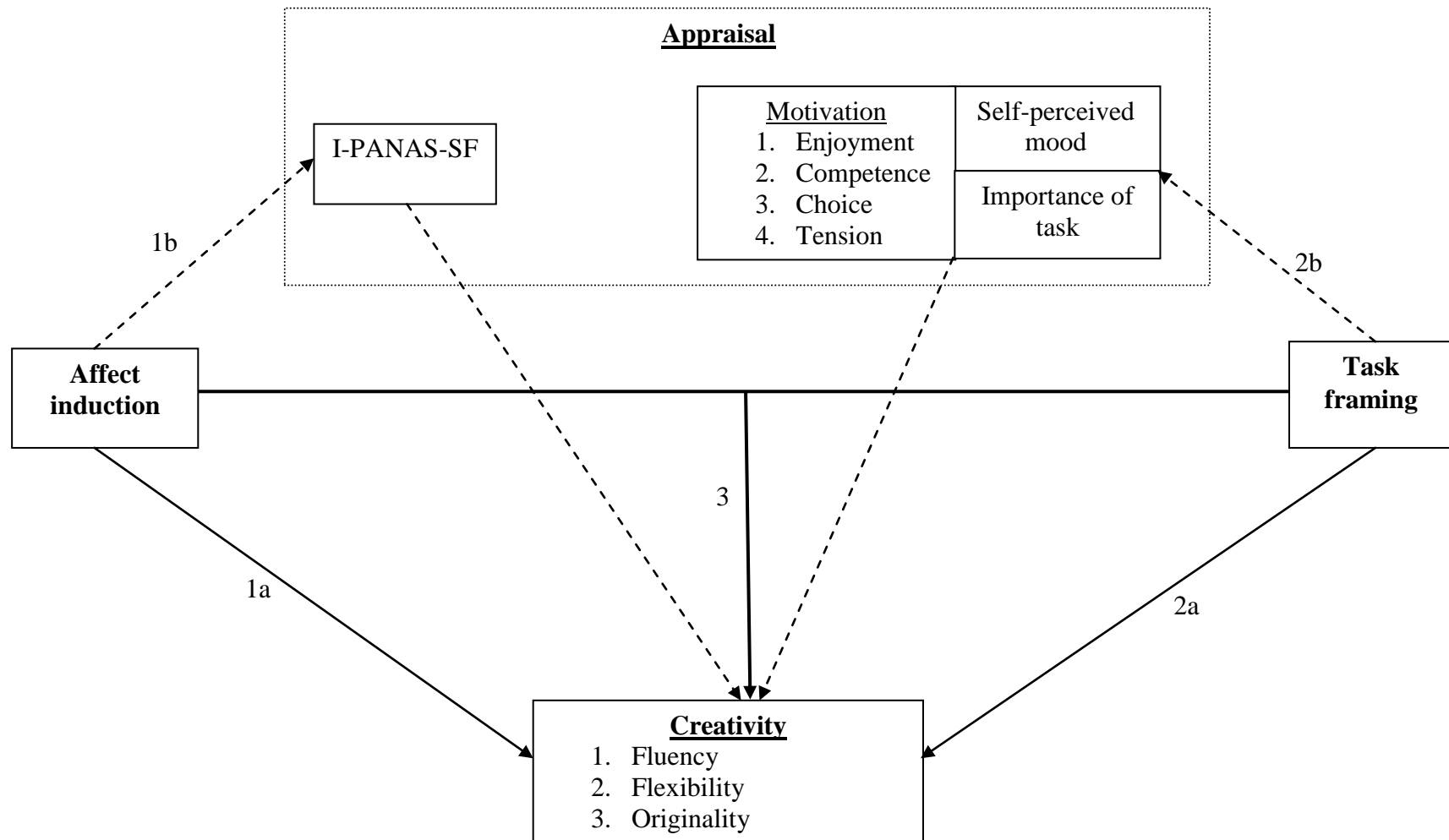


Figure 1. Framework of the studies.

I-PANAS-SF: International Positive and Negative Affect Schedule short form. Solid arrows represent direct effects, whereas dot arrows represent indirect effects through appraisal. The bold solid line connecting affect induction and task framing implies the interaction and the bold arrow refers to the interaction effect on creativity.

Chapter Three

Pilot study

The current research aims to examine the role of self-appraisal on the affect-creativity link. To study the influence of affect, participants' affect was experimentally manipulated in the laboratory. In particular, the film affect induction procedure was used to elicit affect due to its effectiveness in eliciting both positive and negative affect as compared to other induction procedures (Gerrards-Hesse et al., 1994; Westermann, Spies, Stahl, & Hesse, 1996). Hence, the purpose of this pilot study was to develop a set of effective video clips for the film affect induction procedures in the following studies. Despite past studies have developed a library of effective video clips (see Gross & Levenson, 1995; Hewig et al., 2005), some of those video clips, such as *When Hally Met Sally* and *The Champ (Death Scene)*, were produced more than two decades ago. Additionally, these studies were mainly conducted in the western countries. Given that studies have continually demonstrated that individual differences, such as culture and gender, may influence the generation of emotion (Bagozzi, Wong, & Yi, 1999; Sato et al., 2007; Schimmack, Oishi, & Diener, 2002; Von Leupoldt et al., 2007), it is necessary to evaluate the efficacy of the existing video clips before applying them. Moreover, the current study also examined the potential new video clips to ensure sufficient video clips for affect induction. Taken together, the goal of this study is to examine the validity of both new and old video clips and to further prepare a set of video clips that are effective to elicit a corresponding affect for our sample and for both genders in the following studies.

Method

Participants

Participants included 50 undergraduate students (half of them were female), who received extra course credits for participation. Their mean age was 20.56 ($SD = 1.51$).

Materials

Twelve video clips that were assumed to convey positive, negative, and neutral affect, respectively, were examined. The 12 video clips consisted of video clips that had been validated in previous studies [e.g., *When Hally Met Sally*, *The Champ* (*Death Scene*)] and new video clips which have not been experimentally examined but were identified in either Google.com or Youtube.com as prone to elicit corresponding feelings (e.g., *Armageddon* for sadness). Table 2 shows the title and duration of the video clips. All the video clips and instructions (in text form) were presented to participants in a 36-minute computer-based visual file. To control for order effect, the 12 video clips in the visual file were presented in two restricted orders. Each order was randomly determined. There were two visual files, and each of them consisted of instructions and 12 video clips which were presented in a fixed order. Each participant, however, only watched one of the two visual files.

Participants were instructed to indicate their feelings after watching each clip (i.e., valence) and the extent to which they feel that way (i.e., intensity) on two paper-based items. In particular, participants indicated their valence on a 7-point scale, ranging from 1(*very unpleasant*) to 7(*very pleasant*) for the first question (i.e., How do you feel after watching the film?). The second question (i.e., To what extent do you feel this way?) asked participants to indicate how strong or intense such feeling was on

a 7-point scale, ranging from 1(*extremely weak*) to 7(*extremely strong*). Following the self-evaluation of feeling and intensity, a demographic information questionnaire was included to query participants about their age, gender, and years of study in the university.

Procedure

Upon their arrival, participants were told that some video clips were being pilot-tested for future psychological experiments. After obtaining participants' consent, the experimenter verbally explained the procedure of the study and answered all queries by the participants. In particular, participants were told that they would watch a visual file comprised of 12 video clips along with instructions. At the end of each video clip, a text-form instruction was shown on the screen requesting the participants to stop the visual file (by pressing the space bar key) and to answer two mood checking items, then resume the visual file by pressing the space bar key again. Participants were reminded that there would be no questions about the video clips to ensure participants' full focus on those manipulations and reduce their level of anxiety (see Jausovec, 1989 for a similar procedure). After watching all the video clips and reporting their feelings and intensity, the participants answered the demographic questionnaire and were debriefed, thanked, and dismissed. The whole experiment took approximately 60 minutes.

Table 2
Video Clips Examined in Pilot Study

	Title (episode name)	Producer/ Director(s)	Year	Duration ^a	Induced affect
1	Big Bang theory (The Vengeance Formulation)	Molaro, Belyeu, & Cendrowski	2009	2:49	positive
2	Friends (Chandler, gym)	Crane & Kauffman	1997	2:22	positive
3	Mr. Bean (Room 246)	Weiland, Driscoll, & Atkinson	1993	2:53	positive
4	When Harry met Sally ^b	Reiner, Scheinman, & Ephron	1989	2:35	positive
5	Armageddon	Bay, Bruckheimer, & Hurd	1998	2:10	negative
6	Bambi ^b	Hand et al.	1942	2:19	negative
7	Click	Coraci et al.	2006	2:57	negative
8	The Champ (Death Scene) ^b	Zeffirelli & Lovell	1979	2:45	negative
9	A conversation about the International Award for Young People	International Award Association	n.d.	2:43	neutral
10	Gordon Ramsay cookalong live (Gordon Ramsay learns Turkish Cuisine)	Smith, Weed, Ramsay, Adler, & Llewellyn	2008	2:45	neutral
11	Singapore, the cleanest city in the world	Christian Broadcasting Network	2008	2:48	neutral
12	Beyond Gold: The journey to the first Youth Olympic Games (Part 2 of 4)	SYOGOC ^c	2010	2:49	neutral

Note: ^a Duration is presented in minute and second format. ^b Clips that were examined in Gross & Levenson's (1995) study. ^c Singapore Youth Olympic Games Organizing Committee.

Results

Half of the participants watched the first visual file and the other half watched the second visual file to control for the order effect. Several repeated-measure analyses of variance (ANOVAs) with group as between-subject factor and clips as within-subject factor were conducted to examine the differences between the two groups of participants in evaluating the video clips. Results showed that there was no significant difference between the two groups, with the exception of the valence score for the neutral clip entitled *Gordon Ramsay cookalong live*. Participants in Group 2 ($M = 4.96$, $SD = 1.34$) reported significantly higher score than Group 1 ($M = 4.28$, $SD = 0.79$), $t(38.97) = -2.187$, $p < .05$, Cohen's $d = -.62$. Therefore, the clip was excluded from further analysis. The valence and intensity scores for the remaining video clips were combined for further analysis. Table 3 shows the mean and standard deviation of each video clip.

To examine the main effect of gender and video clips on valence and intensity, several 4 (video clips) \times 2 (gender) repeated-measure ANOVAs were conducted. For positive video clips, main effect of gender was found significant in the valence scores, $F(1, 48) = 13.13$, $p = .001$, $\eta^2 = .215$. In particular, when compared to female participants, male participants rated *When Harry met Sally* and *Mr. Bean* as more pleasant, $t(45.16) = 3.802$, $p < .001$, $d = 1.13$ for *Harry*; $t(48) = 2.31$, $p = .025$, $d = 0.67$ for *Mr. Bean*. Moreover, there were significant differences among video clips in the valence scores, $F(3, 144) = 6.35$, $p < .001$, $\eta^2 = .117$. Post-hoc comparison showed that participants felt more pleasant after watching *Big Bang theory* and *Friends* as compared to the clip *When Harry met Sally* ($ps < .01$). In addition, significant main effect of gender was found in the rating of intensity, $F(1, 48) = 4.84$, $p = .033$, $\eta^2 = .092$. Again, male participants reported higher score than female participants on

Friends, $t(48) = 2.29$, $p = .026$, $d = 0.66$, and *When Harry met Sally*, $t(48) = 2.06$, $p = .045$, $d = 0.59$. No other effect was found in the intensity rating.

Table 3
Mean and Standard Deviation of the Video Clips Tested in Pilot Study.

	Feeling						Intensity					
	Male		Female		total		Male		Female		total	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Positive												
BigBang*	5.80	1.00	5.36	1.35	5.58 ^b	1.20	5.76	0.93	5.36	1.47	5.56	1.23
Friends*	5.76	0.83	5.48	1.00	5.62 ^c	0.92	5.72 ^a	0.89	5.08	1.08	5.40	1.03
Harry	5.52 ^a	1.16	4.08	1.50	4.80 ^{bc}	1.51	5.56 ^a	0.92	4.92	1.26	5.24	1.13
MrBean	5.60 ^a	1.22	4.80	1.22	5.20	1.28	5.32	1.28	5.12	0.93	5.22	1.11
Negative												
Armageddon*	2.72	1.31	2.44	1.00	2.58 ^d	1.16	4.96	1.31	5.36	1.63	5.16	1.48
Bambi	2.96	0.93	3.40	1.08	3.18 ^{df}	1.02	4.72	1.02	4.68	1.07	4.70 ^g	1.04
Click	3.08	0.81	2.68	0.85	2.88 ^e	0.85	4.72	1.43	4.96	1.31	4.84 ^h	1.36
Champ*	2.24	0.88	2.00	1.29	2.12 ^{ef}	1.10	5.60	0.82	5.80	0.87	5.70 ^{gh}	0.84
Neutral												
Conversation*	4.16	1.07	4.16	0.90	4.16	0.98	4.44	1.19	4.80	1.08	4.62	1.14
Gordon	4.64	1.08	4.60	1.22	4.62	1.14	4.64	1.35	4.88	1.05	4.76	1.20
Singapore	4.16	0.94	4.48	0.71	4.32	0.84	4.20 ^a	1.61	5.00	0.96	4.60	1.37
Olympic*	4.64	0.81	4.44	0.77	4.54	0.79	4.28	1.67	4.76	1.09	4.52	1.42

Note. BigBang = Big bang theory (The Vengeance Formulation); Friends = Friends (Chandler, gym); Harry = When Harry met Sally; MrBean = Mr. Bean (Room 246); Champ = The Champ (Death Scene); Conversation = A conversation about the International Award for Young People; Gordon = Gordon Ramsay cookalong live; Singapore = Singapore, the cleanest city in the world; Olympic = Beyond Gold: The Journey to the first Youth Olympic Games (Part 2 of 4).

^amean scores that significantly differ from opposite gender, ^{b-h}scores that have same superscript are significantly differ from each other.

* clips that were selected for affect induction in following studies.

For negative clips, there were significant differences among clips in valence, $F(3, 144) = 12.12$, $p < .001$, $\eta^2 = .202$. Post-hoc comparison showed that participants rated the *Armageddon* and *The Champ (Death Scene)* significantly more unpleasant than *Bambi* ($ps < .01$). Participants also perceived *The Champ (Death Scene)* as more unpleasant than *Click* ($p = .002$). In addition, effect of within-subject factor (i.e., video clip) was found significant in intensity, $F(3, 144) = 8.72$, $p < .001$, $\eta^2 = .154$.

Specifically, participants reported that *The Champ (Death Scene)* induced significantly more intense unpleasant feeling than *Bambi* and *Click* ($ps < .01$). Main effect of gender was not found in both valence and intensity ratings.

For the neutral clips, there was no significant difference in both valence and intensity rating scores, except for the intensity score for the *Singapore, the cleanest city in the world*. Specifically, female participants reported significantly more intense feelings than male participants, $t(48) = -2.14$, $p = .038$, $d = -0.62$.

The findings showed that the selected video clips elicited the corresponding affect successfully. For each type of affect, two video clips that had significantly higher scores and had no significant gender difference in self-reported valence rating were kept: *Big Bang theory* and *Friends* for positive affect, *Armageddon* and *The Champ (Death Scene)* for negative affect, and *A Conversation about the International Award for Young People* and *Beyond Gold: The journey to the first Youth Olympic Games* for neutral affect. A 6(video clips) \times 2(gender) repeated-measure ANOVA was conducted to further ensure the selected six video clips were distinct from each other in terms of valence. Results showed that the within-subject effect was significant, after correcting the degree of freedom with Greenhouse-Geiser estimates of sphericity ($\epsilon = .743$), $F(3.72, 178.36) = 109.92$, $p < .001$, $\eta^2 = .696$. Further comparisons showed that there was no significant difference between the two video clips within the same (affect) group, but the video clips in one (affect) group significantly differed from video clips of other (affect) groups ($ps < .01$). Gender difference was not found. These findings suggest that these six video clips are valid in inducing the corresponding affect for both genders. Hence, these video clips were kept for the following studies.

Discussion

The current study examined the effectiveness of the 12 new and old video clips in eliciting positive, negative, and neutral affect. Moreover, the gender difference in responding to these video clips was also evaluated.

Although there were differences in the rating of valence and intensity for some video clips, the results indicate that six video clips, two clips from each category of affect, are effective in eliciting corresponding affect. More importantly, both genders responded equally to these video clips. Therefore, the goal of the current study to prepare a set of effective video clips for affect induction in the following studies is fulfilled.

In addition to the reveal of efficient video clips, there are also several interesting findings in the current study. First, in contrast to the previous findings, the video clip *When Harry met Sally*, which has been consistently found effective in eliciting positive affect in the Western population, was rated as the least pleasant among the positive video clips. Furthermore, there were significant gender differences on both valence and intensity ratings for *When Harry met Sally*. Female participants perceived the video clip as less pleasant than male participants did. The incompatible results can be accounted for by the video clip depicting a woman acting out a fake orgasm. The result, however, is consistent with a previous study on Japanese participants (Sato et al., 2007). The study found that, instead of feeling amused, participants were surprised, aroused, and even embarrassed by viewing the clip. Gender differences were also revealed in the clips *Mr. Bean* and *Friends* for ratings of valence and intensity, respectively. These findings, consistent with past research (Bagozzi et al., 1999; Von Leupoldt et al., 2007), indicate that there are cultural and

gender differences on the perception of emotional stimuli. Hence, validation checking is necessary prior to applying the video clips to different cultural populations.

Second, consistent with previous findings, *The Champ (Death Scene)* was found effective in evoking negative affect in both genders (Gross & Levenson, 1995; Hewig et al., 2005). The finding further supports the effectiveness of this video clip. Moreover, the result also suggests that this video clip is independent of cultural and gender differences in eliciting negative affect, despite being produced more than three decades ago. Further studies can be done on this particular video as identifying the underlying aspects of this clip that successfully and consistently evokes negative affect may provide insight to the affect induction research in selecting and developing potential visual stimuli in the future.

Although the results support that the six video clips are able to elicit the corresponding affect, it is necessary to mention several limitations that can be derived from the current research design. First, the affect manipulation checking relies only on two self-report items. One may argue that the effectiveness of these video clips remains open to question unless the findings are replicated by other validated measurements, such as the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). Moreover, self-report method has been criticized as prone to biases and lacking of objectivity. In addition, it is necessary to take caution that the current study only dealt with undergraduate students. It is unclear whether the findings can be generalized to other populations unless the results have been replicated with more diverse samples such as children and elder adults. Despite these limitations, the findings and the design of the present study fulfill the purpose of this pilot study. Using two items, for example, reduces participants' burden and feeling of fatigue and may avoid the participants' biased feelings towards the video clips. More importantly,

it is the intention of the present research to focus on undergraduate students. Despite the limitation on the generalizability of the results, focusing on a particular population may eliminate the impacts of some potential confounding variables (e.g., background differences).

Based on the aforementioned limitations, future studies are suggested to affirm the appropriateness of the clips by using different measurements and comparing the current adapted procedure with other induction procedures. Another way to further validate the efficiency of the clips is to examine the effect of the clips in affect-performance relationships that have been well-developed as seen in literature, such as the affect-creativity link. Despite the effectiveness of the clips requiring further research, the existing findings contribute to the literature and affect induction research by developing a set of video clips that are effective to induce young adults' affect within the Singapore cultural context.

In summary, six of the 12 video clips (i.e., two clips from each type of affect) were found to be effective in inducing positive, negative, and neutral affect, respectively. More importantly, these video clips did not show gender differences on the self-reported valence. The findings suggest that these clips are not only effective in eliciting target affect, but also indicate similar effects on both genders. Nonetheless, more studies with different measurements are required to validate the effectiveness of these six video clips.

Chapter Four

Study 1

The main purpose of this study is to evaluate the relationship between (induced) affect and creative performance and the role of individual's appraisal on this relationship. According to the mood-as-input model, task contexts may shape the interpretation of the affective signals and, in turn, determine the implications of affect (Martin & Stoner, 1996; Martin et al., 1993). Based on this notion, it is believed that the individuals' appraisal may play a role on the relationship between affect and creativity. In the current research, appraisal refers to an evaluative process reflecting the way individuals have perceived and interpreted a particular event (Frijda & Zeelenberg, 2001). For example, appraisal in problem solving or coping means evaluating how relevant, harmful, and controllable the problem is (Gil, 2005). Furthermore, depending on the perspective the person adapts, appraisal could be positive, negative, or both (Kelly et al., 2011). In general, positive appraisals mean interpreting a situation in a positive light while negative appraisals refer to perceiving a situation in a negative manner. Appraisal is also used to reflect the extent to which a person believes she or he is able to cope with the difficult circumstances (Johnson, Gooding, Wood, Taylor, et al., 2010). Compared to those who hold negative appraisal, people with positive appraisal tend to have higher confidence in their coping ability. As a result, positive self-appraisal has been considered as a key source of resilience (Johnson, Gooding, Wood, & Tarrier, 2010). The distinction of the two types of appraisal also can be manifested by behavioral differences. Specifically, positive appraisals lead to approaching or pursuing, while negative appraisals lead to avoiding or escaping of the stimulus that evoke the appraisal (Kelly, Mansell, Sadhnani, & Wood, 2012). Within the context of the present study, appraisal is operationally

defined as to what extent a person evaluates and interprets the situation in positive and negative manners (see instruments for details).

