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Emotions as an Intervening Variable in the Creative Process

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by

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An Abstract of a Thesis
in
Creative Studies

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

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Buffalo State College
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Department of Creative Studies

ABSTRACT OF THESIS

Emotions as an Intervening Variable in the Creative Process

This thesis explored the impact that emotionally laden stimuli had on individuals' creative process and creative products as assessed by independent domain experts. Sixty-five undergraduate students were randomly separated into three treatment conditions and instructed to create an artistic collage composition on the theme of New Year's Eve. Two of the treatment groups received, in addition to the general instructions set, a text based priming stimulus that was either an emotionally laden narrative or factual narrative about New Year's Eve. All participants were asked to complete a task reflection questionnaire and the FourSight cognitive style measure. Using the Consensual Assessment Technique framework, six independent domain experts rated each collage in 18 distinct dimensions including Creativity. Although there was no significant difference in the Creativity Scale score between the three treatments groups (the group that received the emotional narrative was hypothesized to outperform the other two groups), an interaction effect emerged between the presence of the emotionally laden narrative and two of FourSight's cognitive style preferences, which modulated creative performance. Implications of these findings are discussed as well as limitations and recommendations for future research efforts in the topic of emotion and creative cognition.

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CHAPTER ONE: RATIONALE AND RESEARCH QUESTIONS

Introduction

The purpose of this chapter is to provide the context that shaped this research study. In doing so, a rationale is provided in support of carrying out this research study and finally, the research question and hypotheses are outlined.

Research Study's Context

Life in the 21st century can be distinguished from past periods of time by the pervasive influence of computer technology at every level of human interaction. Computer technology has expanded and offered revolutionary new angles to the scientific study of creativity such as *artificial intelligence* (Boden, 2004, Hofstadter, 1995) and *neuroscience* (Damasio, 2001; Dietrich, 2004; Flaherty 2005; Stein 2007) in contrast to the prevailing (and traditional) cognitive psychology approach. On one hand, artificial intelligence researchers have tried to understand creativity by computer modeling of cognitive processes associated with the creative process. On the other hand neuroscientists, with the use of sophisticated computer imaging technology, have probed deep into the brain of individuals while engaged in creative tasks with the hopes of identifying brain functions, patterns and regions associated with creative production.

What is interesting about these 21st century approaches to the study of creativity is that, although they have confirmed many of the models and theories proposed by the cognitive-behavioral sciences approach, they still have not provided a clear-cut blueprint of the creative phenomenon. While specific cognitive processes have been replicated with

the use of artificial intelligence algorithms and scanned through neuroimaging studies, researchers in both of these fields agree that much of the ambiguity around the mechanisms of creativity reside in the role of emotion in creative cognition (Boden, 1998, 2004; Damasio 1994, 2001; Stein, 2007). For example, Boden (1998) was emphatic in stating that while artificial intelligence has been fairly successful in replicating critical creative processes such exploration of conceptual spaces and analogical/combinatorial processes, it still fails in modeling the evaluative processes and decision making processes that are governed by emotion and motivation. From the field of neuroscience similar evidence points to the fact that while the ability to generate many novel associations and combinations is desirable for creative production, the above is useless if humans do not have the ability to evaluate and make decisions, which precisely calls upon emotional decision-making brain mechanisms (Damasio, 2001; Naqvi, Shiv & Bechara, 2006). Furthermore, recent studies in neuroscience point to a tight interplay between emotion and cognition, in which brain emotional functions and regions play critical roles in core cognitive processes such as attention, memory encoding, and memory retrieval (Duncan & Barret, 2007) all of which are critical to the creative process (Mumford, Mobley, Uhlman, Reiter-Palmonm, & Doares, 1991).

Although evidence coming from different fields of study point to emotion as a critical ingredient of the creative phenomenon, the cognitive science paradigm, the dominant paradigm governing the last several decades of psychological research, has systematically neglected the study of emotion (LeDoux, 1996). The scientific study and modeling of the creative process has been no exception to this research approach (Runco, 2007). For example, the Creative Problem Solving process (Isaksen, Dorval & Treffinger,

2000; Noller, Parnes, & Biondi, 1976; Osborn, 1963; Parnes, 1981; Puccio, Murdock, & Mance, 2005; Treffinger, Isaksen, & Dorval, 1994), central to the Creative Studies curriculum dictated at the International Center for Studies in Creativity, and one of the most widely studied creative process models, falls into the category of the *cognitive-rational-semantic* theories of creativity (Treffinger, Isaksen, & Firestien, 1983). Governed by this ruling paradigm, the large body of research regarding the role of emotion in creativity has focused mostly in peripherals areas to creativity such as motivation, the creative drive and the affective states that are conducive to creativity (Amabile, 1985; Boden, 1998; Collins & Amabile, 1999; Damasio, 2001; Flaherty, 2005; Hennessey, 1999; Levine, 2007; Lubart & Getz, 1997; Runco 2007; Salovey & Mayer, 1990; Treffinger, 1980).

Only in recent years, researchers in the field of creativity are converging to the fact that to have a full understanding of the creative phenomenon, both cognitive and affective dimensions of creativity and the way these two core mechanisms interact, must be thoroughly comprehended (Amabile, Barsade, Mueller, & Staw, 2005; Boden, 2004; Damasio, 2001; Dietrich, 2004; Fuchs, Kumar, & Porter, 2007; Lubart & Getz, 1997; Puccio, Murdock, & Mance, 2005; Puccio, Murdock, & Mance, 2007). For example, Puccio et al.'s (2007) latest revision of the Creative Problem-Solving (CPS) framework, The Thinking Skills Model, has deliberately included a set of affective skills that go hand in hand with each of the thinking skills deployed when engaged in CPS.

With the advent and hype of emotional intelligence theory (Goleman, 1995; Salovey & Mayer, 1990) many researchers' efforts have been channeled to better understand the nature of emotion and its influences in individuals' interpersonal skills,

leadership, and creative behavior. Consequently, evidence from a more recent body of research has expanded the breadth of influence of emotion in creativity. For example, in the domain of creative personality, research on emotional creativity (EC) (Averill, 1999; Fuchs et al., 2007; Ivcevich, Brackett, & Mayer, 2007) has yielded strong correlations between EC and creative performance (Dollinger, Urban & James, 2004; Fuchs et al., 2007; McCrae, 1987). In the domain of organizational psychology, positive correlations have been established between emotional intelligence (EI) and creative leadership (Goleman, Boyatzis, & McKee, 2001; Puccio et al., 2007; Zhou & George, 2003).

Despite the above progress in understanding the influence of emotion in creativity, efforts at assessing the influence of emotion at the very core of the creative process are still scarce (Amabile et al., 2005; Isen, 1999; Russ & Schafer, 2006). It should come as no surprise that tampering with an individual's emotions is a delicate issue that imposes substantial ethical and experimental limitations to the empirical assessment of emotions. Consequently, the current state in this area of inquiry has remained mostly in the theoretical arena (Boden, 2004; Damasio, 2001; Dietrich, 2004; Lubart & Getz, 1997; Puccio et al., 2005) and besides the recent efforts of Amabile et al. (2005) and Russ and Schafer (2006), there has been no thread of continuous research efforts to probe deeper into the ways in which emotions modulate the creative process.

Rationale, Research Question and Hypotheses

Among the available theories regarding the role of emotion in the creative process, one that was germane to this research study was Lubart and Getz's (1997) emotional resonance mechanism theory. This theory stated that as an individual

experiences both external and internal stimuli, he/she tags each processed and recorded stimuli in his/her brain with an emotional valance (value). Subsequently, in the process of retrieving these stimuli for cognitive processing, the emotional valance of the stimuli is both activated and propagated throughout the brain, in what Lubart and Getz (1997) termed as the emotional resonance mechanism. This emotional resonance mechanism allows distant and remote concepts that share a similar emotional tone and/or valance to be brought to awareness and proximity and therefore, enhancing the probability that these are manipulated in conjunction to spur novel concepts and ideas. In this way, creative combinations might emerge from two or more totally remote concepts that share absolutely no logical relationship at all.

Building on the idea that there might be a mechanism operating in the brain as described by Lubart and Getz (1997), the purpose of this research study was to contribute to the notion that emotion indeed has an influence in creative production beyond motivation and creative drive, by modulating directly the process of generating novel and useful combinations. Furthermore, if associations driven by emotions yield ideas, concepts and/or products judged as more creative than the output of cognitive-factual driven associations, this would demand complementing current creativity facilitation frameworks too narrowly focused on provoking rational cognitive shifts, with a deliberate use of emotion as a springboard for generating novel and useful ideas.

Given the above rationale, the primary research question proposed for this research study was:

Will individuals exposed to an emotional priming stimulus (before engaging in a creative task) exhibit higher degrees of creativity than individuals exposed to either a rational-factual priming stimulus or no stimuli at all?

The underlying assumption behind this research question was that the exposure to an emotional priming stimulus should activate an individual's emotional resonance mechanism. In doing so, the individual would start working with his or her emotions, either consciously or unconsciously, to seek novel patterns to be applied in completing the experimental creative task.

Given the above research question, the following hypotheses are presented:

Hypothesis #1: $H_1 = CL_{EP} > CL_{FP} > CL_{NP}$

Creativity Level = CL

No Priming = NP

Factual Priming = FP

Emotional Priming = EP

The above hypothesis is interpreted as follows:

The expected level of creativity (as rated by domain experts) of an individual's artistic work who is exposed to an emotional priming stimulus during the creative process should be significantly higher than the expected level of creativity of an individual's artistic work who is exposed to a factual priming stimulus during the creative process or to no priming stimuli at all. Consequently, the expected level of creativity (as rated by domain experts) of an individual's artistic work who is exposed to a factual priming stimulus during the creative process should be

significantly higher than the level of expected creativity of an individual's artistic work who is exposed to no priming stimulus at all.

Hypothesis #2: Under the premise of an emotional resonance mechanism in operation, individuals exposed to an emotional priming stimulus should report higher degrees of engagement in creative and/or unconventional thinking than individuals who are exposed to a factual priming stimulus or no stimulus at all.

Hypothesis #3: Under the premise of an emotional resonance mechanism in operation, individuals exposed to an emotional priming stimulus should report a greater tendency to tap deliberately into their emotions and feelings during their creative process than individuals who are exposed to a factual priming stimulus or no stimulus at all.

Chapter Summary

Emotion and the affective components of creativity has been an elusive area of scientific study. Nonetheless, researchers studying the creative phenomenon from varied fields of study (e.g. cognitive psychology, artificial intelligence and neuroscience) have converged to the fact that it is impossible to fully grasp the blueprint of creativity without understanding the scope of influence, role and interplay between emotion and creative cognition. Efforts in understanding emotion as an intervening variable at the core of the creative process, meaning the way that emotion intervenes in the process of forming new and useful combination, have been mostly theoretical. In light of the above gap, this research study was an attempt to cast empirical evidence in favor of the effect of using emotions as an intervening factor in the process of creating new and useful combinations, patterns, concepts and/or idea.

CHAPTER TWO: LITERATURE REVIEW

Introduction

The purpose of this chapter is to review the body of research and literature that has examined the relationship between emotions and the creative process. In order to fully comprehend the above-mentioned relationship, a broader view will be offered to give the reader a systemic approach to the interaction between these two variables. Thus, literature regarding the creative personality and the environment that fosters creativity, and their respective links to emotions, will also be covered. In addition, key concepts and definitions will be provided with regard to creativity, the creative process, emotions and cognition in order to ensure a thorough and clear understanding of the body of literature and research presented in this chapter.

Key Concepts and Definitions

What is Creativity?

Definitions, models and theories of creativity are abundant in the field of creative studies (Davis, 2004; Mumford, 2003; Runco, 2007; Sternberg, 1999). Rhodes (1961) provided a meta-framework that allowed for the classifying of these definitions, theories and models into the *four P's* taxonomy: (a) the creative person; (b) the creative process; (c) creative product(s); and (d) the creative press (understood as the environment that fosters creativity). Simonton (1988) advocated including a fifth "P", that stands for *persuasion,* emphasizing the role of the individual to push for social acceptance of his creation. In addition, Runco (2003) lobbied for a sixth "P" that stands for *potential*, in an

attempt to recognize individuals who have creative potential, but who lack the skills to express such creativity. Given the four P's framework, Murdock and Puccio (1993) suggested the adoption of an ecological approach to creativity by studying creative behavior as an interaction of the four P's. One contemporary creativity model that has captured this systemic approach is Woodman and Schoenfeldt's (1990) interactionist model of creative behavior in organizational contexts. In this model, creative behavior would be modulated by an individual's personality, cognitive style, contextual influence, social influences, and overall anteceding conditions. The systemic nature of the creative phenomenon makes creativity a complex multifaceted construct (Guilford, 1967; Mackinnon, 1978; Mumford & Gustafson, 1988; Stein, 1974; Torrance, 1979). The fact that creativity is a systemic, complex, and multifaceted phenomenon makes the scientific study of creativity a tough endeavor. First, there are limitations to the ecological validity of the instruments used to capture any given dimension of creativity (e.g, divergent thinking, incubation, problem definition, personality traits, environmental factors, etc.). Second, it is almost impossible to get an ecological assessment that fully captures the systemic interactions that modulate creative production and/or creative behavior (Murdock & Puccio, 1999).

Among creativity scholars, there is consensus that for something to be creative, it must meet two qualitative criterions: (a) a degree of novelty, newness, and/or originality and (b) a level of appropriateness, value, and/or usefulness (Davis, 2004; Lubart, 2001; Runco, 2007). Hence a widely accepted definition of creativity is the production of ideas, concepts and/or products that are both novel and useful (Amabile, 1988; Boden, 1998; Stein, 1974). The word *product* is used in its broadest sense, and may include ideas

concepts, behaviors, relationships, systems and both tangible and intangible products and services. MacKinnon (1978) viewed the *creative product* as a reflection (and a converging point) of the interacting forces of the creative personality, creative process and the environment. Accordingly, in Mackinnon's view the best way to study creativity is to start by examining the creative products of individuals. Although the definition of creativity as *the production of novel and useful ideas* is appropriate for describing creativity in wide range of contexts, there are other definitions in the literature that better capture the nature of the creative personality, creative process, and creative environment. For example, Ackoff and Vergara (1988) regarded creativity as the ability to overcome self-imposed constraints. This is a personality definition within the *Third Force Psychology* family of creativity theories (Treffinger, Isaksen, & Firestien, 1983), such as Maslow (1968, 1970) and Rogers' (1959,1961) self-actualization theory. Understanding that there are numerous definitions and theories available in the literature, *creativity as the production of novel and useful ideas* will be adopted for the practical implications it has for experimental research design. Furthermore, in the present study's research design (described in detail in Chapter Three of the present volume) it was the creative product that was used to assess differences in creativity level among participants.

In terms of the creative process, more than advocating for a specific model, the emphasis of this research has to do with its associative nature. Several creativity scholars have stressed the importance of associative processes as fundamental processes to creativity (Boden, 1998; Davis, 2004; Finke, Ward, & Smith, 1992; Gordon, 1961; Koestler, 1964; Lubart & Getz, 1997; Mednick, 1962; Runco, 2007; Simonton, 1988; Weisberg, 1995). However, for creativity to crystallize into an idea that is both novel and

useful, there are numerous mental operations and thinking skills (Lubart, 2001; Puccio, Murdock, & Mance, 2007) besides the associative components of cognition, which are necessary for such outcome (e.g. categorization, sorting, synthesizing, evaluation, etc.). Considering the above, and without undermining the role of other processes necessary for creativity, the main focus of this research study is to assess the power of emotions as a mechanism for crafting associations (Lubart & Getz, 1997) that are conducive to the production of ideas, concepts, and products that are both novel and useful.

What is Emotion?

Just as there is no "one" inclusive definition of creativity, the same holds true with regard to a definition of emotions. Levine (2007) argued that in the scientific literature, concepts of emotion, affect, and mood are widely used and interchanged. In clinical terminology, *emotion* describes what a person is feeling at a given moment and context. On the other hand, *affect* has to do more with an outward expression of an emotional state (Levine, 2007). Lastly, *mood* tends to be used for a pervasive emotional state that perpetuates itself for longer periods of time (Salovey & Mayer, 1990). Salovey and Mayer (1990) defined *emotion* as a response to meaningful stimuli, whose source might be either internal or external. Meaningful refers to the stimuli's *emotional valence*, which is the significance an individual assigns to the stimuli while it is experienced and then subsequently encoded in our memory. In addition, emotional responses are adaptive. Any individual has the ability to regulate his emotional responses in order to catalyze personal transformation and better social fitness (Goleman, 1995; Mayer & Salovey, 1997).

LeDoux (1989; 1996) offered a biological perspective to the definition of emotion that is worth exploring for the purpose of this research study. He differentiated *emotion* from the concept of *feelings*. In his view, emotions are biological and physiological responses, triggered by either internal or external stimuli. These responses are most of the time unconscious to the individual. He affirmed that there are commonalities with regard to emotional reactions, both neurological and phenomenological, between humans and other species. Many emotional responses have been kept by evolution because they serve as a mechanism for the preservation of the species. For example, the *fear emotional mechanism* generates corresponding physiological responses such as adrenaline rush, muscle tension, and freezing that allows human beings (and animals) to better cope with dangerous situations (LeDoux, 1996). On the other hand, *feelings* are the product of the conscious appraisal of an emotional state and its representation in working memory. In other words, feelings are the product of an individual's awareness of his/her emotional reaction (LeDoux, 1996). LeDoux was explicit in the fact that the emotional reaction and cognitive appraisal mechanism work as a closed feedback loop. Duncan and Barret (2007) stressed this interplay a step further, by declaring that there is no distinction at all between emotions and cognition. Emotional memories might be encoded both consciously (the product of conscious cognitive appraisal) and unconsciously (those related to the physiological reactions elicited by emotional reactions). Given the above biological framework, the awareness and emotional memories that we often describe as feelings are only possible with the *conscious* cognitive appraisal of an emotional state (Duncan & Barret, 2007; LeDoux, 1996; Stein, 2007). Whether the neural correlates of emotions are indeed distinct from those of general cognition is still in debate (Duncan &

Barret, 2007; LeDoux, 1996), yet it is only through the conscious cognitive appraisal mechanism that we become aware of emotions in the form of feelings (LeDoux, 1996; Stein, 2007).

Lubart and Getz (1997) offered a descriptive framework that helps to crystallize a definition of emotions. They distinguished between biological, social and psychological factors modulating different emotions. Depending on the influence of these three variables on a particular response, it will determine the degree of complexity of the emotional experience. Consequently, and in line with LeDoux (1996), they recognized fear as a primitive biologically based emotional state. On the other hand, happiness and love are deemed to be more complex emotions modulated by psychological and social factors (Lubart & Getz, 1997). The inclusion of a psychological factor makes these complex emotional responses quite idiosyncratic and subjective in nature. Lubart and Getz regarded the latter as affective experiences or feelings. Note that this fits LeDoux's (1996) definition of feelings as the conscious cognitive appraisal of emotions. This could be interpreted as the conscious modulation of the emotional response by the myriad of psychological traits and memories of each individual. Here after, and for the purpose of this research study, *emotion* will be regarded as the conscious cognitive appraisal (feelings) of an elicited emotional state, with its corresponding physiological reactions and flow of memories triggered, as a part of the appraisal process. Note that at times, and according to the different pieces of literature under review, emotions will be addressed as either emotions or affects and therefore, either emotional states or affective states respectively.

What is Cognition?

Neisser (1967) defined *cognition* as the mental process by which stimuli input is transformed, reduced, elaborated, stored, recovered, and used. According to LeDoux (1989), cognition would refer simply to brain computation processes. Note that both definitions are neutral with regard to content and therefore, the brain can process both factual computations and/or affective computations. Another view extracted from the field of cybernetics is that cognition is a human trait linked to information processing that happens in the mind (Hollangel, 2002). Based on the above definitions, *cognition* will be regarded as the mental processes by which individuals manipulate information of diverse nature such as external, internal, factual, and/or affective information.

The Role of Emotion in Creativity under the Four P's Framework

The following pages will offer a review of the relationship between emotions and creativity using Rhodes' (1961) four P's creativity framework: (a) person (ality); (b) process; (c) product; and (d) press (environment). Although each dimension will be reviewed independently, the ecological view on creativity (Murdock & Puccio, 1993) must be kept in mind at all times. In addition, and in line with MacKinnon's (1978) perspective that the creative product is the result of the interacting forces between the creative personality, creative process and creative environment, the intervening role of emotions in creativity will only be discussed in terms of the creative personality, the creative environment, and the creative process. The creative product will be regarded as a dependant variable from the other three P's.

Emotion and the Creative Personality

Personality is understood as patterns of thoughts, feelings and behaviors that determine our individuality and are stable, both across different contexts and in time (Phares, 1986). By stating that personality is a relatively stable construct, it does not impede an individual from changing and modifying aspects of his personality in the long term. Accordingly, the *creative personality* would encompass a set of traits that are potentially conducive to creative behavior and that meet the above criteria. In this line of thought, the seminal work of the IPAR studies (MacKinnon, 1963; 1965) and the creation of the Adjective Check List (Gough & Heilbrun, 1965) are the foundations of the body of theory and research around the creative personality. Maslow (1968, 1970) and Rogers (1959,1961), pioneers of the humanistic strand of psychology, offered complementary insights to the study of the creative personality. Whereas most researchers of the creative personality focused their attention on acts of genius**,** Maslow and Rogers focused their attention to ordinary everyday life creativity. In this context, they proposed that individuals who behaved creatively in everyday life were highly self-actualized individuals. Self-actualization, as regarded by Maslow and Rogers, was an individual's optimal condition for growth, self-fulfillment and happiness. Davis (2004) offered a list of traits of the self-actualized man that remarkably overlaps with those traits of the creative persona. For example, the self-actualized man was described by Davis (2004) as an individual tolerant to ambiguity, with a sense of humor, autonomous, who experiences moments if peak performance, intrinsically motivated, and with an original and inventive way at looking at life.

Barron and Harrington (1981) offered the following synthesis of the creative personality's core traits:

> The empirical work of the past 15 years on the personality characteristics of creative people brought a few surprises. In general, a fairly stable set of core characteristics (e.g. high valuation of esthetic qualities in experience, broad interests attraction to complexity, high energy, independence of judgment, autonomy, intuition, self-confidence, ability to resolve antinomies or to accommodate apparently opposite or conflicting traits in one's self-concept, and, finally, a firm sense of self as "creative") continued to emerge as correlates of creative achievement and activity in many domains. (p. 453)

Costa and McCrae (1985) regarded the pool of traits described above to fit a broad domain of personality labeled *openness to experience*. Accordingly, one of the foundations of Roger's (1961) theory of creativity is the need of openness to experience as mechanism for creative growth and self-actualization. One of most respected and used models of personality is the NEO-PI (Five Factor model) developed by Costa and McCrae (1985). In turn, openness to experience is one of the five personality scales within the NEO-PI model. According to McCrae (1987), the openness to experience scale involves sensitivity to fantasy, aesthetics, ideas, action, and values. The NEO-PI has been used in different creative personality studies (Dollinger, Urban, & James, 2004; McCrae, 1987). In a longitudinal study on 268 individuals ranging from 18 to 80 years, McCrae (1987) reported correlations between six tests of divergent thinking, the NEO-PI model, and a 30-item Creative Personality Scale (CPS) (Gough, 1979). The correlations between the openness to experience scale and the scores of five out of the six divergent thinking

tests were all positive, ranging from values of .18 to .41 (most of them at levels of significance of $p < .001$). Given the fact that this was a longitudinal study that spanned over 13 years, McCrae regarded the above pattern of correlations to be remarkable, especially when considering that there were differences in the time and methodology with which the data was recorded. The correlation between the CPS scores and the openness to experience scale ranged from .26 to .61 (most correlations at levels of significance of $p < .001$*).* Although Barron and Harrington (1981) acknowledged that differences in creativity domain might lead to variability in personality traits, McCrae (1987) regarded openness to experience to be a common characteristic of creative individuals. Dollinger et al. (2004) used a sample of 151 university students to test correlations between the scores from the Test of Creative Thinking-Drawing Production (TCT-DP), the Thematic Apperception Test (TAT), scores from the Creative Personality Scale (CPS) (Gough, 1979) and the NEO-PI (Costa & McCrae, 1985), in order to validate the use of the TCT-DP and TAT as creativity product measures. The NEO-PI's openness to experience scale correlated positively with both creativity measures TCT-DP and TAT, at values of .36 ($p < .001$) and .27 ($p < .05$) respectively. Although the focus of their research was validating the two creative product measures mentioned above, their results supported McCrae's (1987) established relationship between openness to experience and scores of creative production. In addition, the openness to experience scale correlated positively at levels of .55 ($p < .001$) with the CPS scale scores replicating McCrae's results.

Given the above findings, openness to experience (as measured by the NEO-PI) emerges as a consistent creativity personality trait. Although variability on personality traits should be expected across different creativity domains, openness to experience

might be regarded as a general creativity personality trait. The relationship between emotion and the openness to experience trait (and in turn to the creative persona) comes through the construct of Emotional Creativity (EC).

Averill (1999) coined the concept of *Emotional Creativity (EC)*, defined as the generation, expression and use of novel and useful emotions. He advocated that the same relationship that has been established between intelligence and creativity, that of a threshold theory (Barron & Harrington, 1981; Davis, 2004; Runco, 2007), is also valid for the relationship between emotional intelligence (EI; Mayer & Salovey, 1997; Salovey & Mayer, 1990; Salovey & Mayer, 1995) and emotional creativity. For an emotional response to be considered creative, it must meet three criteria: (a) novelty (with regard to the individual's past behavior); (b) effectiveness (must be of potential benefit to the individual or group); and (c) authenticity (reflects the individual's own values and beliefs) (Averill, 1999). According to Averill, there are different levels of EC responses. The lowest level would demand an emotional response that is only effective to cope with a given situation. A higher level would demand modifying an emotional response to better serve the need of the individual or the group. In its maximum expression, a highly creative emotional response would demand developing a totally new emotional form based on a change in belief and the rules by which emotions are constituted (Averill, 1999). For example, when an individual is in conflict with a close friend, an emotional creative response would entail transforming conflicting emotions (beyond coping) and behaving in a new and constructive way that results in a stronger friendship (Fuchs, Kumar & Porter, 2007).

Averill created the *Emotional Creativity Inventory (ECI)* in order to measure levels of EC. The ECI is composed of three subscales derived from the criteria mentioned above: (a) preparedness (knowledge about one's emotion); (b) novelty; and (c) effectiveness/authenticity (for the psychometric properties of the ECI, see Averill, 1999). Interestingly, in a study that included 149 psychology undergraduate students, Averill reported correlations of the ECI scores and the NEO-PI that suggested a strong overlap between the ECI and the openness to experience scale ($r = .58$, $p < .001$). In Averill's (1999) words, "The overlap is most evident with respect to the novelty of the experience, and somewhat less so for the effectiveness/authenticity" (p. 349). In a more recent research, Fuchs et al. (2007) reported studies that showed positive and significant correlations between the ECI and creative personality measures such as the Self Perceived Creativity Test, Creative Activities and Interests and the CPS (Gough, 1979). The purpose of Fuchs et al.'s study was to find correlations between EC, alexthymia (difficulty in expressing one's feelings) and styles of creativity. For this purpose, they administered a battery of psychometric instruments including the ECI, the Self Perceived Creative Capacity Scale (SPCC) plus seven subscales of styles of creativity in every day life, the Inventory of Childhood Memories and Imaginings (ICMI: a measure of fantasy proneness) and the BVAQ-20B (a measure to assess level of alexthymia) to a sample of 322 students. Fuchs et al. (2007) found that the correlations between ECI total scale and its subscales (novelty, preparedness and effectiveness/authenticity), the SPCC, and ICMI suggested an overlapping of constructs. A confirmatory factor analysis revealed a single factor that accounted for 42.21% of the total variance. The factor was interpreted as a general creative capacity factor, comprising both fantasy and emotional aspects of

creativity (Fuchs et al., 2007). This results are in line with Averill's (1999) assertion that cognitive (rational) creative is hardly distinguishable from emotional creativity due to the tight interplay of emotions (in social o individual contexts) and rational cognition in everyday life. Ivcevich, Brackett, and Mayer (2007) conducted two empirical studies that suggested that emotional creativity and cognitive creativity could indeed be separated. Their results from confirmatory factor analysis yielded distinct factors for cognitive creativity and emotional creativity.

Ivcevic et al. (2007) studies yielded additional degrees of evidence in support of EC as a predictor of creative potential. In Study 1, Averill's (1999) ECI correlated positively and significantly with two cognitive creativity tests, the Remote Associate Test (RAT) and Consequences test (derived from the Torrance Test of Creative Thinking) with values of $r = .22$, $p < .05$ and $r = .27$, $p < .05$, respectively. A similar pattern of correlations was reported from Study 2. In addition to the above-mentioned creativity measures, Study 1 included a poem writing creativity task and Study 2 included a self-creativity report measure. The correlations reported between the poem writing scores and the ECI scores (total and subscales) were at levels of .30 ($p < .01$) except for the ECI's effectiveness scale. In regard to the self-report creativity measure used in Study 2, the ECI's total scale score correlated positively at a level of .26 ($p < .01$). The above results favor EC as a predictor of creative behavior. In addition, Ivcevic et al.'s (2007) studies replicated Averill's (1999) pattern of correlations between the NEO-PI's openness to experience scale and the ECI. They suggested that there might be an overlapping of both instruments as the NEO-PI's openness to experience scale includes a facet scale of *openness to feelings.*

In light of the above-described relationship between emotional creativity and the creative persona, one would expect that there should be some relationship between the close yet distinct construct of emotional intelligence (EI) and the creative persona. Salovey and Mayer (1990) defined EI as, " the ability to monitor one's own and other's feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions"(p. 189). Hence, EI is the intersection between the cognitive and emotional aspects of an individual's personality (Salovey & Mayer, 1995). In the above statement, the term *cognitive* involves applying a criterion of intelligence to the appraisal of the emotional state. Therefore, the individual is not just conscious of his emotional state, but he evaluates whether it is appropriate or not for a given situation (Salovey & Mayer, 1995). Salovey and Mayer (1990) related EI to Gardner's (1983) multiple intelligence theory, in particular, with the *social intelligence* category. EI theory involves the following areas of influence over emotion: (a) the ability to perceive emotions accurately; (b) use emotions to enhance one's thinking; (c) understand and label emotions; and (d) regulate emotions in self and others (Mayer & Salovey, 1997). In terms EI regulation of emotions, a sustained positive mood might influence an individual's organization and use of memory in creative problem solving tasks and enhance overall creative performance (Isen, 1999; Ivcevich et al., 2007; Salovey & Mayer, 1990). The influence of moods in the creative problem solving process will be explored further along within this chapter in the section pertaining the review of emotion and the creative process.

From a research standpoint, the body of research that correlates EI to the creative personality and creative performance is scarce. Ivcevic et al's (2007) empirical studies

(mentioned earlier in the context of EC) tested the direct relationship between EI (using the Mayer-Salovey-Caruso Emotional Intelligence Test [MSCEIT]) with cognitive intelligence (SAT scores), with cognitive creativity through the use of the Remote Associate Test (RAT) and Consequences test (derived from the Torrance Test of Creative Thinking), with the personality test (NEO-PI) and the poem creative task. Ivcevic et al.'s studies revealed that EI correlated with cognitive intelligence (SAT scores) moderately (Study 1 $r = .34$, $p < .001$ and Study 2 $r = .30$, $p < .01$). This findings supported the notion that EI is a distinct construct, yet a subset of general intelligence. The pattern of correlations between EI and cognitive creativity were non significant (except for one value in Study 2). With regard to correlations with the NEO-PI, none of EI's total scores and its subscales correlated significantly with the scale of openness to experience (However, there were other significant correlations; For example, EI's regulation of emotion subscale correlated positively and significantly with the NEO-PI's extraversion, agreeableness and conscientiousness scales [$r = .19$, $p < .05$; $r = .28$, $p < .01$; and $r = .19$, $p < .05$ respectively]). Moreover, the EI scores did not correlate with the poem-writing task used in Study 1, nor the creativity self-report measure used in Study 2. The above results leads to the interpretation that EI has no relationship either with the creative personality (through the openness to experience link) or as a predictor of creative behavior. However, Ivcevic et al. (2007) hypothesized that the EI might serve as regulator between emotional traits and creativity, particularly in individuals with high mood swings. In addition, there is a direct link between EI and leadership (Zhou & George, 2003), and the latter with the modulation of creativity in organizational settings (Puccio, Murdock, & Mance, 2007;

Zhou & George, 2003). This relationship will be further explored in the next section of this chapter.

Summarizing the above arguments, *openness to experience* seems to emerge as general trait of the creative personality. Evidence from past research efforts suggested that openness to experience as captured by the NEO-PI might be a sound predictor of creative potential. The relationship of emotions with the creative personality comes from the evidence and close relationship (somehow overlapping) between *emotional creativity* and *openness to experience*. In this line of thought, the ECI has exhibited good predictive capabilities of creative behavior as reported by Averill (1999), Fuchs et al. (2007) and Ivcevic et al. (2007). An emotional creative individual should be capable of transforming his emotional states into novel and effective emotional responses that serve as a catalyst for creative behavior. Although research doesn't support a significant relationship between EI and openness to experience and/or creative production tests, Ivcevich et al. (2007) suggested that EI might serve as a regulation mechanism for creative individuals prone to high mood swings. In addition, there is a considerable body of literature that has linked EI to leadership (Brown, Bryant, & Reilly, 2006; Caruso, Mayer, & Salovey, 2002; Dulewicz, Young, & Dulewicz, 2005) Leadership in turn has been related to creative performance in organizational settings (Ekvall, 1996, 1999; Puccio et al., 2007; Zhou & George, 2003). Therefore, emotional intelligent leaders regulate their emotional responses to the situational context (these responses might not be creative per se) setting the appropriate climate for the creative expression of others (Goleman, Boyatzis, & McKee, 2001; Zhou & George, 2003). The interaction of emotion and the climate that is conducive to creativity will be explored in detail in the next section of this chapter.

Emotion and the Creative Environment

With regard to the broad area of environment, the field of creativity has mainly focused its research in the strand of organizational climate. Researchers have allocated their efforts in identifying the variables within the organizational climate that are conducive to creative performance (Amabile, Conti, Coon, Herron, & Lazenby, 1996; Ekvall, 1996, 1999; Isaksen & Lauer, 2002). *Organizational climate* is understood as a conglomerate of behaviors, attitudes and feelings that characterize life in an organization (Ekvall, 1996, 1999). Ekvall (1996) regarded climate to be an independent construct of people's perceptions, hence something intrinsic and embedded within the organization. However, individuals indeed have a perception of the organizational climate, and in turn, these perceptions translate into a *psychological climate*. The psychological climate is understood as the perception of attitudes, feelings and behaviors that characterize organizational everyday life (Puccio et al., 2007). In this same vein of thought, Amabile et al. (1996) referred to the *psychological context of creativity*, as the sum of individual perceptions of the work environment that modulate creative behavior. The metaphor of climate has been used to portray the dynamic and changing nature of the organizational climate. Therefore, in the same way weather shifts in location and time, so does organizational climate vary in location and time. These variations will have an effect on individual's attitudes, moods and behaviors towards organizational and creative performance (Puccio et al., 2007). It is important to distinguish the concept of organizational climate to that of organizational culture, the latter being a more permanent and deeply grounded set of values, beliefs, history and traditions that are less susceptible to variations (Ekvall, 1996; Isaksen & Lauer, 2002; Puccio et al., 2007). With regard to

the climate that fosters creativity, research has shown high degrees of evidence that the *climate* is indeed an intervening variable in creative performance (and overall organizational performance). Thus, a set of dimensions that either favor or impede creativity have been identified and documented in the creativity literature (Amabile et al. 1996; Ekvall, 1996, 1999; Einarsen & Mathisen, 2004; Isaksen & Lauer, 2002; Lauer, 1994; Puccio et al., 2007). Among the dimensions identified in the literature that facilitate creative behavior, a few of them are: (a) challenge; (b) freedom; (c) idea support; (d) trust and openness; (e) dynamism and liveliness; (f) playfulness and humor; and (g) risk taking to name a few (Ekvall, 1996; Puccio et al., 2007). Among those dimensions that hinder creative behavior we find: (a) conflict (Ekvall, 1996); (b) workload pressure; and (c) organizational impediments (Amabile et al., 1996).

As already mentioned at the end of the previous section, the creativity literature suggests that there is a strong link between leadership and creativity (Puccio et al., 2007; Runco, 2007), and of particular relevance for this section, between leadership style and the creative climate. In regard to latter, Ekvall (1996) stated that, "The conclusion should be that the climate to a fairly large extent is in the hands of the manager." (p. 122). Furthermore, Puccio et al. (2007) reported that leadership style might explain between 52% and 70% of employee's perception of a particular organizational climate, and whether or not the latter is conducive to creative performance. The leadership style that fosters creativity is analogous to the transformational leadership style, the latter characterized by: (a) being open to change; (b) encouraging new ideas; (c) encouraging debate; and (d) encouraging risk taking and failure (Puccio et al., 2007).

Interestingly, the transformational leadership pattern of behavior described above, overlaps with Goleman et al.'s (2001) description of the *emotional intelligent leader*. Accordingly, the EI leader is described as an individual who creates work environments characterized by trust, collaboration, healthy risk taking and learning. Note the resemblance of the work environments' characteristics described above, with those of the creative climate that fosters creativity (Amabile et al. 1996; Ekvall, 1996, 1999; Isaksen & Lauer, 2002). In addition, transformational leadership theories are unique in terms of the emphasis on emotional and empathic components of leadership (Bono, Foldes, Vinson, & Muros, 2007). Goleman et al. (2001) emphasized the importance of leaders' management and regulation of moods as a crucial factor driving employee performance. Hence, EI leaders can assess their emotional state through emotional self-awareness, authentically regulate and modify their emotional responses through self management, understand their impact through empathy, and ultimately, deploy behaviors that will positively boost other's affective states and performance (Goleman et al., 2001). A study carried out by Bono et al. (2007) in regard to 57 individuals working in a health care company, yielded evidence in favor of transformational leadership behavior as an intervening variable in employee's emotional states and perception of job satisfaction. Thus, individuals who worked for supervisors rated high on transformational leadership reported having more episodes of positive emotions than individuals who worked for low-level transformational leadership supervisors (Bono et al., 2007). In addition, transformational leadership served as a buffer between non-authentic emotional regulation (faking positive emotions and hiding negative emotions) and decreased job satisfaction. Bono et al. (2007) synthesized their findings as follows:

> Our results suggest that managers' transformational leadership behaviors may have broad, deep, and long-lasting effects on individual employees and the organization as a whole. Beyond their immediate effects on employee mood, the positive emotions elicited by transformational leaders have the potential to influence the overall work climate and customer satisfaction. (p. 1364)

At this point it is worth noting that the psychological climate was defined as the perception of attitude, behaviors and feelings that characterize the organizational day-to-day experience. Therefore, leaders have the capacity to catalyze the perception of a positive climate through genuine positive emotions. Consequently, the perception of a positive climate will contribute to generate a climate of trust, playfulness and openness, all of which are dimensions of the climate that fosters creative behavior. With regard to the relationship between transformational leadership and emotional intelligence (EI), though there is a theoretical fit (Goleman et al., 2001), the experimental evidence of a direct relationship is still elusive (Brown et al., 2006; Duckett & Macfarlane, 2003; Dulewicz et al., 2005). Nonetheless, the fact that the relationship hasn't been established experimentally doesn't imply that this relationship between EI and transformational leadership doesn't exist in reality (Brown et al., 2003). In line with Goleman et al.'s (2001) view, Zhou and George (2003) stated that in an organizational setting, it is precisely the EI leader's behaviors that are determinant in awakening and supporting employee creative behavior. Zhou and George (2003) argued that whatever the stage of the creative process (they described a process similar to Treffinger, Isaksen, & Dorval, 1994, Creative Problem Solving model), individuals and groups might easily engage in maladaptive behaviors that hinder creative performance. Some of these behaviors are

related to expressions of anxiety, conflict, frustration, confrontation, morale decay and overexcitement. With regard to the triggers underlying these behaviors, Zhou and George (2003) emphasized the ambiguity that often characterizes creative endeavors (departing from what is known), the fear of failure, fatigue on long-term projects, differences in problem solving styles among team members, and attribution of creative work credit. Therefore, an EI leader should be capable of channeling constructively his/hers and others' emotions to serve the creative process and in turn, create a climate that is supportive to healthy emotional-behavioral expression (Zhou & George, 2003). The latter resonates with Amabile et al.'s (1996) stimulants scales to creativity *supervisory encouragement* and *work group support* and also, with Ekvall's (1996,1991) dimensions of *idea support*, *trust and openness*, and *debate*. Prince (2003) reported case studies in which the above kind of leadership style resulted in favorable organizational climates that led to corporate success. In addition, he reported his empirical observations derived from Synectics (Gordon, 1961; Gordon & Poze, 1981; Prince, 1967) sessions in corporate problem solving scenarios and the impact that negative discounting emotional behaviors had in the climate conducive to creativity (referred to as *field*). He reported that individuals who felt being negatively discounted by their peers during the sessions, immediately (and often unconsciously) engaged in defensive maneuvers and behaviors. These behaviors tended to be adversarial to the "offender" regardless if such behaviors were destructive to organizational purposes. The net impact of these dynamics was reflected in a negative *field* and the Synectics group performance declined (Prince, 2003). Thus, he emphasized that as emotional beings, individuals need to be aware that behaviors and communication patterns are emotionally charged and the latter, susceptible

to subjective interpretations and reactions that will have an impact over climate. Lastly, Amabile, Barsade, Mueller, and Staw (2005) stated that organizations are affective laden environments. In their view, creativity is an affectively charged event (Zhou & George, 2003) in which complex cognitive processes co-occur with (and shape) emotional experiences and vice versa. In their research study in organizational setting, they found that there was a positive and linear relationship between an individual's creative engagement and states of positive mood. In addition, they also found evidence that the style and tone of peer and/or supervisor feedback could either initiate a virtuous or vicious creative cycle. This resonates again with the dimensions of the creative climate that fosters or impedes creativity (Amabile et al., 1996; Ekvall, 1996, 1999) and the importance of leadership (Puccio et al., 2007; Zhou & George, 2003) in setting the climate that is conducive to creative behavior.

In recapitulation of the above arguments, creativity research has mainly focused in the sphere of organizational climate, and in particular, in identifying those variables in the climate that either facilitate or hinder creative performance (Amabile, 1996; Ekvall, 1996). Research in the creative climate has revealed a strong relationship between the climate that is conducive to creativity and the transformational leadership style (Puccio et al., 2007). This leadership style is unique in terms of the emphasis on *emotional and empathic* components of leadership (Bono et al. 2007). In addition, there are theoretical parallels between transformational leadership and the emotional intelligent leaders (Goleman et al., 2001). Bono et al.'s (2007) research stressed the fact that transformational leadership influenced individual's positive moods. Amabile et al.'s (2005) suggested a linear relationship between positive mood and creative performance

in organizational settings. Given the fact that the creative process is an emotionally charged event (Amabile et al., 2005; Zhou & George, 2003), Zhou and George stated that it is through the leader's emotional intelligence skills that creativity is ignited, modulated and effectively sustained in an organization. Finally, Prince (2003) offered case studies that supported the fact that effective modulation of emotional-behavior leads to a climate conducive to creativity and that when negatively emotional driven behaviors are not controlled, the climate becomes disrupted and creative performance declines.

Emotion and the Creative Process

Wallas' (1926) four-stage model of the creative process, which included the stages of preparation, incubation, illumination, and verification, was one of the first attempts to model the creative process. In addition, many historical creative breakthroughs, as reported in biographies and autobiographies of creative eminent individuals, have been described using this model (Davis, 2004; Lubart, 2001; Runco, 2007). However, this model says little or nothing about what are the mental processes at work at each of its stages (Lubart, 2001). In his presidential address to the American Psychological Association, Guilford (1950) manifested his discomfort with the four-stage model regarding the lack of details about the cognitive processes essential to creative thought. Thus, he made a deliberate call for more research geared towards unveiling these underlying cognitive mechanisms. Since then, there has been an ongoing quest in the field of creative studies to indentify and model the stages, sequences, processes, and sub-process that underlie creative thought (and if these are distinct from those of ordinary thought). Among some of these models of the creative process are Gordon's (1961)

Synectics model, Mednick's (1962) associative theory of creative thought, Koestler's (1964) bisociation model, Guilford's (1967) Structure of the Intellect, Torrance's (1988) scientific method approach, Simonton's (1988) chance configuration theory, Woodman and Schoenfeldt's (1990) interactionist model of creative behavior, Finke et al.'s (1992) Geneplore model, Sternberg and Lubart's (1996) creativity investment model and Osborn's (1963) Creative Problem Solving process model and its subsequent modifications (Isaksen, Dorval & Treffinger, 2000; Noller, Parnes & Biondi, 1976, Parnes, 1981, 1988; Puccio, Murdock, & Mance, 2005; Treffinger et al., 1994). Whether it is stages, components or specific conscious or unconscious cognitive processes and skills, all these models mentioned above suppose that an individual engages in cognitive processing of some sort to produce novel and useful results (Lubart, 2001). Mumford, Mobley, Uhlman, Reiter-Palmon, and Doares (1991) proposed a framework that helped categorize cognitive sub processes into a set of core processes that occur in the following loosely sequence: (a) problem construction; (b) information encoding and retrieval; (c) category search (relevant schemas); (d) specification of optimum fitting categories; (e) combination and reorganization of category information to find novel solutions; (f) idea evaluation; and (g) implementation and monitoring. In turn, these *core processes* underlying the creative process (Mumford et al., 1991) can be synthesized (for the sake of analytical simplicity) into three process-clusters: (a) attention and encoding of information; (b) retrieval and manipulation of information; and (c) evaluation and decision-making. Before digging deeper into analyzing the role of emotions in modulating the cognitive processes described above, first it's necessary to review how the field of creativity has traditionally linked emotions to the creative process and

secondly, elaborate on the findings from the field of neuroscience on the interplay between emotions and cognition.

Traditional views on Emotion and the Creative Process

The traditional relationship between emotion (in much of the creativity literature referred to as affective states) and the creative process is two-tiered. First, different affective states either facilitate or hinder the creative process. Second, different affective states influence the motivation for creativity, in particular, that of intrinsic motivation (Amabile, 1985; Collins & Amabile, 1999; Hennessey, 1999). With regard to the affective states that facilitate creativity, there is literature that has tied affective disorders (mood swings and states of mania) with heightened creative states characterized by episodes of exacerbated creative productivity (Andreasen, 1987; Flaherty, 2005; Runco, 2007). There is mixed evidence as to whether it is that positive or negative moods facilitate the creative process (Runco, 2007). However, recent research has tipped the balance towards positive mood as an affective state that is more conducive to creative performance (Amabile et. 2005; Isen, 1999; Kaufman, 2003; Zhou & George, 2003). In spite of this, it is acknowledged that there might be differences across domains with regard to the influence of positive and negative moods in the creative process (e.g. organizational creativity, artistic creativity, scientific creativity, etc.; Runco, 2007). On a different train of thought but related to affective states conducive to creativity, Treffinger (1980) proposed a three-stage model for creative learning with consideration of both cognitive and affective dimensions that facilitate the creative process and creative learning. Among the affective factors contributing to creativity he described curiosity,

openness to experience, tolerance for ambiguity, openness to complex feelings, conflict relaxation, psychological safety in fantasy and imagery, and commitment to productive living towards self-actualization. Note the resemblance of these affective factors to the creative personality traits described previously in this chapter. In a similar fashion, Puccio et al. (2005) have detailed the affective skills that complement the cognitive skills in the thinking skills model of creative problem solving. Among these affective skills that facilitate the process, they mentioned curiosity, dreaming, sensing gaps, playfulness, avoiding premature closure, sensitivity to the environment and tolerance for risks. The second avenue by which emotions have been traditionally linked with the creative process has been through the affective modulation of intrinsic motivation. Research has shown that individuals perform most creatively when personal interests, a sense of challenge, a sense of enjoyment, and personal satisfaction fuel their creative behaviors (Amabile, 1985; Hennessey & Amabile, 1988). In other words, when their motives for creative engagement respond to intrinsic motivation stimuli as opposed to extrinsic motivation stimuli. Hennessey (1999) has theorized that extrinsic constraints (like rewards) are not detrimental to creative performance per se. What undermines creative performance in presence of extrinsic motivation is the negative affective state that germinates as a consequence of the link between extrinsic constraints and stereotyped unpleasant tasks (e.g. rewards mean that there is *work* ahead, and many individuals regard work as an unpleasant task). As opposed to the latter affective state, an individual engaging in intrinsic motivation driven tasks would experience what Csikszentmihalyi (1990) termed as *Flow*, understood as a moment-by-moment enjoyment and alignment

between the self and the task. This state of flow facilitates the creative process (Csikszentmihalyi, 1990).

Without undermining the relevance of the relationship between affective states and the creative process as described above, the field of neuroscience is offering evidence that the influence of emotions might go beyond the modulation of the affective states that facilitate the creative process. Consequently, the evidence is pointing to the direction that emotions are a direct regulator of several cognitive processes, the same processes described previously as governing the creative process.