Given that affect and appraisal are theoretically related (Ellsworth, 2013; Tong, 2010) and affect is related to creative performance, it is hypothesized that appraisal may mediate the relationship between affect and creativity. These conceptual relationships, however, receive little attention in past studies. Little is known about the role of the type of appraisal (i.e., positive or negative) on the affect-creativity link. Therefore, it is theoretically important to know the relationship between affect and appraisal and the role of this relationship on creative performance. Given that affect may elicit a cognitive tendency to follow the appraisal dimension that evoked the affect (Lerner & Keltner, 2000; Lynn et al., 2012), it is assumed that positive, relative to negative, affect is more likely to elicit positive appraisal, whereas negative, relative to positive, affect is more likely to evoke negative appraisal. Furthermore, the present study attempts to assess how affect influences creativity through appraisal. One of the questions, for example, is whether positive affect promotes creativity via positive appraisal and impairs creativity through negative appraisal. These exploratory investigations may shed light on the understanding of the underlying mechanism of the affect-creativity link.

Another purpose of this study is to validate the effectiveness of the six video clips in affect induction. In the pilot study, six video clips were selected and the capability of these video clips in eliciting positive, negative, and neutral affect was examined. Results revealed that the six video clips were effective and showed similar effect on both genders. Nevertheless, the results were only based on two simple self-evaluation items and participants evaluated all the 12 video clips. There is a possibility that watching all the video clips may engender a carry-over effect and confound the

findings, though the previous analyses showed that there was no significant difference between the two groups who watched the video clips in different orders. This study also aims to examine whether the facilitation effect of affect on creative performance can be replicated with the affect induced by these video clips. Replicating the facilitation effect is vital because it not only serves as the basis for investigating the role of self-appraisal on the affect-creativity link in the following studies, but also serves to further validate the selected video clips. The latter may further exclude the potential methodological drawback of self-assessment of affect.

Therefore, this study intends to examine the effect of induced affect on creativity and individual's appraisal and to validate the effectiveness of the video clips in affect induction. In addition, this study also assesses the conceptual mediating role of individual's appraisal on the affect-creativity link. Based on literature review and pilot study findings, it is hypothesized that the video clips will induce positive, negative, and neutral affect respectively. These induced affect, except the neutral affect, may direct the way people perceive and interpret information (i.e., self-appraisal in this study) and may increase individuals' creativity through appraisal. In addition, it is also assumed that the elicited positive affect may enhance creative performance directly. To assess the effectiveness of induction procedure and the facilitation effect of induced affect on creativity, participants watched video clips and then answered the measurement of affect and creativity test. The conceptual relationship between affect and appraisal was evaluated by administering the appraisal measurement twice, that is, before and after the affect induction procedure.

The following sections begin by introducing the instruments and design of the study and followed by the analyses of the hypothesized relationships. The present

study ends with a section on discussion of the limitations and the implications of the findings.

Method

Participant and Design

A total of 71 undergraduate students (39 men) participated in the study for extra course credits. The mean age of the participants was 21.62 ($SD = 1.58$), ranging from 18 to 26 years old. A mixed design was used in the present study with affect condition as the between-subject factor. Participants were randomly assigned to positive, negative, and neutral affect conditions. There are several dependent variables, including performance on creativity test and the repeated-measure of valence and appraisal.

Data used in this study were derived from a larger project that examined the fluctuation of the influence of affect on creative performance. Participants in this project, whose affect was manipulated by watching video clip (tested in the pilot study), were given a four-item divergent thinking task. The items were presented with latin square design within 20 minutes (i.e., 5 minutes for each item). Participants were instructed to generate as many possible uses for four common objects (i.e., paper, chair, pencil, & phone) as they could.

The 71 participants in the present study were those who answered the item *paper* in the early stage of the divergent thinking task (i.e., first 10 minutes after affect induction). Specifically, the item *paper* was presented as the first item to half of the participants and as the second item to the other half of the participants. Focus was given to these participants because responses derived from the early stage would allow for an examination of the effect of positive affect in 10 minutes. This is important

because the results can be served as a basis for using a 10-minute creativity task in the following studies if any significant result is found in the present study. Moreover, unlike other items, there was no significant order effect between these two groups of participants.

Instruments

Video clips. Video clips that had been examined and found effective in the pilot study were used to elicit positive, negative, and neutral affect. However, only one of the two video clips for each type of affect was used in the present study. Specifically, the clips used included *Big Bang Theory* for positive affect, *The Champ (Death Scene)* for negative affect, and A Conversation about the International Award for Young People for neutral affect. In addition to the three clips, another neutral clip that introduced the preparation of the first Youth Olympic Games was also used. All participants watched this neutral video clip to neutralize their affect before involving in the affect induction. The reason is, in general, most people would normally have an above neutral affect or a mild positive affect (Cacioppo, Gardner, & Berntson, 1999; Diener & Diener, 1996) Thus, watching a neutral clip prior to the affect induction procedure may avoid a confounding effect of initial affect (Kaufmann & Vosburg, 2002).

Valence checking. Similar to the pilot study, the effectiveness of the affect induction procedure was evaluated by asking participants to indicate their feeling after watching the clip (i.e., valence) on a single item consisting of five emotional facial icons, ranging from 1(*very sad*) to 5(*very happy*). Participants answered the measure before and after the affect induction to assess the change of affect.

Intensity checking. Intensity of the valence was evaluated by asking participants to indicate to what extent they perceived the valence on a 7-point likert scale, ranging from 1(*very weak*) to 7(*very strong*). Similarly, participants was administered the evaluation before and after the affect induction.

Evaluation of appraisal. The International Positive and Negative Affect Schedule short form (I-PANAS-SF; Thompson, 2007, see appendix 1) was used to assess individual's appraisal. It consists of five items for positive appraisals (*inspired, determined, attentive, active, & alert*) and five items for negative appraisals (*upset, hostile, ashamed, nervous, & afraid*). Participants rated to what extent they have such appraisal at the present moment on a 5-point scale, ranging from 1(*very slightly or not at all*) to 5(*extremely*). The I-PANAS-SF is the modified version of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). Despite the PANAS is more widely used in research on affect, the items also reflect the way individuals perceive themselves. For instance, the positive term *inspired* may indicate whether or not individuals perceive that they possess additional intuition. Furthermore, the items allow for assessing positive and negative beliefs about the affect and/or whether affect influences people's perception of their situation (see Kelly et al., 2012; Kelly et al., 2011 for a similar method). The I-PANAS-SF has been found to be reliable, valid and adequate for cross-cultural English-based studies (Thompson, 2007). The I-PANAS-SF was administered before and after the affect induction and was found to have moderate to good reliability. The Cronbach's alphas for the pre-induction measured positive appraisal and negative appraisal were .83 and .71, respectively, and for the post-induction measured were .85 and .70, respectively.

Evaluation of creativity. The Alternate Uses Task (AUT) derived from Wallach and Kogan's (1965) creativity tests was used to measure participants' creativity. Participants were instructed to generate as many different ways using a common object (e.g., paper) as possible within five minutes (Steinberg et al., 1997; Torrance, 1969). Participants' responses were measured for fluency, flexibility, and originality. Fluency refers to the total responses given by an individual. Flexibility represents the number of categories of the generated responses. Higher scores (i.e., more categories) imply the responses are more diverse, whereas lower scores indicate the ideas are more convergent. The third index, originality, represents the frequency of occurrence of responses. Each response is attributed a score between $1/N$ (response only given by one participant in the sample of N participants) and 1 (every participants in the sample generate the response), and this score is then subtracted from 1 to make its interpretation consistent with other creativity indexes (Runco et al., 1987; Zenasni & Lubart, 2011; Zenasni & Lubart, 2008). In other words, responses with higher score are more unique or novel. Last, but not least, the mean originality score for a given participant is obtained by averaging all his or her scores.

Prior to the computation of flexibility score, two raters, who were blind to the hypothesis and experimental conditions, coded the participants' responses. Discrepancies were reconciled via discussions. Finally, a coding scheme consisting of 7 categories were generated for the uses of paper (see appendix 2). For example, the first category (Decorative purpose) includes the uses that are related to artistic applications such as using paper for decoration and making handy craft. By using this developed scheme, participants' responses were sorted in terms of the seven dimensions and their flexibility scores were computed. In order to verify the rating,

half of the participants were randomly selected and their responses were judged by another independent rater. The inter-rater reliability (measured by Pearson-correlation) was .81 ($p < .001$) (the interrater intraclass correlation coefficient was 0.89, 95% confidence interval 0.78-0.94), suggesting that the two rating results were consistent with each other. Therefore, the rating score was used to represent participants' flexibility. Similarly, originality was rated by an independent rater along with the researcher, with the exception that both rated all responses and computed the originality score for all participants. The inter-rater reliability was relatively high with a Pearson correlation of .88 ($p < .001$) and an intraclass correlation coefficient of 0.83 (95% confidence interval 0.45-0.92), suggesting that the two rating scores were consistent. Therefore, the two rating scores were averaged to represent participants' originality score.

Procedure

Participants were randomly assigned to one of the three affect conditions (i.e., positive, negative, and neutral) upon their arrival. After completing the informed consent form, all participants watched a neutral video clip (*Beyond Gold: The journey to the first Youth Olympic Games*) and answered the first measure of affect (i.e., pre-induction measure of valence and intensity to check the neutralization effect of the clip) and appraisal. Then, a second video clip corresponding to the participants' group condition was shown, followed by the second measure of affect and appraisal (post-induction measure) and the AUT. In the original project, participants were given 20 minutes to answer the four AUT items (i.e., 5 minutes for each item). Participants included in this study were those who answered the item *paper* either in the first or the second 5-minute. A countdown clock was shown on the computer screen and participants were automatically directed to next item at the end of every 5 minutes.

Finally, after answering a demographic questionnaire, participants were thanked, briefed, and dismissed. The whole (original) study took approximately 40 minutes.

Figure 2 shows the procedure of the study.

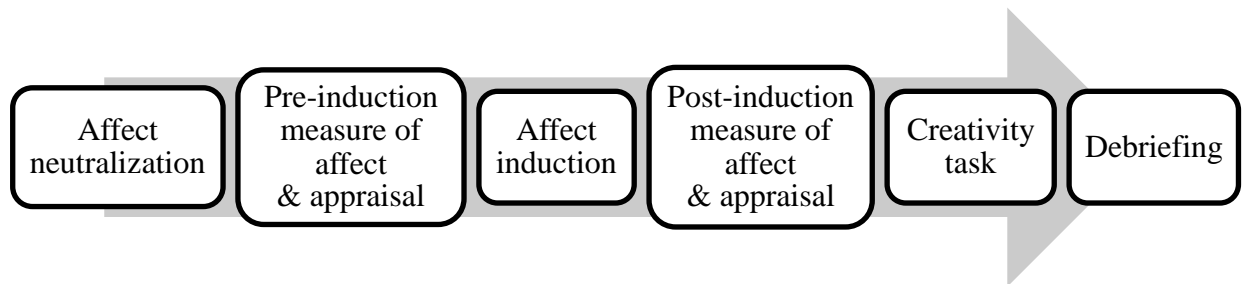


Figure 2. Procedure of Study 1

Results

Valence and Intensity Baseline Checking

Participants' self-report on the two measures of valence and intensity after watching a neutral video clip (i.e., pre-induction measure) were submitted to a 3 (affect: positive, negative, & neutral) \times 2 (gender) ANOVA, respectively. Significant effect was not found in both measurements with the exception that the main effect of affect was found to be significant in the valence score, $F(2, 65) = 3.90, p = .025, \eta^2 = .107$. Post-hoc analysis with Tukey's HSD at .05 level indicated that participants in the negative affect condition ($M = 3.68, SD = 0.48$) reported higher score than their counterparts in the positive affect condition ($M = 3.23, SD = 0.53$). In other words, prior to the affect manipulation, participants in the negative affect condition felt more positive feeling relative to their counterparts in the positive affect condition. Table 4 shows the descriptive statistics for both pre- and post-induction measured affect and appraisal scores.

Table 4

Descriptive Statistics for Pre- and Post-Induction Affect Scores in Study 1

	Positive		Negative		Neutral		Min	Max
	Pre	Post	Pre	Post	Pre	Post		
Valence	3.23 (0.53)	4.41 (0.59)	3.68 (0.48)	2.08 (0.57)	3.46 (0.59)	3.25 (0.61)	1	5
Intensity	5.32 (1.00)	5.77 (1.02)	5.20 (0.91)	4.88 (1.42)	4.88 (1.04)	4.63 (1.06)	1	7
I-PANAS-SF	2.48 (0.84)	3.01 (0.85)	2.66 (0.90)	2.21 (0.95)	2.43 (0.91)	2.34 (0.84)	1	5
Positive								
I-PANAS-SF	1.19 (0.37)	1.08 (0.24)	1.07 (0.20)	1.88 (0.73)	1.12 (0.20)	1.22 (0.38)	1	5
Negative								

Note. Standard deviations were shown in parenthesis. Pre: Pre-induction measured scores. Post: Post-induction measured scores. I-PANAS-SF: International Positive and Negative Affect Schedule short form.

Affect Manipulation Checking

To examine the efficacy of affect induction, two 3 (affect) \times 2 (gender) ANOVAs were conducted, with post-induction measured valence and intensity as dependent variables. Analysis on the post-induction measured valence showed that there was a main effect of affect, $F(2, 65) = 90.63, p < .001, \eta^2 = .736$. Post-hoc test revealed that participants who watched the happy video clip reported significantly higher score ($M = 4.41, SD = 0.73$) than did those who watched the sad ($M = 2.18, SD = 0.60$) or neutral video clip ($M = 3.42, SD = 0.52$). Moreover, participants in the negative affect condition reported significantly lower rating (i.e., higher negative rating) than did neutral affect group. Similarly, there was a significant main effect of affect in post-induction intensity score, $F(2, 65) = 5.66, p = .005, \eta^2 = .148$. Post-hoc test with Tukey's HSD revealed that participants who watched the happy video clip reported significantly more intense feeling ($M = 5.77, SD = 1.02$) than did those who watched the sad ($M = 4.88, SD = 1.42$) or the neutral clip ($M = 4.63, SD = 1.06$). Other effects were not found. To conclude, the results indicate that the affect induction was successful.

Appraisal Checking

The I-PANAS-SF was administered twice to measure participants' appraisal before and after the involvement of the affect induction. The scores were submitted to a 3 (affect) \times 2 (gender) ANOVA, respectively. Significant difference was not found in the pre-induction measured scores. However, there was a main effect of affect in the post-induction measured positive appraisal, $F(2, 65) = 5.98, p = .004, \eta^2 = .155$. As expected, participants in the positive affect condition reported a significantly higher score (i.e., more positive appraisal) than did their counterparts in the negative affect and the neutral affect conditions. Nonetheless, the effect was qualified by the Affect \times Gender interaction, $F(2, 65) = 3.40, p = .039, \eta^2 = .095$. Further analysis showed that female participants who watched the happy video clip ($M = 3.04, SD = 1.11$) reported significantly higher score than did their counterparts who watched the sad video clip ($M = 1.91, SD = 0.77$). Similarly, male participants who were assigned to the positive affect condition ($M = 2.98, SD = 0.67$) reported significantly higher positive appraisal than did their counterparts in the neutral affect condition ($M = 1.97, SD = 0.77$). In addition, in the neutral affect condition, female participants ($M = 2.72, SD = 0.76$) reported significantly higher score than did male participants ($M = 1.97, SD = 0.77$). Other effect was not found.

Besides, there was a main effect of affect on post-induction measured negative appraisal score, $F(2, 65) = 15.91, p < .001, \eta^2 = .329$. Post-hoc tests revealed that participants in the negative affect condition reported a significantly higher score ($M = 1.88, SD = 0.73$) than did those in the positive affect ($M = 1.08, SD = 0.24$) and the neutral affect conditions ($M = 1.21, SD = 0.38$). The results suggest that affect influences appraisal in a particular way; specifically, positive affect results in more positive appraisal but has no impact on negative appraisal and vice-versa.

Impact of Affect on Creativity

To examine the influence of affect and gender difference on each dimension of creativity, several 3 (affect) \times 2 (gender) ANOVAs were conducted (see Table 5). Results revealed that there was a significant main effect of affect on flexibility, $F(2, 65) = 4.36, p = .017, \eta^2 = .118$. Post-hoc tests with Tukey's HSD showed that, compared to those in the negative affect ($M = 4.28, SD = 1.21$) and the neutral affect conditions ($M = 4.38, SD = 1.10$), participants in the positive affect condition generated more diverse responses ($M = 5.23, SD = 1.19$). No other effect was found and there was no significant difference in fluency and originality.

Table 5
Creativity Scores for Each Affect Condition in Study 1

	Positive		Negative		Neutral	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Fluency	13.41	6.21	10.72	5.49	10.17	3.07
Flexibility	5.23 ^{ab}	1.19	4.28 ^a	1.21	4.38 ^b	1.10
Originality	0.77	0.07	0.79	0.08	0.81	0.04

Note. Scores with same script significantly differed from each other at .05 level.

Mediating Role of Self-Appraisal on the Affect-Creativity Link

As mentioned earlier, the impact of affect is not usual but depends on how individuals interpret the meaning embedded in affect and react to it. Therefore, it is hypothesized that individual's appraisal may mediate the influence of affect on creativity. Preacher and Hayes's (2008) multiple mediation procedure was used to test this theoretical mediating role of self-appraisal in the relationship between affect and creativity. These analyses also investigated the specific relationship among affect, appraisal, and creativity. One of the analyses, for instance, is to assess whether positive affect influences creativity through positive or negative appraisal.

Given the results indicated that affect manipulation successfully induced corresponding affect, affect condition, but not valence score, was used as a predictor in

these analyses. Affect manipulation was dummy coded into two variables (d1 = positive affect, d2 = negative affect) with the neutral affect group serving as the reference group. Self-report on the 10-item I-PANAS-SF after the affect manipulation was used to indicate participants' appraisal after being induced to a given type of affect. Both positive and negative appraisals were treated as potential mediators and the creativity indexes as dependent variables.

Mediation analyses on fluency indicated positive affect was significantly related to both positive appraisal ($B = .74, SE = .23, t = 3.26, p = .002$) and negative appraisal ($B = -.47, SE = .15, t = -3.21, p = .002$). However, the relationships between positive appraisal and fluency and those between negative appraisal and fluency were not significant, suggesting that both types of appraisal do not mediate the relationship between positive affect and fluency. Interestingly, it was found that negative affect was significantly related to both positive appraisal ($B = -.45, SE = .23, t = -1.98, p = .05$) and negative appraisal ($B = .73, SE = .13, t = 5.81, p < .001$). Furthermore, negative appraisal significantly predicted fluency ($B = -2.52, SE = 1.25, t = -2.01, p = .049$), but positive appraisal did not ($B = 1.32, SE = .69, t = 1.93, p = .058$). These preliminary results suggest that negative appraisal, but not positive appraisal, may play a mediating role. The relationship between negative affect and fluency (i.e., total effect) was not significant ($B = -1.00, SE = 1.29, t = -.77, p = .44$). The direct effect of negative affect on fluency after controlling for the effect of negative appraisal was also not significant ($B = 1.44, SE = 1.63, t = .88, p = .38$). Nevertheless, changes in the magnitude and the direction of effect were observed. The results with 10,000 bootstrapping revealed that the indirect effect of negative affect on fluency via negative appraisal was significant, with a 95% confidence interval of -4.03 to -0.26. These findings indicate that negative appraisal mediates the relationship between

negative affect and fluency (when the effect of positive appraisal was controlled). In other words, negative affect increases negative appraisal, which in turn, inhibits fluency (see Figure 3A).

Similarly, the mediating role of appraisal on the relationship between positive affect and flexibility was not supported due to both types of appraisal not predicting flexibility. Negative affect, however, was found to have an impact on flexibility through negative appraisal. In particular, negative affect was significantly related to negative appraisal, and the latter significantly predicted flexibility ($B = -.60$, $SE = .29$, $t = -2.05$, $p = .04$). Both total effect and direct effect of negative affect on flexibility was not significant ($B = -.50$, $SE = .30$, $t = -1.67$, $p = .10$ for total effect; $B = .05$, $SE = .38$, $t = .12$, $p = .91$ for direct effect). However, changes of the magnitude and the direction of effect were observed after adding the effect of negative appraisal. The results with 10000 bootstrapping revealed that the indirect effect of negative affect on flexibility via negative appraisal was significant, with a 95% confidence interval of $-.94$ to $-.01$. These findings indicate that negative appraisal mediates the detrimental effect of negative affect on flexibility (when the effect of positive appraisal was controlled). To be more specific, negative affect leads to higher negative appraisal which, in turn, hinders flexibility (see Figure 3B).