Emotion and Cognition: Evidence from Neuroscience

In a literature review of neuroimaging studies of emotions and cognition, Duncan and Barret (2007) claimed that there is enough evidence to hold affect (emotions) as a form of cognition. Moreover, they affirmed that the distinction held in past years between these two seemingly distinct mental processes, is more phenomenological rather than ontological. In Duncan and Barret's (2007) words:

> Our review of the neuroanatomical and neuroimaging literature reveals, however, that no brain areas can be designated specifically as ''cognitive'' or ''affective''. Although it is the case that subcortical regions are regulated by prefrontal cortical regions, this state of affairs does not inevitably translate into the conclusion that cognitive parts of the brain regulate affective parts of the brain. Instead, it appears that affect is instantiated by a widely distributed, functional network that includes both subcortical regions (typically called ''affective'') and anterior frontal regions (traditionally called ''cognitive''). As a result, parts of the brain that have

> traditionally been called ‘‘cognitive’’ participate in instantiating an affective state, not merely regulating that state after it has been established. Furthermore, the parts of the brain that have traditionally been called ‘‘affective’’ participate in cognitive processes. The so-called ‘‘affective’’ brain areas (e.g., the amygdala and brainstem) participate in sensory processing and contribute to consciousness in a manner that meets most definitions of ‘‘cognition’’. (p. 1187-1188)

Duncan and Barret elaborated extensively in the direct role that emotions play in cognitive processes such as sensory stimuli processing, attention and awareness to external and internal stimuli, language generation, memory encoding (valence), memory retrieval, and information manipulation. Levine (2007) made similar observations stating that the role of emotion in decisions among competing behaviors is at times a guide to information, a selective attention spotlight, a motivator of behavior, and a common currency for comparing alternatives. It is widely accepted that the creative process allows individuals to navigate from ill-defined scenarios to states of resolution (Mumford, Zaccaro, Harding, Jacobs, & Fleishman, 2000). Neuroscience research (with patients that have had localized brain injuries) has revealed that one of the key mechanisms by which individuals cope with ambiguity and ill-defined situations is with the use of emotions as a guideline to decision-making (Damasio, 1994; Naqvi, Shiv & Bechara, 2006; Stein, 2007). In addition, evaluation is an instrument for decision-making and it is also a core process within the creative process, in particular during the convergent thinking stages of creativity (Mumford et al., 1991; Puccio et al., 2007). Damasio (2001) was emphatic that the ability to generate many novel associations and combinations would be useless if we did not have the ability to evaluate and make decisions, which precisely calls upon the

emotional decision-making mechanism. In this vein of thought and drawing from the related field of artificial intelligence (AI), Boden (1998) emphasized that the evaluative processes pertinent to the creative process are extremely difficult to model by AI. The main difficulties in modeling such processes reside in the fact that identifying criteria that is relevant to evaluate ideas is extremely personal, cultural and contextual sensitive. In this line of thought, Boden (1988) stated: "For example, just why we like or dislike something will often have a lot to do with motivational and emotional factors – considerations about which current AI has almost nothing to say" (p. 354). LeDoux (1989, 1996) remarked that emotions guide evaluation and decision-making mostly in an unconscious fashion, and therefore, that emotions directly modulate attention to stimuli and cognition (whether we are aware of such processes or not).

One important concept that has been stressed by several neuroscientists in past years is the *emotional valance* related to the cognitive appraisal of stimuli (Damasio, 2001; Dietrich, 2004; Duncan & Barret, 2007; Flaherty, 2005; LeDoux, 1989, 1996, Stein, 2007). The emotional valence of a stimulus can be defined as the affective significance that an individual assigns (either consciously or unconsciously) while he or she experiences the stimulus (Flaherty, 2005; LeDoux, 1996). The most basic form of affective significance is whether the stimulus is pleasant or unpleasant and whether it is conducive to arousal or relaxation (Duncan & Barret, 2007; LeDoux, 1989, 1996; Stein, 2007). Consequently, it is the assignment of affective valences to stimuli (ranging from basic survival values to social significance) that determines the strength with which stimuli are experienced, the vividness with which these stimuli will be subsequently encoded in memory, and the kind of bonds that these memories will generate with other

encoded stimuli (Duncan & Barret, 2007; LeDoux, 1996; Stein, 2007). Considering the above, emotions would modulate associative processes by directly influencing the repertoire and availability of stored content in memory. In other words, the vividness, quality, and associative resonance of a stored stimulus are determined by the strength of the affective valence (either positive or negative) with which the memory was experienced and subsequently encoded (Duncan & Barret, 2007; LeDoux, 1996; Stein, 2007).

More directly related to the creative process, Dietrich (2004) stated that emotions were one possible source for creative insight. An individual may deliberately recall emotional memories into to working memory for manipulation and/or let a novel unconscious emotional associations emerge spontaneously into awareness in the form of insight. Nevertheless, he stated that although it is useful to separate cognitive factual processing from emotional processing in terms of conceptual analysis, in reality, factual and emotional processes are tightly weaved and massively distributed in the brain, and the same holds true while the brain is engaged in the creative process (Dietrich, 2004). Epstein (2004) stated that the process of metaphor (analogical thinking), recognized by creativity scholars to be one of the highest levels of associative thinking (Gordon, 1961; Harrington, 1981; Lubart & Getz, 1997; Weisberg, 1995), involves all dimensions of thought. For example, a successful work of art is a pleasing reflection of our sensory, emotional and cognitive neural functions (Epstein, 2004). Lastly, there is growing evidence that the release of the neurotransmitter *dopamine*, related to the emotional-reward system of the brain, decreases the latent inhibition threshold or the filter for the amount of stimuli that we deem as relevant. This lower latent inhibition threshold makes

us more sensible to the environment, facilitates flexible attention, selection of stimuli, and overall cognitive flexibility (Ashby, Isen, & Turken, 1999; Stein, 2007)

Emotion at the Core of the Creative Process

As reviewed in the previous section, there are indications that emotion and affective states may play a more direct role than the just being a motivational drive to the creative process, but of directly intervening and modulating the cognitive processes underlying the creative process. Accordingly, Isen (1999) presented a review of more than 25 studies in which positive affect had a significant influence in different cognitive processes underlying creativity. According to her research, there would be three ways in which affective states, and in particular positive affective states, would intervene in cognitive processing. First, positive affect enhances the quantity of stimuli available for associations. Second, it expands the breadth of relevant possible stimuli to be considered in a problem-solving scenario. Third, it increases over all cognitive flexibility and therefore, increases the probability that two concepts might be associated in a novel way. In this vein of thought, Amabile et al.'s (2005) study in real world organizational setting casted evidence that there was a linear relationship between positive affect and the creative process and that therefore, people's positive feelings and creative cognitions were complexly interwoven in their daily work lives. On a different but related research thread, Russ and Schafer (2006) conducted a study to test the relationship between affect and creativity, specifically the relationship between affect in children's play, emotional memories and divergent thinking. Interestingly, they found stronger evidence supporting the relationship between negative affect in play (as measured by the Affect in Play Scale)

and scores of divergent thinking than positive affect and scores of divergent thinking (the latter only correlated with scores of originality at levels of $r = .34$, $p < .05$). As expressed earlier in this section, it is necessary to further investigate the influence of positive and negative affect (and moods) in the creative process and the need to differentiate influences across different domains. In addition, Russ and Schafer (2006) also found that children's emotional memories scores correlated with divergent thinking scores. This results supported Isen's (1999) premise that access to emotions in memories broadens the scope of associative processes (Russ & Schafer, 2006). A secondary hypothesis of this study, that is key to the present research's primary question, was that the use of emotionally laden stimuli should yield higher levels of divergent thinking scores than emotionally neutral stimuli. The results of their study did not exhibit significant differences between scores of divergent thinking induced by emotional-laden objects versus emotional-neutral objects. Nonetheless, the authors recognize that there might have been a flaw in their methodology as it was a panel of adults that determined which stimuli were emotional-laden and which were emotional-neutral as opposed to having children categorize the nature of the stimuli (Russ & Shaffer, 2006).

Lastly, Lubart and Getz (1997) have proposed a theoretical model of emotional resonance for the construction of metaphorical figures during the creative process. This model serves a *theoretical umbrella* for the present research study and hence, it will be described in detail. Drawing from the concept of emotional valence explained earlier, the authors elaborated on the concept of *endocepts* to denote the idiosyncratic emotions attached to concepts, objects, peoples, and events represented in memory (Lubart & Getz, 1997). Their model is built upon three premises: (a) all images and concepts in memory

have an attached endocept; (b) that there is a mechanism of automatic endocept resonance that propagates an active emotional wave through memory and activates other endocepts; and (c) a resonance threshold mechanism that determines whether or not an activated endocept will enter into working memory and consciousness (Lubart & Getz, 1997). With regard to the resonance propagating mechanism, they hypothesized that when an image is activated (either by internal or external stimuli), the idiosyncratic emotional valence of that image is also activated and moreover, it is propagated as a wave through memory and the associational cortices of the brain. Therefore, other endocepts proximate to the propagated endocept might be activated and their attached images brought into awareness along with the original image. If two images or concepts share proximate affective tones, they might be perceived as more related and the latter favors possible associations (Lubart & Getz, 1997). Regarding the threshold mechanism, it determines whether an activated endocept and its corresponding image will receive further attention and processing in working memory. Hence, it regulates the quantity of associated concepts handled at a single time. Lubart and Getz hypothesized that individuals differ in their threshold sensitivity and that the latter would be determined by an individual's attunement to his or her own emotions. Note how the above-mentioned mechanism is linked with an individual's emotional intelligence and emotional creativity level described previously. Also, emotional sensitivity might fluctuate according to an individual's affective swings (Flaherty, 2005; Isen, 1999; Lubart & Getz, 1997).

To illustrate the endocept resonance mechanism described above, consider the following example from Lubart and Getz (1997):

> …we describe a classroom demonstration that we conducted with 20 business school students in Paris. The problem was to redesign and improve elevators. Students began by accessing their elevator endocept through a structured list of emotional descriptors. For example, one student viewed elevators as restrictive, boring, and cold. After activating the elevator endocept, the resonance with other endocepts was hypothesized to occur automatically. Students then named a diverse set of objects that they felt were emotionally similar to an elevator. One student, for example, suggested a cage for animals at a zoo because these cages also felt confining ("caged in"), boring, and cold ("uninviting"). An association was formed between caged animals and elevators; animal cages were a potential source domain for a metaphor that captured a novel perspective on elevators, the focus of the original problem. Developing the metaphor that an elevator is a zoo cage, the student reasoned that, like animals, people may find their cage boring because they see the same scenery everyday. One idea resulting from this metaphor was to change the displays (e.g., posters) on elevators walls every so often. Another insight from the zoo cage metaphor was that people find the elevator uninviting because it lacks features of their natural habitat; elevators could be improved by furnishing them in the style of a person's living room. (p. 296)

In light of the above theory, Lubart and Getz hypothesized that emotional driven metaphors enhance the probability of novel associations between two or more remote concepts (through endocept resonance), as compared to purely cognitive-factual driven metaphors. Note that individual differences must be accounted for in terms of

individual's attunement with their emotions, resonance threshold level and overall environmental conditions that foster creativity. With the above considerations in mind, the latter hypothesis is precisely the main hypothesis of the present research study in the attempt to empirical test the power of emotions as a vehicle for generating high degrees of novel associations conducive to creativity. As expressed before, it is necessary to keep in mind that the creative process involves several other cognitive processes, beside the associative processes being emphasized in this study, in order to yield ideas that are both novel and useful (Mumford et al, 1991; Puccio et al., 2007).

Summing up, there has been an ongoing quest in the field of creative studies (and recently neuroscience and artificial intelligence) to reveal the underlying mental processes that govern the creative process. Mumford et al. (1991) comprised a list of core processes that have appeared in several models of the creative process and these could be synthesized in three process-clusters: (a) attention and encoding of information; (b) retrieval and manipulation of information (associations/combinations); and (c) evaluation and decision-making. Traditionally, emotions have been linked to the creative process first, in the form of the affective states that are conducive to creativity and secondly, as responsible for fueling creative drive, in particular, through intrinsic motivation (Amabile, 1985; Collins & Amabile, 1999; Hennessey, 1999). Although there is still no clear-cut evidence with regard to whether positive or negative affective states would be conducive to creativity, Amabile et al.'s (2005) study casted evidence for a linear relationship between positive affect and creativity in organizational settings.

Without denying the relevance of the above relationship between emotions and the creative process, the field of neuroscience has yielded evidence that emotions might

play a significant role in directly modulating the cognitive processes involved in the creative process. Duncan and Barret (2007) advocated that there is enough evidence to even disregard the distinction between cognition and emotions. Research studies have pointed out that emotions would directly govern processes such as selective attention, memory encoding and memory retrieval (Duncan & Barret, 2007; LeDoux, 1996). In addition, emotions are part of the decision making mechanism, in particular, when in presence of ill-defined scenarios (Damasio, 1994, 2001; Naqvi et al., 2006; Stein, 2007). Ill-defined and ambiguous situations are precisely the kind of situations that have been acknowledged to benefit the most out of creative behavior (Mumford et al., 2000). It's important to revisit the concept of emotional valence, or the affective significance given by an individual to the way he experiences stimuli and subsequently encodes them into memory (Damasio, 2001; Dietrich, 2004; Duncan & Barret, 2007; Flaherty, 2005; LeDoux, 1989, 1996, Stein, 2007). Isen (1999) reviewed more than 25 studies that would substantiate the influence of emotions in cognitive processing. In general, positive affect enhanced individual's cognitive flexibility and the latter was conducive to higher degrees of creativity. Russ and Schafer (2006) reported significant correlations between emotional memory and divergent thinking, meaning that indeed access to emotions in memories broadens the scope of associative processes. Lastly, Lubart and Getz (1997) emotional resonance theory of metaphor was reviewed in light of its relevance to the research questions of the present study. This theory regarded the emotional valence of encoded stimuli to be a potential mechanism to form associations between remote or distant factual concepts but who are proximate in their affective tone. They hypothesized that the kind of metaphors and associations driven by concepts linked through endocept

resonance should yield higher degrees of novelty than those associations driven by pure cognitive-factual representations. The latter is precisely the main hypothesis that present research study is attempting to validate.

Chapter Summary

The present chapter set to deliver key definitions and concepts in order to provide a better understanding of the rationale, research questions and methodology used in this research study. In addition, an attempt was made to present an extensive review of the body of literature, theories and research on the relationship between emotions and the creative process. Although the focus of this study is on process, the creative phenomenon can only be understood from a systems view, meaning that considerations must be taken with regard to the interactions between the creative process, creative personality and creative environment that result in the creative product. Consequently, a review of the relationship between emotion and both, the creative personality and the creative environment, was provided to illustrate how emotion intervenes at different facets of the creative phenomenon. Lastly, a theoretical model of emotional driven metaphoric thinking was reviewed as it provides the foundations for this research study's questions and hypotheses.

CHAPTER THREE: METHODS AND PROCEDURES

Introduction

The purpose of this chapter is to provide a detailed account of the methodology and experimental design used in this investigation. A rationale is presented for the overarching experimental methodology used as well as details on the procedures used to generate and collect data.

Methodology Background

This was a quantitative experiment based on Amabile's (1982) consensual assessment technique (CAT) to assess a product's creative qualities. Under this framework, a product, concept and/or idea is deemed creative to the extent that a number of independent domain experts can agree it is creative. A domain expert is any individual that has familiarity and competency in a given domain of inquiry (e.g. an artist for evaluating artistic work). Consequently, creativity can be regarded as a quality of such products judged to be creative. In addition, it can be inferred that the process by which the product came to fruition can also be viewed as creative (Amabile, 1982). The above framework is in line with MacKinnon's (1978) view on the assessment of creativity; the best way to study creativity is by examining the creative products of individuals. Therefore, the creative product is a crystallized synthesis of the interacting forces between the creative personality, the creative process and environment (Amabile, 1982; MacKinnon, 1978).

Experimental Design and Task Description

The research design involved one control group and two treatment groups with only post test observation data collection. The experiment consisted in having individuals create an artistic collage composition (a creative product) under two different treatment conditions and a control condition, which later were rated by independent domain experts in number of dimensions, including creativity. Although it is reasonable to assume that creating a collage composition is subject to an individual's artistic skills, Amabile (1982) stated that the collage activity is among the least demanding task in terms of artistic skills as opposed to other artistic endeavors such as drawing, sculpting and/or painting. Despite the above, and as way to control for artistic skill, an artistic proficiency questionnaire was administered to all participants where they were asked to rate themselves in their level of artistic skill on a scale from one (low level) to five (high level).

Other benefits of using the collage task are that it allows for a variety of expressions, a considerable flexibility in responses, different degrees of novelty, and overall, its output is a distinct product that can be assessed in a number of dimensions, including creativity, by independent observers (Amabile, 1982). A pilot experience was carried involving twelve graduate students from the International Center for Studies in Creative, Buffalo State College prior to the research study to test the appropriateness of the collage task. This pilot experience confirmed that the collage task complied with the above criteria and in addition, it was executable in a reasonable lapse of time, approximately thirty minutes.

The Treatment Conditions

The anchor theme for the research study's collage task was New Year's Eve. The control group and both experimental groups participants were instructed to *represent as creatively as possible what New Year's Eve meant them* (see appendices A1 and A2). The treatment condition for both experimental groups consisted in a narrative-priming stimulus in the context of the New Year's Eve theme (see appendices B1 and B2). The control group did not receive any priming stimulus besides the baseline instruction described above. Research has indicated that text narrative is an effective medium to elicit a reader's emotional response (Cupchick, Oatley, & Vorderer, 1998; Soederberg & Stine, 1995). The narrative-priming stimulus had two forms, one factual and one emotional. The factual narrative was meant to convey information in the form of facts about the New Year's Eve theme as way of providing further factual stimulation to ideation and the creative process. The emotional narrative was meant to elicit an emotional response around the New Year's Eve theme and at the same time, activate an individual's emotional resonance mechanism (Lubart & Getz, 1997) in consonance with their creative process. Consequently, one experimental group was denominated as the *Factual Group* and the other experimental group was denominated as the *Emotional Group* throughout the research study.

The narratives were written by the researcher and, following Amabile's (1985) protocol, they were put through a two-stage refinement and validation process. First, and in an iterative process, three graduate students helped refine the structure and content of the narratives. Second, a sample of 40 undergraduate students enrolled in courses CRS 201 and CRS 303, at Buffalo State College, NY, representative of the research study's

demographic sample, rated the narratives' emotional content. In doing so, the 40 students were randomly assigned to one of two groups (20 individuals per group), either to the emotional narrative rating group or the factual narrative rating group. Individuals were kept blind as to which narrative they were rating. To rate the level of emotional content of the narratives, each individual read their respective narrative and proceeded to rate it using a likert scale instrument that ranged from a score of one (*absolutely factual content*) to a score of seven (*absolutely emotional content*) (see appendix C). The mean score for the emotional narrative was 5.05, whereas the mean score for the factual narrative was 2.6. Due to the fact that the rating score data set did not distribute normally, the Mann-Whitney *U* test was used to compare the mean scores between the two groups. The value obtained was $U = 69.00$ at a $p < .01$. The above indicated that the mean score for the emotional content was significantly different between the two narratives, meaning that the emotional narrative indeed was rated with higher emotional content than the factual narrative. In addition, the factual narrative score was skewed towards the absolutely factual content end of the continuum of the likert scale whereas the emotional narrative mean score was skewed towards the absolutely emotional content end of the continuum of the likert scale, which contributed to the validation of priming stimuli.

Research Study Sample

The sample for this research study comprised 75 individuals drawn from three sections of undergraduate creative studies CRS 205 course at Buffalo State College. Individuals within each section (approximately 25 individuals per section) were randomly assigned using a web number randomizer (Retrieved December 4, 2008 from

http://www.randomizer.org) to either the control group or one of the two experimental groups. A voluntary written consent form was administered to all participants. The final number of participants was 65 individuals, from which 51 were female and 14 were male. Twenty individuals, 13 female and 7 male, composed the final control group and their average age was 18.5 years. Twenty-three individuals, 19 female and 4 male, composed the emotional experimental group and their average age was 18.59 years. Finally, twenty-two individuals, 19 female and 3 male, composed the factual experimental group, and their average age was 18.86 years.

Experimental Logistics

The experiment was carried out at a large conference hall at Buffalo State College during a class hour period for each CRS 205 sections respectively. This meant that the testing protocol was ran three times, one for each section, in the same room and following the exact same sequence of events. The room was setup with three rows of long tables that sat approximately nine individuals with an appropriate workspace. Consequently, and for each of the three sections, in the first row sat all control group participants, in the second row all emotional group participants and in the third row all factual group participants.

Participants were provided with an envelope that contained: (a) consent form, (b) art proficiency questionnaire, (c) instruction sheet, (d) either the emotional or the factual narrative (if he/she was part of one of the experimental groups), (d) task reflection questionnaire and (f) the collage materials (see appendix D). The materials for the collage comprised of a pair of scissors, a glue stick, a set of assorted color construction papers,

and a piece of white cardboard (11’ x 7’). The entire testing protocol took 60 minutes according to the following sequence of events:

Experimental Phase	Minutes
Introductions and distribution of experimental packets	5
Consent form / art proficiency questionnaire /Instruction briefing	5
Material inspection and collage planning (incubation period)	10
Collage Task	30
Complete task reflection questionnaire	5
Experiment wrap up	5

As described above, at the end of the collage task participants were asked to complete a Task Reflection Questionnaire. This was a four or five-item questionnaire (depending whether participant had been assigned to the control or one of the experimental groups, respectively). This questionnaire used a likert scale questions to have participants reflect on the task and their creative process while working on the artistic collage (see appendices E1 and E2).

Judging Protocol and Logistics

As mentioned above, the CAT framework (Amabile, 1982) is based on the ability of independent domain experts to achieve a level of agreement in regard to the assessment of a product. In this research study, as the product was an artistic collage, the domain experts had to be any individual with familiarity and competency in the domain of the visual arts. Accordingly, six judges were selected. Five of these judges were practicing artists and graduate students at the Creative Arts Therapy program in Nazareth

College, Rochester, NY. The sixth judge was an art teacher and Creative Studies graduate student at Buffalo State College, Buffalo, NY.

Each judge rated the whole pool of collages independently and in a unique random display order. Following Amabile's (1982) rating protocol judges were given the following set of instructions and supporting information. First, judges had to rate according to their implicit definition and criteria for each of the 18 dimensions for each collage. In other words, no definitions were provided at all, only descriptions for each dimension (see appendix F).

Although the primary dimension of interest was the creativity dimension, the rationale for having judges rate the collages in the 18 dimensions described above was to be able to extract a pure creativity score. In this sense, they idea was to separate as much as possible the creative qualities from the technical qualities when assessing each collage (Amabile, 1982). Each rater was provided with background information regarding the nature of the artwork such as, that undergraduate students participating in the research study had been instructed to represent as creatively as possible in a collage composition what the New Year's Eve theme meant to them. In addition, raters were shown a picture of the set of materials that each individual had been provided with. Raters were kept blind to the fact that the collages were the output of a control group and two experimental groups and to the overall purpose of the research study.

Second, and critical to the evaluation process, judges were instructed to rate a specific collage as compared to the rest of the collages and therefore, stay away from comparison to other external absolute standard or criteria for each of the proposed dimensions. In this sense, raters were encouraged to discriminate among those collages

that were best in show and those that were worst in show from the pool of collages, regardless if by the rater's criteria all collages were poor. Raters used a rating template that had their rater code number, collage number, and a 25-point scale for each dimension (see appendix G). Raters were given three hours to rate the pool of collages (N=65).

Additional Measure

In order to provide an extra layer of information, participants were requested to complete the *FourSight: The Breakthrough thinking profile* measure (Puccio, 2002). This measure is a self-report instrument that yields as an output, an individual's preferences for different operations associated with the Creative Problem Solving framework. From the relative comparison of an individual's scores, a creative problem solving style is extracted. The scores on each of the four scales or preferences range from 9 to 45. Because the creative problem-solving framework represents the natural process by which any human being solves complex problems (Puccio, Murdock & Mance, 2007), an individual's problem solving style might provide some insight into the quality and nature of the artwork created by the research participants. In fact, a previous study carried out by McClean (2004) showed that the creativity scores of collages created by undergraduate students, as rated by independent judges, correlated at different levels of significance to each of the cognitive creativity styles as measured by *FourSight*.

Two weeks after completing the creative collage protocol, two out of the three CRS 205 sections completed the FourSight measure during class hours. The third section received the FourSight measure as a take home assignment. From the sections that received the measure during class hours, 43 participants completed the measure, whereas

from the remaining section, only one participant returned the completed measure. Consequently, control group participants completed 14 measures, with a gender distribution of seven males and seven females and an average age of 17.93 years. Emotional treatment group participants completed 15 measures, with a gender distribution of three males and 12 females and an average age of 18.73 year. Factual treatment group participants completed 15 measures, with a gender distribution of two males and 13 females and an average age of 18.27 years.

Chapter Summary

In this chapter the experimental methodology was outlined in full detail as well as the procedures to generate and collect data. Chapter Four provides a report of the collected data and quantitative analysis results .

CHAPTER FOUR: RESULTS

Introduction

The purpose of this chapter is to provide the results of the quantitative analysis pertaining this research study. SPSS 16.0.2 software for Mac OSX was used to calculate all statistics reported in this chapter. As described in the previous chapter, this study included three sources of data: (a) the task reflection questionnaire (participants completed this questionnaire at the end of the collage task session); (b) six sets of domain expert ratings per participant's collage (each collage was rated on 18 scales); and (c) the FourSight cognitive style measure.

Descriptive statistics are provided for all of the above variables and also inter-rater reliabilities for the 18 rating scales. The inter-rater reliabilities are crucial to the consensual assessment technique (CAT) (Amabile, 1982) for two reasons. First, high levels of agreement between judges (above 70%) make it conceptually and statistically sound to aggregate scores into a total mean score for each participant for each of the 18 scales. The above allows manipulating the aggregated data and doing statistical operations such as analysis of variance, correlations to other variables and regression analysis. Second, a high level of agreement between judges makes it safer to assume that the product under scrutiny indeed posses the qualities subscribed by the judges. For example, let us suppose that the level of agreement in the scoring of the Creativity scale by the six domain experts is above 70%. Then, if collage A is rated low on creativity (mean score for all six judges) and collage B is rated high on creativity (mean score for

all six judges), we can conclude with a high degree of confidence that indeed collage B is more creative than collage A.

After presenting the descriptive statistics and reliability results, inferential statistics were used to test for differences among the experimental conditions in this study. The first analysis used analysis of variance tests to examine differences between the three different conditions, control group, factual priming group and emotional priming group, for each of the 18 dimensions assessed by the domain experts. According to the hypotheses presented in Chapter One, there was an emphasis in assessing whether there was a statistical difference in those scale/criterions associated with creativity between the three treatment conditions. Additionally, correlations and linear regressions were calculated between the three sources of data described above to extract possible interaction effects between the variables.

Descriptive Statistics

Table 4.1.1 shows the general descriptive statistics for the task reflection questionnaire total scores. Tables 4.1.2, 4.1.3, and 4.1.4 show the descriptive statistics for the Task Reflection Questionnaire total scores separated by experimental condition (i..e, control group, emotional group, and factual group).

Table 4.1.1.

Descriptive Statistics Task Reflection Questionnaire Total Scores All Participants

Variable	n	M	SD	Minimum	Maximum
Level of Engagement	65	5.65	1.243	1	7
Level of Enjoyment	65	6.23	0.948	4	7
Contribution of Emotions	65	5.54	1.160	1	7
Contribution of the Narrative[1]	45	5.02	1.602	1	7
Nature of the Ideas	65	4.51	1.659	1	7

[1]Control Group participants did not answer this question

Table 4.1.2.

Descriptive Statistics Task Reflection Questionnaire Total Scores Control Group

Variable	n	M	SD	Minimum	Maximum
Level of Engagement	20	5.15	1.531	1	7
Level of Enjoyment	20	6.00	0.858	4	7
Contribution of Emotions	20	5.60	0.995	4	7
Contribution of the Narrative[1]					
Nature of the Ideas	20	3.95	1.701	1	7

[1]Control Group participants did not answer this question

Table 4.1.3

Descriptive Statistics Task Reflection Questionnaire Total Scores Factual Group

Variable	n	M	SD	Minimum	Maximum
Level of Engagement	22	5.77	0.922	4	7
Level of Enjoyment	22	6.09	1.065	4	7
Contribution of Emotions	22	5.68	0.945	4	7
Contribution of the Narrative	22	5.32	1.323	2	7
Nature of the Ideas	22	5.00	1.662	1	7

Table 4.1.4.

Descriptive Statistics Task Reflection Questionnaire Total Scores Emotional Group

Variable	n	M	SD	Minimum	Maximum
Level of Engagement	23	5.96	1.147	3	7
Level of Enjoyment	23	6.57	0.843	4	7
Contribution of Emotions	23	5.35	1.465	1	7
Contribution of the Narrative	23	4.74	1.815	1	7
Nature of the Ideas	23	4.52	1.534	1	7

Table 4.2.1 shows the general descriptive statistics for the aggregated scores for the 18 Rating Scales used by the domain experts to rate the pool of collages. Tables 4.2.2, 4.2.3, and 4.2.4 show the descriptive statistics for the aggregated scores for the 18 Rating Scales used by the domain experts to rate the pool of collages separated by experimental condition.

As a highlight, although the Creativity scale mean scores were similar between control group (M = 12.93, SD = 3.092), factual priming group (M = 11.89, SD = 4.270),

and the emotional priming group (M = 12.56, SD = 4.476), the variances for both groups that received a priming stimulus were more than one SD higher than the variance for the control group.

Table 4.2.1.

Descriptive Statistics 18 Rating Scales Total Scores All Participants

Variable	n	M	SD	Minimum	Maximum
Creativity	65	12.47	3.953	4	20
Novel Use of Materials	65	11.62	4.250	3	22
Novel Idea	65	12.18	3.422	3	19
Effort Evident	65	13.45	4.228	2	22
Variation in the Use of Shapes	65	13.90	4.018	2	22
Level of Detail	65	11.04	4.111	2	22
Level of Complexity	65	10.71	4.128	2	21
Technical Goodness	65	11.82	3.523	5	20
Overall Organization	65	13.15	3.668	5	20
Neatness	65	12.31	3.718	4	21
Balance	65	14.55	3.712	5	22
Pleasing Use of Color	65	13.55	3.515	4	20
Pleasing Use of Shapes	65	12.69	3.690	5	20
Symmetry	65	14.65	4.673	5	24
Expression of Meaning	65	10.64	5.093	2	20
Overall Liking	65	9.69	3.905	2	20
Aesthetical Appeal	65	10.01	4.105	2	20
Emotional Evocativeness	65	9.90	3.691	2	18

Table 4.2.2.

Descriptive Statistics 18 Rating Scales Total Scores Control Group

Variable	n	M	SD	Minimum	Maximum
Creativity	20	12.93	3.092	6	17
Novel Use of Materials	20	11.42	3.142	6	17
Novel Idea	20	12.26	2.812	9	16
Effort Evident	20	13.39	3.355	8	18
Variation in the Use of Shapes	20	13.08	2.869	8	18
Level of Detail	20	10.58	3.609	5	17
Level of Complexity	20	10.03	2.752	5	14
Technical Goodness	20	12.44	3.508	8	20
Overall Organization	20	13.52	3.675	8	20
Neatness	20	13.22	3.371	7	21
Balance	20	15.15	3.209	11	22
Pleasing Use of Color	20	14.18	3.276	8	20
Pleasing Use of Shapes	20	13.10	3.279	8	20
Symmetry	20	15.12	4.361	9	24
Expression of Meaning	20	12.08	4.833	4	20
Overall Liking	20	10.54	3.401	5	17
Aesthetical Appeal	20	10.78	4.054	4	20
Emotional Evocativeness	20	9.35	3.158	3	14

Table 4.2.3.

Descriptive Statistics 18 Rating Scales Total Scores Factual Group

Variable	n	M	SD	Minimum	Maximum
Creativity	22	11.89	4.270	4	20
Novel Use of Materials	22	10.98	4.387	3	20
Novel Idea	22	11.79	3.378	6	16
Effort Evident	22	13.03	4.824	2	20
Variation in the Use of Shapes	22	13.39	4.402	2	22
Level of Detail	22	10.89	4.887	2	22
Level of Complexity	22	10.51	4.689	2	21
Technical Goodness	22	11.63	3.398	6	17
Overall Organization	22	12.97	3.793	5	20
Neatness	22	12.67	4.039	4	19
Balance	22	14.72	4.129	6	20
Pleasing Use of Color	22	13.33	4.159	4	20
Pleasing Use of Shapes	22	12.39	4.103	6	19
Symmetry	22	14.80	5.062	6	23
Expression of Meaning	22	9.62	5.256	2	19
Overall Liking	22	8.74	3.939	2	16
Aesthetical Appeal	22	9.58	4.053	3	17
Emotional Evocativeness	22	9.95	3.696	4	18

Table 4.2.4.

Descriptive Statistics 18 Rating Scales Total Scores Emotional Group

Variable	n	M	SD	Minimum	Maximum
Creativity	22	12.56	4.476	4	20
Novel Use of Materials	23	12.39	4.957	4	22
Novel Idea	22	12.47	4.106	3	19
Effort Evident	23	13.89	4.436	2	22
Variation in the Use of Shapes	23	15.09	4.360	5	22
Level of Detail	23	11.58	3.821	4	20
Level of Complexity	22	11.38	4.635	3	21
Technical Goodness	23	11.46	3.733	5	19
Overall Organization	23	13.01	3.684	8	20
Neatness	22	11.19	3.635	5	20
Balance	23	13.85	3.746	5	20
Pleasing Use of Color	23	13.22	3.105	8	19
Pleasing Use of Shapes	23	12.63	3.744	5	19
Symmetry	23	14.11	4.703	5	22
Expression of Meaning	23	10.36	5.089	2	20
Overall Liking	22	9.93	4.326	2	20
Aesthetical Appeal	23	9.75	4.283	2	18
Emotional Evocativeness	23	10.32	4.185	2	17

Table 4.3.1 shows the general descriptive statistics for the FourSight scales total scores. Note that from the total sample of 65 individuals only 44 of them were able to complete the FourSight measure. Tables 4.1.2, 4.1.3, and 4.1.4 show the descriptive statistics for the FourSight total scales total scores separated by treatment conditions.

Table 4.3.1.

Descriptive Statistics FourSight Scores All Participants

Variable	n	M	SD	Minimum	Maximum
Clarifier	44	30.73	5.087	21	43
Ideator	44	28.66	5.779	16	41
Developer	44	28.89	6.233	15	40
Implementer	44	31.57	5.675	19	44

Table 4.3.2.

Descriptive Statistics FourSight Scores Control Group

Variable	n	M	SD	Minimum	Maximum
Clarifier	14	30.71	4.631	23	39
Ideator	14	29.93	5.181	19	39
Developer	14	28.43	5.854	15	35
Implementer	14	31.57	4.586	24	41

Table 4.3.3.

Descriptive Statistics FourSight Scores Factual Group

Variable	n	M	SD	Minimum	Maximum
Clarifier	15	32.07	4.818	22	40
Ideator	15	29.13	5.829	16	40
Developer	15	30.07	5.675	18	37
Implementer	15	32.73	6.552	19	42

Table 4.3.4.

Descriptive Statistics FourSight Scores Emotional Group

Variable	n	M	SD	Minimum	Maximum
Clarifier	15	29.40	5.705	21	43
Ideator	15	27.00	6.234	19	41
Developer	15	28.13	7.279	17	40
Implementer	15	30.40	5.792	20	44

Next, Cronbach alphas were calculated for the FourSight measure. Table 4.3.5 shows the results of this analysis of internal consistency. Regarding the FourSight scale's Cronbach alphas, the reliabilities were acceptable considering the fact that the FourSight measure is still a young psychometric instrument (see table 4.3.5).

Table 4.3.5.

FourSight Scales Cronbach Alphas

Variable	α
Clarifier	0.675
Ideator	0.721
Developer	0.790
Implementer	0.752

Inter-Rater Reliabilities 18 Rating Scales

With regard to the inter-rater reliability coefficients, as reported by Amabile (1982), these were calculated using the Spearman-Brown prediction formula:

$$\text{Reliability} = \frac{n\,r}{1 + (n-1)\,r}$$

Where n = number of judges and *r* = mean inter-rater correlation.

Given the above formula, the closer the inter-rater reliability coefficient is to a value of 1, the higher the reliability and consequently, the degree to which judges agree on the assessment of a particular scale. Considering the above, 16 out of the 18 scales yielded coefficients either above or close to the .70 threshold level, which is considered an acceptable inter-rater reliability for this kind of analysis (Amabile, 1982). The Novel Idea scale yielded a coefficient .572 and the Emotional Evocativeness scale yielded a coefficient of .544. The low coefficient on the Emotional Evocativeness scale comes as no surprise as this is a very subjective criterion that is modulated by a myriad of factors such as the rater's personality, experience, his/her own attunement to emotions, etc. With regard to Novel Idea scale, the low coefficient is surprising and interesting. On one hand, one would expect that if the Creativity scale was highly reliable (.756), then the Novel Idea scale should also be, as novelty is a core criterion of creativity (Amabile, 1988; Boden, 1998; Stein, 1974). On the other hand, the fact that the inter-rater reliability for this scale was low (while the Creativity scale coefficient was high), might be interpreted that for some judges it was not enough for a collage to be novel in order to be judged creative. This appears to support the widely accepted definition of creativity, where something creative needs not only to be novel, but also useful. Table 4.4 summarizes the inter-rater reliabilities for the 18 scales.

Table 4.4.

Inter-rater Reliability Coefficients 18 Rating Scales

Variable	R
Creativity	0.756
Novel Use of Materials	0.825
Novel Idea	0.572
Effort Evident	0.820
Variation in the Use of Shapes	0.790
Level of Detail	0.817
Level of Complexity	0.803
Technical Goodness	0.695
Overall Organization	0.739
Neatness	0.724
Balance	0.735
Pleasing Use of Color	0.676
Pleasing Use of Shapes	0.692
Symmetry	0.821
Expression of Meaning	0.802
Overall Liking	0.663
Aesthetical Appeal	0.697
Emotional Evocativeness	0.544

Analysis of Variance Among Treatment Conditions

A described in Chapter One, the focus of this research study was to assess the effects on creative behavior and creative performance of individuals exposed to different priming stimuli during their creative process. Accordingly, analysis of variance tests were calculated to assess if there were any significant differences among the treatment conditions with regard to the self-report Task Reflection Questionnaire and the 18 Rating Scales used by the domain experts to rate the creative collages. With regard to the Task

Reflection Questionnaire tests, due to the fact that this data set did not distribute normally, the Kruskall Wallis test (*H*) was used instead of the ANOVA (*F*) test. The results of this test show that there was a significant difference between the treatment conditions for the Level of Enjoyment scale ($H = 6.147$, $p = .046$) and that the difference observed in the Natrure of Ideas scale approached significance ($H = 5.459$, $p = .065$). Results for all *H* tests are summarized in Table 4.5.1.

Table 4.5.1.

Kruskall Wallis Test Task Reflection Questionnaire

Variable	*df*	*H*	*p*
Level of Engagement	2	4.101	0.129
Level of Enjoyment	2	6.147	0.046
Contribution of Emotions	2	0.355	0.837
Contribution of the Narrative[1]	1	1.070	0.301
Nature of the Ideas	2	5.459	0.065

[1] Control Group participants did not answer this question

Because there was one significant *H* coefficient (Level of Enjoyment Scale) and one *H* coefficient that approached significance (Nature of the Ideas), post hoc Mann-Whitney tests (*U*) were calculated comparing different set of pairs among treatment conditions. When comparing the control group (no priming) with the factual group, there was significant difference in the Nature of the Ideas scale ($U = 137$, $p = .033$), precisely the scale that approached significance in Kruskall Wallis test (*H*). The above means that those individuals that received the factual priming stimuli, self-reported that the ideas they entertained while creating the collage were more “out of the box” than the ideas entertained by those who received no priming stimuli (see table 4.5.2).

Table 4.5.2.

Mann-Whitney test Control Group vs Factual Group

Variable	*U*	*p*
Level of Engagement	166.0	0.160
Level of Enjoyment	199.0	0.576
Contribution of Emotions	208.5	0.761
Nature of the Ideas	137.0	0.033

When performing pair-comparisons between the control group and the emotional group, there was a significant difference in the Level of Enjoyment scale ($U = 136$, $p = .012$) while the difference in the Level of Engagement scale approached significance ($U = 135.5$, $p = .060$). Consequently, emotional group participants were more involved with the task than control group participants (see table 4.5.3).

Table 4.5.3.

Mann-Whitney test Control Group vs Emotional Group

Variable	*U*	*p*
Level of Engagement	155.5	0.060
Level of Enjoyment	136.0	0.012
Contribution of Emotions	218.0	0.762
Nature of the Ideas	179.0	0.206

Finally post hoc *U* tests between factual group and emotional group did not yield any significant differences in any scale (see table 4.5.4).

Table 4.5.4.

Mann-Whitney test Factual Group vs Emotional Group

Variable	*U*	*p*
Level of Engagement	217.5	0.399
Level of Enjoyment	188.5	0.091
Contribution of Emotions	228.5	0.562
Contribution of the Narrative	208.5	0.301
Nature of the Ideas	189.0	0.137

The second set of analysis of variance tests were calculated to assess whether there were any significant differences among the treatment conditions and the 18 Rating Scales aggregated scores (domain expert ratings). Because the 18 Rating Scales scores distributed normally ANOVA (*F*) tests were used to calculate the coefficients. Surprisingly, there were no significant *F* coefficients among the three conditions for any of the 18 variables. The results for the ANOVA tests are summarized in Table 4.6.

Table 4.6.

ANOVA Tests 18 Rating Scales Among the Three Groups

Variable	*df*	*F*	*p*
Creativity	2	0.389	0.679
Novel Use of Materials	2	0.644	0.529
Novel Idea	2	0.230	0.795
Effort Evident	2	0.231	0.794
Variation in the Use of Shapes	2	1.644	0.202
Level of Detail	2	0.330	0.720
Level of Complexity	2	0.725	0.488
Technical Goodness	2	0.453	0.638
Overall Organization	2	0.142	0.868
Neatness	2	1.800	0.174
Balance	2	0.690	0.505
Pleasing Use of Color	2	0.458	0.635
Pleasing Use of Shapes	2	0.196	0.823
Symmetry	2	0.260	0.772
Expression of Meaning	2	1.283	0.285
Overall Liking	2	1.152	0.323
Overall Aesthetic Appeal	2	0.515	0.600
Emotional Evocativeness	2	0.365	0.696

Correlation Coefficients Within the Three Sources of Data

Correlation coefficients among the items of the Task Reflection Questionnaire items were calculated using Spearman's [ρ] (referred to as r_s), as opposed to Pearson moment coefficients, because this data set didn't follow a normal distribution. Correlations were all positive and most of these significant at the level of $p < .05$. The high correlation between the item Level of Engagement and Level of Enjoyment ($r_s = .640$, $p < .01$) was expected, as high levels of enjoyment while doing a task should be

conducive to high levels of engagement in that task. Of particular interest is the high correlation between the item of Contribution of the Narrative and the item of Contribution of Emotions ($r_s = .544$, $p < .01$). This correlation suggests that there might be an interaction effect between the priming stimulus (the narrative), the use of emotion, and creative thinking. More specifically, as self-reported by the participants, the more the narrative stimulated their creative thinking, the more they self-reported using their emotions to crystallize the ideas portrayed in their collages. The summary of all the Spearman correlation coefficients is presented in Table 4.7.

Table 4.7.

Spearman Correlations Task Reflection Questionnaire

Variable	1	2	3	4	5
Level of Engagement	1.00				
Level of Enjoyment	.640**	1.00			
Contribution of Emotions	.175	.315*	1.00		
Contribution of the Narrative	.329*	.346*	.544**	1.00	
Nature of the Ideas	.193	.308*	.264*	0.206	1.00

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Correlations coefficients among items of the 18 Rating Scales were calculated using Pearson product-moment correlation coefficients (r) as this data set distributed normally. Almost all correlation coefficients were positive and significant meaning that according to the judges' perception, a good collage probably was better on every scale than a poor collage. Although the Creativity scale correlated positively with all 17 scales, it correlated most strongly with those scales that have a novelty criterion embedded such

as the Novel Idea scale ($r = .903$, $p < .01$) and Novel Use of Material scale ($r = .846$, $p < .01$). It is interesting such a high correlation between the Creativity Scale and the Novel Ideas scale considering that the inter-rater reliability coefficient of the latter was somewhat low. In addition, the Creativity scale also correlated strongly, at levels of $r > .80$ ($p < .01$), with the Effort Evident scale, Variation in the Use of Shapes scale, Level of Complexity scale, Overall liking scale, and Aesthetical Appeal scale. It is also worth noting that the Technical Goodness scale, although it correlated at a high level with the Creativity scale ($r = .638$, $p < .01$), it correlated at higher levels ($r > .80$, $p < .01$) with scales associated to technical proficiency such as Overall Organization scale, Neatness scale, and Pleasing Use of Shapes scale. The summary of all the product-moment correlations for the 18 scales is presented in Table 4.8.

Table 4.8.

Pearson Product-Moment Correlations 18 Scales Aggregated Scores

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Creativity	1.00																	
Novel Use of Materials	.846**	1.00																
Novel Idea	.903**	.773**	1.00															
Effort Evident	.800**	.759**	.678**	1.00														
Variation in the Use of Shapes	.804**	.782**	.743**	.801**	1.00													
Level of Detail	.673**	.625**	.520**	.866**	.756**	1.00												
Level of Complexity	.824**	.789**	.717**	.884**	.872**	.890**	1.00											
Technical Goodness	.638**	.450**	.514**	.710**	.494**	.651**	.634**	1.00										
Overall Organization	.566**	.353**	.462**	.651**	.345**	.513**	.495**	.829**	1.00									
Neatness	.304*	0.115	0.238	.355**	0.122	.268*	0.241	.785**	.748**	1.00								
Balance	.485**	.294*	.440**	.509**	.284*	.321**	.379**	.656**	.812**	.730**	1.00							
Pleasing Use of Color	.583**	.436**	.466**	.631**	.405**	.486**	.508**	.736**	.825**	.657**	.798**	1.00						
Pleasing Use of Shapes	.718**	.535**	.594**	.782**	.587**	.678**	.706**	.834**	.819**	.616**	.702**	.844**	1.00					
Symmetry	.486**	.308*	.458**	.519**	.291*	.340**	.383**	.653**	.778**	.655**	.921**	.741**	.692**	1.00				
Expression of Meaning	.583**	.517**	.416**	.670**	.477**	.571**	.567**	.583**	.560**	.333**	.420**	.564**	.596**	.437**	1.00			
Overall Liking	.873**	.709**	.738**	.799**	.632**	.688**	.774**	.795**	.739**	.470**	.614**	.772**	.844**	.627**	.723**	1.00		
Overall Aesthetic Appeal	.807**	.641**	.684**	.752**	.543**	.611**	.692**	.804**	.787**	.532**	.691**	.818**	.852**	.713**	.625**	.948**	1.00	
Emotional Evocativeness	.619**	.514**	.599**	.662**	.547**	.603**	.660**	.564**	.521**	.306*	.454**	.590**	.601**	.506**	.641**	.709**	.653**	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

With regard to FourSight scores, correlations coefficients between the four scales were calculated using Pearson product-moment correlation coefficients (*r*) as this data set distributed normally. All four scales (preferences) were positively correlated at levels of $r > .60$ ($p < .01$), meaning that individuals' preferences were complementary and not competing. It is worth noting that the Developer scale yielded the strongest pattern of correlations to the other three scales/preferences. This means that the higher the Developer preference, the stronger the other preferences should be. In addition, it is no surprise that the strongest correlation was found between the Developer and Clarifier ($r > .749$, $p < .01$). As FourSight theory states, both preferences rely heavily on analytical skills, yet for different outcomes in the context of the Creative Problem Solving framework (Puccio, 2002). Table 4.9 summarizes all the correlation coefficients between all four FourSight preferences.

Table 4.9.

Pearson Product-Moment Correlations FourSight Scores

Variable	Clarifier	Ideator	Developer	Implementer
Clarifier	1.00			
Ideator	.616**	1.00		
Developer	.749**	.743**	1.00	
Implementer	.641**	.621**	.712**	1.00

Note. n = 44

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations Among the Three Sources of Data

The first pattern of correlations analyzed between sources of data was between the scores of the Task Reflection Questionnaire (self-report instrument) and the 18 Rating Scales aggregated scores (domain experts assessments). Because the Task Reflection Questionnaire data set did not distribute normally, the Spearman's [ρ] was used to correlate these two data sets. As Table 4.10 shows, this analysis yielded only one significant coefficient. Contrary to these results, one would have expected some level of convergence between an individual's self-assessment of his creative process and the evaluation by independent raters of the product of that creative process. The discussion and implications of these results will be developed in the following chapter.

Table 4.10.

Spearman Correlations Task Reflection Questionnaire & 18 Scales Aggregated Scores

Variable	Level of Engagement	Level of Enjoyment	Contribution of Emotions	Contribution of Narrative	Nature of ideas
Creativity	.110	-.047	.004	.016	.064
Novel Use of Materials	.160	.052	-.064	.022	.052
Novel Idea	.114	-.047	.000	-.012	.136
Effort Evident	.119	-.011	-.079	.073	-.138
Variation in the Use of Shapes	.301*	.170	.085	.173	.110
Level of Detail	.132	.022	-.003	.045	-.156
Level of Complexity	.215	.055	-.008	.036	.030
Technical Goodness	.051	-.056	-.005	-.009	-.161
Overall Organization	-.052	-.181	-.006	-.055	-.080
Neatness	-.137	-.227	.050	-.055	-.156
Balance	-.090	-.208	-.041	-.142	.033
Pleasing Use of Color	.061	-.087	-.021	.007	.009
Pleasing Use of Shapes	.116	-.058	-.057	-.058	-.050
Symmetry	-.061	-.138	-.024	-.094	.076
Expression of Meaning	-.144	-.109	-.133	.141	-.101
Overall Liking	.079	-.041	-.098	-.041	-.002
Overall Aesthetic Appeal	.109	-.040	-.032	-.022	.006
Emotional Evocativeness	.101	-.037	-.047	.072	.008

*. Correlation is significant at the 0.05 level (2-tailed).

The second pattern of correlations analyzed between sets of data was between the scores of the Task Reflection Questionnaire and the Foursight scores. Because the Task Reflection Questionnaire data set did not distribute normally, the Spearman's [ρ] was used to correlate these two data sets. As a highlight, the Contribution of the narrative scale, meaning the extent to which receiving a narrative about New Year's Eve contributed to participants' creative thinking, was highly correlated with the Clarifier scale at a level of $r_s = .557$, $p < .01$. The above resonates with FourSight theory, where individuals with a high Clarifier preference benefit from additional data to form a comprehensive picture of the task and/or challenge at hand (Puccio, 2002). Table 4.11 shows all correlation coefficients between the variable of these two data sets.

Table 4.11.

Spearman Correlations Task Reflection Questionnaire & FourSight Scores

Variable	Clarifier	Ideator	Developer	Implementer
Level of Engagement	-.087	-.054	-.076	.039
Level of Enjoyment	.026	.170	.216	.255
Contribution of Emotions	.159	-.002	.092	.045
Contribution of Narrative[1]	.557**	.391*	.357	.383*
Nature of ideas	.200	.177	.215	.272

Note. n = 44

[1]Control Group participants did not answer this question

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The last pattern of correlations analyzed between data sources was between the FourSight scores and the 18 Rating Scales aggregated scores. Pearson product-moment correlations were used to calculate the coefficients as both data sets distributed normally. Surprisingly, there were no significant correlation coefficients between the variables of

both data sets. Implications about this result will be explored in the next chapter. Table 4.12 shows all correlation coefficients for these two data sets.

Table 4.12.