In regard to originality, positive affect was significantly related to both positive appraisal ($B = .74$, $SE = .23$, $t = 3.26$, $p = .002$) and negative appraisal ($B = -.47$, $SE = .15$, $t = -3.21$, $p = .002$). Moreover, negative appraisal significantly predicted originality ($B = -.04$, $SE = .01$, $t = -2.63$, $p = .01$), but positive appraisal did not ($B = -.004$, $SE = .09$, $t = -.47$, $p = .64$), suggesting that negative appraisal may play a mediating role. The direct effect of positive affect on originality was not significant ($B = -.03$, $SE = .02$, $t = -1.60$, $p = .11$). However, after controlling for the effect of

appraisal, the relationship between positive affect and originality became significant ($B = -.04$, $SE = .02$, $t = -2.14$, $p = .04$). The results with 10,000 bootstrapping revealed that the indirect effect of positive affect on originality via negative appraisal was significant, with a 95% confidence interval of .002 to .04. Due to both positive and negative appraisals not predicting originality, the hypothesized mediating role of appraisal on the relationship between negative affect and originality was not supported. These findings indicate that negative appraisal mediates the relationship between positive affect and originality (when the effect of positive appraisal was controlled) (see Figure 3C). In other words, positive affect decreases negative appraisal and the low negative appraisal results in higher originality.

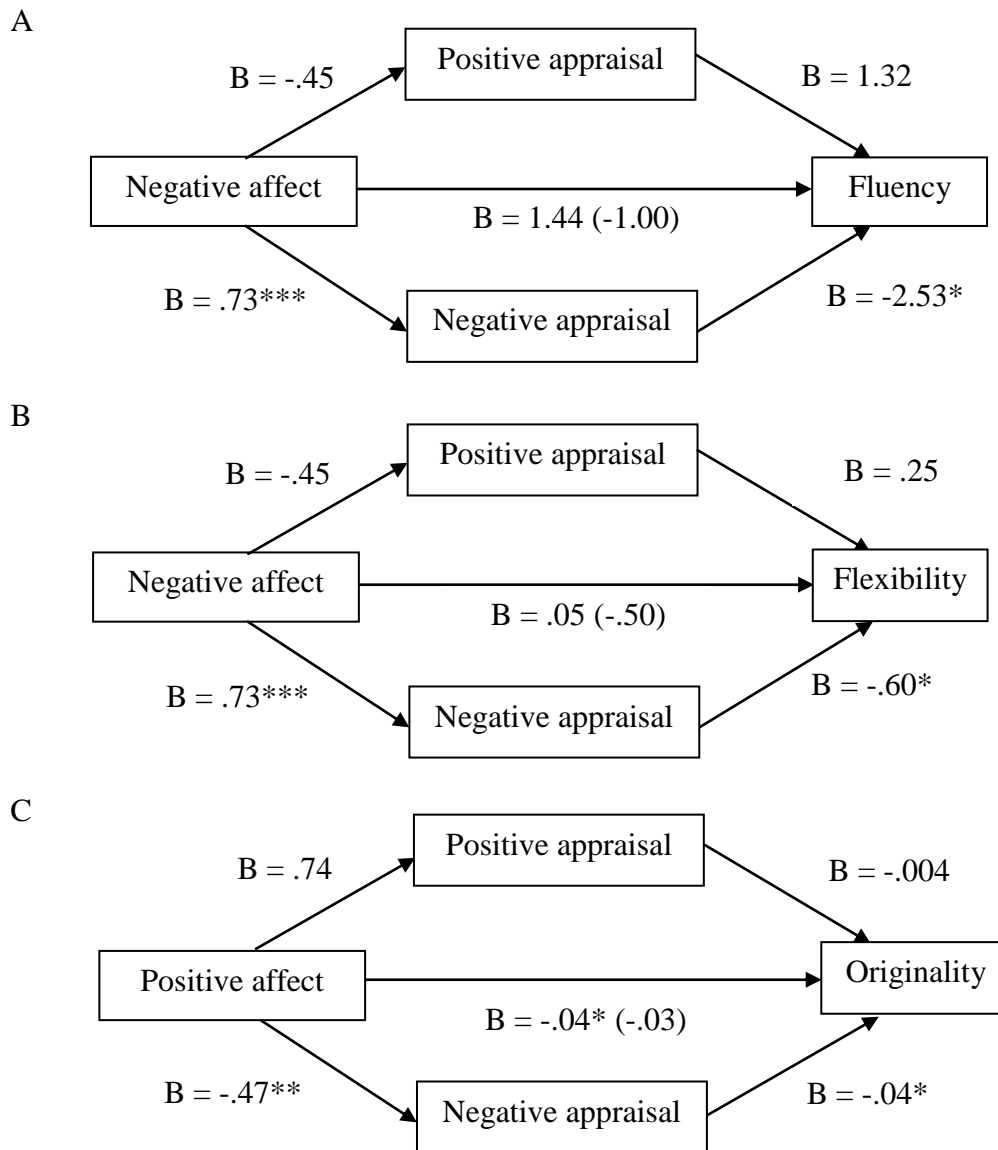


Figure 3. The mediation effects of positive and negative appraisal on the relationship between negative affect and fluency (A), between negative affect and flexibility (B), and between positive affect and originality (C).

The unstandardized coefficients for the total effect (path c) were shown in parentheses. * $p < .05$, ** $p < .01$, *** $p < .001$.

Discussion

The present study investigated the relationship among affect, appraisal, and creativity. Based on literature review, it is assumed that affect is influential on creativity via appraisal. The current study not only examined the theoretical mediating role of individual's appraisal, but also further investigated the specific role of positive appraisal and negative appraisal on the affect-creativity link. Additionally, the direct

impact of the induced affect on creative performance and the effectiveness of the selected video clips in eliciting affect were also assessed.

Several noteworthy findings were discovered. First, the results have shown that the participants in the positive affect condition are more flexible than their counterparts in negative affect and neutral conditions, as hypothesized. This result lends further support to the previous findings (Fredrickson & Branigan, 2005; Isen et al., 1985; Isen et al., 1992) that positive affect is conducive to creativity.

Furthermore, the hypothesis of the mediating role of appraisal on the relationship between affect and creativity is supported. Nevertheless, only negative appraisal was found to have mediating effect on the link. In particular, positive affect promotes originality through negative appraisal. Individuals who feel positive tend to report less negative appraisal and this less negative interpretation is conducive to the generation of novel ideas. Similarly, negative affect impairs both fluency and flexibility via negative appraisal. The results show that compared to others, individuals whose negative affect had been induced are more likely to have more negative appraisal, and this high level of negative appraisal somehow hinders individuals from being fluent and flexible in the following divergent thinking task. The results suggest that negative appraisal is more influential than positive appraisal. As mentioned earlier, people with negative appraisal are prone to interpret a situation in a negative manner. This general negative interpretation of the situation to a certain extent is equivalent to negative feedback, which is informative and yet detrimental to individual confidence and expectation of success (Fishbach, Eyal, & Finkelstein, 2010). As a result, people who possess higher negative appraisal are less motivated and believe that additional endeavor is useless and exert less effort than did those with lower negative appraisal. These results are consistent with past findings (e.g., Baas et al., 2008; Gasper, 2004)

that positive affect facilitates, whereas negative affect hinders, creative performance. The findings lend support to the mood-as-input model that the influence of affect is context-dependent, suggesting that affect does not exert influence on creativity directly as previously assumed. Thus, future research on the relationship between affect and creative performance is warranted to take individual differences into account. Further studies are also encouraged to investigate other potential factors that may influence the affect-creativity link. For example, based on the findings of the current study that negative affect influences both fluency and flexibility through negative appraisal, future studies may manipulate the level of negative appraisal and examine to what extent negative appraisal influences the effect of negative affect. This direction of study may provide further insight to the inconclusive role of negative affect on creative performance.

For the affect induction, in line with findings of the pilot study, induction procedure using the selected video clips is successful. Results derived from self-reported measurements of affect affirm the capability of those video clips in eliciting particular affect. For instance, participants who watched a happy clip reported more positive feeling than their counterparts who watched a sad or a neutral clip. Moreover, compared to participants in the neutral affect condition, those in negative affect condition reported significantly more negative feeling.

As a result, the present study found that, consistent with most literature (Davis, 2009; Isen & Daubman, 1984; Isen et al., 1987; Isen et al., 1985; Kaufmann & Vosburg, 2002; Murray et al., 1990), the induced positive affect, but not negative affect, facilitates creativity. These convergent results provide robust evidence to the effectiveness of the video clips and the facilitation effect of positive affect on creative performance.

Limitations

There are several limitations in this study. First, the role of appraisal is not robust because the total effect of affect (predictor) on creativity (dependent variable) was not significant. The conventional approach puts great emphasis on the significance of total effect because it is the prerequisite to determine whether there is an effect to mediate (Baron & Kenny, 1986). This contention seems reasonable because there is no point of testing mediation if the predictor has no relationship with the dependent variable. Nevertheless, recent studies on mediation analysis indicated that overemphasizing on the significance of total effect may lead to misleading conclusions (Hayes, 2009; Rucker, Preacher, Tormala, & Petty, 2011; Zhao, Lynch, & Chen, 2010). Indeed, Rucker and colleagues (2011) contended that the requirement for a significant total effect is no longer necessary for mediation analysis as long as the hypothesized mediating role is grounded by theories.

Second, there is a discrepancy between findings of the direct and the indirect effects (mediating effect of appraisal) of affect on creativity. Evaluation of the direct effect shows that participants whose positive affect had been induced generated significantly more diverse responses, but did not significantly outperform their counterparts in fluency and originality. However, the condition differences in fluency were in the predicted direction, despite not being significant. This is possibly due to the sample size in each condition being relatively small and made it harder to detect the facilitation effect of positive affect, as compared to a larger sample size. Moreover, the high standard deviation implies that the effect of affect on participants' performance is not stable. More studies are warranted to explore the potential factors that lead to this fluctuation. One of the reasons could be the item of the creativity task

is relatively easy and hence, participants can generate more ideas without relying on the facilitation effect of affect.

Third, although the analysis on the mediating role of appraisal shows that positive affect is conducive to originality through negative appraisal, the design of the current study is not able to explain the reason positive affect enhances flexibility directly but increases originality indirectly. A possibility to explain this inconsistency, as suggested by the past findings (e.g., De Dreu et al., 2008) and the mood-as-input model (Martin & Stoner, 1996; Martin et al., 1993), is that positive affect facilitates each dimension of creativity via different paths (De Dreu et al., 2008; Pessoa, 2009). Therefore, more studies are required to examine this conceptual dual pathway approach. Another possible reason is that the facilitation effect of positive affect induced by a single video clip in less than 3 minutes in length may dissipate over time and hence, it has less impact at the end of 10 minutes (Kaufmann & Vosburg, 2002). Therefore, performance of participants who answered the AUT item 5 minutes after the induction may be influenced, though no significant difference was found between these participants and their counterparts who answered the item immediately after the induction procedure. To resolve this issue, further studies may consider using more than one video clip for affect induction, especially when two or more AUT items (or more than one assessment) are used for creativity evaluation.

It is worth to note that, in the pre-induction measure, participants in the negative affect condition reported significantly higher valence score than their counterparts in the positive affect condition after watching the neutral clip. Someone may argue that the failure of neutralization and the differences in initial affect condition indicate that participants in the negative affect condition somehow differ from other participants, and these differences may confound findings of the present study. Nevertheless, it is

worth to note that people are in an above neutral affect or a mild positive affect most of the time (Cacioppo et al., 1999; Diener & Diener, 1996), and the (pre-induction measured) mean valence score reported by the negative affect group was below 4 (happy); hence, it can still be considered as neutral. In the subsequent induction procedure, participants in negative affect condition reported significantly higher negative affect than their counterparts in other affect condition, suggesting that the initial differences did not interfere with the effectiveness of affect induction. However, the question whether the participants (in the negative affect condition) are prone to affect induction compared to others remains open. Future studies are needed to investigate whether the initial differences in affect result in any impact to findings. One way is to replicate the findings of the current study with individuals who do not show initial differences in affect.

Finally, only one of the two video clips for positive affect and negative affect induction was used, respectively. Thus, the findings revealed in the present study are not able to answer whether the unused video clips are as effective as those clips tested in this study. Findings of the pilot study, however, have shown that there is no significant difference between the two video clips within the same affect group. Even so, it is still necessary to examine the effectiveness of the two remaining video clips in the future studies.

Implications

Despite the presence of several notable caveats, it is believed that the findings of the present study have some noteworthy theoretical and practical implications. For example, the current study reveals that affect may influence creative performance either directly or indirectly. This finding not only lends support to the existing theories,

but also expands our understanding of the affect-creativity link and offers a new direction for future studies. Moreover, the discovery of the mediating role of appraisal on the relationship between affect and creativity also offers an insight to supervisors indicating that creating a working environment with positive (or negative) atmosphere is not sufficient to boost workers' creativity. Supervisors also need to ensure that employees possess corresponding appraisal that may lead to the facilitation effect of affect on creative performance.

In conclusion, the present study reveals that affect influences creativity and the effect is mediated by individual's appraisal. The findings of this study indicate that affect conveys different meanings and the interpretation of these affective signals and their impact on performance is influenced by individual appraisal. Similarly, the features of task (e.g., the importance of task, difficulty, and structure of task), which also convey different signals and may influence people's interpretation of the task, are assumed to have similar effect on performance through individual interpretation (Friedman et al., 2007). If that is the case, the inconclusive findings of the facilitation effect of positive affect could be due to the differences in task construal. In particular, the varieties of creativity measurements (e.g., divergent thinking tasks, creative-problem solving tasks) may change the way individuals appraise and, in turn, influence their performance. Therefore, the next study aims to examine the role of task features to understand the extent these factors influence individual appraisal and performance on creativity tasks.

Chapter Five

Study 2

Study 1 showed that positive affect is conducive to creativity, whereas negative affect is detrimental to creativity. Positive affect directly enhances flexibility (i.e., generate ideas in different themes) and indirectly increases originality through negative appraisal. Negative affect, in contrast, decreases both fluency and flexibility via negative appraisal. These results indicate that a) both positive and negative affect have different impacts on creativity through different pathways, and b) individual's appraisal is involved in the relationship between affect and creativity. This partly explains the mixed findings of past studies on the impact of affect on creativity.

Given that affect and appraisal are influential to creativity, it is assumed that factors that have impact on affect and/or individual's appraisal may also have the potential to influence creativity. This conceptual relationship, however, has received little attention in research on the affect-creativity link. Hence, the purpose of this study is to identify one of the potential factors that are related to affect and/or appraisal and assess its influence on creativity. According to literature, as discussed in Chapter 2, task features are influential to individual's performance (Bishop & Johnson, 2011; Richardson, Jones, Croker, & Brown, 2011). Task features refer to any characteristics that can be used to profiling tasks and/or forming individual's perception of the task. Given that task features comprise any task-related characteristics and it is impractical to use such a broad term, task feature is operationally defined as task construal within the context of this study. Task construal is a special case of individual appraisal. Self-appraisal refers to a person's subjective interpretation of the current situation.

Although appraisal can be categorized to positive and negative appraisals, as discussed in the previous chapter, appraisal can also be described as a belief in coping with the

circumstances (Johnson, Gooding, Wood, Taylor, et al., 2010). Task construal, in contrast, is a perception and comprehension of the task which can be influenced by external factors such as manipulation. Instead of investigating how task construal influences positive and negative appraisals, the present study aims to examine whether task construal (indexed by the task framing manipulation of the importance of task) has any impacts on individual's appraisal of the task, which is characterized by self-perceived importance of task, self-perceived affect, and motivation (enjoyment, competence, choice, and tension). It is hypothesized that task construal may influence individual's performance directly and indirectly via affect or appraisal of task. Therefore, this study examined the role of task construal on individual's appraisal and creativity, as well as the conceptual mediating role of appraisal on the relationship between task framing and creativity.

In the following part, literature about the potential impacts of task features (e.g., task type, task structure) on performance and affect was first reviewed to justify the focus on task construal. The framing effect on performance was then briefly reviewed to justify the use of task framing manipulation in the current study. Next, the design of this study was introduced and followed by the results of analyses. Finally, the limitations and implications of the findings were discussed.

The Relationship between Task Features and Performance

A variety of measurements have been employed in past studies to examine the affect-creativity link. In experimental studies, for example, researchers examined the impact of affect on different types of creativity tasks, ranging from divergent thinking tasks to creative problem solving tasks. In addition to the task type, the design and the instructions of the tasks also vary from one to another. In some of the studies (e.g., Baas, De Dreu, & Nijstad, 2011a, Study 3; Kaufmann & Vosburg, 2002), for instance,

participants were explicitly instructed to complete the creativity task within certain amount of time (e.g., 4 minutes), whereas other studies (e.g., Friedman et al., 2007; Isen, 1987; Zenasni & Lubart, 2008) allowed longer time or even untimed. More importantly, to avoid confounding the effect of affect, some researchers manipulate the purpose of the study to make participants believe that the affect manipulation and the creativity measurement are not related (Kaufmann & Vosburg, 2002). It is believed that these distinctions in task features may have an impact on participants' performance to a certain extent. For instance, individuals who work in a limited time condition may experience pressure (Chan et al., 2001) and hence undermine their performance. It has also been found that both too high and too low time pressure are detrimental to creative performance (M. Baer & Oldham, 2006). One of the reasons that time pressure undermines creativity is that time pressure distracts and influences the way people allocate cognitive resources (J. Baer & Kaufman, 2008) and execute processing strategies (Antes & Mumford, 2009). The deviant responses suggest that time pressure may lead participants to perceive the task differently. In other words, time pressure may play a role on the way people appraise the task, which in turn, may influence their performance on the task. In addition to time pressure, individuals' affective perception of the task may also foster performance. Participants incline to generate more ideas for a divergent thinking task when they perceive the task as pleasant (Zenasni & Lubart, 2011). Indeed, the finding is in line with the concept of flow—the “process of optimal experience” (Csikszentmihalyi & LeFevre, 1989, p. 816) or a state of concentration in which “people get fully immersed in difficult tasks for the sake of the activity itself” (Baumann & Scheffer, 2011, p. 267). According to Ullén and colleagues (2012), flow experience is also characterized by low self-awareness and enjoyment and, more important, this experience usually occurs when

the challenge of a task matches the skills of an individual. In other words, individuals prone to enjoy and fully concentrate in a task when they perceive balance between challenge of the task and their ability. The enjoyment and concentration resemble intrinsic motivation and hence, leads people to pay more effort to the task.

The structure of task, or how the embedded problem of a task is presented (Goodman, Alexander, Chizhik, Chizhik, & Eidelman, 2010), also plays a significant role on performance. Nouri, Erez, Rockstuhl, and Ang (as cited in Erez & Nouri, 2010) found that, compared to a well-defined and strong structure (i.e., with detailed instructions) task, an ill-defined and weak structure task is positively associated with originality of ideas. This is because weak tasks with relatively ambiguous information and no clear cues for reference allow individuals to express their personal thoughts and hence encourage the exploration of novel ideas (Erez & Nouri, 2010). In addition to exerting influence on performance directly, task structures also show indirect effect on creative performance through appraisal. In their study of investigating factors that may impact employees' creative performance, Oldham and Cummings (1996) found that, compared to simple and routine works, employees are more likely to produce creative outcomes when working on complex and challenging jobs. According to Oldham and Cummings, complex jobs encourage higher level of motivation because individuals are excited about the jobs and are interested in completing the works. Furthermore, complex jobs also stimulate employees' creativity by urging them to consider different dimensions of the works. In the same vein, Shalley and Gilson (2004) also indicated that employees who deal with complex jobs tend to pay more attention and effort to their jobs. Moreover, these employees are more persistent on work and take into account of alternatives. These findings suggest that the complex and demanding jobs may tune the way employees appraise the task and these changes of appraisal may

increase their motivation (Kuvaas, 2006) and equip them with necessary cognitive and behavioral tactics that are beneficial for completing the works.