Pearson Product-Moment Correlations FourSight Scores & 18 Scales Aggregated Scores

Variable	Clarifier	Ideator	Developer	Implementer
Creativity	-.206	.057	.000	-.037
Novel Use of Materials	-.172	.104	.079	.062
Novel Idea	-.144	.137	.118	.051
Effort Evident	-.119	.086	-.010	-.076
Variation in the Use of Shapes	-.187	-.036	-.008	-.031
Level of Detail	-.216	-.034	-.169	-.259
Level of Complexity	-.213	.009	-.058	-.181
Technical Goodness	-.235	-.036	-.169	-.177
Overall Organization	-.043	0.016	-.042	-.070
Neatness	-.075	-.095	-.168	-.136
Balance	-.135	-.046	-.059	-.009
Pleasing Use of Color	-.135	.026	-.078	-.077
Pleasing Use of Shapes	-.132	.008	-.095	-.188
Symmetry	-.130	.021	-.066	-.037
Expression of Meaning	-.025	.237	.118	-.039
Overall Liking	-.214	.115	-.044	-.118
Overall Aesthetic Appeal	-.199	.110	-.039	-.073
Emotional Evocativeness	-.027	.237	.076	-.174

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis

Although there were no significant correlations between the FourSight scales and the 18 Rating Scales aggregated scores (see table 4.12), and because all FourSight scales were highly correlated amongst themselves (see table 4.9), linear regression analysis

were used to assess the extent to which each individual preference (independent variables) contributed to explaining the variance of each of the 18 Rating Scales aggregated scores (dependent variables). A second series of linear regressions were carried out for each of the dependent variables where the pool of participants was separated by treatment condition. These set of regression analysis were done to assess whether there was an interaction effect between treatment condition and FourSight preference in explaining the variance of each of the 18 Rating Scales. Note that for the above-mentioned analysis, only the 44 participants that completed the FourSight measure data were used to run the regressions. Accordingly, when clustering participants per treatment condition, the Control Group was comprised of 14 participants, the Factual Group was comprised of 15 participants, and the Emotional Group was comprised of 15 participants.

Regression over the Creativity Rating Scale

The linear model for predicting the Creativity scale had an $R^2 = .114$ yet the F coefficient was not significantly different from zero (F (4, 39) = 1.249, $p = .306$). Although the model was not significant, there was one significant B for the Clarifier Scale ($B = -.496$, $p < .05$). Table 4.13.1 summarizes the results for this linear model.

Table 4.13.1

Simultaneous Linear Regression Analysis All Participants: Total Creativity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.064	0.00
Clarifier	-0.496	-2.112	0.041
Ideator	0.194	0.840	0.406
Developer	0.229	0.802	0.428
Implementer	-0.002	-0.008	0.994

Note. R = .337; R^2= .114; Adj. R^2= .0233; SE = 3.93; N = 44

When the regression was run for the Control Group participants (n=14) the model's fit was moderate-low (R^2 = .213), its *F* coefficient was not significant (*F* (4, 9) = .610, *p* = .666), and there were no significant *B*'s for any of the FourSight scales (see table 4.13.2).

Table 4.13.2.

Simultaneous Linear Regression Analysis Control Group: Total Creativity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.520	0.163
Clarifier	0.016	0.038	0.971
Ideator	-0.479	-0.792	0.449
Developer	-0.201	-0.402	0.697
Implementer	0.571	1.280	0.233

Note. R^2= .213; Adj. R^2= -.136; SE = 3.30; N = 14

When the regression was run for the Factual Group participants (n=15) the model's fit was low (R^2 = .025), its *F* coefficient was not significant (*F* (4, 9) = .064, *p* = .991), and there were no significant *B*'s for any of the FourSight scales (see table 4.13.3).

Table 4.13.3.

Simultaneous Linear Regression Analysis Factual Group: Total Creativity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.656	0.129
Clarifier	-0.056	-0.120	0.907
Ideator	0.123	0.240	0.815
Developer	-0.120	-0.160	0.876
Implementer	-0.072	-0.121	0.906

Note. R^2= .025; Adj. R^2= -.365; SE = 4.99; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was high (R^2 = .561) and its *F* coefficient approached significance (*F* (4, 10) = 3.194, *p* = .065). In addition, the Clarifier scale's *B* was highly significant (*B* = -1.251, *p* < .01) and the Developer scale's *B* approached significance (*B* = .871, *p* = .065). The above results reveal the possibility that there might be an interaction effect operating between problem solving preference and the nature of the stimulus with regard to creative performance. In this case, given an emotional priming stimulus (emotional narrative), the higher the clarifier preference for an individual the lower his creativity rating score as assessed by independent domain experts. On the contrary, in the case of the Developer preference, the interaction between the emotional priming stimulus and the problem solving style is positive with regard to creative performance as assessed by independent

domain experts (the scale had a positive *B*). The implications of this interaction effect will be developed in detail in the following chapter. Table 4.13.4 summarizes the coefficients of this regression model.

Table 4.13.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Creativity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.953	0.014
Clarifier	-1.251	-3.240	0.009
Ideator	0.258	0.839	0.421
Developer	0.871	2.077	0.065
Implementer	0.192	0.575	0.578

Note. R^2= .561; Adj. R^2= .385; SE = 3.51; N = 15

Regression over the Novel Idea Rating Scale

The linear model for predicting the Novel Idea scale had an R^2 = .152, yet the *F* coefficient was not significant (F (4, 39) = 1.745, p = .160). Similar to the results of the Creativity scale general regression (table 4.13), the Clarifier Scale *B* was significant at the level of B = -.558 $p < .05$. Table 4.14.1 summarizes the results for this linear model.

Table 4.14.1.

Simultaneous Linear Regression Analysis All Participants: Total Novel Idea Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.961	0.000
Clarifier	-0.558	-2.431	0.020
Ideator	0.179	0.795	0.431
Developer	0.387	1.387	0.173
Implementer	0.022	0.101	0.920

Note. R = .390; R^2= .152; Adj. R^2= .065; SE = 3.51; N = 44

When the regression was run for the Control Group participants (n=14) the model's fit was high (R^2 = .341), yet its *F* coefficient was not significant (*F* (4, 9) = 1.162, *p* = .389). The Ideator Scale *B* approached significance at the level of *B* = -1.102, *p* = .078 (see table 4.14.2).

Table 4.14.2.

Simultaneous Linear Regression Analysis Control Group: Total Novel Idea Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.994	0.077
Clarifier	0.029	0.073	0.943
Ideator	-1.102	-1.989	0.078
Developer	0.388	0.847	0.419
Implementer	0.604	1.477	0.174

Note. R^2= .341; Adj. R^2= .047; SE = 2.67; N = 14

When the regression was run for the Factual Group participants (n=15) the model's fit was low (R^2 = .048), its *F* coefficient was not significant (*F* (4, 10) = .127, *p* = .969) and there were no significant *B*'s for any of the FourSight scales (see table 4.14.3).

Table 4.14.3.

Simultaneous Linear Regression Analysis Factual Group: Total Novel Idea Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.435	0.182
Clarifier	-0.125	-0.272	0.791
Ideator	0.290	0.574	0.579
Developer	-0.223	-0.300	0.770
Implementer	0.200	0.341	0.740

Note. R^2= .048; Adj. R^2= -.332; SE = 3.96; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was quite high (R^2 = .629) and it's *F* coefficient significant (*F* (4, 10) = 4.234, $p < .05$). In addition, both the Clarifier and Developer scales' *B*'s were significant (*B* = -1.249, $p < .01$ and *B* = .867, $p < .05$ respectively). The above results replicate the direction of the interaction effect described for the Creativity Scale between the emotional priming stimulus and these two creative problem-solving styles with regard to the assessment of the Novel Idea scale. It is worth recalling that the correlation coefficient between the Creativity scale and the Novel Idea scale was very strong (*r* = .903, $p < .01$) and so the interaction effect should follow the same direction. Table 4.14.4 summarizes the results for this linear model.

Table 4.14.4.

Simultaneous Linear Regression Analysis Emotional Group. Total Novel Idea Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.783	0.019
Clarifier	-1.249	-3.518	0.006
Ideator	0.380	1.344	0.208
Developer	0.867	2.248	0.048
Implementer	0.157	0.509	0.622

Note. R^2= .629; Adj. R^2= .48; SE = 3.35; N = 15

Regression over the Novel Use of Material Rating Scale

The linear model for predicting the Novel Use of Material scale had an R^2 = .146 and the *F* coefficient was not significant (F (4, 39) = 1.669, p = .117). Nonetheless, and similar to the results reported on the two previous scales, the Clarifier Scale *B* was significant at the level of B = -.573, $p < .05$. Table 4.15.1 summarizes the results for this linear model.

Table 4.15.1.

Simultaneous Linear Regression Analysis All Participants: Total Novel Use of Materials Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.383	0.002
Clarifier	-0.573	-2.487	0.017
Ideator	0.155	0.687	0.496
Developer	0.315	1.126	0.267
Implementer	0.108	0.492	0.626

Note. R = .382; R^2= .146; Adj. R^2= .059; SE = 4.12; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .089), its *F* coefficient was not significant (*F* (4, 9) = .220, *p* = .921) and there were no significant *B*'s for any of the FourSight scales (see table 4.15.2).

Table 4.15.2

Simultaneous Linear Regression Analysis Control Group: Total Novel Use of Materials Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		0.997	0.345
Clarifier	0.083	0.180	0.861
Ideator	-0.087	-0.133	0.897
Developer	-0.316	-0.586	0.572
Implementer	0.345	0.719	0.491

Note. R^2= .089; Adj. R^2= -.316; SE = 3.60; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .149), its *F* coefficient was not significant (*F* (4, 10) = .439, *p* = .778) and there were no significant *B*'s for any of the FourSight scales (see table 4.15.3).

Table 4.15.3.

Simultaneous Linear Regression Analysis Factual Group: Total Novel Use of Materials Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.024	0.070
Clarifier	-0.537	-1.231	0.247
Ideator	0.122	0.256	0.803
Developer	-0.093	-0.133	0.897
Implementer	0.385	0.692	0.505

Note. R^2= .149; Adj. R^2= -.191; SE = 4.79; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate-high (R^2 = .448) yet its *F* coefficient was not significant (*F* (4, 10) = 2.029, *p* = .116). However there was one significant B coefficient for the Clarifier scale, at the level of *B* = -1.080, *p* < .05. Table 4.15.4 summarizes the results for this linear model.

Table 4.15.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Novel Use of Materials Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.944	0.081
Clarifier	-1.080	-2.495	0.032
Ideator	0.268	0.779	0.454
Developer	0.751	1.598	0.141
Implementer	0.233	0.621	0.549

Note. R^2= .448; Adj. R^2= .227; SE = 4.36; N = 15

Regression over the Effort Evident Rating Scale

The linear model for predicting the Effort Evident scale had an R^2 = .063, and the *F* coefficient was not significant (*F* (4, 39) = .661 *p* = .663). There were no significant *B*'s for any of the FourSight scales (see table 4.16.1).

Table 4.16.1.

Simultaneous Linear Regression Analysis All Participants: Total Effort Evident Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.634	0.001
Clarifier	-0.258	-1.069	0.292
Ideator	0.271	1.142	0.260
Developer	0.077	0.263	0.794
Implementer	-0.134	-0.582	0.564

Note. R = .252; R^2= .063; Adj. R^2= .033; SE = 4.31; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate-high (R^2 = .337), yet the *F* coefficient was not significant (*F* (4, 9) = 1.141, *p* = .397). The Developer scale's *B* coefficient approached significance at the level of *B* = -.923, *p* = .070. See Table 4.16.2 for a full summary of this prediction model.

Table 4.16.2.

Simultaneous Linear Regression Analysis Control Group: Total Effort Evident Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.711	0.121
Clarifier	0.117	0.295	0.775
Ideator	0.444	0.799	0.445
Developer	-0.923	-2.006	0.076
Implementer	0.162	0.396	0.701

Note. R^2= .337; Adj. R^2= .042; SE = 3.28; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-low (R^2 = .220), its *F* coefficient was not significant (*F* (4, 10) = .705, *p* = .606), and there were no significant *B*'s for any of the FourSight scales (see table 4.16.3).

Table 4.16.3.

Simultaneous Linear Regression Analysis Factual Group: Total Effort Evident Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.843	0.017
Clarifier	-0.414	-0.990	0.345
Ideator	0.096	0.210	0.838
Developer	0.235	0.351	0.733
Implementer	-0.346	-0.649	0.531

Note. R^2= .220; Adj. R^2= -.092; SE = 5.13; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate (R^2 = .267), its *F* coefficient was not significant (*F* (4, 10) = .912, *p* = .493), and there were no significant *B*'s for any of the FourSight scales (see table 4.16.4).

Table 4.16.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Effort Evident Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.363	0.203
Clarifier	-0.442	-0.886	0.397
Ideator	0.255	0.642	0.536
Developer	0.604	1.116	0.291
Implementer	-0.052	-0.121	0.906

Note. R^2= .267; Adj. R^2= -.026; SE = 4.49; N = 15

Regression over the Variation in the Use of Shapes Rating Scale

The linear model for predicting the Variation in the Use of Shapes Scale had an R^2 = .075, and the *F* coefficient was not significant (*F* (4, 39) = .792 *p* = .538). There were no significant *B*'s for any of the FourSight scales (see table 4.17.1).

Table 4.17.1.

Simultaneous Linear Regression Analysis All Participants: Total Variation in the Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.356	0.000
Clarifier	-0.419	-1.746	0.089
Ideator	-0.020	-0.085	0.933
Developer	0.288	0.987	0.330
Implementer	0.045	0.195	0.846

Note. R = .274; R^2= .075; Adj. R^2= -.020; SE = 4.06; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate-high (R^2 = .394), yet the *F* coefficient was not significant (*F* (4, 9) = 1.466, *p* = .290). The Implementer scale's *B* coefficient approached significance at the level of *B* = .805, *p* = .070. See Table 4.17.2 for a full summary of this prediction model.

Table 4.17.2.

Simultaneous Linear Regression Analysis Control Group:
Total Variation in the Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.628	0.138
Clarifier	-0.105	-0.279	0.787
Ideator	-0.475	-0.895	0.394
Developer	-0.245	-0.558	0.590
Implementer	0.805	2.056	0.070

Note. R^2= .394; Adj. R^2= .125; SE = 2.68; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .125), its *F* coefficient was not significant (*F* (4, 10) = .356, *p* = .834), and there were no significant *B*'s for any of the FourSight scales (see table 4.17.3).

Table 4.17.3.

Simultaneous Linear Regression Analysis Factual Group:
Total Variation in the Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.638	0.025
Clarifier	-0.213	-0.481	0.641
Ideator	-0.085	-0.175	0.865
Developer	0.097	0.137	0.894
Implementer	-0.194	-0.345	0.738

Note. R^2=- .125; Adj. R^2= -.225; SE = 4.87; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate (R^2 = .249), its *F* coefficient was not significant (*F* (4, 10) =

.829, p = .536), and there were no significant B's for any of the FourSight scales (see table 4.17.4).

Table 4.17.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Variation in the Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.887	0.089
Clarifier	-0.698	-1.382	0.197
Ideator	0.183	0.456	0.658
Developer	0.614	1.120	0.289
Implementer	0.142	0.325	0.752

Note. R^2= .249; Adj. R^2= -.051; SE = 4.47; N = 15

Regression over the Level of Detail Rating Scale

The linear model for predicting the Level of Detail Scale had an R^2 = .112, and the F coefficient was not significant (F (4, 39) = 1.228, p = .315). There were no significant B's for any of the FourSight scales (see table 4.18.1).

Table 4.18.1.

Simultaneous Linear Regression Analysis All Participants: Total Level of Detail Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.090	0.000
Clarifier	-0.170	-0.723	0.474
Ideator	0.289	1.251	0.218
Developer	-0.043	-0.150	0.881
Implementer	-0.299	-1.334	0.190

Note. R = .334; R^2= .112; Adj. R^2= .021; SE = 4.07; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was high (R^2 = .529), yet the *F* coefficient was not significant (*F* (4, 9) = 2.531, *p* = .114). The Developer scale's *B* coefficient was significant at the level of *B* = -1.077, *p* < .05. See Table 4.18.2 for a full summary of this prediction model.

Table 4.18.2.

Simultaneous Linear Regression Analysis Control Group: Total Level of Detail Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.412	0.039
Clarifier	0.160	0.480	0.643
Ideator	0.400	0.856	0.414
Developer	-1.077	-2.779	0.021
Implementer	0.003	0.008	0.994

Note. R^2= .529; Adj. R^2= .320; SE = 2.96; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-high (R^2 = .333), yet its *F* coefficient was not significant (*F* (4, 10) = 1.246, *p* = .353), and there were no significant *B*'s for any of the FourSight scales (see table 4.18.3).

Table 4.18.3.

Simultaneous Linear Regression Analysis Factual Group: Total Level of Detail Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.029	0.013
Clarifier	-0.306	-0.792	0.447
Ideator	0.048	0.113	0.912
Developer	0.352	0.566	0.584
Implementer	-0.638	-1.295	0.224

Note. R^2= .333; Adj. R^2= .066; SE = 4.724; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate-low (R^2 = .220), its *F* coefficient was not significant (*F* (4, 10) = .707, *p* = .605), and there were no significant *B*'s for any of the FourSight scales (see table 4.18.4).

Table 4.18.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Level of Detail Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.453	0.177
Clarifier	-0.324	-0.631	0.542
Ideator	0.41	1.003	0.34
Developer	0.358	0.640	0.537
Implementer	-0.176	-0.395	0.701

Note. R^2= .220; Adj. R^2= -.091; SE = 3.99; N = 15

Regression over the Level of Complexity Rating Scale

The linear model for predicting the Level of Complexity Scale had an R^2 = .109, yet the *F* coefficient was not significant (F (4, 39) = 1.193, p = .329). There were no significant *B*'s for any of the FourSight scales (see table 4.19.1).

Table 4.19.1.

Simultaneous Linear Regression Analysis All Participants: Total Level of Complexity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.795	0.001
Clarifier	-0.356	-1.510	0.139
Ideator	0.214	0.927	0.359
Developer	0.223	0.778	0.441
Implementer	-0.244	-1.089	0.283

Note. R = .330; R^2= .109; Adj. R^2= .018; SE = 4.46; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate (R^2 = .296), yet its *F* coefficient was not significant (*F* (4, 9) = .948, *p* = .480) and there were no significant *B*'s for any of the FourSight scales (see table 4.19.2).

Table 4.19.2.

Simultaneous Linear Regression Analysis Control Group: Total Level of Complexity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.913	0.017
Clarifier	-0.127	-0.311	0.763
Ideator	0.222	0.388	0.707
Developer	-0.617	-1.303	0.225
Implementer	0.025	0.059	0.954

Note. R^2= .296; Adj. R^2= -.016; SE = 2.302; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-low (R^2 = .233), its *F* coefficient was not significant (*F* (4, 10) = .757, *p* = .576), and there were no significant *B*'s for any of the FourSight scales (see table 4.19.3).

Table 4.19.3.

Simultaneous Linear Regression Analysis Factual Group: Total Level of Complexity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.597	0.027
Clarifier	-0.304	-0.735	0.479
Ideator	0.109	0.240	0.815
Developer	0.118	0.177	0.863
Implementer	-0.391	-0.741	0.476

Note. R^2= .233; Adj. R^2= -.074; SE = 5.30; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate (R^2 = .282), yet its *F* coefficient was not significant (*F* (4, 10) = .980, *p* = .461), and there were no significant *B*'s for any of the FourSight scales (see table 4.19.4).

Table 4.19.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Level of Complexity Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.074	0.308
Clarifier	-0.629	-1.274	0.231
Ideator	0.336	0.854	0.413
Developer	0.564	1.053	0.317
Implementer	-0.014	-0.032	0.975

Note. R^2= .282; Adj. R^2= -.006; SE = 5.56; N = 15

Regression over the Technical Goodness Rating Scale

The linear model for predicting the Technical Goodness Scale had an R^2 = .085, yet the *F* coefficient was not significant (*F* (4, 37) = .907, *p* = .469). There were no significant *B*'s for any of the FourSight scales (see table 4.20.1).

Table 4.20.1.

Simultaneous Linear Regression Analysis All Participants: Total Technical Goodness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.522	0.000
Clarifier	-0.255	-1.071	0.291
Ideator	0.256	1.091	0.282
Developer	-0.091	-0.312	0.757
Implementer	-0.108	-0.474	0.638

Note. R = .292; R^2= .085; Adj. R^2= .001; SE = 3.54; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate (R^2 = .307), yet its *F* coefficient was not significant (*F* (4, 9) = .997, *p* = .457) and there were no significant *B*'s for any of the FourSight scales (see table 4.20.2).

Table 4.20.2.

Simultaneous Linear Regression Analysis Control Group: Total Technical Goodness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.526	0.032
Clarifier	-0.522	-1.292	0.229
Ideator	0.765	1.346	0.211
Developer	-0.418	-0.890	0.397
Implementer	-0.209	-0.500	0.629

Note. R^2= .307; Adj. R^2= .000; SE = 3.51; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was high (R^2 = .410), however its *F* coefficient was not significant (*F* (4, 10) = 1.739, *p* = .218), and there were no significant *B*'s for any of the FourSight scales (see table 4.20.3).

Table 4.20.3.

Simultaneous Linear Regression Analysis Factual Group: Total Technical Goodness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.069	0.002
Clarifier	-0.095	-0.261	0.799
Ideator	0.033	0.083	0.936
Developer	0.079	0.135	0.895
Implementer	-0.658	-1.422	0.186

Note. R^2= .410; Adj. R^2= .174; SE = 3.10; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was low (R^2 = .115), its *F* coefficient was not significant (*F* (4, 10) = .324, *p* = .856), and there were no significant *B*'s for any of the FourSight scales (see table 4.20.4).

Table 4.20.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Technical Goodness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.590	0.143
Clarifier	-0.550	-1.003	0.340
Ideator	0.062	0.143	0.889
Developer	0.354	0.596	0.565
Implementer	0.264	0.557	0.590

Note. R^2= .115; Adj. R^2= -.239; SE = 4.16; N = 15

Regression over the Overall Organization Rating Scale

The linear model for predicting the Overall Organization Scale had an R^2 = .012, its *F* coefficient was not significant (*F* (4, 39) = .118, *p* = .957). There were no significant *B*'s for any of the FourSight scales (see table 4.21.1).

Table 4.21.1.

Simultaneous Linear Regression Analysis All Participants: Total Overall Organization Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.613	0.001
Clarifier	-0.019	-0.075	0.941
Ideator	0.127	0.522	0.604
Developer	-0.050	-0.167	0.869
Implementer	-0.101	-0.427	0.672

Note. R = .109; R^2= .012; Adj. R^2= -.089; SE = 3.83; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .154), its *F* coefficient was not significant (*F* (4, 9) = .410, *p* = .797) and there were no significant *B*'s for any of the FourSight scales (see table 4.21.2).

Table 4.21.2.

Simultaneous Linear Regression Analysis Control Group: Total Overall Organization Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.843	0.098
Clarifier	-0.135	-0.304	0.768
Ideator	0.753	1.201	0.261
Developer	-0.395	-0.761	0.466
Implementer	-0.398	-0.861	0.412

Note. R^2= .154; Adj. R^2= -.222; SE = 4.06; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .113), its *F* coefficient was not significant (*F* (4, 10) = .320, *p* = .857), and there were no significant *B*'s for any of the FourSight scales (see table 4.21.3).

Table 4.21.3.

Simultaneous Linear Regression Analysis Factual Group: Total Overall Organization Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.484	0.032
Clarifier	0.073	0.164	0.873
Ideator	-0.104	-0.213	0.836
Developer	-0.078	-0.109	0.915
Implementer	-0.239	-0.421	0.683

Note. R^2= .113; Adj. R^2= -.241; SE = 4.23; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was low (R^2 = .145), its *F* coefficient was not significant (*F* (4, 10) = .425, *p* = .787), and there were no significant *B*'s for any of the FourSight scales (see table 4.21.4).

Table 4.21.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Overall Organization Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.456	0.176
Clarifier	-0.446	-0.828	0.427
Ideator	0.009	0.020	0.984
Developer	0.396	0.677	0.514
Implementer	0.319	0.684	0.510

Note. R^2= .145; Adj. R^2= -.196; SE = 4.03; N = 15

Regression over the Neatness Rating Scale

The linear model for predicting the Neatness Scale had an R^2 = .037, its F coefficient was not significant (F (4, 39) = .379, p = .822). There were no significant B's for any of the FourSight scales (see table 4.22.1).

Table 4.22.1.

Simultaneous Linear Regression Analysis All Participants: Total Neatness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.640	0.001
Clarifier	0.123	0.505	0.617
Ideator	0.064	0.266	0.791
Developer	-0.256	-0.860	0.395
Implementer	-0.073	-0.312	0.757

Note. R = .193; R^2= .037; Adj. R^2= -.061; SE = 3.83; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was high (R^2 = .427), nonetheless its *F* coefficient was not significant (*F* (4, 9) = 1.678, *p* = .238). The Implementer scale's *B* coefficient approached significance at the level of *B* = -.815, *p* = .061. See Table 4.22.2 for a full summary of this prediction model.

Table 4.22.2.

Simultaneous Linear Regression Analysis Control Group: Total Neatness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.040	0.003
Clarifier	-0.473	-1.287	0.230
Ideator	0.804	1.558	0.154
Developer	-0.164	-0.384	0.710
Implementer	-0.815	-2.139	0.061

Note. R^2= .427; Adj. R^2= .173; SE = 3.07; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-low (R^2 = .210), its *F* coefficient was not significant (*F* (4, 10) = .665, *p* = .631), and there were no significant *B*'s for any of the FourSight scales (see table 4.22.3).

Table 4.22.3.

Simultaneous Linear Regression Analysis Factual Group: Total Neatness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.485	0.032
Clarifier	0.216	0.514	0.618
Ideator	0.035	0.075	0.941
Developer	-0.632	-0.935	0.372
Implementer	0.019	0.035	0.972

Note. R^2= .210; Adj. R^2= -.106; SE = 4.25; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was low (R^2 = .080), its *F* coefficient was not significant (*F* (4, 10) = .217, *p* = .923), and there were no significant *B*'s for any of the FourSight scales (see table 4.22.4).

Table 4.22.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Neatness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.341	0.209
Clarifier	-0.149	-0.266	0.796
Ideator	-0.191	-0.429	0.677
Developer	0.075	0.124	0.904
Implementer	0.376	0.778	0.455

Note. R^2= .080; Adj. R^2= -.288; SE = 4.03; N = 15

Regression over the Balance Rating Scale

The linear model for predicting the Balance Scale had an R^2 = .029, its *F* coefficient was not significant (*F* (4, 39) = .290, *p* = .882). There were no significant *B*'s for any of the FourSight scales (see table 4.23.1).

Table 4.23.1.

Simultaneous Linear Regression Analysis All Participants: Total Balance Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.276	0.000
Clarifier	-0.237	-0.964	0.341
Ideator	0.003	0.011	0.991
Developer	0.033	0.110	0.913
Implementer	0.118	0.503	0.618

Note. R = .170; R^2= .029; Adj. R^2= -.071; SE = 3.84; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .130), its *F* coefficient was not significant (*F* (4, 9) = .337, *p* = .847) and there were no significant *B*'s for any of the FourSight scales (see table 4.23.2).

Table 4.23.2.

Simultaneous Linear Regression Analysis Control Group: Total Balance Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.803	0.021
Clarifier	-0.407	-0.900	0.391
Ideator	0.155	0.244	0.813
Developer	0.039	0.075	0.942
Implementer	-0.174	-0.372	0.719

Note. R^2= .130; Adj. R^2= -.256; SE = 3.597; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .098), its *F* coefficient was not significant (*F* (4, 10) = .271, *p* = .890), and there were no significant *B*'s for any of the FourSight scales (see table 4.23.3).

Table 4.23.3.

Simultaneous Linear Regression Analysis Factual Group: Total Balance Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.422	0.036
Clarifier	-0.070	-0.156	0.879
Ideator	-0.054	-0.110	0.915
Developer	-0.441	-0.610	0.555
Implementer	0.333	0.581	0.574

Note. R^2= .098; Adj. R^2= -.263; SE = 4.64; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate-low (R^2 = .191), its *F* coefficient was not significant (*F* (4, 10)

= .590, p = .678), and there were no significant B's for any of the FourSight scales (see table 4.23.4).

Table 4.23.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Balance Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.937	0.081
Clarifier	-0.689	-1.315	0.218
Ideator	0.018	0.043	0.967
Developer	0.476	0.837	0.422
Implementer	0.377	0.831	0.426

Note. R^2= .191; Adj. R^2= -.133; SE = 3.99; N = 15

Regression over the Pleasing Use of Colors Scale

The linear model for predicting the Pleasing Use of Colors Scale had an R^2 = .041, its F coefficient was not significant (F (4, 39) = .414, p = .797). There were no significant B's for any of the FourSight scales (see table 4.24.1).

Table 4.24.1.

Simultaneous Linear Regression Analysis All Participants:
Total Pleasing Use of Colors Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.251	0.000
Clarifier	-0.195	-0.798	0.430
Ideator	0.223	0.928	0.359
Developer	-0.067	-0.227	0.822
Implementer	-0.043	-0.183	0.856

Note. R = .202; R^2= .041; Adj. R^2= -.058; SE = 3.61; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .100), its *F* coefficient was not significant (*F* (4, 9) = .250, *p* = .903) and there were no significant *B*'s for any of the FourSight scales (see table 4.24.2).

Table 4.24.2.

Simultaneous Linear Regression Analysis Control Group:
Total Pleasing Use of Colors Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.297	0.227
Clarifier	-0.167	-0.364	0.725
Ideator	0.496	0.766	0.463
Developer	-0.192	-0.359	0.728
Implementer	-0.006	-0.012	0.990

Note. R^2= .100; Adj. R^2= -.300; SE = 3.74; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .148), its *F* coefficient was not significant (*F* (4, 10) = .436, *p* = .780), and there were no significant *B*'s for any of the FourSight scales (see table 4.24.3).

Table 4.24.3.

Simultaneous Linear Regression Analysis Factual Group: Total Pleasing Use of Colors Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.732	0.021
Clarifier	-0.134	-0.308	0.765
Ideator	0.107	0.224	0.827
Developer	-0.212	-0.302	0.769
Implementer	-0.153	-0.276	0.788

Note. R^2= .148; Adj. R^2= -.192; SE = 4.54; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was low (R^2 = .160), its *F* coefficient was not significant (*F* (4, 10) = .475, *p* = .754), and there were no significant *B*'s for any of the FourSight scales (see table 4.24.4).

Table 4.24.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Pleasing Use of Colors Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.442	0.035
Clarifier	-0.697	-1.306	0.221
Ideator	0.097	0.228	0.824
Developer	0.332	0.573	0.580
Implementer	0.351	0.758	0.466

Note. R^2= .160; Adj. R^2= -.177; SE = 3.37; N = 15

Regression over the Pleasing Use of Shapes Scale

The linear model for predicting the Pleasing Use of Shapes Scale had an R^2 = .067, its *F* coefficient was not significant (*F* (4, 39) = .700, *p* = .597). There were no significant *B*'s for any of the FourSight scales (see table 4.25.1).

Table 4.25.1.

Simultaneous Linear Regression Analysis All Participants: Total Pleasing Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		4.223	0.000
Clarifier	-0.106	-0.440	0.662
Ideator	0.245	1.036	0.306
Developer	-0.008	-0.029	0.977
Implementer	-0.267	-1.160	0.253

Note. R = .259; R^2= .067; Adj. R^2= -.029; SE = 3.74; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .067), its *F* coefficient was not significant (*F* (4, 9) = .161, *p* = .953) and there were no significant *B*'s for any of the FourSight scales (see table 4.25.2).

Table 4.25.2.

Simultaneous Linear Regression Analysis Control Group: Total Pleasing Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.631	0.137
Clarifier	-0.128	-0.273	0.791
Ideator	0.360	0.547	0.598
Developer	-0.320	-0.587	0.571
Implementer	-0.032	-0.066	0.949

Note. R^2= .067; Adj. R^2= -.348; SE = 3.81; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was high (R^2 = .433), however its *F* coefficient was not significant (*F* (4, 10) = 1.907, *p* = .186), and there were no significant *B*'s for any of the FourSight scales (see table 4.25.3).

Table 4.25.3.

Simultaneous Linear Regression Analysis Factual Group: Total Pleasing Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.496	0.006
Clarifier	0.018	0.049	0.962
Ideator	0.364	0.934	0.373
Developer	-0.281	-0.491	0.634
Implementer	-0.625	-1.377	0.199

Note. R^2= .433; Adj. R^2= .206; SE = 3.66; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate-low (R^2 = .186), its *F* coefficient was not significant (*F* (4, 10) = .571, *p* = .690), and there were no significant *B*'s for any of the FourSight scales (see table 4.25.4).

Table 4.25.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Pleasing Use of Shapes Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.697	0.120
Clarifier	-0.572	-1.088	0.302
Ideator	-0.027	-0.065	0.950
Developer	0.627	1.099	0.298
Implementer	0.203	0.447	0.665

Note. R^2= .186; Adj. R^2= -.140; SE = 4.00; N = 15

Regression over the Symmetry Scale

The linear model for predicting the Symmetry Scale had an R^2 = .035, its *F* coefficient was not significant (*F* (4, 39) = .350, *p* = .842). There were no significant *B*'s for any of the FourSight scales (see table 4.26.1).

Table 4.26.1.

Simultaneous Linear Regression Analysis All Participants: Total Symmetry Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.458	0.001
Clarifier	-0.218	-0.888	0.380
Ideator	0.177	0.737	0.466
Developer	-0.059	-0.198	0.844
Implementer	0.035	0.148	0.883

Note. R = .186; R^2= .035; Adj. R^2= -.064; SE = 4.82; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .087), its *F* coefficient was not significant (*F* (4, 9) = .214, *p* = .924) and there were no significant *B*'s for any of the FourSight scales (see table 4.26.2).

Table 4.26.2.

Simultaneous Linear Regression Analysis Control Group: Total Symmetry Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.065	0.069
Clarifier	-0.299	-0.646	0.534
Ideator	0.328	0.503	0.627
Developer	-0.083	-0.153	0.881
Implementer	-0.251	-0.522	0.614

Note. R^2= .087; Adj. R^2= -.319; SE = 5.00; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .064), however its *F* coefficient was not significant (*F* (4, 10) = .171, *p* = .949), and there were no significant *B*'s for any of the FourSight scales (see table 4.26.3).

Table 4.26.3.

Simultaneous Linear Regression Analysis Factual Group: Total Symmetry Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.928	0.083
Clarifier	-0.038	-0.083	0.936
Ideator	0.100	0.199	0.846
Developer	-0.442	-0.601	0.561
Implementer	0.197	0.338	0.743

Note. R^2= .064; Adj. R^2= -.311; SE = 5.80; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate (R^2 = .205), its *F* coefficient was not significant (*F* (4, 10) = .646, *p* = .642), and there were no significant *B*'s for any of the FourSight scales (see table 4.26.4).

Table 4.26.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Symmetry Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.569	0.148
Clarifier	-0.720	-1.387	0.195
Ideator	0.278	0.673	0.516
Developer	0.254	0.450	0.662
Implementer	0.350	0.778	0.455

Note. R^2= .205; Adj. R^2= -.113; SE = 4.96; N = 15

Regression over the Expression of Meaning Scale

The linear model for predicting the Expression of Meaning Scale had an R^2 = .139 and its *F* coefficient was not significant (*F* (4, 39) = 1.576, *p* = .200). The Ideator Scale *B* approached significance at the level of *B* = .423, *p* = .070 (see table 4.27.1).

Table 4.27.1.

Simultaneous Linear Regression Analysis All Participants: Total Expression of Meaning Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.165	0.037
Clarifier	-0.249	-1.077	0.288
Ideator	0.423	1.863	0.070
Developer	0.185	0.656	0.516
Implementer	-0.274	-1.239	0.223

Note. R = .373; R^2= .139; Adj. R^2= .051; SE = 4.96; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate (R^2 = .237), its *F* coefficient was not significant (*F* (4, 9) = .698, *p* = .612) and there were no significant *B*'s for any of the FourSight scales (see table 4.27.2).

Table 4.27.2.

Simultaneous Linear Regression Analysis Control Group: Total Expression of Meaning Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		0.520	0.616
Clarifier	0.282	0.665	0.523
Ideator	0.726	1.217	0.254
Developer	-0.594	-1.204	0.259
Implementer	-0.289	-0.657	0.528

Note. R^2= .237; Adj. R^2= -.102; SE = 5.07; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate (R^2 = .267), however its *F* coefficient was not significant (*F* (4, 10) = .910, *p* = .495), and there were no significant *B*'s for any of the FourSight scales (see table 4.27.3).

Table 4.27.3.

Simultaneous Linear Regression Analysis Factual Group: Total Expression of Meaning Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.675	0.125
Clarifier	-0.479	-1.183	0.264
Ideator	0.235	0.531	0.607
Developer	0.674	1.035	0.325
Implementer	-0.566	-1.097	0.298

Note. R^2= .267; Adj. R^2= -.026; SE = 5.33; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was moderate (R^2 = .278), its *F* coefficient was not significant (*F* (4, 10) = .961, *p* = .470), and there were no significant *B*'s for any of the FourSight scales (see table 4.27.4).

Table 4.27.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Expression of Meaning Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.230	0.247
Clarifier	-0.681	-1.376	0.199
Ideator	0.213	0.541	0.600
Developer	0.695	1.293	0.225
Implementer	-0.014	-0.033	0.974

Note. R^2= .278; Adj. R^2= -.011; SE = 5.12; N = 15

Regression over the Overall Liking Scale

The linear model for predicting the Overall Liking Scale had an R^2 = .156 and its *F* coefficient was not significant (*F* (4, 39) = 1.804, *p* = .148). Both, the Clarifier and the Ideator Scale's *B's* approached significance at the levels of *B* = -.430, *p* = .068 and *B* = .421, *p* = .069 respectively. See table 4.28.1 for a full summary of this model.

Table 4.28.1.

Simultaneous Linear Regression Analysis All Participants: Total Overall Liking Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.562	0.001
Clarifier	-0.430	-1.879	0.068
Ideator	0.421	1.869	0.069
Developer	0.081	0.290	0.774
Implementer	-0.161	-0.736	0.466

Note. R = .395; R^2= .156; Adj. R^2= .070; SE = 3.77; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .107), its *F* coefficient was not significant (*F* (4, 9) = .270, *p* = .890) and there were no significant *B*'s for any of the FourSight scales (see table 4.28.2).

Table 4.28.2.

Simultaneous Linear Regression Analysis Control Group: Total Overall Liking Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.093	0.303
Clarifier	-0.119	-0.259	0.801
Ideator	0.170	0.263	0.798
Developer	-0.341	-0.640	0.538
Implementer	0.231	0.486	0.639

Note. R^2= .107; Adj. R^2= -.289; SE = 3.86; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-low (R^2 = .213), its *F* coefficient was not significant (*F* (4, 10)

= .677 p = .623), and there were no significant B's for any of the FourSight scales (see table 4.28.3).

Table 4.28.3.

Simultaneous Linear Regression Analysis Factual Group: Total Overall Liking Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.993	0.074
Clarifier	-0.099	-0.237	0.817
Ideator	0.317	0.690	0.506
Developer	0.064	0.096	0.926
Implementer	-0.573	-1.072	0.309

Note. R^2= .213; Adj. R^2= -.102; SE = 4.13; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was high (R^2 = .447), yet its F coefficient was not significant (F (4, 10) = 2.018, p = .168). The Clarifier scale's B was significant at the level of B = -1.078, $p < .05$. See Table 4.28.4 for a full summary of this model.

Table 4.28.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Overall Liking Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.937	0.081
Clarifier	-1.078	-2.488	0.032
Ideator	0.355	1.031	0.327
Developer	0.644	1.368	0.201
Implementer	0.207	0.551	0.594

Note. R^2= .447; Adj. R^2= .225; SE = 3.73; N = 15

Regression over the Overall Aesthetic Appeal Scale

The linear model for predicting the Overall Aesthetic Appeal Scale had an R^2 = .129 and its *F* coefficient was not significant (F (4, 39) = 1.450, p = .236). The Clarifier scale's *B* approached significance at the level of B = -.421, p = .078. See Table 4.29.1 for a full summary of this model.

Table 4.29.1.

Simultaneous Linear Regression Analysis All Participants: Total Overall Aesthetic Appeal Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.272	0.002
Clarifier	-0.421	-1.807	0.078
Ideator	0.383	1.674	0.102
Developer	0.042	0.147	0.884
Implementer	-0.071	-0.319	0.752

Note. R = .360; R^2= .129; Adj. R^2= .040; SE = 4.02; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was low (R^2 = .127), its *F* coefficient was not significant (*F* (4, 9) = .327, *p* = .853) and there were no significant *B*'s for any of the FourSight scales (see table 4.29.2).

Table 4.29.2.

Simultaneous Linear Regression Analysis Control Group: Total Overall Aesthetic Appeal Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.152	0.279
Clarifier	-0.302	-0.667	0.522
Ideator	0.318	0.498	0.630
Developer	-0.243	-0.460	0.656
Implementer	0.131	0.280	0.786

Note. R^2= .127; Adj. R^2= -.261; SE = 4.55; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was low (R^2 = .157), its *F* coefficient was not significant (*F* (4, 10) = .466 *p* = .760), and there were no significant *B*'s for any of the FourSight scales (see table 4.29.3).

Table 4.29.3.

Simultaneous Linear Regression Analysis Factual Group: Total Overall Aesthetic Appeal Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.870	0.091
Clarifier	-0.059	-0.135	0.895
Ideator	0.282	0.594	0.566
Developer	0.004	0.005	0.996
Implementer	-0.478	-0.864	0.408

Note. R^2= .157; Adj. R^2= -.180; SE = 4.40; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was high (R^2 = .428), yet its *F* coefficient was not significant (*F* (4, 10) = 1.867, *p* = .193). The Clarifier scale's *B* was significant at the level of *B* = -1.115, *p* < .05. See Table 4.29.4 for a full summary of this model.

Table 4.29.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Overall Aesthetic Appeal Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.030	0.070
Clarifier	-1.115	-2.531	0.030
Ideator	0.258	0.736	0.479
Developer	0.673	1.406	0.190
Implementer	0.258	0.675	0.515

Note. R^2= .428; Adj. R^2= .199; SE = 3.84; N = 15

Regression over the Emotional Evocativeness Scale

The linear model for predicting the Emotional Evocativeness Scale had an R^2 = .234 and its *F* coefficient was significant (F (4, 39) = 2.978, $p < .05$). The Ideator scale's *B* was significant at the level of $B = .530$, $p < .05$. See Table 4.30.1 for a full summary of this model.

Table 4.30.1.

Simultaneous Linear Regression Analysis All Participants: Total Emotional Evocativeness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		3.264	0.002
Clarifier	-0.133	-0.608	0.547
Ideator	0.530	2.472	0.018
Developer	0.160	0.604	0.549
Implementer	-0.532	-2.556	0.015

Note. R = .484; R^2= .234; Adj. R^2= .155; SE = 3.39; N = 44

When the regression was run for the Control Group participants (n=14), the model's fit was moderate-high (R^2 = .331), yet its *F* coefficient was not significant (*F* (4, 9) = 1.112, *p* = .408) and there were no significant *B*'s for any of the FourSight scales (see table 4.30.2).

Table 4.30.2.

Simultaneous Linear Regression Analysis Control Group: Total Emotional Evocativeness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		-0.147	0.887
Clarifier	0.658	1.659	0.132
Ideator	0.282	0.505	0.626
Developer	-0.702	-1.520	0.163
Implementer	0.105	0.255	0.805

Note. R^2= .331; Adj. R^2= .033; SE = 3.10; N = 14

When the regression was run for the Factual Group participants (n=15), the model's fit was moderate-high (R^2 = .330), yet its *F* coefficient was not significant (*F* (4, 10) = 1.231 *p* = .358), and there were no significant *B*'s for any of the FourSight scales (see table 4.30.3).

Table 4.30.3.

Simultaneous Linear Regression Analysis Factual Group: Total Emotional Evocativeness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		1.996	0.074
Clarifier	-0.243	-0.629	0.544
Ideator	0.409	0.967	0.356
Developer	0.534	0.858	0.411
Implementer	-0.819	-1.660	0.128

Note. R^2= .330; Adj. R^2= .062; SE = 3.58; N = 15

When the regression was run for the Emotional Group participants (n=15) the model's fit was high (R^2 = .412), yet its *F* coefficient was not significant (*F* (4, 10) = 1.752, *p* = .215), and there were no significant *B*'s for any of the FourSight scales (see table 4.30.4).

Table 4.30.4.

Simultaneous Linear Regression Analysis Emotional Group: Total Emotional Evocativeness Ratings Regressed on FourSight Styles

Variable	*Bs*	*t*	*p*
Constant		2.372	0.039
Clarifier	-0.399	-0.894	0.392
Ideator	0.457	1.286	0.227
Developer	0.544	1.122	0.288
Implementer	-0.582	-1.505	0.163

Note. R^2= .412; Adj. R^2= .177; SE = 3.80; N = 15

Complementary Analysis Results

Although not a focus of this research study, given the fact that this study combined self report data (FourSight measure) with data collected from creative products' creativity ratings, there was an opportunity to test whether an individual's problem solving level of confidence (as measured by FourSight) was conducive to higher levels of creativity. The underlying assumption in the above hypothesis is that the stronger an individual's preference for all tasks under the Creative Problem-Solving framework, he or she should develop stronger Creative Problem-Solving skills in time that in turn should be conducive to higher degrees of creativity.

To calculate participants' total FourSight confidence level, each individual's four scales (preferences) scores were added to create a Total FourSight score per individual. Note that for this analysis it is not relevant whether an individual is strong on one preference or another, but whether he or she has a strong preference for the whole

Creative Problem-Solving process. The range for the Total FourSight scores among the 44 participants that completed the measure was between a score of 75 and a score of 158 (minimum possible is 36; maximum possible is 180). From this range of scores, two groups were created to test the above hypothesis, a Low Total FourSight score group (LTF) that included all participants whose Total FourSight scores were in between 75 and 111 and a High Total FourSight score group (HTF) that included all participants whose Total FourSight scores were in between 130 and 158. Consequently, the LTF was comprised of 18 participants and the HTF was comprised of 15 participants (distributed between the three treatment conditions). Due to the fact that these subsamples were different in numbers and did not distribute normally, the Mann-Whitney *U* test was used to test if there was a difference in their mean Creativity scores. The results of the *U* test ($U = 136$, $p = .782$) showed that there was no significant difference for the Creativity rating scale between the LTF ($M = 12.94$, $SD = 4.575$) and HTF ($M = 12.98$, $SD = 4.063$). Implications for this result are discussed in the next chapter.

Chapter Summary

This chapter presented the quantitative results obtained from the statistical analysis of the data obtained from the three sources of data included in this research study: (a) the task reflection questionnaire; (b) the domain experts collage ratings; and (c) the FourSight measure. Analysis, implications and recommendations derived from these results will be presented in the following chapter.

CHAPTER FIVE: DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

Introduction

The purpose of this chapter is to compare the results presented in the previous chapter against the proposed hypotheses outlined in Chapter One, highlight implications of these findings for the field of creativity, review limitations of this study's methodology and procedures, and offer recommendations for future research studies focused on assessing the interaction between cognition, emotion and creativity.

Interpretation of the Research Outcomes

The purpose of this research study was to assess the impact that an emotionally laden stimulus had on an individual's creative process and consequently, over his or her creative products. The underlying assumption was that given an emotionally laden stimulus, an individual's emotional resonance mechanism (as the one described by Lubart & Getz, 1997) would be activated, and that the latter would be conducive to high levels of novelty in creative production. As presented in Chapter One, the main hypothesis for this research study was the following:

> *The expected level of creativity (as rated by domain experts) of an individual's artistic work who is exposed to an emotional priming stimulus during the creative process should be significantly higher than the expected level of creativity of an individual's artistic work who is exposed to a factual priming stimulus during the creative process or to no priming stimuli at all. Consequently, the expected level of creativity (as rated by domain experts) of an individual's artistic work who is*

exposed to a factual priming stimulus during the creative process should be significantly higher than the level of expected creativity of an individual's artistic work who is exposed to no priming stimulus at all.

From the 18 Rating Scales aggregated scores descriptive statistics presented in Chapter Four, it is fairly clear that regarding the Creativity Scale (and the related scales of Novel Idea and Novel use of Material) there were no significant differences between the three groups. This was confirmed by the ANOVA tests results reported in Table 4.6 where there were no significant *F* coefficients for any of the 18 scales. Therefore, on a first layer of scrutiny, the main hypothesis of this research study was not supported by the data.

Even though the above results lend to the interpretation that the priming stimulus (New Year's Eve factual and emotional narrative) had no effect on the participants' creative process and subsequent creative production as assessed by domain experts, a closer look at the descriptive statistics reveal the possibility of something different. Despite the fact that the Creativity Scale mean scores were similar between Control Group ($M = 12.93$, $SD = 3.092$), Factual Group ($M = 11.89$, $SD = 4.270$), and the Emotional Group ($M = 12.56$, $SD = 4.476$), the *SD* for both groups that received a priming stimulus were more than one *SD* higher than the *SD* for the Control Group. The same pattern repeats for those scales closely related to creativity such as the Novel Idea Scale and the Novel Use of Material Scale (see table 5.1).

Table 5.1.

Summary of Descriptive Statistics All Participants: Creativity, Novel Use of Materials and Novel Idea Scales

	Control Group		*Factual Group*		*Emotional Group*	
Variable	M	SD	M	SD	M	SD
Creativity	12.93	3.092	11.89	4.270	12.56	4.476
Novel Use of Materials	11.42	3.142	10.98	4.387	12.39	4.957
Novel Idea	12.26	2.812	11.79	3.378	12.47	4.106

Relatively speaking, this means that Control Group individuals performed fairly even with regard to the Creativity Scale (and its related scales), whereas for those individuals that received a narrative (either the factual or the emotional version) it seems that the stimulus brought to play a third intervening variable that triggered a wider spectrum of creative performance scores. The regression analyses presented on Chapter Four casted evidence in support of an interaction effect between cognitive style as measured by the FourSight measure and the nature of the priming stimulus in explaining (predicting) differences in creative performance as assessed by independent domain experts. More detail on this interaction effect will be developed later in this chapter.