Based on the discussions above, the current research proposes that the features of task may influence creativity, either directly or indirectly (via appraisal). Task feature, as explained earlier, is defined as task construal in the present study. The current study aims to investigate how task construal influences individuals' creative performance and how individuals appraise the task (i.e., important, unimportant vs. neutral). Task framing was used to manipulate the level of task construal (i.e., level of importance) in the current study. Framing refers to "the fundamental theme of a message presented to influence the reader in an expected way" (Yue, Cheung, & Wong, 2010, p. 2). It is commonly used in experimental studies to manipulate condition of task (DeWall, Baumeister, & Vohs, 2008) in order to influence participants' judgment and orientation to fit with the framing condition. More importantly, framing has also been found consistently and effectively to influence individual's performance in different fields of studies. For example, studies on decision making have found that the way a problem is framed (e.g., gains or losses) leads people to shift their reference point and, in turn, places more attention on risk aversion than risk taking (Tversky & Kahneman, 2004). Bies-Hernandez (2012) demonstrated that loss-framed grading system not only results in negative perception of psychology courses but also decreases academic performance in courses.

To summarize, this study investigates whether experimentally constructing a task as important directly influence individuals' creative performance and individual's appraisal of task (i.e., perceived importance of task, self-perceived affect, and motivation). Furthermore, the present study also examines the mediating role of task appraisal on the relationship between task framing and creativity. It was hypothesized

that task framing, especially the important task condition, may have an implication to creativity and individual's appraisal, and its effect on creativity is mediated by appraisal.

Method

Participants and Design

Eighty-one university students (66 females) participated in this study for extra course credits. Their mean age was 20.37 ($SD = 1.44$), ranging from 18 to 25 years old. A between-subject design with task framing condition as independent variable was used in this study. Creativity and the components of appraisal (e.g., motivation, affect) were treated as dependent variables, respectively, in separate analyses.

Instruments

Evaluation of affect. The Self-Assessment Manikin (SAM; Bradley & Lang, 1994; Lang, 1980) was adopted and modified to measure affect. The original SAM is a 3-item affect evaluation questionnaire that assesses valence (feeling), intensity, and dominance (degree of control) with images that depict different degrees of the three constructs, respectively. The images in the original valence item, however, were replaced by the emotional facial icons used in Study 1 because the facial icon scale was more direct and easier to understand. Respondents indicated to what extent the items are truly depicting themselves on a 9-point scale. For example, participants reported how they feel from 1 (*very negative*) to 9 (*very positive*) in the valence item. Appendix 3 shows the three items used in the present study.

Evaluation of creativity. As in Study 1, participants' creativity was measured by the AUT (Wallach & Kogan, 1965), which scored for fluency, flexibility, and originality. The only exception was participants answered two items (i.e., paper &

chair). Moreover, participants were told to use as much time as they need to complete the AUT. The time spent on task was recorded and treated as one of the dependent variables to test whether task framing influences the effort participants put on the AUT. The results of this preliminary investigation may provide initial evidence to understand whether time plays a role on the relationship between task framing and creativity.

As in Study 1, participants' flexibility scores were first computed by the researcher in terms of the coding scheme, which developed in another study (see appendix 4 for coding scheme for chair). To validate the rating scores, another independent rater graded half of the randomly-selected responses for the two items. The inter-rater reliabilities measured by Pearson correlation and intraclass correlation were .80 ($p < .001$) and .89 (95% confidence interval 0.79-0.94) for the paper item and were .86 ($p < .001$) and .92 (95% confidence interval 0.85-0.96) for the chair item, indicating that the rating is valid. Hence, the rating was used for further analysis. For originality, the researcher and an independent rater rated all participants' responses for the two items. The inter-rater reliabilities measured by Pearson correlation and intraclass correlation were .97 ($p < .001$) and .99 (95% confidence interval 0.98-0.99) for the paper item and were .92 ($p < .001$) and .95 (95% confidence interval 0.92-0.97) for the chair item, suggesting that the two rating scores for each item were highly consistent. Therefore, the rating scores were averaged to generate a mean score for each item. Participants' overall originality was derived by averaging the two items' mean score.

Evaluation of motivation. The Task Evaluation Questionnaire (TEQ, see appendix 5) is a special version of the Intrinsic Motivation Inventory which has been used for studies on intrinsic motivation and self-regulation (e.g., Deci, Eghrari, Patrick, & Leone, 1994; McAuley, Duncan, & Tammen, 1989; Ryan, 1982; Tsigilis &

Theodosiou, 2003), was used to measure participants' motivation in the current study. This 22-item questionnaire consists of four subscales: interest/enjoyment, perceived choice, perceived competence, and pressure/tension. Respondents indicate to what extent the items are truly depicting themselves from 1 (*not at all true*) to 7 (*very true*). The TEQ was administered twice (before and after the AUT) to examine the fluctuation of self-perceived motivation after completing the task. The reliability (Cronbach alpha) of the four subscales ranged from .69 (choice) to .83 (enjoyment) for the pre-task measure and from .77 (choice) to .92 (enjoyment) for the post-task measure.

Self-perceived importance of task. Three 9-point bipolar items were used to measure effectiveness of task framing. Participants were instructed to evaluate the task in terms of importance, difficulty, and familiarity. In the evaluation of importance, for example, participants indicated to what extent they think the task is important from 1 (*very unimportant*) to 9 (*very important*). The remaining items on difficulty and familiarity, however, are filler items to deceive participants from knowing that the main concern is how important they feel the task is.

Procedure

Participants were told that some psychological instruments were being pilot-tested for future studies on appraisal. Participants joined the study in group of 2 to 7 but completed the study on a computer individually.

After completing the informed consent form, participants were randomly assigned to important, unimportant, and neutral groups. The first two experimental groups (important vs. unimportant) received an additional cover story to manipulate the importance of the task. Specifically, participants in the important group were told

that performance on the task has been found to predict future career achievement to lead the participants to believe that their task performance is important. Whereas the unimportant group was told that the task is a kind of game. This is to lead the participants to perceive the task as relax and less important. After receiving the cover story, participants in the experimental groups were given the first assessment of affect and motivation (pre-task measure) and followed by the AUT. Participants in the neutral group (i.e., control group) did not receive any cover story and were administered the pre-task measure and the AUT. All the experimental and control groups received the same instructions for the pre-task measure and the AUT.

After completing the AUT, participants reported their self-perceived affect and motivation again (post-task measure), as well as their perceived importance of the task. Participants were debriefed, thanked, and dismissed after completing a demographic questionnaire. The whole study took approximately 30 minutes. Figure 4 diagrammatically depicts the procedure of the study.

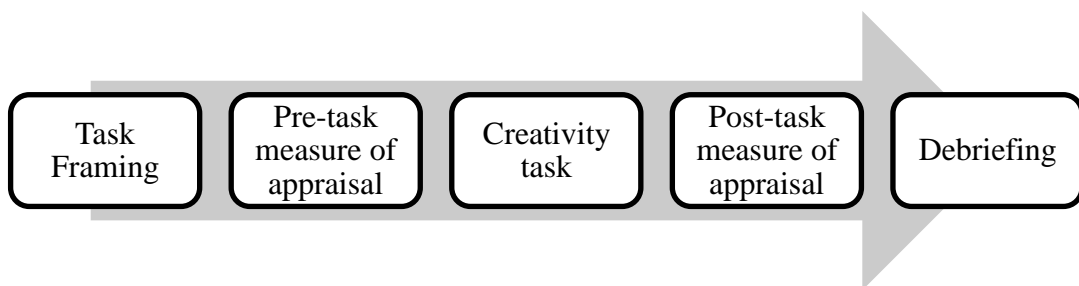


Figure 4. Procedure of Study 2

Results

Time spent on AUT

Participants were allowed to use as much time as they need to answer the AUT. The amount of time they spent on each item was recorded respectively. On average, participants spent 100.97s and 127.40s in suggesting different ways of using chair and

paper. The time spent on the two AUT items were averaged because they were highly correlated, $r(79) = .897, p < .001$. The mean score was log transformed to reduce the impact of positive skewness before submitting to further analyses. A one-way ANOVA, with the averaged time as dependent variable and the task framing condition (important, unimportant, and neutral) as independent variable, revealed a main effect of task, $F(2, 78) = 3.29, p = .042, \eta^2 = .078$. Post-hoc analyses showed that participants in the important condition ($M = 2.05, SD = 0.32$) spent significantly more time on the AUT than their counterparts in the neutral condition ($M = 1.93, SD = 0.34$). No other significant differences were found.

Task Appraisal

As illustrated, task appraisal in the current study encompasses self-perceived importance of task, self-perceived affect, and motivation (enjoyment, competence, choice, and tension). Table 6 shows the means and the standard deviations for the task appraisal factors and their intercorrelations. Pearson correlation analyses showed that the level of importance of task was negatively correlated with the post-task measured affect and motivation. In other words, participants are more likely to experience negative feeling and perceive less enjoyment, competence, and choice when they perceive the task as important.

Self-rated importance of task. In addition, a one-way ANOVA on the self-rated importance of task was conducted to examine whether task framing influences individual's perception of task. Results indicated that the effect of task framing was significant, $F(2, 78) = 18.76, p < .001, \eta^2 = .325$. In particular, participants in the important task framing condition ($M = 5.83, SD = 1.30$) perceived the task significantly more important than those in the unimportant ($M = 4.00, SD = 1.24$) and

the neutral conditions ($M = 3.97$, $SD = 1.19$). This suggests that the task framing manipulation is successful in directing individual's perception of task.

Self-rated affect. Participants' affect was measured for valence, intensity, and the degree of control. However, only valence was reported in the Table 6 because it is one of the main interests of the current study to examine the impact of valence of affect on creativity and whether it is influenced by task framing. The intensity and the degree of control, conversely, only ensure that the induced affect, especially positive affect, is not too strong because high level of positive affect is detrimental to performance (Cohn & Fredrickson, 2009; Isen, 2008). Three repeated-measure ANOVAs were conducted to examine the differences in affect. The independent variable was task framing and the dependent variables were the pre- and the post-task measured scores of valence, intensity, and the degree of control, respectively. Results indicated that there was no difference between the pre- and the post-task measured scores in all dimensions. Moreover, a main effect of task framing was not found. The results indicate that working on the AUT and task framing do not have any impact to individuals' affect.

Self-rated motivation. Pearson-correlation analysis showed that the pre- and the post-task measured scores for each dimension were significantly correlated. Moreover, significant correlations were found between the different dimensions. Post-task measured enjoyment, for example, was positively and significantly correlated with post-task measured competence and choice, respectively. To assess the differences between the pre- and the post-task measured scores and the effect of task framing, several repeated-measure ANOVAs were conducted with task framing as an independent variable and (pre- & post-task measured) motivation scores as the dependent variables. Analyses indicated that there was no significant difference

between the pre- and the post-task measured scores and the task framing effect was not found in all dimensions. However, a significant interaction effect was found in enjoyment, $F(2, 78) = 4.00$, $p = .022$, $\eta^2 = .093$, and competence, $F(2, 78) = 4.01$, $p = .022$, $\eta^2 = .093$. Further analyses showed that participants in the important task condition reported significantly less enjoyment after completing the task ($M = 3.71$, $SD = 1.04$) than their initial level ($M = 4.33$, $SD = 0.96$). On the contrary, the neutral group reported significantly higher level of competence after completing the task ($M = 4.10$, $SD = 1.09$) than their initial level ($M = 3.72$, $SD = 0.90$).

Task Framing Effect on Creativity and Task Appraisal

Several one-way ANOVAs were conducted to examine the direct effect of task framing on creativity. Prior to that, fluency score was log-transformed because of the high kurtosis (> 2). Results showed that there was no significant difference between the experimental groups (i.e., important & unimportant) and the neutral group in each creativity dimension.

To test whether task framing manipulation has impact on participants' task appraisals (i.e., self-perceived importance of task, self-reported valence, & motivation), several linear regression analyses were conducted with task framing manipulation (dummy coded with the neutral group as the comparison group) as predictors and appraisal factors as the dependent variables. Moreover, for the analyses on self-reported valence and motivation scores, the baseline (i.e., pre-task measured) scores were entered in the first step and predictors were entered in the second step to examine the effect of task framing. Analyses showed that the important task framing significantly predicted self-rated importance of task ($\beta = .58$, $t = 5.49$, $p < .001$), enjoyment ($\beta = -.25$, $t = -2.72$, $p = .008$), competence ($\beta = -.31$, $t = -2.89$, $p = .005$), and tension ($\beta = .23$, $t = 2.38$, $p = .02$), after controlling for the effect of baseline

scores (see Table 7). No significant effect was found for unimportant task framing. The results suggest that, compared to their counterparts in the neutral condition, participants in the important task condition are more likely to perceive the task as important, report less enjoyment and competence, and feel more stressful.

Table 6
Descriptive Statistics for Task Appraisal Factors

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11
1. Importance	4.53	1.49	1										
2. Pre-valence	5.74	1.25	-.11	1									
3. Post-valence	5.85	1.17	-.28*	.68**	1								
4. Pre-Enjoyment	4.32	0.83	-.19	.22	.27*	1							
5. Pre-Competence	3.81	0.90	.10	.39**	.11	.45**	1						
6. Pre-Choice	4.75	0.97	-.17	-.06	-.06	.23*	.02	1					
7. Pre-Tension	2.65	1.02	.03	-.08	-.01	.07	-.02	-.19	1				
8. Post-Enjoyment	4.08	1.12	-.50**	.20	.42**	.68**	.21	.29*	-.03	1			
9. Post-Competence	3.84	1.09	-.33**	.32**	.51**	.53**	.49**	.08	.01	.66**	1		
10. Post-Choice	4.84	1.09	-.36**	.05	.13	.44**	.13	.76**	-.19	.53**	.32**	1	
11. Post-Tension	2.65	1.12	.21	-.09	-.22*	.11	.07	-.04	.64**	-.09	-.26*	-.13	1

Note. Importance: Self-rated importance of task, Pre: Pre-task measured, Post: Post-

task measured. * $p < .05$; ** $p < .01$.

Table 7
Summary of Hierarchical Regression Analyses Predicting Individual's Appraisal
From Task Framing and Pre-Task Measured Appraisal

Predictor	Self-rated importance of task			
	Adjusted R^2	ΔR^2	ΔF	β
Important ^a	.31	.33	18.76***	.58***
Unimportant ^a				.01
Predictor	Self-perceived affect			
	Adjusted R^2	ΔR^2	ΔF	β
Step 1	.45	.46	67.62***	Step 1 Step 2
Pre-affect				.68*** .68***
Step 2	.45	.01	0.65	
Important ^a				-.11
Unimportant ^a				-.05
Predictor	Self-reported motivation: Enjoyment			
	Adjusted R^2	ΔR^2	ΔF	β
Step 1	.45	.46	66.35***	Step 1 Step 2
Pre-enjoyment				.68*** .68***
Step 2	.49	.05	3.99*	
Important ^a				-.25**
Unimportant ^a				-.05
Predictor	Self-reported motivation: Competence			
	Adjusted R^2	ΔR^2	ΔF	β
Step 1	.24	.24	25.54***	Step 1 Step 2
Pre-competence				.49*** .50***
Step 2	.29	.07	4.18*	
Important ^a				-.31**
Unimportant ^a				-.13

Table 7 continued.

Predictor	Self-reported motivation: Choice			
	Adjusted R^2	ΔR^2	ΔF	β
				Step 1 Step 2
Step 1	.57	.58	106.77***	
Pre-choice				.76*** .74***
Step 2	.58	.02	2.10	
Important ^a				-.04
Unimportant ^a				.13

Predictor	Self-reported motivation: Tension			
	Adjusted R^2	ΔR^2	ΔF	β
				Step 1 Step 2
Step 1	.40	.40	53.62***	
Pre-task measured tension				.64*** .61***
Step 2	.43	.04	2.95	
Important ^a				.23*
Unimportant ^a				.06

Note. ^a Reference group is the neutral task condition. * $p < .05$, ** $p < .01$, *** $p < .001$.

Relationship between task Appraisal and creativity

Several hierarchical multiple regression analyses were conducted to examine the effect of participants' task appraisal on each dimension of creativity. Specifically, participants' pre-task measured motivation and valence scores were first entered in the model. Self-rated importance of task and the post-task measured motivation and valence scores were entered in the second step. Finally, the interactions between the (self-rated) importance of task and the post-task measured appraisal (i.e., motivation and valence) were entered in the third step. The interactions between motivation and valence were not considered because, according to participants' self-report, there was no significant difference between the pre- and the post-task measured valence and motivation. Thus, it is assumed that the relationship between valence and motivation has negligible, if not zero, effect on creativity. Results (see Table 8) showed that the main effect of the pre-

task measured enjoyment ($\beta = -0.36, t = -2.04, p = .046$), the post-task measured choice ($\beta = 1.61, t = 3.51, p = .001$), and the Importance \times Choice interaction ($\beta = -2.31, t = -3.37, p = .001$) significantly predicted (log-transformed) fluency.

Flexibility were significantly predicted by the pre-task measured enjoyment ($\beta = -.36, t = -2.17, p = .034$) and competence ($\beta = .36, t = 2.23, p = .029$), self-rated importance of task ($\beta = 1.60, t = 2.05, p = .044$), the post-task measured valence ($\beta = 1.30, t = 2.66, p = .01$) and choice ($\beta = 1.24, t = 2.87, p = .006$), the Importance \times Valence interaction ($\beta = -1.58, t = -2.10, p = .006$), and the Importance \times Choice interaction ($\beta = -1.60, t = -2.48, p = .016$). For originality, a significant effect was found in the self-rated importance of task ($\beta = 2.74, t = 3.35, p = .001$), the post-task measured valence ($\beta = 1.09, t = 2.13, p = .037$) and choice ($\beta = 1.39, t = 3.08, p = .003$), the Importance \times Valence interaction ($\beta = -1.84, t = -2.34, p = .022$), and the Importance \times Choice interaction ($\beta = -2.00, t = -2.96, p = .004$).

Table 8
Summary of Hierarchical Regression Analyses Predicting Creativity From
Individual's Appraisal and Self-Rated Importance of Task.

Predictor	Fluency		Flexibility		Originality	
	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.05		.09		.05	
Pre-Valence		.00		-.11		.12
Pre-Enjoyment		-.36*		-.36*		-.21
Pre-Competence		.17		.36*		-.03
Pre-Choice		.18		.23		.21
Pre-Tension		.04		.16		.03
Step 2	.04		.14		.03	
Importance		1.32		1.60*		2.74**
Post-Valence		.87		1.30*		1.09*
Post-Enjoyment		-1.14		-.80		-.86
Post-Competence		-.41		-.69		.01
Post-Choice				1.24**		
		1.61**				1.39**
Post-Tension		-.30		-.31		.71
Step 3	.19		.13		.21	
Importance \times Post-Valence		-1.22		-1.58*		-1.84*
Importance \times Post-Enjoyment		1.45		1.09		1.06
Importance \times Post-Competence		.57		.58		.13
Importance \times Post-Choice		-		-1.60*		-
		2.31**				2.00**
Importance \times Post-Tension		.52		.25		-.53
Adjusted R^2	.09		.19		.12	

Note. Importance: self-rated importance of task. * $p < .05$, ** $p < .01$, *** $p < .001$.

Mediating effect of self-rated importance of task

The present study found that the important task framing condition significantly predicted the importance of task, and the latter, in turn, significantly predicted flexibility and originality. Moreover, ANOVA analyses showed that there was no significant difference on creativity among the task framing conditions. These results suggest that the important task framing may exert influence on creativity through individuals' appraisal of the importance of task, instead of influencing creativity directly. Preacher and Hayes's (2008) multiple mediation procedure was employed to test the assumed mediating role of the self-rated

importance of task on flexibility and originality respectively. For flexibility, results indicated that the important task framing significantly predicted the self-rated importance of task ($B = 1.85$, $SE = 0.30$, $t = 6.16$, $p < .001$) and the appraisal of importance was marginally significantly associated with flexibility ($B = 0.20$, $SE = 0.10$, $t = 1.97$, $p = .053$). The relationship between the important task framing and flexibility was not significant before ($B = 0.23$, $SE = 0.28$, $t = 0.84$, $p = .40$) and after controlling for the effect of the appraisal of importance ($B = -0.14$, $SE = 0.33$, $t = -0.42$, $p = .68$). Nevertheless, results with 10,000 bootstrapping revealed that the indirect effect of the important task framing on flexibility via the appraisal of importance was significant, with a 95% confidence interval of .004 to .84. For originality, important task framing was significantly associated with the self-rated importance of task, but no other significant relationship was found. In other words, task constructed as important impacts flexibility, but not originality, through individuals' appraisal of how important the task is (see Figure 5).

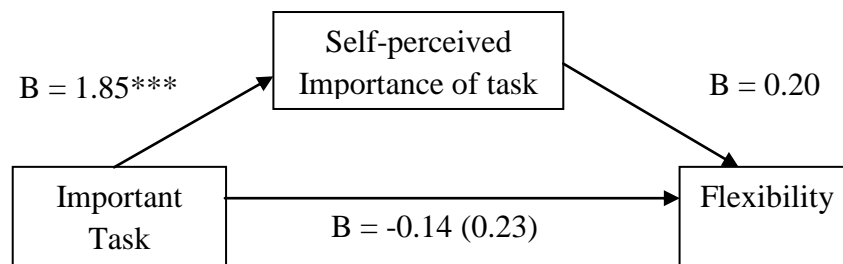


Figure 5. The mediation effects of self-perceived importance of task on the relationship between important task framing condition and flexibility. The unstandardized coefficient for the total effect (path c) was shown in parenthesis. *** $p < .001$.

Discussion

This study examined the relationships among the task feature (indexed by task framing), individuals' appraisal, and creativity. In particular, the current study examined whether task constructed as important have any (direct) influence on

creativity and whether this relationship is mediated by appraisal, which is characterized by the self-rated importance of task, valence, and motivation.

The hypothesis that task framing has a direct impact on creativity was not supported. In other words, participants performed equally in the important and other (unimportant and neutral) task conditions. There are, at least, two possible reasons responsible for this result. One possibility is that the task framing method used in the current study is not effective in manipulating task construal. Another possibility is that task construal does not influence creativity directly as expected but indirectly through other variables, such as self-appraisal. The first explanation seems less plausible because, as discussed above, participants in the important task condition reported that they perceived the task as more important after the task framing manipulation. Moreover, when task constructed as important, participants were more likely to perceive the task as important and reported more tension, less enjoyment, and less competence, after controlling for the effect of the initial level of appraisal. The results indicate that the task framing manipulation is successful in leading participants to perceive the task as crucial and in changing their motivation, and these changes mediate the effect of the task framing manipulation on creativity.

By using a repeat-measured design, the current study showed that participants' appraisal of the task was related to creativity. Interestingly, results indicated that, after controlling for the effect of baseline scores, individual's appraisal exerted different impacts on each dimension of creativity. For example, the self-reported valence and the importance of task significantly and positively predicted flexibility and originality but not fluency, whereas the pre-task measured enjoyment predicted fluency and flexibility. On the contrary, the interaction effect of the self-reported importance and choice significantly predicted all the

dimensions of creativity. The findings suggest that individuals' appraisal has an influence on creativity in overall, but the effects are diverse and some of them are only applicable to a particular aspect of creativity. The results partly replicate the findings of Study 1 in which negative appraisal is conducive to originality in the positive affect condition but is detrimental to fluency and flexibility when negative affect had been induced.

As discussed above, the important task framing is significantly related to appraisal and appraisal is able to predict specific dimension of creativity. These findings provide an initial support to test the hypothesized mediating role of appraisal (i.e., self-reported importance of task) on the task feature-creativity link. Results indicated that the mediation model was not fully supported, though the relationship was in the expected direction. More importantly, the indirect effect of the important task framing on flexibility via the perceived importance of task was found. The finding is noteworthy because it shows preliminary evidence that task framing may not directly influence creativity as previously assumed but through individual's subjective perception of how important the task is. Therefore, the findings of the current study are consistent with the hypothesis that individuals may change their appraisal in terms of the way they interpret the task. The changes of appraisal, in turn, promote creative performance. The current study not only lends support to the notion that the features of task have impact on individuals' appraisal, but also contributes to the literature by showing that the features of task do not directly influence creativity as assumed but through other factors, such as the extent to which participants think the task is important.

Limitations and Future Directions

Several limitations of the current study should be addressed. First, data indicated that the task construal manipulation via task framing did not have an impact on creativity directly. The design of the study is not able to offer a plausible explanation for the insignificant relationship. Nevertheless, based on the data, it is hypothesized that individual's motivation on the task may be responsible for the degradation of the task framing effect on creativity. The reason is that participants who dealt with task constructed as important reported less motivation (i.e., less interest and competence) than their counterparts. According to literature on creativity, motivation is one of the critical factors that may influence creativity. In general, people with low motivation are more likely to be less creative than those with high motivation (Amabile, 1983). Hence, it is possible that the important task framing decreases motivation, and the low motivation interferes with the facilitation effect of the important task framing on creative performance. Future studies are necessary to examine if this conceptual relationship might account for the insignificant finding of the current study. Moreover, it is important to note that there could be other possibilities for not able to observe the direct effect of task framing. For example, there was no significant difference between the valence levels measured before and after the AUT, suggesting that task framing may only effective to a part of, but not all, measurements of appraisal in the present study. Furthermore, the second measure of appraisal (i.e., motivation and valence) was administered after the AUT. It is possible that, other than the effect of task framing, participants' performance on the AUT may also influence their appraisal. Future studies are suggested to replicate the current study with other task framing methods and to examine the pure effect of task framing on appraisal by

administering the appraisal measurement immediately after the task framing manipulation and before the creativity task. Also, it is worth to investigate whether performance on the creativity task exerts any influences on appraisal in the future research.

Finally, the study only measured participants' affect after the task framing manipulation to assess whether the manipulation changes individuals' affect. Therefore, it is not clear whether individuals' initial affect influences the effectiveness of task framing. One way to test this relationship is by experimentally inducing participants' affect prior to task framing. This design may also examine whether the induced affect interacts with task framing to influence creativity and appraisal. The exploration of this direction is beneficial because Study 1 and the present study showed that both affect and task framing are associated with appraisal and creativity. It is interesting to know whether affect and task framing benefit from (or compete with) each other and exert greater influence on appraisal and creativity. In other words, it provides insight to the compatibility of affect and task framing by examining questions such as whether the facilitation effect of positive affect on creativity is stronger when working on an enjoyable task than an important task. Thus, investigating the interaction between affect and task framing may further expand our understanding of the affect-creativity link.

Although the hypothesized mediating role of individual's appraisal on the relationship between the task feature and creativity is partially supported, the present study provides evidence that task construal, especially when constructing task as important, may influence the way individuals appraise the task and these changes in appraisal may influence creativity. The findings provide insights to the

literature in which people's creativity, to a certain level, is influenced by the way they appraise the task. Researchers are suggested to consider individuals' appraisal in their study of creative performance. In addition, the findings also offer suggestions to the enhancement of creativity at the work place. For example, besides emphasizing on how critical the work is, supervisors should pay attention to individual differences in the appraisal of task when they intend to boost their subordinates' creative performance. More studies, however, are necessary to capture a more comprehensive picture of the relationship between appraisal and creative performance. For instance, future studies can be done to investigate whether individuals' affect will interact with their appraisal and exert different influences on creativity.

Chapter Six

Study 3

Study 1 and Study 2 showed that both experimentally manipulated affect and task construal (via task framing) can influence individual appraisal which, in turn, influences creative performance. However, it is important to note that the previous two studies investigated the impact of affect on appraisal and the impact of task construal on appraisal solely. Given that both affect and task construal may influence self-appraisal, it is assumed that affect and task construal may interact with each other. Indeed, literature suggests that task construal moderates the influence of affect on creative performance.

As discussed in Chapter 2, the mood-as-input model (Martin & Stoner, 1996; Martin et al., 1993) sheds light on the unique relationship between affect and creativity. According to the mood-as-input model, affect conveys a different meaning and the effects of these signals are not general but context-dependent. That is, the impact of affect on performance depends on how people interpret the signals conveyed by the affect. As hypothesized, Martin and colleague (1993) found that individuals who experienced the same affect reacted differently depending on the instruction they received. Specifically, when individuals were instructed to ask themselves whether they have achieved their goal in a task, people with positive affect would agree that they have fulfilled the goal, whereas people with negative affect would disagree. As a result, people with positive affect would complete the task sooner than their counterparts with negative affect. Indeed, the latter would continue doing the task in order to pursue their goals. In contrast, when individuals were asked whether they enjoy the task, people with positive affect were still more likely to agree compared to those with negative affect.

However, compared to the latter, people with positive affect would persist longer on the task. The reason is that positive affect signals people that they are enjoying the task and hence, motivates them to continue doing the task. On the contrary, negative affect signals people that they are not enjoying the task and thus, leading people to stop doing the task.

Why do people react differently to the same affect? Martin and colleagues explained that “with different interpretations, the same affect can have different motivation effects” (Martin et al., 1993, p. 318). That is to say, affect may serve as a source for other processes and determine individuals’ motivation towards their task. Similarly, Friedman and colleagues (2007) indicated that affect has significant influence on individuals’ motivation. In particular, positive affect signals safety and/or satisfaction and motivates people to explore for stimulation and maximize incentives (i.e., having fun); whereas negative affect implies that the current situation is problematic and motivates people to work harder and to get rid of this dissatisfaction. Because of these differences, Friedman and colleagues predicted that affect is conducive to creative performance when affect is motivationally compatible with the task. The motivational compatibility refers to the way individuals perceive the task (i.e., task construal) they are dealing with is congruent with the motivational signal conveyed by the affect they experience, such as working on a fun task when experiencing positive affect. In their study, Friedman and colleagues investigated the motivational compatibility approach by examining the effect of induced affect on tasks framed as either fun or serious. As predicted, participants demonstrated high creativity when affect and task construal were compatible in motivation, for instance, working in a serious task while experiencing negative affect. Friedman and colleagues also examined the

participants' interest in engaging with fun activities (e.g., hearing a good joke) or somber activities (e.g., listening to a sad song), and their motivation and liking of the task. Consistent with their hypothesis, participants with positive affect showed more interest in fun activities compared to somber activities, and reported higher motivation and liking for tasks framed as fun compared to tasks framed as serious. The results suggest that people tend to have higher motivation when working on tasks that are compatible with their affective states, and have lower motivation when tasks and affective states are incompatible. In other words, motivation may mediate the influence of Affect \times Task construal interaction effect on creative performance.

Despite Friedman and colleagues' (2007) findings supported the motivational compatibility approach, the role of motivation in the relationship between affect and appraisal of task still remains open. There are, at least, two questions that deserve attention. First, it is not clear on how and what aspect of motivation contributes to the enhancement of creativity. Motivation is multidimensional (Ryan & Deci, 2000, 2007) but Friedman and colleagues only tapped on general motivation. Thus, little is known about what particular aspect of motivation mediates the relationship and whether the mediating role of motivation can continue to emerge when focusing on specific dimensions of motivation, instead of general motivation. Second, perhaps the most important is that whether there are factors other than motivation that may mediate the relationship. Research on motivation has documented that people with high motivation tend to spend more time on tasks (Flores, Ari, Inan, & Arslan-Ari, 2012; Singh, Granville, & Dika, 2002). Therefore, it is possible that motivation is conducive to performance simply because individuals with higher motivation devote more effort to the task than

their counterparts with lower motivation. Thus, it is theoretical important to know whether there are other mediators in the effect of motivational compatibility. One way to answer this question is to control the effect of motivation and see if the compatibility effect will continue to exist. If the motivational compatibility effect does not emerge after motivation is being controlled, the result may support the notion that motivation is the key mediator in the relationship. On the contrary, if the effect continues to occur, it suggests that other factors may play a significant role on the facilitative effect of compatibility. In that case, the term motivational compatibility is not adequate and comprehensive enough to reflect the whole picture of the mechanism. It is then necessary to first investigate factors that may play a role in the compatibility effect, study the underlying mechanism, and update the term accordingly. Given that the compatibility effect mainly relies on affect and task construal and, as revealed in Study 1 and Study 2, appraisal mediates the influence of affect and task construal on performance, it is hypothesized that appraisal is a potential mediator and argued that affect-appraisal compatibility approach is a more appropriate term to capture the idea of the compatibility effect.

Taken together, the purpose of this study is threefold. First, the present study aims to examine the influence of experimental manipulation of affect and task construal (via task framing) on motivation. Unlike Friedman and colleagues' study (2007) that assessed only participants' motivation after they underwent manipulation, the current study measures individuals' motivation at the very beginning and after completing a creativity task to capture the fluctuation of motivation. Assessing participants' motivation twice may reveal the extent to which people are motivated by the affect and task framing manipulations. Second, given that motivation is multidimensional (Ryan & Deci, 2000, 2007) and it is

insufficient to just tap on the general surface of the construct, the present study takes a step further to expand the understanding of the role of motivation on the compatibility approach by measuring different dimensions of motivation (e.g., perceived competence, perceived choice). Expanding the measurement of motivation may allow us to understand the aspects of motivation that are influenced by the manipulation of affect and task framing, and the particular aspect that is conducive to creativity. Finally, the present study examines the mediating role of motivation on the compatibility approach. Although Friedman and colleagues (2007) have provided evidence that self-reported task motivation and liking of a task mediate the relationship between the interaction effect of affect and task framing and creativity respectively, it is possible that there could be other mediators. On the basis of the findings of Study 1 and Study 2, it is believed that self-appraisal plays a significant role on the compatibility approach. In other words, it can be hypothesized that the facilitative effect of compatibility between affect and task construal will continue to emerge even the effect of motivation was controlled.

In addition to the aforementioned three goals, the present study also aims to examine the generalization of the findings derived from AUT. Specifically, AUT was the only instrument used in the previous two studies to measure participants' creativity. Someone may argue that the findings derived from the two studies may be due to the measurement effect and challenge the generalizability of the findings to other creativity measurements. Therefore, to rule out these confounding explanations (e.g., the facilitation effect on creativity revealed in previous studies only occur in AUT), another creativity measurement, Similarities task, was adapted in the current study.

Method

Participants and Design

Participants included 180 undergraduate students (half of them were female) who received extra course credits for participating in the study. Twelve participants who reported extreme affect (suggesting insufficient affect induction) and two participants who spent less than 10s on AUT (suggesting not giving attention to the task) were excluded from further analysis. The mean age of the 166 participants was 21.79 ($SD = 1.54$). Participants were randomly assigned to the conditions of a 3 (affect: positive vs. negative vs. neutral) \times 2 (task framing: enjoyable game vs. important task) between-subject factorial design. Dependent variables included creativity (fluency, flexibility, & originality), motivation and time spent on task.

Instruments

Affect induction and measurement. Video clips that had been validated in Study 1 were used to elicit positive, negative, and neutral affect. However, unlike Study 1, participants in each affect condition watched two video clips to ensure the sufficiency of eliciting corresponding affect. To check the manipulation effect, participants were instructed to indicate their feeling after watching the clips on five emotion icons (*1: very sad, 5: very happy*) and the intensity of the feeling on a 7-point likert scale (*1: very weak, 7: very strong*).

Evaluation of motivation. As in Study 2, participants' motivation was assessed by the 22-item TEQ. Similarly, TEQ was administered twice to capture the fluctuation of self-perceived motivation (i.e., enjoyment, competence, choice, and tension) after completing the creativity task. The reliability (Cronbach alpha)

of the four subscales ranged from .72 (tension) to .91 (enjoyment) for the pre-task measured scores and from .78 (choice) to .95 (enjoyment) for the post-task measured scores.

Evaluation of creativity. As in Study 2, AUT (Wallach & Kogan, 1965) was adopted to measure participants' creativity level. Respondents were instructed to generate as many uses as possible for two common objects (paper and chair). An example item of the AUT is "Think about different ways you can use a chair".

Similarities Task (ST) derived from Wallach and Kogan's (1965) creativity tests served as a control creativity task in this study. There were two items and respondents were instructed to list out as many similarities between the two specified objects as possible. Because the original objects in Wallach and Kogan's (1965) study are specific towards children and some of them (e.g., typewriter) are not common nowadays, the present study used objects that are familiar to undergraduate students. An example item of the task is "List all the ways that computers and mobile phones are alike".

Each item of the AUT and ST were scored for fluency (number of total responses), flexibility (number of categories), and originality (frequency of occurrence). The flexibility and originality scores were rated by both researcher and an independent rater who was blind to the hypothesis and the experimental conditions. For the AUT, flexibility scores were first computed in terms of the coding schemes used in Study 2, then validated by asking the independent rater to judge half of the responses (randomly selected) of the two items respectively. The inter-rater reliabilities measured by Pearson correlation and intraclass correlation

were .65 ($p < .001$) and .68 (95% confidence interval 0.41-0.81) for the paper and .84 ($p < .001$) and .90 (95% confidence interval 0.85-0.93) for the chair. The two (item) scores were then averaged to indicate participants' overall flexibility. Furthermore, the independent rater and the researcher rated all responses to compute originality scores for each item. The inter-rater reliabilities measured by Pearson correlation and intraclass correlation were .87 ($p < .001$) and .93 (95% confidence interval 0.90-0.95) for the paper and .74 ($p < .001$) and .82 (95% confidence interval 0.71-0.89) for the chair. Given that the two ratings were consistent, the scores were averaged to represent individual's originality on each item. Participant's overall originality in the AUT was derived by averaging the two items scores.

A similar procedure was conducted to evaluate participants' flexibility and originality in the ST. The inter-rater reliabilities for the two items were relatively high. For flexibility, the Pearson correlation and intraclass correlation were .90 ($p < .001$) and .95 (95% confidence interval 0.93-0.96) for question1 (computer & mobile phone), and were .95 ($p < .001$) and .98 (95% confidence interval 0.97-0.98) for question 2 (restaurant & supermarket). For originality, the Pearson correlation and intraclass correlation were .86 ($p < .001$) and .91 (95% confidence interval 0.88-0.94) for question1, and were .86 ($p < .001$) and .92 (95% confidence interval 0.89-0.94) for question 2.

Procedure

Upon the participants' arrival, participants were assigned to an individual cubicle equipped with a computer. After informed consent was completed, participants answered the first TEQ to measure their baseline motivation. Participants were randomly assigned to one of three affect conditions (i.e., positive,

negative, and neutral) and watched two video clips that correspond to their condition. After watching the video clips, participants answered the two items for affect induction checking, followed by the first creativity measurement (i.e., AUT). The AUT was depicted as a game to half of the participants in each affect condition (enjoyable condition). The other half was told that the AUT is an assessment that relates to their future achievement (important condition). In both conditions, participants were instructed to generate as many uses for two common objects as possible in 20 mins (i.e., 10 mins per item). After that, participants answered the second TEQ, a demographic questionnaire, and the second creativity task (i.e., ST). Participants were then debriefed, thanked, and dismissed. The study took approximately 60 minutes to complete. Figure 6 diagrammatically depicts the procedure of the study.

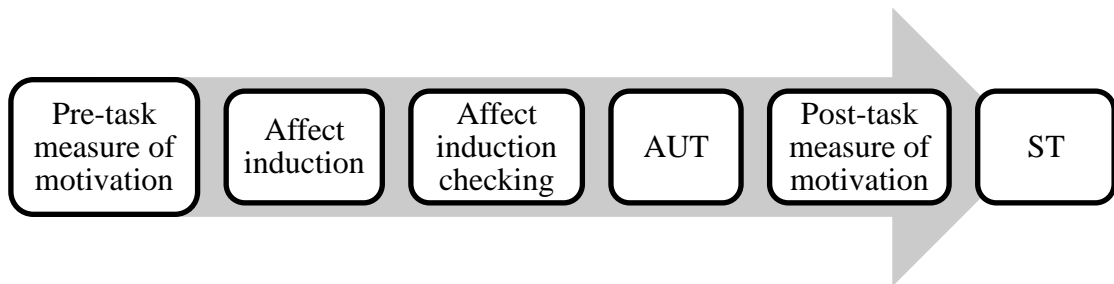


Figure 6. Procedure of Study 3

Results

Affect Manipulation Checking

A 3 (affect: positive vs. negative vs. neutral) \times 2 (gender) ANOVA was conducted to examine the effectiveness of video clips in inducing affect. Results showed a main effect of affect, $F(2, 160) = 290.04$, $p < .001$, $\eta^2 = .784$. Post-hoc test with Tukey's HSD at $p < .05$ revealed that participants who watched amused video clips reported significantly higher score ($M = 4.36$, $SD = 0.64$) than those

who watched sad ($M = 1.83$, $SD = 0.56$) and neutral video clips ($M = 3.44$, $SD = 0.50$). In addition, the negative affect group showed a significantly lower score (i.e., higher negative ratings) than the neutral group. Other effects were not noted. The results suggest that the affect induction was successful.

Intensity of Affect

A 3 (affect) \times 2 (gender) ANOVA on intensity of the induced affect only revealed a main effect of affect, $F(2, 160) = 9.42$, $p < .001$, $\eta^2 = .105$. Post-hoc test with Tukey's HSD showed that participants who watched amused video clips reported significantly more intense affect ($M = 5.73$, $SD = 0.85$) than participants who watched sad ($M = 5.12$, $SD = 0.95$) and neutral video clips ($M = 5.10$, $SD = 0.90$). Nevertheless, the result of a one-sample t-test comparing the mean score of the positive affect group with 6 (i.e., strong) indicated that the intensity of positive affect was significantly lower than the latter, $t(58) = -2.46$, $p = .02$, suggesting that the positive affect was not too strong but rather moderate.