With regard to the secondary hypotheses described in Chapter One, there is little evidence in support of these. Hypothesis number two stated that, under the premise of an emotional resonance mechanism in operation, individuals exposed to an emotional priming stimulus should report higher degrees of engagement in creative and/or unconventional thinking than individuals who were exposed to a factual priming stimulus

or no stimulus at all. The Kruskall Wallis tests (*H*) conducted on the Task Reflection Questionnaire showed that there was a significant difference between the self-report scores of the Nature of Ideas Scale between the Factual Group and the Control Group. The above means that those individuals that received the factual priming stimuli, self-reported that the ideas they entertained while creating the collage were more "out of the box" than the ideas entertained by those who received no priming stimulus (see table 4.5.2). This is in line with analogical and combinatorial theories of creativity in which the wider the array of stimuli an individual has available to cognitively manipulate, the higher the probability of crafting novel combinations (Koestler, 1964; Mednick, 1962; Simonton, 1988) However, this difference did not hold when comparing the Emotional Group score to the Control Group score (the Emotional Group score was indeed higher than the Control Group score, yet the difference was not statistically significant) and/or when comparing Emotional Group score to the Factual Group score regarding the Nature of Ideas scale. As a highlight, while individuals in the Control Group self-reported entertaining the least innovative ideas while creating the collage, their score for the Creativity Scale (as assessed by independent domain experts) was the highest as compared to the two treatment groups, although this difference was not statistically significant. Nonetheless, this brings the issue of which is the relevant locus of evaluation for creativity as there might be a dissonance between a social appreciation of creativity by domain experts and the appreciation of one's own creativity. More of this will be discussed later in this chapter.

Hypothesis number three stated that under the premise of an emotional resonance mechanism in operation, individuals exposed to an emotional priming stimulus should

report a greater tendency to tap deliberately into their emotions and feelings during their creative process than individuals who were exposed to a factual priming stimulus or no stimulus at all. The results didn't support this hypothesis, as the Kruskall Wallis test (*H*) coefficient for the Contribution of Emotion Scale was not significant meaning that there was no difference at all between the three experimental groups. Two critical dynamics modulating the above results regarding hypothesis number three need to be discussed in detail. First, and as exposed in Chapter two, emotional responses operate largely unconsciously and thus at any given time, we are only aware of a small fraction of our emotional activity on a general basis. In this sense, it was most likely that individuals exposed to the emotional priming stimuli indeed might have had experienced heightened emotional activity while doing the collage task, yet they were not consciously aware of it as to self-report it on the Task Reflection Questionnaire. Note that Emotional Group participants reported higher levels of enjoyment and engagement than the other two groups (See table 4.5.1, table 4.5.2, and table 4.5.3). Consequently, participants in the Emotional group were well aware of their overall affective state, yet it seems that at deeper levels of cognition they were not able to tell if their emotions contributed or not to their creative process. Second, and related to the latter, the appraisal of an individual's emotional state and the ability to reflect upon such states depends on an individual's attunement to his or her emotions (probably modulated by his or her emotional intelligence skills) and his or her over all metacognitive skills, meaning the ability to reflect and be aware of one's thinking (and emotions). The Task Reflection Questionnaire indeed demanded a high level of metacognition as it prompted participants to reflect back on their creative process at both the cognitive and emotional level. Given the young age

of the participants (between 18 and 19 years old), it was very much likely that their metacognitive skills were not fully developed to accurately assess the nature of their thinking and emotional states as they worked on the collage task. Note that metacognition and self-awareness are high order cognitive skills that many adults struggle with or never fully develop in their lifetime.

Finally, the results discussed above didn't cast evidence in support of the works of an emotional resonance mechanism as described as Lubart & Getz (1997) operating in concert with participants' creative process. Nonetheless, the above doesn't mean that this mechanism doesn't exist or that it was not operating at all for the individuals who participated in this research study. As mentioned earlier, on one hand, there were third variables intervening between priming stimulus and process that affected individuals' creative process and therefore, limited the possibility to directly correlate higher degrees of creativity and novelty with the presence of an emotionally laden stimulus. On the other hand, and for the reason previously discussed, there might have been limitations to the extent to which participants could self-report the level of contribution of emotions to their creative thinking.

About Objective and Subjective Assessments to Creativity

Since Amabile (1982) introduced the Consensual Assessment Technique (CAT) framework, creativity researchers have embraced this framework for the purpose of assessing the effects of different psychological and environmental interactions over creative production because it provides an objective assessment to creativity. The CAT is indeed a solid framework for the study of creativity for two reasons. First, it relies on the

assessment of a tangible creative product and therefore, it forces to consider creativity beyond the conception of a novel idea, but all the way through implementation to a final product. In addition, when evaluating a creative product, creativity can be unpacked and distinguished from other constructs and dimensions (such as technical goodness) for a more accurate evaluation (less noise). The creative product is a tangible synthesis of the interacting forces of creative talent, the creative process and the environment that fosters creativity. Second, the CAT doesn't rely on any one particular psychological definition of creativity to determine what is creative or what is not (in fact, there is no one meta-valid construct to creativity). On the contrary, it relies on the tacit convergence of a sociological assessment were independent individuals, each with his or her subjective constructs and conceptions, can agree that something possess certain qualities, in this case, that something is indeed highly creative. Validity for this sociological assessment is substantiated on the fact that the judges are domain experts regarding the domain under which a product is being evaluated.

There are two sets of results presented on Chapter Four that provide some insight into what might be a gap between a social and objective appreciation to creativity (CAT) and a psychological and subjective appreciation to creativity (e.g. the Task Reflection Questionnaire). First, and in relation to the Task Reflection Questionnaire, it would be safe to hypothesize that if an individual self reports high levels of engagement with the creative task and that the ideas he/she entertained while in the process of creating the collage were highly out of the box, that the above should be conducive to a final product that is assessed as highly creative by independent domain experts. However, and as table 4.1 shows, there was none but one significant correlation coefficient in the correlation

matrix between the Task Reflection Questionnaire and the 18 Rating Scales scores. Although it was noted earlier that the Task Reflection Questionnaire was subject to some limitations, if the creative product is the tangible synthesis of the creative process, one could have expected a minimum level of convergence between both data sets. Second, when correlating participants' FourSight scores, (individuals' set of preferences for Creative Problem-Solving tasks) with the 18 Rating Scales scores (product), once again there were no significant correlation coefficients at all between the two data sets (see Table 4.12). In addition, when testing if an individual's confidence level with the Creative Problem-Solving process (FourSight Total Score) translated in to higher degrees of creative performance, there was not support in data for such relationship.

The above results may speak to a disconnect and a possible gap between the personal appreciation of creativity and the social appreciation of creativity. In fact, the Factual Group participants self-reported entertaining the most innovative ideas during their creative process nonetheless, their Creativity Scale aggregated mean score was the lowest amongst the three groups (though the differences between the there groups were not significant). If the above is the case, there are a series of questions that need to be addressed as to where do a subjective (psychological) assessment to creativity meet an objective assessment to creativity (sociological).

In the first place, what is the relevant locus of evaluation for creativity? Does a social assessment to creativity do justice to an individual's creative efforts? With no doubt, the choice between a social assessment and a psychological assessment to creativity is contextual and dependent on the purpose of the assessment. In the particular context of education, of developing one's creative abilities and self-actualization, a social

assessment to creativity might be even detrimental, as an individual's creative effort might not be recognized properly, resulting in frustration, damaged self-confidence and increased sense that an individual is not creative at all.

In the second place, what might be the bridge between the psychological and sociological dimensions of creativity? Boden (2004) made a clear distinction between a psychological construct of creativity, which she termed P-creativity (P for psychological), and a sociological construct to creativity, which she termed H-Creativity (H for historical). On one hand, P-creativity stands for creativity as an output of cognition (mental processes), which only needs to be meaningful to the creator himself. On the other hand in H-creativity, the meaning, value, and the degree of novelty of a concept, product and/or idea are socially negotiated by a group of people in time (H-creativity takes place after an act of P-creativity). Unfortunately, Boden didn't offer a mechanism, bridge, and/or third construct that allows connecting the psychological and sociological dimensions of creativity and also, didn't specify who were the relevant social agents that negotiate acts of H-creativity.

Finally, and in regard to the CAT domain experts' impact in judging creativity, do domain experts foster or inhibit creativity in their respective domains? Might it be that domain experts (who serve as the gatekeepers to creativity to in their fields) may become trapped in their paradigms and therefore fail to recognize creative efforts outside the boundaries of such paradigms? In this sense, might the CAT framework be modified to include non-experts that are free from the ruling paradigms of the domain?

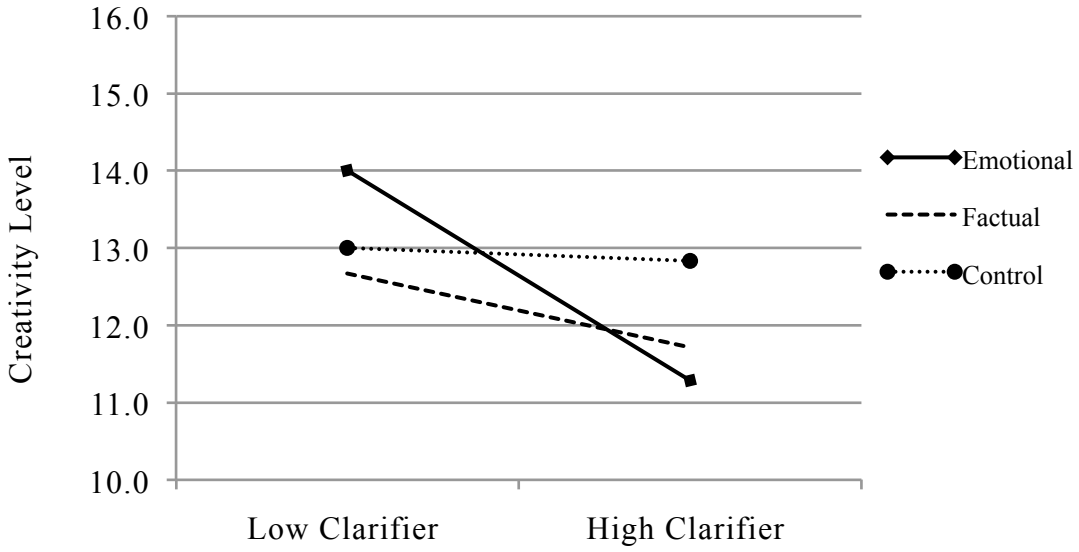
In consideration of the above, further theoretical and empirical efforts are needed to elucidate a sound theoretical framework that balances a psychological assessment to creativity and a sociological assessment to creativity.

Toward an Ecological Approach to Creativity

As mentioned at the beginning of this chapter, although there was no supporting evidence for the primary hypothesis of this research study, the data revealed an interaction effect triggered by the priming stimulus that affected participants' creative performance (the *SD* of the treatment groups were one *SD* higher than the Control Group's *SD*). In particular, and in light of the regression analyses reported in the previous chapter, the interaction effect was confirmed when running regression analyses having the 18 rating scales as dependent variables (each at a time), the FourSight Scale scores as a the dependent variables, and controlling for treatment condition for each of these regressions. The regression models reported for the Creativity Scale, Novel Idea Scale and Novel use of Material Scale, when controlling for Emotional Group participants, casted evidence for a negative interaction effect between the emotional stimulus and the Clarifier preference. That means, when given an emotional priming stimulus (emotional narrative), the higher the individual's Clarifier preference, the lower his or her Creativity, Novel Idea, and Novel use of Material scores as assessed by independent raters. Figure 5.1 shows the above-mentioned interaction effect for the Creativity Scale.

Figure 5.1.

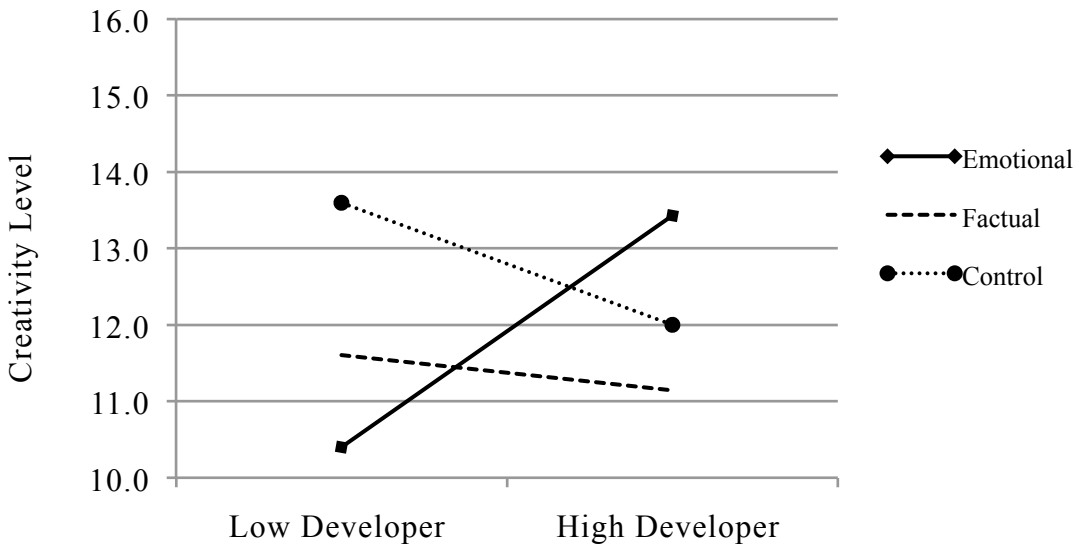
Notional Graph on the Interaction Effect Between Stimuli and the Clarifier Cognitive Style



An opposite pattern emerged for the Developer preference, where the regression models suggest a positive interaction effect between cognitive style preference and the emotional stimulus. That means, when given an emotional priming stimulus (emotional narrative), the higher the individual's Developer preference, the higher his or her Creativity scores as assessed by independent raters (see figure 5.2).

Figure 5.2.

Notional Graph on the Interaction Effect Between Stimuli and the Developer Cognitive Style



Some remarks need to be made to better understand the scope and implications of the above described interaction effects. First, it must be noted that the interaction effect was triggered not by whether an individual was subject or not to a priming stimulus, but by the nature of the stimulus if he or she happened to receive one. In this sense, the interaction effect only surfaced when individuals were given an emotional stimulus (regression analysis yielded significant *B's* only under the emotional condition). Therefore, there is evidence for some sort of an emotional mechanism being triggered by the emotional stimulus, yet whether this mechanism favors or hinders the creative process is being determined, among many possible factors, by an individual's cognitive style.

Second, there is a complex interaction between the Clarifier preference and the Developer preference. As described above, individuals' creative performance shifts in opposite directions when given an emotional stimulus, depending on whether they have a

strong Clarifier or Developer preference. Yet as reported on Table 4.9, the highest correlation coefficient found between FourSight preferences was precisely between the Clarifier and the Developer scales ($r > .749$, $p < .01$). Therefore, and for this demographic, there is a competing interaction effect; the higher the Developer preference in an individual, which boosts creative performance under an emotional priming stimulus, the higher the Clarifier preference should be, which in turn hinders creative performance under the emotional priming stimulus. The final effect of the above interaction should be dependant on the strength (or absolute value) of the preference scale's *B* and the relative scores between the Developer and Clarifier preference for any given individual. In the case of the Creativity Scale, the *B* was stronger for the Clarifier preference ($B = -1.251$, $p < .01$) than for the Developer preference ($B = .871$, $p = .065$), so there should be a tendency towards a detrimental effect to creativity given the emotional priming stimulus. Finally, these results offer interesting insights regarding FourSight taxonomy of Creative Problem-Solving preferences. Research has offered little empirical evidence to differentiate substantially the Clarifier and the Developer preferences (Puccio, 2002). When correlating the FourSight scales to other measures or performance indexes, and probably due to the fact that both of these preferences rely heavily on analytical skills, the Clarifier and Developer scales have tended to move in the same direction and patterns (Puccio, 2002). The results obtained in this research study finally point out a substantial difference between both preferences. For some reason, Clarifiers tend to get hindered in their creative performance by emotional stimuli, while Developers tend to have a boost in creative performance when dealing with emotional stimuli.

Third, and related to detrimental effect of emotional stimuli for Clarifiers, it is interesting to note that when correlating the Task Reflection Questionnaire with the FourSight scores, there was a high correlation between the Contribution of the Narrative Scale scores and the Clarifier Scale scores ($r_s = .557$, $p < .01$). Note that this coefficient was calculated considering both Factual and Emotional group participants. In this sense, and according to FourSight theory, one would have expected that if an individual has a high Clarifier preference, receiving a narrative (information) should contribute to the Clarifier's creative thinking by allowing him or her to craft a comprehensive picture of the challenge at hand (Puccio, 2002). However, the results described above suggest that not every bit of information or stimulus serves the Clarifier's purpose, for if the stimulus is highly emotionally laden, it will likely hinder the individual's creative output (as was the case in this research study). Moreover, though the high Clarifier individual might think that receiving more information is better, he or she may not be aware that emotionally laden stimuli is detrimental to his or her creative performance. With regard to other possible interaction effects modulating the scores of the remaining assessed scales (besides the Creativity, Novel Use of Materials and Novel Idea Scales), there were no other significant regression models in the data.

This level of awareness and detail regarding interaction effects is a huge step toward a deep ecological approach to creativity. In other words, and as expressed by Harington (1990), the results discussed above moves us closer to a deep understanding of what works for who, when, and why in terms of eliciting creative behavior in oneself and others. Puccio et al. (2007) offered the systems approach to creativity in an attempt to portray the interaction forces of person, process, press, and product. FourSight theory

(Puccio, 2002) in turn, offers a connection between the dimensions of person (cognitive style) and process (Creative Problem-Solving framework). The results obtained in this research study build on the above frameworks by offering a deeper understanding of the interaction between the nature of the information being processed, emotion and cognitive style.

Implications of the Findings of this Research Study

There are three key implications derived from the findings of this research study. First, and as suggested earlier, further efforts should be done to close the gap between a psychological and sociological appreciation to creativity. In this regard, it would be great if the CAT framework could be expanded in order to factor in an individual's creative effort, creative process and learning (growth) along with the social assessment of a creative product. In addition, when utilizing the CAT framework for assessing creative products, it is recommended to complement its use with self-report assessments to one's creative products and thus, measure the level of convergence between both assessment lenses. If there are indeed discrepancies between both assessment approaches, then researchers should address such discrepancies, for example, by promoting a dialogue between the individual and the domain expert panel. This way, both parties could gain mutual and deeper understanding regarding the mechanisms and underlying criteria ruling their appreciation to creativity. This dialogue dynamic between individual and domain experts could allow an individual to further develop his/her metacognitive skills and self-awareness in regard to his/her creative process. Also, by understanding the parameters by which domain experts judge creativity (the gatekeepers in one's field), one could make a deliberate choice when engaging in creative endeavors of either abiding to

these parameters or to explore outside the boundaries of such parameters (with the awareness that the latter might go unrecognized by the field).

The second key implication has to do with the evidence found for the interaction effect between cognitive styles, the affective nature of information, and creative production effectiveness. Up front, deeper knowledge about this interaction will allow practitioners in the field of creativity (consultants, trainers, facilitators, and teachers) to be more effective in eliciting creative behavior by adequately selecting the nature of the stimuli and techniques according to their audience's cognitive style profile. In short, this findings will allow practitioners to adopt a more ecological approach to stimulating one's and others creative behavior. In this line of thought, the deeper the understanding of the multiple interactions that take place during creative production, the higher the probability of designing effective creativity heuristic and interventions.

The third key implication relates to the need of gaining an even deeper and more ecological understanding of the creative phenomenon. The interaction effect found in this study between cognitive style and affective nature of stimuli is a clear indication of the tight interplay between emotion, cognition and creativity (Amabile, Barsade, Mueller, & Staw, 2005; Dietrich, 2004; Lubart & Getz, 1997; Puccio, Murdock, & Mance, 2007), and only the tip of the iceberg in this regard. As Duncan and Barret (2007) suggested, the distinction held in past years between cognition and emotion is more phenomenological rather than ontological. Consequently, future research efforts geared toward understanding creative cognition should include and assess both cognitive and emotional dimensions of creativity and the way that one modulates the other and vice versa. As such, further efforts should be directed specifically at unveiling the emotional

mechanisms affecting creative cognition, in the like of the one proposed by Lubart and Getz (1997). Yet even more important, efforts should be directed at understanding the combinations of person, process, press and stimuli, and the specific contexts in which particular combinations of these factors are conducive to higher degrees of creativity.

Limitations of the Study

The present research study is not absent of methodological limitations. First and most critical, the sample size employed in this research study was small (65 participants and only 44 who completed the FourSight measure). A larger sample base, with a minimum of at least 25 individuals per treatment condition (completing 100% of the assessment procedures) would have yielded stronger statistical figures, which in turn would strengthen the findings discussed in this chapter. The above limitation was exacerbated when cutting and grouping the data by treatment condition and cognitive style for the purpose of analyzing the interaction effects discussed earlier.

Second, although there was support in the literature for text based priming stimuli as being effective in eliciting an emotional response, better emotional priming stimuli could have been employed to deliberately tap into emotional cognition and creativity. For example, audiovisual stimuli (a movie) and/or smell (use of scents) are powerful stimuli that have a strong potential for evoking emotional responses. Of course the possibility to design such an experiment that includes audiovisual stimuli and/or smell stimuli would depend on resources available to the researcher. As a way to enhance the effectiveness of text based emotional priming stimuli, Emotional Group participants could have been explicitly instructed, after reading the emotionally laden story, to explore and focus on

their emotions about the New Year's Eve, and then to use those emotions to represent as creatively as possible what the New Year's Eve theme meant to them in the collage composition. Note that in the research design employed for this experiment, Emotional Group participants were given the emotionally laden narrative, but then were only instructed to represent as creatively as possible what the New Year's Eve theme meant to them in the collage composition without an explicit emphasis on having them focus on their emotions for creating their collages.

Third, in an effort to better understand the scope of influence of emotion in the creative process and to also better understand the interactions effects between emotion and aspects of cognition, the research design could have included complementary assessment instruments. Based on the review of the literature exposed in Chapter Two, researchers looking forward to replicate this research study should definitely include the Emotional Creativity Inventory (ECI) (Averill, 1999) as part of the psychometric battery of instruments used to generate participants' creative profiles. In this line of thought, it would be interesting to calculate correlations between the FourSight preferences and the ECI scales. Given the fact that the ECI has correlated highly and positively with tests of creativity (divergent thinking) and to the production of creative products (Ivcevich et al., 2007), what interaction should be expected between the Clarifier Scale, the ECI, and emotionally laden stimuli? In addition to the assessment of creative products (CAT), the methodology could be enhanced by including other creativity tests aimed at probing into specific components, stages or aspects of the creative process in order to assess the impact of emotionally stimuli in such processes. For example, the Torrance Test of Creative Thinking (TTCT) (Torrance, 1974) could be included to assess divergent

thinking skills (originality, fluency, flexibility, elaboration, and resistance to premature closure) essential to divergent phases of the creative process while the Remote Associates Test (Mednick, 1967) could be used to test synthesis and convergent thinking skills essential to convergent phases of the creative process.

Fourth and with regard to the judging protocol, having a larger pool of judges would have resulted in even stronger inter-rater reliability coefficients (although the ones obtained in this research study were acceptable). As expressed earlier in this chapter with regard to the nature of the judges or raters, researchers should ponder whether to have a mix panel between a majority of domain experts and some outsiders as a means to control for the possible limitation of domain experts being trapped by the ruling paradigms and standards of creativity of their respective field. If the level of convergence of such a panel is high with regard to the Creativity Scale, then it is even safer to claim that such products rated high in creativity indeed posses such quality. With regard to the rating procedure itself, although collages were arranged in a random and unique configuration for each round of ratings (per independent rater), the order of the scales within the rating template sheet was kept the same for all judges for all ratings. This could have caused a halo effect due to the fact that rating each collage in terms of the Creativity Scale first, probably influenced the rating of all subsequent scales. In fact the correlations between the Creativity Scale and the remaining 17 scales were all very high and significant at the level of $p < .01$ (see table 4.10). Therefore, it is suggested that in addition to randomizing the sequence by which raters rate the pool of collages, the order of the scales within the rating template sheet should also be randomized.

Finally, caution must be taken when generalizing the findings of this research study. First, and as mentioned above, the sample size was small and the demographic quite specific (undergraduate college students). Second, all the analysis was based on the assessment of an artistic creative product. Do the interaction effects found in this research study transfer to other domains of creativity like scientific, business and/or academic creativity? In this line of thought, further research should be conducted in domains different from artistic creativity to assess whether the interaction effects found between nature of the stimuli and Creative Problem-Solving style still hold.

Future Recommendations

In light of this research study's findings the following research questions are recommended to researchers wanting to assess the interaction between emotion, creative cognition, creative style, and creative behavior: (a) why is it that Clarifiers' creative performance is hindered given an emotionally laden stimulus?; (b) what mechanisms and variables are governing the interaction between the Clarifier preference and the emotionally laden stimulus that leads to a negative impact on creative performance?; (c) why is it that Developers' creative performance is boosted given an emotionally laden stimulus?; (d) what mechanisms and variables are governing the interaction between the Developer preference and the emotionally laden stimulus that leads to a positive impact on creative performance?; (e) are there other qualities of information and stimuli (different from level of emotional charge) that would reveal interaction effects between the nature of the stimuli and the Ideator and Implementer FourSight preferences?; (f) what is the scope (breadth and depth) of influence of emotion in the each of the steps and

processes of creative cognition?; and (g) are the interaction effects found in this research study domain specific or domain general? These are some of the many questions that the findings of this research study open for future creativity research focused on unveiling and understanding the myriad of possible interaction effects that modulate creative cognition.

Chapter Summary

This chapter presented the findings of this research study in contrast to the main research question and hypotheses outlined in Chapter One. Implications regarding the findings were discussed for both creativity practitioners and researchers. Finally limitations of the present research study were exposed and recommendations were outlined for future research focused in understanding the interactions between emotion, cognitive style and creativity.