Time Spent on Task

The time spent on the two AUT items were highly correlated, $r(164) = .903$, $p < .001$, and thus, were averaged and log transformed (because of positive skewness) for further analysis. A 3 (affect) \times 2 (task framing: enjoyable vs. important) \times 2 (gender) ANOVA revealed a main effect of task, $F(1, 154) = 10.12$, $p = .002$, $\eta^2 = .062$. Post-hoc analysis showed that participants in the important condition ($M = 2.19$, $SD = 0.31$) spent more time on the task than their counterparts in the enjoyable condition ($M = 2.05$, $SD = 0.28$). In addition, the correlation analysis showed that the amount of time spent on the task was significantly related to all creativity scores ($ps < .001$). The coefficients ranged from .426 (originality) to .555 (flexibility). Similarly, the time spent on the two ST items were also

averaged and log transformed because of a high correlation, $r(164) = .763$, $p < .001$, and positive skewness. A $3(\text{affect}) \times 2(\text{task framing}) \times 2(\text{gender})$ ANOVA revealed a main effect of task, $F(1, 154) = 7.15$, $p = .008$, $\eta^2 = .044$, indicating that participants in important task condition ($M = 2.17$, $SD = 0.28$) spent significantly more time on the task than their counterparts ($M = 2.06$, $SD = 0.28$). Again, it was found that the time individuals spent on the task were significantly correlated with their creativity scores ($ps < .001$). The coefficients ranged from .395 (fluency) to .629 (flexibility).

Task Motivation

Participants' motivation was measured by four dimensions: interest/enjoyment, perceived competence, perceived choice, and pressure/tension. To understand the changes of motivation, the measurement was administered twice: at the beginning of the study (i.e., before watching video clips) and after completing the AUT. Table 9 shows that the pre- and post-task measured scores for the four dimensions were significantly correlated. Several paired-sample t-tests were then conducted to further examine whether the pre- and post-task measured motivation scores differ from each other. The analyses revealed that participants perceived significantly more interest, competence, and choice at the beginning of the study than after completing the AUT, $ts > 3.68$, $ps < .001$. In addition, participants perceived less tension at the beginning of the study than after completing the AUT though the difference was marginally significant, $t(165) = 1.97$, $p = .051$.

Table 9
Correlation between Pre- and Post-task Measured Motivation

	1	2	3	4	5	6	7	8
1 Pre I/E	1							
2 Pre PCo	.656**	1						
3 Pre PCh	.462**	.127	1					
4 Pre P/T	-.354**	-.298**	-.271**	1				
5 Post I/E	.328**	.212**	.208**	-.102	1			
6 Post Pco	.400**	.481**	.104	-.150	.688**	1		
7 Post PCh	.257**	.047	.568**	-.153*	.542**	.298**	1	
8 Post P/T	-.071	-.056	-.200*	.520**	-.095	-.153*	-.181*	1

Note. Pre I/E: Pre Interest/Enjoyment, Pre PCo: Pre Perceived Competence, Pre PCh: Pre Perceived Choice, Pre P/T: Pre Pressure/Tension, Post I/E: Post Interest/Enjoyment, Post PCo: Post Perceived Competence, Post PCh: Post Perceived Choice, Post P/T: Post Pressure/Tension. * $p < .05$, ** $p < .01$

A multivariate analysis of variance (MANOVA) with affect, task framing, and gender as independent variables and pre-task measured motivation scores as dependent variables, was conducted to examine whether there is any difference in baseline motivation in each condition. Results revealed that there was a significant multivariate effect of gender, Wilks' Lambda = .94, $F(4, 151) = 2.48$, $p = .046$, $\eta^2 = .062$. The univariate analysis showed that gender significantly predicted the level of perceived competence, $F(1, 154) = 6.12$, $p = .014$, $\eta^2 = .038$. The result indicates that, as opposed to female participants ($M = 3.76$, $SD = 1.0$), male participants ($M = 4.16$, $SD = 0.97$) tended to perceive themselves having a higher level of competence at the task. Aside from this, no other effect was found.

Due to the fact that pre- and post-task measured motivation scores were significantly correlated, a multivariate analysis of covariance (MANCOVA) was conducted to examine the effects of independent variables (affect, task framing, and gender) on post-task measured motivation while controlling for the influence of initial motivation. Multivariate tests showed that, after controlling for the effect of pre-task measured motivation, there were significant effects of task framing,

Wilks' Lambda = .85, $F(4, 147) = 6.49$, $p < .001$, $\eta^2 = .15$; gender, Wilks' Lambda = .916, $F(4, 147) = 3.35$, $p = .012$, $\eta^2 = .084$; and Affect \times Gender, Wilks' Lambda = .90, $F(8, 294) = 2.0$, $p = .047$, $\eta^2 = .052$, on post-task measured motivation. Tests of between-subject effects revealed that task framing had significant effect on interest, $F(1, 150) = 16.63$, $p < .001$, $\eta^2 = .10$; competence, $F(1, 150) = 13.84$, $p < .001$, $\eta^2 = .084$; and choice, $F(1, 150) = 6.87$, $p = .01$, $\eta^2 = .044$. Further analyses showed that, relative to their counterparts in the enjoyable condition, participants in the important condition perceived significantly more interest ($M_{\text{important}} = 4.32$, $SD = 1.30$ vs. $M_{\text{enjoyable}} = 3.48$, $SD = 1.13$), competence ($M_{\text{important}} = 3.97$, $SD = 1.12$ vs. $M_{\text{enjoyable}} = 3.32$, $SD = 1.04$), and choice ($M_{\text{important}} = 4.59$, $SD = 1.17$ vs. $M_{\text{enjoyable}} = 4.18$, $SD = 1.13$), after completing the AUT. Moreover, there was a main effect of gender on competence, $F(1, 150) = 9.06$, $p = .003$, $\eta^2 = .057$. Specifically, male participants perceived themselves to have a higher competence level at task ($M = 3.96$, $SD = 1.10$) than female participants ($M = 3.36$, $SD = 1.03$). There was also a significant Affect \times Task framing effect on choice, $F(2, 150) = 4.63$, $p = .011$, $\eta^2 = .058$. Further analyses revealed that participants in the important task condition perceived significantly higher level of choice than their counterparts in the enjoyable task condition in both positive affect, $M_{\text{important}} = 4.78$ ($SD = 1.22$) vs. $M_{\text{enjoyable}} = 4.01$ ($SD = 1.22$), $t(57) = 2.40$, $p = .019$, $d = 0.63$, and neutral affect condition, $M_{\text{important}} = 4.95$ ($SD = 1.10$) vs. $M_{\text{enjoyable}} = 3.91$ ($SD = 1.07$), $t(46) = 3.30$, $p = .002$, $d = 0.96$. In the important task condition, participants in the neutral affect condition were found to perceive significantly higher level of choice ($M = 4.59$, $SD = 1.17$) than those in the negative affect condition ($M = 4.16$, $SD = 1.07$).

Creativity

Creativity was measured by AUT and ST and both tasks were scored for fluency, flexibility, and originality. Table 10 shows the descriptive statistics for and correlation between the creativity scores for each task. The correlations among the creativity scores of the two measurements were all significant, ranging from .252 to 1, $ps < .01$, suggesting that the AUT is a valid measurement of creativity.

Table 10
Means and Standard Deviations for and Correlations between Creativity Scores

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Fluency AUT ^a	2.53	0.66	1					
2. Originality AUT	0.59	0.11	.576**	1				
3. Flexibility AUT	4.09	1.44	.826**	.634**	1			
4. Fluency ST ^a	2.53	0.66	1**	.583**	.835**	1		
5. Originality ST	0.72	0.08	.496**	.252**	.475**	.503**	1	
6. Flexibility ST	4.64	1.87	.567**	.497**	.598**	.578**	.698**	1

Note. AUT: Alternate Uses Test; ST: Similarities Tasks. ^a Square-root transformed.

* $p < .05$, ** $p < .01$

The three creativity indexes of AUT were submitted to a 3 (affect) \times 2 (task condition) \times 2 (gender) ANOVA¹ respectively. The fluency scores (i.e., total responses generated by participants) were square-root transformed because it was highly skewed. Results revealed that there was a main effect of task on the fluency score, $F(1, 154) = 10.55$, $p < .001$, $\eta^2 = .064$. Participants in the important task condition ($M = 2.68$, $SD = 0.71$) were more fluent than their counterparts in the enjoyable task condition ($M = 2.37$, $SD = 0.57$). The main effect, however, was

¹ Several regression analyses were conducted to examine the role of intensity of the valence on creativity. The outcome variables were creativity scores (i.e., fluency, flexibility, and originality) and the predictors were intensity score, task framing (enjoyable condition as reference group), and gender (male as reference group). The three predictors were first entered, while the two-way interaction and three-way interaction effect were entered in the second and third step, respectively. Neither the predictor nor the interaction effect was found to have impact on creativity.

qualified by the Affect \times Task interaction, $F(2, 154) = 3.94, p = .021, \eta^2 = .049$. Further analyses showed that, in the negative affect condition, participants in the important task condition ($M = 2.81, SD = 0.66$) generated significantly more responses than their counterparts in the enjoyable task condition ($M = 2.29, SD = 0.44$), $t(57) = 3.479, p = .001, d = 0.93$. A similar result was found in the neutral affect condition: $M_{\text{enjoyable}} = 2.24 (SD = 0.60)$ vs. $M_{\text{important}} = 2.81 (SD = 0.70)$, $t(46) = 2.668, p = .011, d = 0.87$. Aside from the above, no other effects were noted. In regard to the flexibility, there was only a main effect of task, $F(1, 154) = 15.50, p < .01, \eta^2 = .091$. Participants in the important task condition ($M = 4.52, SD = 0.15$) generated more diverse ideas than their counterparts in the enjoyable task condition ($M = 3.67, SD = 0.15$). Similarly, ANOVA on originality only found a main effect of task, $F(1, 154) = 7.65, p = .006, \eta^2 = .047$. Participants in the important task condition ($M = 0.61, SD = 0.09$) generated more novel responses than did their counterparts in the enjoyable condition ($M = 0.57, SD = 0.12$).

As for the ST, the fluency score was also square-root transformed (because of highly skewed data). It was then submitted to a 3 (affect) \times 2 (task condition) \times 2 (gender) ANOVA. Analysis showed that participants who completed the task in the important task condition ($M = 2.68, SD = 0.70$) generated more responses than participants in the enjoyable task condition ($M = 2.37, SD = 0.57$), $F(1, 154) = 10.87, p = .001, \eta^2 = .066$. The main effect of task, however, was qualified by Affect \times Task interaction, $F(2, 154) = 3.89, p = .023, \eta^2 = .048$. Further analyses revealed that in the negative affect condition, participants in the important task condition ($M = 2.81, SD = 0.66$) generated significantly more responses than their counterparts in the enjoyable task condition ($M = 2.29, SD = 0.44$), $t(57) = 3.479, p = .001, d = 0.93$. A similar result was found in the neutral affect condition,

$M_{\text{important}} = 2.75, SD = 0.70; M_{\text{enjoyable}} = 2.24, SD = 0.60; t(46) = 2.668, p = .011, d = 0.78$. Aside from the above, no other effect was noted. Also, significant difference was not found in both flexibility and originality.

Testing Motivational Compatibility

Prior to examining the role of motivation in motivational compatibility, several hierarchical multiple regressions were conducted to evaluate the impact of motivation on creativity. The outcome variables were creativity scores (i.e., fluency, flexibility, and originality) and the predictors were motivation scores. The pre-task measured motivation scores were entered in the first step to control for their impacts, while the post-task measured motivation scores were entered in the second step. Results showed that the pre-task measured tension and the post-task measured competence significantly predicted fluency ($\beta = -.19, t = -1.99, p = .048$ for tension; $\beta = .26, t = 2.18, p = .031$ for competence). Similar results were also found in the regression on flexibility. However, only the post-task measured competence was found to be significant ($\beta = .32, t = 2.63, p = .01$). No significant result was found in regard to originality.

A series of 3 (Affect) \times 2 (Task Framing) \times 2 (Gender) analyses of covariates (ANCOVAs), with the particular motivation scores that were found to have an impact on creativity as covariates, were conducted on each creativity score to examine whether the motivational compatibility effect continues to occur when the effect of motivation is controlled. For example, the post-task measured competence and the pre-task measured tension were entered as covariates when examining the effect of the three independent variables on fluency. Analysis found that there was a main effect of task framing, $F(1, 152) = 4.41, p = .037, \eta^2 = .028$, and the covariate of competence, $F(1, 152) = 9.95, p = .002, \eta^2 = .06$. Participants

who answered the AUT constructed as important ($M = 2.68$, $SD = 0.71$) significantly outperformed their counterparts ($M = 2.37$, $SD = 0.57$) who answered the AUT constructed as enjoyable. The main effect of task framing, however, was qualified by the interaction effect of affect and task framing, $F(2, 152) = 5.26$, $p = .006$, $\eta^2 = .065$. Further analyses showed that, when negative affect had been induced, participants in the important task condition ($M = 2.81$, $SD = 0.66$) generated significantly more responses than their counterparts in the enjoyable task condition ($M = 2.29$, $SD = 0.44$), $t(57) = -3.48$, $p = .001$, $d = 0.93$. Similarly, in the neutral affect group, participants in the important task condition ($M = 2.75$, $SD = 0.70$) also generated significantly more responses than their counterparts in the enjoyable task condition ($M = 2.24$, $SD = 0.60$), $t(46) = -2.67$, $p = .011$, $d = 0.78$.

Similar results were found in regard to flexibility. There was a main effect of task framing, $F(1, 153) = 11.17$, $p = .01$, $\eta^2 = .068$, and the covariate of (post-task measured) competence was significant, $F(1, 153) = 11.17$, $p = .001$, $\eta^2 = .068$. Participants in the important task condition ($M = 3.79$, $SD = 1.10$) generated more diverse ideas than their counterparts in the enjoyable condition ($M = 3.28$, $SD = 1.13$). Again, the main effect of task framing was qualified by the interaction effect of affect and task framing, $F(1, 153) = 7.09$, $p = .001$, $\eta^2 = .085$. Further analyses showed that, in the negative affect group, participants in the important task condition ($M = 3.88$, $SD = 1.05$) were more likely to generate diverse responses than their counterparts ($M = 3.00$, $SD = 0.72$), $t(57) = -3.65$, $p = .001$, $d = 0.98$. The same trend was also found in the neutral affect group: $M_{\text{important}} = 4.05$ ($SD = 1.06$) vs. $M_{\text{enjoyable}} = 3.06$ ($SD = 1.23$), $t(46) = -2.95$, $p = .005$, $d = 0.86$. In addition, when given an enjoyable task, participants in the positive affect group ($M = 3.78$, $SD = 1.22$) were significantly more flexible than their counterparts in the negative

affect ($M = 3.00$, $SD = 0.72$) and the neutral affect groups ($M = 3.06$, $SD = 1.23$), $F(2, 78) = 4.34$, $p = .016$, $\eta^2 = .10$. There was no analysis on originality because none of the motivation scores was found to have an impact on originality.

Similarly, several hierarchical multiple regressions were conducted to evaluate the relationship between motivation and creativity measured by the ST. Results indicated that the post-task measured competence significantly predicted fluency ($\beta = .26$, $t = 2.22$, $p = .028$). In addition, both pre- and post-task measured competence also significantly predicted flexibility ($\beta = -.28$, $t = -2.48$, $p = .014$ for pre-task measured competence; $\beta = .43$, $t = 3.66$, $p < .001$ for post-task measured competence) and originality ($\beta = -.27$, $t = -2.38$, $p = .019$ for pre-task measured competence; $\beta = .30$, $t = 2.49$, $p = .014$ for post-task measured competence). Several 3 (Affect) $\times 2$ (Task Framing) $\times 2$ (Gender) ANCOVAs were then conducted to test the motivational compatibility approach when those motivation scores that have an impact on creativity were controlled. The analysis on fluency indicated that there was a main effect of task framing on fluency score, $F(1, 153) = 5.03$, $p = .026$, $\eta^2 = .03$. In particular, participants who completed the task constructed as important ($M = 2.68$, $SD = 0.70$) generated significantly more ideas than their counterparts ($M = 2.37$, $SD = 0.57$). The effect, however, was qualified by the Affect \times Task framing interaction effect, $F(2, 153) = 5.27$, $p = .006$, $\eta^2 = .06$. Further analyses found that participants in the negative/important condition ($M = 2.81$, $SD = 0.66$) outperformed those in the negative/enjoyable condition ($M = 2.29$, $SD = 0.44$), $t(57) = -3.48$, $p = .001$, $d = 0.93$. The same trend was also found in the neutral affect group. Participants in the important task condition ($M = 2.75$, $SD = 0.70$) were more fluent than their counterparts ($M = 2.24$, $SD = 0.60$), $t(46) = -2.67$,

$p = .011$, $d = 0.78$. No significant effect was found in both flexibility and originality.

By inspecting the results discussed above, it was found that task framing manipulation, especially when task constructed as important, leads participants to devote more time to a task. Moreover, the amount of time participants spent on the task is significantly correlated with their performance. The results suggest that the amount of time spent on task may mediate the relationship between task framing manipulation and creativity. Hence, several mediation analyses were conducted to examine the mediating role of time with Preacher and Hayes's (2008) multiple mediation procedure. The predictor was task framing (dummy coded, 0: enjoyable, 1: important), mediator was the (log-transformed) time spent on each creativity task, and the dependent variables were the creativity indexes measured by the two tasks (i.e., AUT & ST). For the AUT, the important task framing manipulation was found significantly related to time spent on task ($B = 0.14$, $SE = 0.05$, $t = 3.05$, $p = .003$), and the latter was significantly related to fluency ($B = 1.27$, $SE = 0.14$, $t = 9.30$, $p < .001$). The significant relationship between task framing and fluency ($B = 0.31$, $SE = 0.10$, $t = 3.11$, $p = .002$) was not found after controlling for the effect of time ($B = 0.13$, $SE = 0.08$, $t = 1.571$, $p = .12$). Moreover, the indirect effect of important task framing on fluency via time was significant with a 95% confidence interval of .07 to .31. These indicate that the amount of time participants assign to the task mediates the relationship between important task framing condition and fluency. A similar trend was found in flexibility (95% confidence interval of .11 to .51) and originality (95% confidence interval of .01 to .04). Figure 7 shows the details of the mediation effect for fluency (Figure 7A), flexibility (Figure 7B) and originality (Figure 7C).

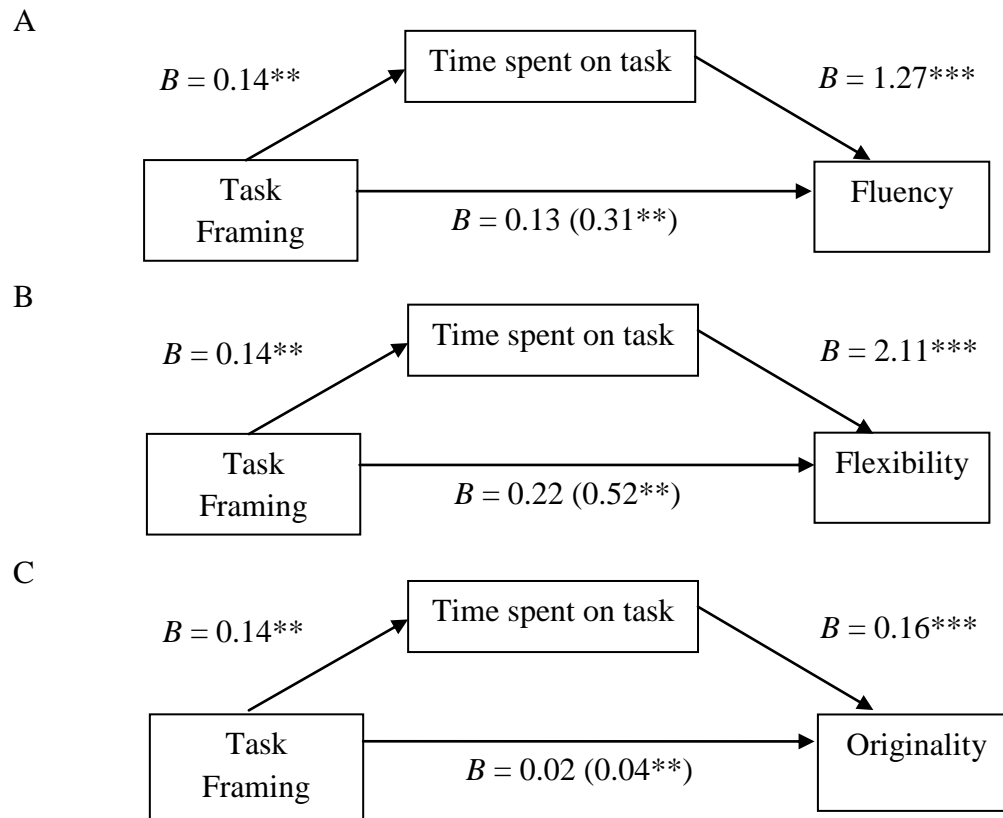


Figure 7. The mediation effects of time on the relationship between task framing and fluency (A), flexibility (B), and originality (C) measured by alternate uses task (AUT). The unstandardized coefficients for the total effect (path c) were shown in parentheses. $**p < .01$, $***p < .001$.

For the ST, the important task framing manipulation was found significantly related to the time spent on task ($B = 0.11$, $SE = 0.04$, $t = 2.54$, $p = .01$), and the latter was significantly related to fluency ($B = 0.96$, $SE = 0.16$, $t = 5.94$, $p < .001$). The significant relationship between task framing and fluency ($B = 0.31$, $SE = 0.10$, $t = 3.16$, $p = .002$) still continued to exist after controlling for the effect of time ($B = 0.21$, $SE = 0.09$, $t = 2.25$, $p = .03$). Nonetheless, the association between task framing and fluency was attenuated and the results showed that the indirect effect of important task framing on fluency via time devoted to the task was significant, with a 95% confidence interval of .03 to .21. These indicate that the amount of time participants assign to a task mediates the relationship between important task framing condition and fluency (measured by ST). The time effect was also

significantly related to flexibility ($B = 4.06$, $SE = 0.41$, $t = 9.90$, $p < .001$), and originality ($B = 0.17$, $SE = 0.02$, $t = 8.73$, $p < .001$). Again, the (direct) associations between task framing and the two indexes of creativity were not significant ($B = 0.45$, $SE = 0.29$, $t = 1.56$, $p = .12$ for flexibility; $B = 0.02$, $SE = 0.01$, $t = 1.49$, $p = .14$ for originality). Nonetheless, the indirect effect of important task framing on flexibility via time devoted to the task was significant with a 95% confidence interval of .12 to .85. A similar trend was also found in originality. The 95% confidence interval for the indirect effect was .005 to .03. Figure 8 shows the details of the mediation effect for fluency (Figure 8A), flexibility (Figure 8B) and originality (Figure 8C) measured by ST.

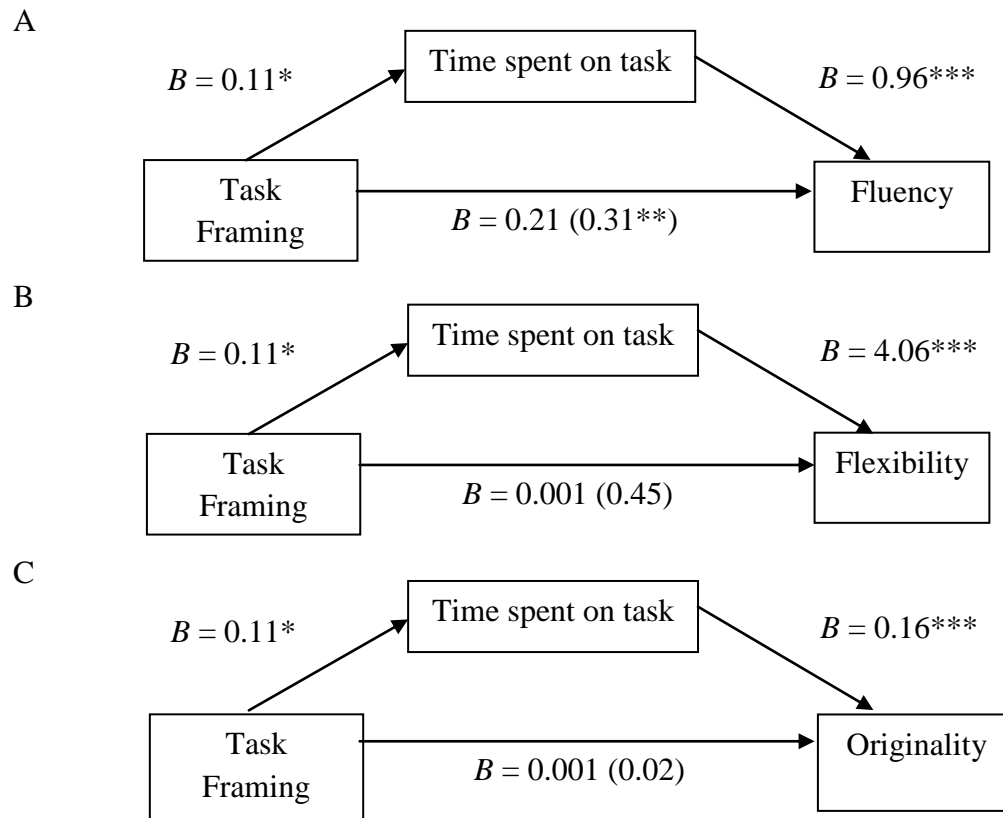


Figure 8. The mediation effects of time on the relationship between task framing and fluency (A), flexibility (B), and originality (C) measured by similarities task (ST).

The unstandardized coefficients for the total effect (path c) were shown in parentheses. $**p < .01$, $***p < .001$.

Discussion

The present study extended previous work on the affect-creativity link by examining the motivational compatibility approach (Friedman et al., 2007).

According to the approach, affect is conducive to task performance when individuals perceive that the task and affect are motivationally compatible.

Specifically, individuals are expected to show high creativity when they are a) experiencing positive affect and given an enjoyable task, or b) in negative affect and instructed to do a serious task. In addition, the present study also examined individuals' motivation and the role of motivation in the hypothesis.

To test the hypotheses, individuals' affect and appraisal were manipulated. Participants' affect (positive, negative, or neutral) was successfully induced by

watching two film clips. Task framing was used to manipulate individuals' appraisal of the task. In particular, the creativity tests were either framed as an enjoyable game or an important task and were scored for fluency, flexibility, and originality.

The present study reveals several interesting findings. First, the facilitation effect of compatibility is replicated. In line with previous findings (e.g., Friedman et al., 2007), affect is found to be conducive to creativity when it is compatible with an individual's appraisal of task. In particular, participants in the negative/important condition outperformed those in the negative/enjoyable condition in both the AUT and the ST. Also, when dealing with an enjoyable task, participants who had been induced with positive affect generated more varied ideas compared to their counterparts in the negative and the neutral affect conditions. The outperformance of the positive/enjoyable condition, however, was only found in the AUT but not in the ST. The findings indicate that task construal (i.e., indexed by task framing) may moderate the facilitation effect of affect on creativity. Specifically, affect is beneficial to creativity only when its motivational signal is compatible with the appraisal of the task.

It is important to note that the facilitation effect of motivational compatibility persists even after controlling for the influence of motivation. The results imply that, in addition to (self-rated) motivation, other factors may also be responsible for the compatibility effect. Future studies are suggested to investigate the potential factors that may play a role in the facilitation effect. Theoretically, the findings contribute to the understanding and the extension of the compatibility approach. For instance, the motivational compatibility approach is somewhat misleading as motivation is not the sole mediator. Affect-appraisal compatibility

approach is suggested because, as discussed, individual appraisal could be the key to the compatibility effect. Findings of Study 1 and Study 2 show that the two main ingredients of the compatibility approach—*affect* and *task construal*—exert influence on creative performance through self-appraisal, suggesting that self-appraisal may mediate the compatibility effect. The findings of the present study, however, are insufficient to offer a direct support of this hypothesis because individual appraisal is not directly examined. Future work should take into account the direct effect of self-appraisal and examine the hypothetical mediating role of appraisal.

Moreover, the main effect of task framing is consistently found in the AUT. Specifically, participants who perceived the task as important are more likely to have a better performance, as opposed to those who deal with an enjoyable game-like task. The main effect, however, was qualified by the interaction between *affect* and *task framing*. Specifically, the facilitation effect of important task framing was found in both negative and neutral affect groups but not in the positive affect group.

In addition, data evidence indicates that task construal (manipulated by task framing) enhances creative performance via the time spent on task. That is, the more time individuals spend on a serious task, the more likely they are to achieve creative ideas. This is in line with previous research findings indicating that time pressure is detrimental to creativity (Amabile et al., 1996; Cheung et al., 2004) and the feeling of having control over time is positively related to creativity (Costa et al., 2001). The replication suggests that time is an essential factor to creative performance. However, little is known about the role of time on the relationship between *affect* and *creativity*. Researchers are encouraged to manipulate the length

of time and investigate whether the time spent on task causes any impact to the facilitation effect of affect on creative performance.

To evaluate the role of motivation in the compatibility approach, the present study examined the fluctuation of motivation by using a within-subject design measuring self-rated motivation. It was found that participants were less motivated (i.e., decrease in interest, competence, & choice) after completing the AUT, compared to the baseline motivation level they reported at the beginning of the experiment. The decreasing of motivation could be due to two possible factors. One is that participants may have felt that they have to participate in the experiment for credit and thus are less motivated to join the study. The task framing manipulation, as revealed in analyses, is also responsible for the changes of motivation. Specifically, participants who completed the AUT framed as a game-like task reported lower level of interest, competence, and choice than their counterparts who were told the performance of the task is critical. This indicates that the enjoyable task framing is somehow detrimental to motivation. Although the result seems to be counterintuitive at first glance, it is consistent with the findings of studies related to goals in which high goals are conducive to performance because people are more willing to spend more effort in difficult but attainable tasks (Chan, 2005; Lau & Li, 1996). In other words, enjoyable task framing leads participants to believe that the task they are going to do is only a game and they are not required to achieve any particular goals. The lacking of goals, therefore, decreases their motivation to spend effort on task.

Finally, replication of the compatibility effect on two creativity tasks provides evidence to the generalizability of the findings. Two different divergent thinking tasks were used in the present study to capture the impact of affect and task

construal on creativity. Results are replicated, though differences have been observed. For instance, the analyses on both tasks showed that in the negative affect group, participants who were informed that performance on the task was important generated more responses than those who were told that the task was just a game. More importantly, the same result was also found in both tasks after controlling for the effect of motivation. The consistent findings provide additional evidence and validation to the findings. Moreover, the consistency also suggests that the interaction effect of affect and task construal can be generalized to other divergent thinking tasks. Note that, however, the facilitation effect of compatibility was not found in flexibility and originality. It remains open whether the compatibility effect only promotes fluency but not other aspects of creativity. Future studies are warranted to investigate this question by using different measurements of creativity and/or different task framing methods.

Limitations and Implications

There are, at least, two limitations that should be addressed when interpreting the findings of the present study. One is that there is no control group in the task framing manipulation. The findings of the effect of task construal were only derived from comparing the enjoyable and the important task framing conditions. Therefore, it is unclear whether individuals who undergo the task framing manipulation would perform differently from people who receive no (task framing) manipulation in creativity and motivation. Also, the current study is not able to assess the effectiveness of task framing without a control group and the corresponding assessment. Nevertheless, self-reporting of task perception in Study 2 indicates that the important task framing manipulation is successful. Moreover, note that the main interest of the current study is to test the motivational

compatibility approach. Therefore, comparing the interaction effect of affect and task construal (manipulated by enjoyable and serious task framing) is adequate for the nature of the study. Even so, the evaluation of efficacy of task framing manipulation through comparing an experimental group with a control group needs further investigation.

Another limitation is the single measurement of motivation (i.e., TEQ). Friedman and colleagues (2007) found that motivation mediates the effect of motivational compatibility (i.e., interaction of affect and task framing) on creativity, indicating that the compatibility increases individual's motivation and the latter, in turn, enhances creative performance. The present study examined the role of motivation on the compatibility in a different direction. Instead of testing the mediating role of motivation, the current study controlled for the effect of motivation and examined whether the impact of motivational compatibility continues to occur. It was found that the compatibility (of affect and task construal) is still conducive to creativity without the influence of motivation. Two possible reasons may account for this finding. One is that, as discussed earlier, factors other than motivation (e.g., self-appraisal) may be involved in the compatibility-creativity link. That is, the motivational compatibility may increase creativity via other factors or the effect of motivation is moderated or mediated by other factors. Another possibility is that the TEQ is a valid and effective measurement of motivation, but it is not comprehensive enough to capture the whole picture of participants' motivation. It is also possible that some of the dimensions of TEQ (e.g., competence, tension) may not benefit from the compatibility, although these dimensions are related to creativity. The use of a single measurement of motivation fails to provide answers towards these potential questions. Future studies are

warranted to use other methods of measurement to replicate the findings and investigate the role of motivation on the relationship between compatibility and creativity.

Despite these limitations, the findings of the current study are useful in two ways. One is the reveal of independent effect of task construal on creative performance. Specifically, the finding is useful to the study of real-world creative performance, such as creativity in workplace where affect manipulation is not as feasible as in the laboratory. Based on the current study findings, it is suggested that constructing the project as a serious task can boost workers' creative performance. Moreover, given that creative ideas are more likely to be generated when individuals spend more time on the task, supervisors are suggested to give more time to subordinates to work on their task. The findings of the facilitation effect of time on creativity may also provide hints to people who are engaged in creative activities or individuals who seek for creative achievements in which practices not only make perfect but also increase the chances to produce diverse and novel ideas, especially when dealing with a serious task.

The compatibility approach provides further insights to the enhancement of creativity. In addition to framing a work as serious, as discussed above, supervisors should also take into consideration employees' affect or emotional feeling when pursuing creative ideas. Data suggest that individuals are prone to be creative when their affect and appraisal of the task are compatible, such as feeling moderately negative while working on a serious task or dealing an enjoyable task with positive feeling. Therefore, it is suggested that managers may adjust the working atmosphere according to the features of work. For instance, if performance on the work is highly critical to the organization, managers should clearly emphasize the

importance of the work to employees and, at the same time, evoke a moderate negative feeling among workers. In addition, the facilitation of the two compatible conditions may also be used in different stages of the process of creation to maximize performance. In particular, at the beginning of the process in which more ideas are needed to increase the chances of getting novel ideas, constructing the work as enjoyable and eliciting positive feeling may facilitate performance, given that positive affect cues more diverse materials and increases associations between different concepts (Isen, 1987, 2008). On the contrary, at the later stage of creation, the goal is to scrutinize all generated ideas in order to find out the original and useful (i.e., workable) ones. In this case, supervisors may emphasize the importance of the task and evoke moderate negative feelings to facilitate detailed and systematic processing (Hirt et al., 1996). The analytical thinking is conducive to decision making and hence enhances the probability to select the most creative ideas.

Chapter Seven

General Discussion

The current thesis hypothesized that both positive and negative affect are influential to creative performance. The impact of affect, however, is found to be a function of an individual's appraisal. Three studies have shown that self-appraisal mediates not only the influence of affect, but also the impact of task context on creative performance. Moreover, it was found that affect and task context may interact with each other and boost creativity when the task is constructed in a manner compatible with the affective signal. The findings suggest that self-appraisal plays a critical role in the enhancement of creativity. The following parts of this chapter discuss the findings of the current thesis and the implications in details, as well as the limitations and the suggestions for future studies.

The Conceptual Role of Self-Appraisal

Decades of studies have shown that affect may influence creativity but the results are controversial (Davis, 2009). For example, while positive affect has been consistently found to facilitate creativity, it has also been found to hinder the generation of the original ideas (George & Zhou, 2002; Kaufmann & Vosburg, 1997). Although the existing theories explain the effect of positive affect, they are insufficient to account for the inconsistent findings. The early works (e.g., the flexibility hypothesis; Isen, 1987, 2008), for example, explained the facilitation effect but not the detrimental effect of positive affect, not to mention the facilitation effect of negative affect. Subsequent theories (e.g., mood-as-input; Martin & Stoner, 1996; Martin et al., 1993) tackle this issue by indicating that the meanings embedded in the affective signals vary from one context to another.

These theories, however, are not sufficient to explain the mechanism that underlies the differences in interpreting the meaning conveyed by the same affective signals.

As a result, the present study integrates the strengths and the weaknesses of the existing theories and proposes a more comprehensive framework. In other words, the present research suggested a theoretical solution to the mixed findings (of the relationship between affect and creativity) by testing the role of self-appraisal. It is believed that individual appraisal may mediate the facilitation effect of affect, not just the motivation derived from the compatibility between mood and task. In particular, it is argued that the different motivational signals (conveyed by affect and task condition) are resulted from individual's self-appraisal. The motivational compatibility between mood (in terms of valence or arousal) and task is not important. The key is that the appraisals of mood and task are compatible. This conceptual idea provides a better explanation to the interaction effect of affect and task than motivational compatibility. For example, self-appraisal explains the reason negative affect and serious task lead people to feel that current situation is problematic and wary of mistake, respectively.

Motivational compatibility of appraisal is more likely to occur in, but not limited to, enjoyable task/positive affect condition or important task/negative affect condition. However, it is important to note that individuals may appraise even the same task differently. For example, when participants learn that their performance of the task may predict their future career achievement, some participants may take the task seriously in order to prove themselves, but others may consider the task as an interesting psychological test. Therefore, it is possible that appraisals of positive affect and important task induce motivational compatibility and in turn, enhance task performance. However, the facilitation

effect will only happen when the appraisal of affect and appraisal of task are congruent, that is, individuals appraise the positive affect indicating the current situation is safe and appraise the important task positively (e.g., it is fun and interesting). In addition, it is worth to note that the two task framing conditions (enjoyable vs. important) only differed in task instruction. Participants' self-report on arousal/intensity did not show difference in the two conditions. Additionally, regression analyses were conducted to examine the impact of arousal on creativity. No significant effect was found. These indicate the facilitation effect observed in the current research is due to valence but not arousal (or intensity). In other words, arousal has no impact on the relationship between affect and creativity.

Consistent with previous literature, these studies have documented that positive affect is conducive to creative performance but the facilitation effect depends on how an individual interprets the affective signal (Study 1) and the task (Study 3). Although the current study did not find that negative affect has a direct impact on creativity, the results indicate that negative affect is conducive to creativity when the task is compatible with the signals embedded in negative affect (Study 3). However, negative affect is found to impair fluency and flexibility via negative appraisal (Study 1).

According to the flexibility hypothesis (Isen, 1987, 2008) and the broaden-and-build theory (Fredrickson, 1998, 2001), positive affect is conducive to creativity because it retrieves intense and diverse information from memory. The abundance of materials allows the connection of different concepts and, in turn, increases the probability of generating new ideas. The facilitation effect of negative affect, however, cannot be explained by these theories.

The facilitation effects of positive and negative affect can be explained by the mood-as-input model (Martin & Stoner, 1996; Martin et al., 1993). According to the mood-as-input model, each affect conveys different signal and it is the subjective interpretation of the affective signal that determines the impact of affect. In other words, the impact of affect is a function of an individual's appraisal. Consistent with the model, the current thesis found that negative affect hinders fluency and flexibility through negative appraisal but improves fluency when people appraise that the task as important (i.e., the important task framing manipulation). The latter also lends support to the motivational compatibility approach (Friedman et al., 2007) and the dual competition model (Pessoa, 2009; Pessoa & Engelmann, 2010) which posits that affect is conducive to performance when it is congruent with (individual's appraisal of) the task and is deleterious to performance when it is irrelevant to the task. Taken together, the results lend support to the theoretical role of self-appraisal. Indeed, it is necessary to include appraisal into the affect-creativity link and the impact of task context on creativity.

Findings and Implications

As mentioned earlier, three studies were conducted to examine the relationship between affect and creativity and the mediating role of appraisal on the affect-creativity link (Study 1), the relationship between task construal and appraisal and the mediating role of appraisal on the effect of task framing on creativity (Study 2), and the interaction effect of affect and task framing on creativity (Study 3).

Some noteworthy findings are revealed in the current thesis. In line with previous studies, Study 1 reveals that positive affect is conducive to creativity. Furthermore, the current results show that individual appraisal mediates the

relationship between affect and creativity. For example, compared to their counterparts with negative affect, students with positive affect reported less negative appraisal and were more likely to demonstrate higher originality. Study 2 examined the relationships among task context (characterized by the task framing manipulation), individual appraisal, and creativity. Results indicate that task framing (i.e., constructing the task as important) does not influence creativity directly but rather through individual appraisal. In particular, linking performance on creativity task and their future career achievement led participants to appraise the task as important and the change of appraisal was positively associated with their performance on the task.

The role of affect and task framing on creativity was considered in Study 3. Consistent with the motivational compatibility approach (Friedman et al., 2007), participants outperform when their appraisal of the task is congruent with the affect they experience. For instance, people who felt negative were more creative when working on the important tasks than the enjoyable tasks. Furthermore, the pilot study shows that six video clips are effective to elicit positive, negative, and neutral affect respectively in the sample. The effectiveness of these video clips is further validated in Study 1.

Theoretically, these findings offer a new insight to the literature on the affect-creativity link; contradictory to the assumption that affect exerts direct influence on performance, the current results indicates that the impact and the signals of affect are subject to individual differences. Specifically, the impact of affect on creativity depends on how individuals appraise the affect and the task. The results lend support to the previous findings that affect has an influence on performance and the meanings of the affective signals vary from one to another (Martin &

Stoner, 1996; Martin et al., 1993). For instance, consistent with previous studies (e.g., Grawitch et al., 2003; Vosburg, 1998a), the present study found that positive affect promotes, but negative affect inhibits, performance. The facilitation of positive affect, however, only exists in enjoyable game-like task, which has less restriction on responses (compared to insight task where only one ideal answer exists) and allows participants to list as many ideas as they can think of. Of additional important, the findings also offer a potential explanation to the mixed findings that were found in past studies (e.g., Akinola & Mendes, 2008; George & Zhou, 2002; Kaufmann & Vosburg, 1997), such as negative affect was found to enhance performance. According to the findings of the present study, negative affect is conducive to performance because participants in those studies were led to believe that they were dealing with a serious task (e.g., his or her performance is highly emphasized and/or quality of the response is critical). Appraising a task as serious is congruent with the signal of negative affect and this compatibility will direct individuals to devote effort to the task. Similarly, this compatibility approach also accounts for the negative impact of positive affect that was documented in literature (e.g., Kaufmann & Vosburg, 1997; Melton, 1995). For example, the impairment of positive mood on problem solving performance in Kaufmann and Vosburg's (1997) study is possibly due to participants were given a serious, demanding insight task that requires ideal solution. The incompatibility between individual's appraisal (of the task) and signal of positive mood interferes participants and, in turn, results in the low performance. Taken together, the findings suggest that it is necessary for future studies to examine the role of individual appraisal, rather than just focusing on the direct impact of affect. Also, practical implications can be suggested towards creativity enhancement based on

these findings. For instance, individuals may be able to generate creative solutions when they believe that the task they are engaging is important. When dealing with an important task, inducing a moderate negative feeling may enhance creativity. On the contrary, when dealing with a relatively enjoyable task such as brainstorming for ideas in the early stage of a task, inducing a moderate positive feeling may increase performance.

The findings of these three studies also offer a preliminary insight to the question of how self-appraisal influences the effect of affect on creative performance. Building upon the sequence of the studies, it is posited that the process consists of three stages. In the first stage, individuals receive the affective signals embedded in the affect and interpret the meaning of the signals in terms of their subjective interpretation. The evaluation of task takes place in the second stage. In particular, individuals appraise the task by interpreting the implicit signals conveyed by the features of the task (e.g., serious task indicates that high performance is expected). Finally, people make a comparison of the two types of appraisal of affect and task. If these two appraisals are congruent with (or relevant to) each other, the affect is conducive and individuals' creative performance is improved; if the appraisals are incompatible, the affect may impair or have no effect on creative performance. Furthermore, it is assumed that stage 1 and 2 may happen at the same time as the two appraisal processes rely on different cognitive resources. This 3-stages-appraisal process notion is in line with the dual competition model (Pessoa, 2009; Pessoa & Engelmann, 2010) and the dual pathway approach of affect (De Dreu et al., 2008). Further studies, however, are warranted to validate the hypothetical process. It would be interesting to examine to what extent other characteristics of affect (e.g., activation, arousal) and the types

of task construal influence the appraisal process. Future research may examine the role of other individual variables, such as personality trait and cognitive ability, on the process; the findings may extend further understanding of the underlying mechanism of self-appraisal on the affect-creativity link.

Limitations and Suggestions

In addition to the limitations and the suggestions that have been discussed in each study, some issues are necessary to be addressed. First, it is important to note that affect is multidimensional and the present research only focuses on the valence, one of the major features of affect. Indeed, studies have revealed that other features of affect, such as arousal and activation, may have an influence on creativity as well. Hutton and Sundar (2010), for instance, found that the influence of affect on creativity is a function of the interaction between arousal and valence. People at a relatively high arousal level (manipulated by playing video game) are more creative when in positive affect. In contrast, at a low arousal level, negative affect results in higher creativity than positive affect. Similarly, a meta-analysis showed that the facilitation effect of affect relies on the hedonic tone, activation, and regulatory focus (Baas et al., 2008). The research also indicated that activating positive affect is conducive to creativity when couples with promotion focus (i.e., approach motivation), whereas activating negative affect hinders creativity when associated with prevention focus (i.e., avoidance motivation). Similarly, when compared to deactivating affect (e.g., sad, relaxed), activating affect (e.g., happy, angry) results in higher creativity (Baas, De Dreu, & Nijstad, 2011b; De Dreu et al., 2008). De Dreu and colleagues (2008) further revealed that positive and negative activating affect enhance creativity through different pathways. In particular,

activating affect in positive tone increases originality via cognitive flexibility, while activating affect in negative tone enhances fluency through perseverance.

It is also important to note that the present research only used a unidimensional item to assess valence. Given that it is possible that people may experience both positive and negative affects simultaneously, sad is not necessarily the opposite of happy. Therefore, the (unidimensional) scoring is not ideal and may not be able to comprehensively capture the influence of the (induced) affect. Nevertheless, unidimensional scoring is supported by some researchers and used in examination of affect. For example, the original item in the Self-Assessment Manikin (SAM; Bradley & Lang, 1994; Lang, 1980) uses images to depict different degrees of positive and negative valence. In addition, the findings derived from the unidimensional item were found consistent with the results using the PANAS (Tan & Qu, in press), a widely used measurement of affect that taps in positive and negative dimensions respectively (Watson et al., 1988). The consistency suggests that the unidimensional scoring is able to capture the induced affect though it is not ideal. Future studies, however, are encouraged to use other assessments to examine the role of the induced positive and negative affects, respectively.

Vosburg (1998a), however, argued that comparing positive to negative affect may not be meaningful. This is because negative affect consists of a variety of aversive mood states (e.g., anger, fear), whereas positive affect is relatively simple and unidimensional. Therefore, it is suggested to compare the other dimensions of negative affect and examine their impacts on creativity, rather than just focusing on general negative affect. In contrast to the notion of concentrating on one particular affect, other studies have shown that individuals are more creative when

experiencing contradictory affect than being primed with only one affect (Fong, 2006; George & Zhou, 2007; Kaushik & Rani, 2005). For example, George and Zhou (2007) demonstrated that, in a supportive working context, employees were found to be most creative when both positive and negative affect were high. These findings imply that each dimension of affect (e.g., arousal, activating) plays an essential role in influencing creativity, either independently or interactively. In other words, only assessing the effect of valence of affect is far from sufficient to capture the whole picture of the relationship between affect and creativity. Nevertheless, it is worth noting that the main purpose of this research is to examine the theoretical role of individual appraisal on the affect-creativity link. It is impractical to consider all the dimensions of affect before verifying the effect of appraisal. The current research, therefore, is both theoretically and practically important towards the study on the affect-creativity link. The findings of the effect of individual appraisal and the interaction effect of affect and task framing serve as a basis for future studies to expand the current relationship by including other dimensions of affect that have been found to have an impact on creativity.

The measurement of creativity is another issue that deserves attention. Similar to the past studies, the current research employed the divergent thinking tests (Alternate Uses Task & Similarities Task) to measure participants' creativity. Despite the divergent thinking tests are widely used for measuring creativity, it is important to note that the tests have some flaws as well (see McGeown et al., 2012; Runco & Acar, 2010; 2012 for details). For instance, Runco and Acar (2010) reported that individuals' experience significantly predicted their performance on divergent thinking tests (fluency & originality), suggesting that the divergent thinking tests may prone to experiential bias. Another controversial aspect of the

divergent thinking tests is the relationship between the divergent thinking ability and real-world performance. A number of studies have revealed that performance on the divergent thinking assessments is not predictive of any actual creative achievement (J. Baer, 1993/1994; McGeown et al., 2012; Okuda, Runco, & Berger, 1991). Han and Marvin (2002), for example, reported that fluency and flexibility measured by the divergent thinking test could not predict creative performance in collage making and math problem. Additionally, it is worthy to note that the present research mainly used Alternate Uses Task (AUT) to assess participants' creativity. To verify the effectiveness of the AUT, Similarities Task (ST) was used in Study 3. The ST results were consistent to the AUT results though differences were found. The replication, to certain extent, supports the validity of the AUT and implies the confounding effects are negligible. Future studies, however, are suggested to control for those confounding effects (e.g., counter-balancing the sequences of the two tasks) and examine the relationship between the AUT and the ST.

Despite these criticisms and limitations, divergent thinking ability and its assessments are, still, important and useful to creativity research for at least two reasons. The first reason is that gender differences and ethnicity biases are less observed in divergent thinking assessments (J. Baer & Kaufman, 2008; Kaufman et al., 2008). Consistent with these findings, there was no gender difference in participants' performance in the current research. Another reason, perhaps the most important reason, is that divergent thinking tests predict individual's creativity potential. Moreover, divergent thinking tests estimate creativity better than other methods (e.g., intelligence tests). In the reanalysis of data from Torrance's longitudinal study, Plucker (1999) found that divergent thinking was

better than traditional IQ in predicting how people differed in creative achievement. Along the same line, there was a moderate correlation between creativity scores (as measured by TTCT) and participants' personal achievement (e.g., action group work, designing a house) which was measured 50 years later in a follow-up study of Torrance's longitudinal study (Runco et al., 2010). In contrast to studies that show low predictive validity, other studies have found that divergent thinking ability is moderately related to actual creative achievement. For instance, a meta-analysis (Kim, 2008) showed that the divergent thinking scores predicted creative achievement ($r = .22$) better than IQs ($r = .17$) in art, science, writing, and social skills. Han and Marvin (2002) also found a weak but significant correlation between divergent thinking ability and creativity in storytelling but not other areas. These findings imply that divergent thinking tests are far from being a comprehensive and adequate assessment of creativity, yet the tests are able to unveil some individual aspects that are essential to creativity to a certain extent. The controversial role of divergent thinking on creativity was better summed up by Walczyk and colleagues (2008). They contended that "divergent thinking is not synonymous to creative potential, but it is a useful theory for understanding original ideation, novelty, and the potential for creative problem solving" (p. 330). Similarly, Runco and Acar (2012) also contended that divergent thinking assessments are useful in estimating the potential for creative thinking and divergent thinking is a good indicator of future creative performance.

Given that the psychometric qualities of divergent thinking tests remain open, future studies are suggested to employ different assessments to capture different dimension of creativity (Cramond, 1994). Moreover, considering other assessments may further verify the findings derived from divergent thinking tests.

There are other assessments or methods that can be used to measure individual creative performance, for example, assessments by others. The common way of this assessment is to have assessors (e.g., parent, supervisor, peer), who are familiar with and have chances to work with the examinee, to evaluate examinee's creativity by using checklists (Kaufman et al., 2008). These checklists focus on personal characteristics that are believed to be indicative of creativity, such as motivation, thinking styles, and creativity-relevant abilities. Several rating scales have been produced and used in identifying gifted students, for example, the Creativity Checklist (Proctor & Burnett, 2004), Gifted Rating Scales (Pfeiffer & Jarosewich, 2007), and Scales for Rating the Behavioral Characteristics of Superior Student (Renzulli & Hartman, 1971; Renzulli, Siegle, Reis, Gavin, & Sytsma Reed, 2009; Renzulli et al., 2002), just to name a few. Similar methods have also been used in assessing employees' creativity. Zhou and George (2001), for instance, developed a 13-item scale for supervisors to evaluate creativity of their subordinates.

Another type of assessments that has been widely used in creativity research is self-assessment. Examinees are asked to evaluate their own creativity in terms of their characteristics that are relevant to creativity. For example, based on the notion that certain types of personality or traits are conducive to creativity, personality inventories such as the Gough Personality Scale (Gough, 1979) and the NEO Personality Inventory (Costa & McCrae, 1992, 2008; McCrae, Costa, & Martin, 2005) are used to measure one's creativity. In addition to personality, self-assessment also relies on individual's behaviors or past achievements. For example, the CAQ (Carson et al., 2005) evaluates creativity via 96 items across 10 domains, such as drama, writing, humor, invention, science, and architecture. The Runco

Ideation Behavior Scale (RIBS; Runco, Plucker, & Lim, 2000-2001) is another self-assessment that focuses on ideation, that is, the involvement in processes or activities of idea generation.

In addition to including different measurements, redefining the scope and the structure of creativity may also help to capture the whole picture of the affect-creativity link. Contrary to what has been widely assumed in which divergent thinking is the key to creativity, some theorists and researchers have begun to emphasize the role of convergent thinking and claim that both divergent and convergent thinking play a vital role in the production of novel ideas (Cropley, 2006; Kilgour & Koslow, 2009; Lubart, 2001; Runco, 2003; Runco & Acar, 2012). The rationale is that, while divergent thinking leads to the production of alternative or multiple solutions, convergent thinking “involves the reorganization and integration of ideas within a domain to make a coherent whole” (Kilgour & Koslow, 2009, p. 299) and thus leads individuals to use their knowledge or experience to guide divergent thinking to produce the potential solutions and then figure out the best or correct solution to question. Cropley (2006) argued that generating and exploring novelty are two indispensable processes to produce effective creativity (i.e., ideas that are both novel and useful). Specifically, in order to produce an effective and creative idea, individuals need to be involved in divergent thinking to generate a group of novel ideas and then be guided by convergent thinking to scrutinize, evaluate, and identify workability and acceptability of the ideas. So, given that convergent thinking is critical to the production of effective creativity, it is necessary for future research on the affect-creativity link to take into consideration the effects of convergent thinking. There are, at least, two questions that need to be explored in the future. First, to what

extent affect influences convergent thinking and whether the relationship between affect and creativity (i.e., divergent thinking) found in the present study can be replicated with convergent thinking. Second, it is also interesting to know whether factors that are associated with convergent thinking (e.g., knowledge, experience) may have an impact on the mediating role of individual appraisal on the affect-creativity link. Answers to these questions may contribute to the literature by offering a new understanding of the relationship between affect and creativity.

Similarly, attention should also be given to the assessment of self-appraisal. In particular, the effectiveness of I-PANAS-SF (Thompson, 2007) as a measurement of appraisal remains open. Although data supported that appraisal mediates the effect of affect on creativity, one may argue that the relationship between affect and self-appraisal is not robust because the self-appraisal was measured by the I-PANAS-SF. In particular, the I-PANAS-SF has been commonly used to measure affect rather than appraisal. Moreover, the choice of appraisal variables (self-perceived importance, self-perceived affect, & motivation) in the present study is rather arbitrary. Despite the three indicators are supported by theories and empirical evidence, it is important to note that appraisal could be characterized by other variables, depends on how researchers define it and what dimensions of appraisal the researchers are interested in. It is also noteworthy to emphasize that the key of the conceptual framework is the compatibility of self-appraisal between affect and task. Additionally, there are different ways to operationalize individual appraisal. Therefore, future studies can examine whether the facilitation effect observed in the present research could be extended to other dimensions of appraisals. Additionally, there are different kinds of appraisal (e.g., task appraisal, performance appraisal). Therefore, it is necessary to use other more

comprehensive measurements of appraisal to examine the role of appraisal in the affect-creativity link, for example, using motivation questionnaire to measure competence and value appraisal (Ahmed et al., 2010) and using the appraisal of life events scale to assess appraisals of stressful events in terms of threat, challenge, and loss (Ferguson, Lawrence, & Matthews, 2000; Ferguson, Matthews, & Cox, 1999), just to name a few.

The choice of task framing condition also deserves attention. The choice of important vs. enjoyable tasks is based on theoretical and practical reasons. Friedman and colleagues, for instance, believe that important and enjoyable tasks are theoretically compatible with the motivation conveyed by negative affect and positive affect, though they did not explain the reason in details. Nevertheless, it is possible that the interaction between affect and task framing could be due to factors other than self-appraisal and motivation. For instance, attention may be another mechanism that potentially may influence the results. Unfortunately, the main goal of the present research was to examine the appraisal compatibility hypothesis and hence, the current thesis did not include any measures on attention. Future studies can systematically investigate how task framing or appraisal may influence participants' attention.

Finally, in line with the findings of the impact of self-appraisal, studies on creativity have consistently found that some particular types of personality or traits are related to creativity. For example, extroverts and individuals high in openness to experience tend to be more creative than introverts and those low in openness to experience (Feist, 1998; George & Zhou, 2001; McCrae, 1987). Similarly, positive affectivity is also related to creativity. People with high positive affectivity tend to have higher creativity than those with low positive affectivity (De Dreu, Nijstad, &

Baas, 2011). These findings indirectly support the importance of including individual differences in studying the influence of affect on creativity. Moreover, these findings also point out a new direction for future research. Future studies are suggested to take a step further to examine whether people's personality or trait moderates the mediating role of individual appraisal on the relationship between affect and creativity. For instance, on the basis that high neuroticism are related to negative appraisal (Tong, 2010), it is interesting to examine whether openness to experience leads to positive appraisal and, in turn, influences the impacts of affect on creativity.

The issues discussed above are essential towards studying the affect-creativity link, but are not considered in the current research due to interest and scope limitation. It is strongly believed that including these issues in future studies may further broaden our understanding of the relationship between affect and creative performance.

Conclusion

Creativity has received greater emphasis in this rapidly changing and competitive environment. The current research attempted to resolve the inconsistent findings of the influence of affect on creative performance. As suggested by the literature, the impact of affect is a function of the way people interpret the affect . The current research proposed a theoretical framework to investigate the role of individual appraisal on the relationship between affect and creativity. A series of experiments show that self-appraisal mediates the impact of affect on creativity, as well as the influence of the task framing manipulation on creative performance. Moreover, affect and task framing also interacts with each other and the interaction results in higher creativity when they are compatible than

they are not. In addition, the current research also validated six short video clips that are effective in eliciting positive, negative, and neutral affect in Singapore undergraduate students. As a result, the present research not only provides empirical evidence to the conceptual role of individual appraisal, but also unveils a potential underlying mechanism of the affect-creativity link to account for inconclusive past findings. The findings also provide an insight to the literature and open a room for future research on the relationship between affect and creativity. More studies, however, are needed to replicate the findings and further expand our knowledge of the facilitation effect of affect on creativity.

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Appendixes

Appendix 1: International Positive and Negative Affect Schedule Short Form

(I-PANAS-SF; Thompson, 2007)

The following scale is about your feeling. Please indicate to what extent you feel this way right now, that is, at the present moment. Read each item and then select the appropriate answer.

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Upset	1	2	3	4	5
Hostile	1	2	3	4	5
Alert	1	2	3	4	5
Ashamed	1	2	3	4	5
Inspired	1	2	3	4	5
Nervous	1	2	3	4	5
Determined	1	2	3	4	5
Attentive	1	2	3	4	5
Afraid	1	2	3	4	5
Active	1	2	3	4	5

Appendix 2: Coding Scheme for Uses of Paper

No	Category name	Examples
1	Decorative purpose	wallpaper, decoration, art and craft
2	Household goods	lamp shade, curtain, table cloth
3	Origami	paper plane, origami, fold into different shapes
4	Physical harm	cut people, burn, pranks
5	Applied on	drawing, printing, painting
6	Functional use	napkins, food packaging, divider
7	Miscellaneous	recycle, litter, to tear

Appendix 3: Affect Measurement for Study 2

1. How do you feel now?



Very
negative

1

2



negative

3

4



neutral

5

6



positive

7

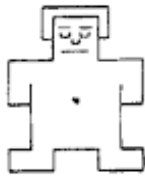
8



Very positive

9

2. To what level do you feel this way?



Very weak

1

2



weak

3

4



medium

5

6



strong

7

8



Very strong

9

3. To what level do you control this feeling?



Very low

1

2



low

3

4



medium

5

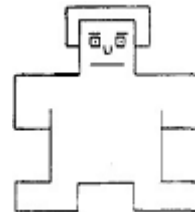
6



high

7

8



Very high

9

Appendix 4: Coding Scheme for Uses of Chair

No	Category name	Examples
1	Instrument/Item	divider, bottle opener
2	Physical harm	self-defense tool, hit people
3	Exercise	weight lifting,
4	Typical uses	stand on it, put stuff on it
5	Art	material for drawing, carving figures on it
6	Entertainment	playing games, dancing
7	Special function	push cart, rocking chair
8	Miscellaneous	gift, baton

Appendix 5: Task Evaluation Questionnaire (TEQ)

For each of the following statements, please indicate how true it is for you, using the following scale:

1	2	3	4	5	6	7
not at all true		somewhat true			very true	

1. While I was working on the task I was thinking about how much I enjoyed it.
2. I did not feel at all nervous about doing the task.
3. I felt that it was my choice to do the task.
4. I think I am pretty good at this task.
5. I found the task very interesting.
6. I felt tense while doing the task.
7. I think I did pretty well at this activity, compared to other students.
8. Doing the task was fun.
9. I felt relaxed while doing the task.
10. I enjoyed doing the task very much.
11. I didn't really have a choice about doing the task.
12. I am satisfied with my performance at this task.
13. I was anxious while doing the task.
14. I thought the task was very boring.
15. I felt like I was doing what I wanted to do while I was working on the task.
16. I felt pretty skilled at this task.
17. I thought the task was very interesting.
18. I felt pressured while doing the task.
19. I felt like I had to do the task.
20. I would describe the task as very enjoyable.
21. I did the task because I had no choice.
22. After working at this task for a while, I felt pretty competent.