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Creative Collage Instruction sheet

a) Make sure you have the following materials:

- *Set of scrapbook papers*
- *Glue*
- *White cardboard*
- *Scissors*

If you are missing any of these materials, please inform the researcher in order to replace the package or supply you with the missing material(s).

b) With the given set of materials, you have to create a collage composition that represents ***as creatively as possible*** what the following theme means to you: ***"New Year's Eve"***.

c) You will be given ***10 minutes*** to examine the materials and to start planning for creative ways to outline your collage composition. The researcher will give you a warning when you have 2 minutes left so that you make yourself ready to start working.

d) You will have ***up to 30 minutes*** to create the collage composition. You are ***only allowed*** to use the white cardboard, scrapbook papers, glue, and scissors provided in your set of materials. ***Do not start working until the researcher explicitly instructs you to do so.*** The researcher will give you a warning when you have 5 minutes left so that you start finalizing your collage. If you don't finish within the 30 minutes, please leave your collage as it is on top of the table.

e) Upon completion of your collage and/or once the 30 minutes time limit is over, please complete the "task debrief questionnaire" (***pink sheet of paper inside your envelope***).

f) Finally, please leave your collage composition on top of the table and put the ***consent form, art proficiency questionnaire and the task debrief questionnaire back into the envelope***.

Creative Collage Instruction sheet

a) Make sure you have the following materials:

- Set of scrapbook papers
- Glue
- White cardboard
- Scissors

If you are missing any of these materials, please inform the researcher in order to replace the package or supply you with the missing material(s).

b) With the given set of materials, you have to create a collage composition that represents ***as creatively as possible*** what the following theme means to you: ***"New Year's Eve"***.

c) You will be given ***10 minutes*** to ***read the enclosed narrative (green sheet of paper in your envelope)***, examine the materials and start planning for creative ways to outline your collage composition. The researcher will give you a warning when you have 2 minutes left so that you make yourself ready to start working. ***Please make sure you have read the narrative before the two-minute warning. This narrative is meant to give you deeper context over the New Year's Eve theme.***

d) You will have ***up to 30 minutes*** to create the collage composition. You are ***only allowed*** to use the white cardboard, scrapbook papers, glue, and scissors provided in your set of materials. ***Do not start working until the researcher explicitly instructs you to do so.*** The researcher will give you a warning when you have 5 minutes left so that you start finalizing your collage. If you don't finish within the 30 minutes, please leave your collage as it is on top of the table.

e) Upon completion of your collage and/or once the 30 minutes time limit is over, please complete the "task debrief questionnaire" (***pink sheet of paper inside your envelope***).

f) Finally, please leave your collage composition on top of the table and put the ***consent form, art proficiency questionnaire and the task debrief questionnaire back into the envelope***.

Emotional Narrative:

Christmas, with its gift giving and feasting, had drawn to a close. My favorite holiday- New Year's Eve- was approaching. The planning for this New Year's Eve was particularly special. Mother was unusually busy baking all week. There were so many scrumptious cakes and delicacies that we (my little sister and I) were not allowed to touch them, under peril of our lives! I remember her cooking a large leg of pork, a turkey, and a Virginia ham. On the big day, at about 7pm, my mother set our dining room table with all of these wondrous dishes, and the irresistible mixed aroma filled the room. My father prepared the drinks table with bottles of alcohol of all imaginable colors and shapes. Everything looked beautiful.

Father instructed both my little sister and I to get dressed in our *best* clothes. Mother spent forever combing our hair, almost a thread at a time. I didn't quite understand what made this New Year's Eve so special. Just before the chimes began to sound from our local church, Father stepped outside our front door and waited there until the chimes had ceased. When he returned, I could not believe my eyes. It was like a dream. I was immediately transported seven years back. I could vividly see my brother Frank walking out onto the porch wearing his shining uniform. That 3rd of August had been a grey day for the family and particularly for me. Frank and I had shared room for as long as I could remember. He was my buddy, hero and baseball mentor! I could still hear his voice as he waved goodbye saying, "I will be back…I will be back…Promise". That night, when I saw him standing at the door, I felt a burst of joy, excitement, sadness and nervousness all mixed at the same time. It was like being shaken in the vortex of a big wave. I found myself running as fast as I could to *our room* digging into the bottom drawer of the cabinet to find the *Yankee's cap* he had given me the day he left. I put the cap on - messing up Mom's hard work on my hair - and at full speed I ran back into the living room. I jumped into his lap, embracing him like a piton for *I don't how long*. After two hours (actually only 10 minutes) Father pulled me away to let Frank literally breathe.

After our family dinner, Father opened our door and invited our neighbors into our home, to celebrate that special New Year's Eve. I tried to keep my eyes open to enjoy Franks' stories, the food and the laughter, but I was not able to stay awake very long. I will never forget that day. It is one of the most happiest I have ever known.

Factual Narrative:

New Year's traditions are fascinating. One of the most common is the making of New Year's resolutions. That tradition dates back to the early Babylonians. Popular modern resolutions might include the promise to lose weight or quit smoking. The early Babylonian's most popular resolution was to return borrowed farm equipment.

The tradition of using a baby to signify the New Year began in Greece around 600 BC. It was the tradition at that time to celebrate their god of wine, Dionysus, by parading a baby in a basket. This represented the rebirth of that god as the spirit of fertility. Early Egyptians also used a baby as a symbol of rebirth. Although the early Christians denounced the practice as pagan, the popularity of the baby as a symbol of rebirth forced the Church to reevaluate its position. The Church finally allowed its members to celebrate the New Year with a baby, substituting the baby Jesus for Dionysus. The Germans have used the symbol of a baby for the New Year since the fourteenth century, and brought the image to colonial America.

It has been thought that one could affect the luck you have throughout the coming year by what you do or eat on the first day of the year. For that reason, it has become common for folks to celebrate the first few minutes of a brand new year in the company of family and friends. Parties often last into the middle of the night after the ringing in of a new year. It was once believed that the first visitor on New Year's Day would bring either good luck or bad luck the rest of the year. It was particularly lucky if that visitor happened to be a tall dark-haired man. Traditional New Year foods are also thought to bring luck. Many cultures believe that anything in the shape of a ring is good luck, because it symbolizes *coming full circle*, completing a year's cycle. For that reason, the Dutch believe that eating donuts on New Year's Day will bring good fortune. Many parts of the U.S. celebrate the New Year by consuming black-eyed peas typically accompanied by either hog jowls or ham. Black-eyed peas and other legumes have been considered good luck in other cultures as well. The hog, and thus its meat, is considered lucky because it symbolizes prosperity. Cabbage is another good luck vegetable that is consumed on New Year's Day by many. Cabbage leaves are also considered a sign of prosperity, being representative of paper currency. In some regions, rice is a lucky food that is eaten on New Year's Day.

The song, *Auld Lang Syne*, is sung at the stroke of midnight in almost every English-speaking country in the world to ring in the New Year. Early variations of the song were sung prior to 1700 and inspired the modern rendition. An old Scotch tune, *Auld Lang Syne* literally means old *long ago*, or simply, *the good old days*.

Narrative Evaluation Scale:

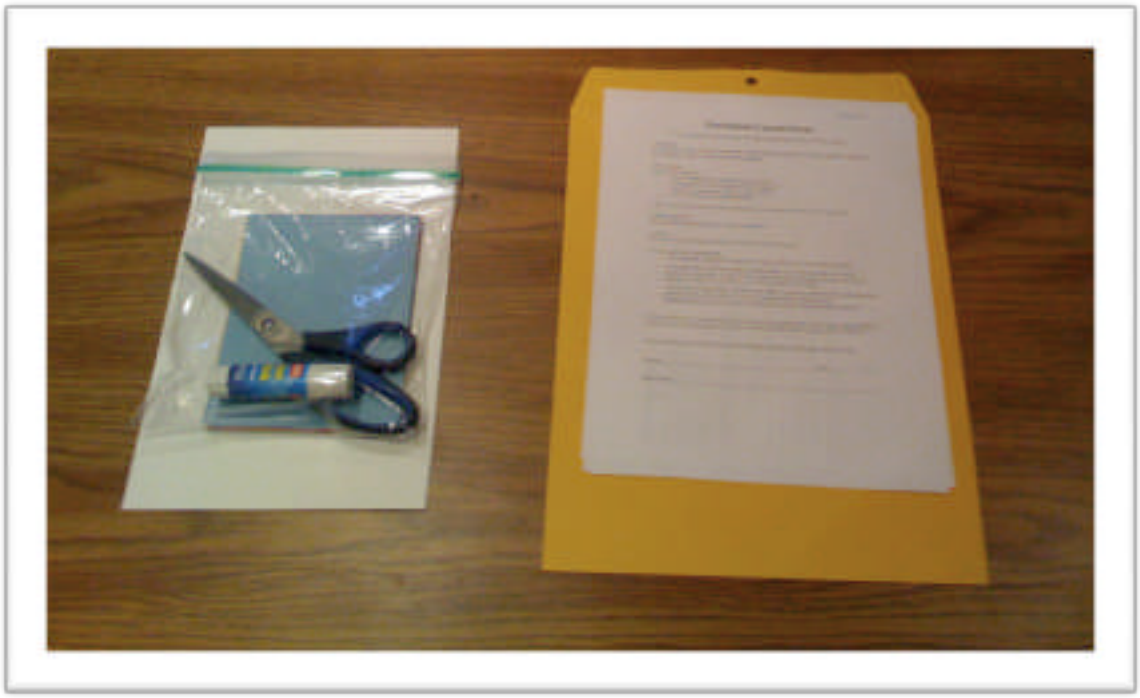
Dear Participant,

Please read the narrative that is enclosed in the packet. Once you have finished reading it, please proceed to rate it in terms of the level of emotion contained in the narrative. On one hand, a rating of **(1)** means that the narrative has almost no emotional charge, or in other words, that it is purely factual. On the other hand, a rating of **(7)** means that the narrative has a high emotional charge.

According to your opinion, how emotional was the narrative you read? Please mark with an "(X)" the level of emotional charge.

Absolutely factual content			**Balanced content**			**Absolutely Emotional content**
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Set of Materials:



Task Reflection Questionnaire Control Group:

Participant #1

Dear Participant,

Thank you very much for your participation in this research study. As a final task, please proceed to answer the following questions by marking with an (x) the box that best represents your answer to each question. These questions are designed to help you reflect on yourself, the task you just completed, and your creative process as you worked on this collage activity.

1. Overall, how engaging did you find this creative task?

Not engaging at all			Somewhat engaging			Absolutely engaging
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

2. Did you enjoy working on this creative task?

Did not enjoy			Neutral			Did enjoy
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

3. To what degree did you find that your ideas emerged from your emotions and feelings about New Year's Eve?

Not at all			Somewhat			A great deal
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

4. In developing your collage, how would you characterize the ideas you developed, explored, and considered?

Completely "within the box"			Strayed somewhat "outside the box"			Completely "outside the box"
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Task Reflection Questionnaire Treatment Groups:

Participant #36

Dear Participant,

Thank you very much for your participation in this research study. As a final task, please proceed to answer the following questions by marking with an (x) the box that best represents your answer to each question. These questions are designed to help you reflect on yourself, the task you just completed, and your creative process as you worked on this collage activity.

1. Overall, how engaging did you find this creative task?

Not engaging at all			Somewhat engaging			Absolutely engaging
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

2. Did you enjoy working on this creative task?

Did not enjoy			Neutral			Did enjoy
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

3. To what degree did you find that your ideas emerged from your emotions and feelings about New Year's Eve?

Not at all			Somewhat			A great deal
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

4. To what degree did the New Year's Eve narrative stimulate your creative thinking?

Didn't stimulate at all my creative thinking			Somewhat stimulated my creative thinking			Completely stimulated my creative thinking
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

5. In developing your collage, how would you characterize the ideas you developed, explored, and considered?

Completely "within the box"			Strayed somewhat "outside the box"			Completely "outside the box"
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

Rating Dimensions &Description:

1. **Creativity:** Using your own subjective definition of creativity, the degree to which the design is creative.
2. **Novel idea:** The degree to which the design itself is original or striking especially in conception or style.
3. **Novel use of materials:** The degree to which the design shows novel use of materials, i.e. paper being altered, 3-dimensional, unique usage of background paper.
4. **Liking:** Your own subjective reaction to the design; the degree to which you like it.
5. Overall aesthetic appeal: In general, the degree to which the design is pleasing in appearance as a whole.
6. **Pleasing Placement of Shapes:** The degree to which there is an aesthetic appeal in the placement of shapes in the design.
7. **Pleasing use of Color:** The degree to which the design shows an aesthetically pleasing use of color.
8. **Technical Goodness:** Using you own subjective criteria for technical goodness, the degree to which the work is good technically.
9. **Overall Organization:** The degree to which the design shows a coherent unity or functioning whole, illustrates overall organization.
10. **Neatness:** The degree to which the neatness is shown in the work, the design is free from irregularity or untidiness.
11. **Effort Evident:** The degree to which the design shows effort evident, the placement and design seems to have been done to achieve a particular end.
12. **Balance:** The degree to which the design shows good balance, an aesthetically pleasing integration of elements.
13. **Variation of Shapes:** The degree to which the design shows wide usage of the various shapes available, how many different shapes were incorporated in the design.
14. **Degree of Symmetry:** The degree to which the overall design is symmetrical, beauty of form arising from balanced proportions.
15. **Expression of Meaning:** The degree to which the overall design conveys the meaning of New Years Eve
16. **Detail:** The small elements that collectively constitute completeness, the amount of detail in the design.
17. **Complexity:** The level of complexity or how intricate the overall design is.
18. **Emotional Evocativeness:** The degree to which the design expresses emotional meaning

Creative Collage Rating Template

Rater #

Collage#

	Low										Medium										High				
Creativity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Novel use of material	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Novel idea	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Effort evident	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Variation in shapes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Detail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Complexity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Technical goodness	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Organization	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Neatness	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Balance	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Pleasing use of color	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Pleasing use of shapes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Symmetry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Expression of meaning	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Liking	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Aesthetic appeal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Emotional evocativeness	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Examples of the Highest Rated Designs in the Creativity Scale:

Examples of the Highest Rated Designs in the Creativity Scale:

Examples of the Lowest Rated Designs in the Creativity Scale:

Examples of the Lowest Rated Designs in the Creativity Scale:

Theme:
Understanding the Creative Process

Initiative:
Assessing the role of emotions as an associative mechanism within the creative process

Thesis Title:
Emotions as an intervening variable in the creative process

Rationale and questions:

The purpose of this study is to unveil, through an experimental quantitative research design, the power of emotions as an associative mechanism within the creative process. The cognitive science paradigm, the dominant paradigm governing the last several decades of psychological research, has systematically neglected the study of emotion (LeDoux, 1996). The scientific study and modeling of the creative process has been no exception to this research approach (Runco, 2007). For example, the Creative Problem Solving process (Isaksen, Dorval & Treffinger, 2000; Noller, Parnes, & Biondi, 1976; Osborn, 1963; Parnes, 1981; Puccio, Murdock, & Mance, 2005; Treffinger, Isaksen, & Dorval, 1994), central to the Creative Studies curriculum dictated at the International Center for Studies in Creativity, and one of the most widely studied creative process models, falls into the category of the *cognitive-rational-semantic* theories of creativity (Treffinger, Isaksen, & Firestien, 1983)

With the advent of emotional intelligence theory (Goleman, 1995; Salovey & Mayer, 1990) and the findings in the field of neuroscience about the role of emotion in cognition (Damasio, 2001; Dietrich, 2004; Duncan & Barret, 2007; Flaherty 2005; LeDoux, 1996; Stein 2007), the field of creativity is beginning to acknowledge the close

interplay between cognition and emotion in driving the creative process (Amabile, Barsade, Mueller, & Staw, 2005; Boden, 1998; Damasio, 2001; Dietrich, 2004; Fuchs, Kumar, & Porter, 2007; Lubart & Getz, 1997; Puccio et al., 2005). This suggests a more direct role of emotion within the creative process, in particular, with regard to the associative mental processes that generate novel output. Lubart and Getz (1997) have suggested that emotional associative mechanisms might yield associations between more remote concepts than those derived from factual driven associative mechanisms. Therefore, an emotional driven creative process might be conducive to higher degrees of novelty than a cognitive-factual driven process. Given the above rationale, the primary research question proposed for this research study is:

* Will individuals exposed to an emotional priming stimulus (before engaging in a creative task) exhibit higher degrees of creativity than individuals exposed to a rational-factual priming stimulus?

Statement of significance:

The proposed study builds on the momentum gained by emotional intelligence research, which has redirected many researchers' efforts to better understand the nature of emotion. With regard to creativity, the role of emotion in the creative process has traditionally been accounted for governing motivation, modulating the affective states that are conducive to creativity, and fueling creative drive (Amabile, 1985; Boden, 1998; Collins & Amabile, 1999; Damasio, 2001; Flaherty, 2005; Hennessey, 1999; Levine, 2007; Lubart & Getz, 1997; Runco 2007; Salovey & Mayer, 1990; Treffinger, 1980). Nevertheless, there is a recent body of research that has casted evidence in support of a

broader scope of influence of emotion in creativity. For example, with regard to the *creative personality,* research on *Emotional Creativity (EC)* (Averill, 1999; Fuchs et al., 2007; Ivcevich, Brackett, & Mayer, 2007) have yielded correlates between EC, openness to experience, the creative personality, and creative performance (Dollinger, Urban & James, 2004; Fuchs et al., 2007; McCrae, 1987). On the other hand, the field of organizational psychology has stressed the relationship between *Emotional Intelligence (EI)* and leadership (Goleman, Boyatzis, & McKee, 2001; Zhou & George, 2003). Leadership in turn, has been related with the climate that fosters creative performance (Ekvall, 1996, 1999; Puccio, Murdock, & Mance, 2007). In spite of this, the research of the role of emotion as an associative mechanism within the creative process (Amabile et al. 2005; Isen, 1999; Russ & Schafer, 2006) is still scarce. Consequently, the relationship between emotion and the associative mechanisms underlying the creative process remains to be mostly theoretical (Amabile et al., 2005; Lubart & Getz, 1997). This study is intended to add to the empirical body of research supporting the power of emotion as an associative mechanism for creativity. If emotionally laden stimuli elicit more powerful associations than emotional neutral stimuli, and the former lead to higher degrees of creativity, then the results of this study would demand a reconsideration of the role of emotion in the creative process (beyond governing creative drive) and creativity facilitation methods.

Research Methodology:

The research methodology is quantitative and involves two experimental groups and one control group. The sample, approximately 75 individuals, will be drawn from a

pool of undergraduate students enrolled in Creative Studies courses CRS 205 (three sections), at Buffalo State College, NY. Individuals will be instructed to perform a creative task consisting in a *scrap paper collage* according to Amabile's (1982) testing protocol. In order to control for artistic proficiency, a questionnaire will be used to assess participant's art proficiency level. Individuals will randomly be assigned to either the control group or one of the experimental groups using a web-based random number generator (http://www.randomizer.org). Note that the configuration of the groups will be determined before engaging in the creative task and will be kept as such for the whole experiment. For the control group, there will be no priming stimuli before engaging in the collage task. On the other hand, both experimental groups will be primed (treatment condition) with either an emotional laden stimulus or a rational-factual stimulus (emotionally neutral) before engaging in the collage task. The stimuli, with which both experimental groups will be primed, will be a short narrative of a universal theme such as *New Year's Eve.* This narrative will have two forms: (a) emotional laden narrative and (b) rational-factual narrative. **The emotional narrative is written in first person style to increase the overall emotional charge of the narrative. On the other hand, the factual narrative is written in third person style to make is as emotionally neutral as possible**. The validity of the priming stimulus, meaning that the emotional narrative indeed elicits emotions while the factual narrative is emotionally neutral will be validated following Amabile's (1985) protocol. First, a focus group of graduate students (4 individuals) will initially proof read and provide feedback to refine the narratives. Subsequently, a panel of at least 20 individuals will rate whether the narratives are either emotionally laden or emotionally neutral (Amabile, 1985). After the experiment, relevant

domain experts will assess the degree of creativity of the collages according to Amabile's (1982) consensual assessment technique. Each judge will use a likert-type scale to rate the degree of creativity of each collage. Inter-rater reliability will be calculated to check the validity of the experiment. Statistical comparison of mean scores between experimental groups and control group creativity scores will be used to test if there is a significant difference in the level of creativity exhibited and whether or not the hypothesis and theoretical stance are supported by the data. Judges will be asked to evaluate secondary variables besides creativity level (e.g. technical proficiency, neatness, variety of shapes, complexity, etc…) and a factor analysis will be conducted to ensure that creativity ratings cluster into a stand-alone factor (meaning that judges produced a pure creativity score). In addition, the FourSight® measure (a cognitive style measure) will be administered to enrich the data analysis.

Learning goals:

- Improve my research skills.
- Improve my writing skills; my intention is to actively contribute to the field of creativity with future scholarly publications.
- Have a thorough understanding of the body of literature in the creative studies field.
- Have a thorough understanding of the relationship between emotions and creativity.
- Have a thorough understanding of the scope of influence of emotions in creativity.

Outcomes:

- An approved thesis to complete my Master's degree in Creative Studies.
- Bound manuscript.
- Online submission to web publisher.
- Scholarly Article to publish in peer reviewed journal related to the field of creativity.

Timeline:

Thesis Task	Expected date of completion.
Concept paper	Apr-08
Chapter 2: Literature Review	Apr-08
Agreement with CRS 205 instructors	May-08
Definition of a sample	Jun-08
Submit Human Subject proposal	Aug-08
Validation of experimental priming stimuli	Aug-08
Chapter 1: Rationale / Research questions	Sep-08
Perform research experiment	Sep-08
Judge Ratings	Sep-08
Chapter 3: Methodology	Oct-08
Data analysis	Jan-09
Chapter 4: Results	Feb-09
Chapter 5: Discussion	Apr-09
Write research paper for peer reviewed journal	May-09

Principal investigator: Diego E. Uribe

Faculty advisor: Dr. Gerard J. Puccio

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Human Subjects and Consent Forms:

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September 16, 2008

Diego Eduardo Uribe Larach
Center for Studies in Creativity
CHAS 247

Dear Diego:

The IRB has determined that this protocol is exempted under one of the categories specifically waived under Section 101(b) (1-6) or 101 (i) of the Code of Federal Regulations (45 CFR 46). Nonetheless the Institutional Review Board has reviewed and approved your study entitled, "Emotions as an Intervening Variable in the Creative Process." Approval is granted from September 15, 2008 to September14, 2009. The Federal Regulations requires that an IRB shall conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year.

Please note that it is your responsibility to notify the Board in advance and obtain IRB approval should you make any substantive changes in the study. In addition, it is your responsibility to provide the Board with a report summarizing the results of your study within 90 days of the completion of the study.

If you have any questions, please feel free to contact Gina Game, IRB Administrator, at 878-6700 or gameg@rf.buffalostate.edu. Thank you for submitting to the Buffalo State College's IRB and good luck with your research!

Sincerely,

Jill M. Norvilitis, Ph.D.
Institutional Review Board Chair

JMN:gg
Cc: Dr. Gerard Puccio

THE RESEARCH FOUNDATION
The State University of New York

APPROVED

Protocol # 734

PROPOSAL ABSTRACT FOR RESEARCH
INVOLVING HUMAN SUBJECTS

Certificate of Exemption

Researcher/Project Director: Diego Eduardo Uribe Larach Ext.:

Building/Room No.: E-mail: duribel@gmail.com

Faculty Sponsor (for student projects): Dr. Gerard Puccio

Project Title: Emotions as an intervening variable in the creative process

Project Dates: ~~Feb 2008~~ 9/15/08 to ~~May 2009~~ 9/14/09 Date of Submission: 08/28/2008

Check one: ☑ Thesis ☐ Dissertation ☐ Faculty Research ☐ Student Research

Project Funding Source: Personal

Research Involving Human Subjects Training Programs

In June 2000 PHS revised its' policy related to human subject protection and mandated that all key personnel involved in PHS-funded human subject research must receive formal instruction in human subject protection. The Federal Wide Assurance (FWA) that Buffalo State College currently has on file with the Office of Human Research Protections (OHRP) further stipulates that the same standards that are applied to federally-funded research will also be applicable to all nonfederal, departmental, and student research conducted at Buffalo State. Therefore, in order to satisfy this requirement, FACULTY SPONSORS who are involved in research that involves human subjects at Buffalo State College are required to participate in a training program. If you completed human subject training, please attach your certificate to this form. If you still require training, please refer to the Research Foundation website:

http://www.rf.buffalostate.edu/rf6/research_compliance/human_subjectsIndex.htm

Requested Information

Please use the following format and place a √ next to each to indicate that the information is complete and attached to this form.

☑ A. PURPOSE, RESEARCH VARIABLES, AND POPULATION

Purpose of the study - State concisely and unequivocally what the study is intended to accomplish.

Background - Briefly state the background of the study and identify the main question the current study is intended to address.

Certification of Project Director:

I have reviewed the Federal regulation concerning the use of human subjects in research and training programs, and the guidelines of at the State University College at Buffalo. I agree to abide by these policies.

Diego Uribe — *Signature of Project Director* — 9/2/08 — *Date*

Faculty Sponsor Approval:

Signature of Faculty Sponsor — 9/2/08 — *Date*

Research Foundation Approval:

Signature of RF Operations Manager or Designee — 9/15/08 — *Date*

APPROVED

Participant Consent Form

** You must be 18 years of age or older to participate in this research study **

1. Purpose:
The purpose of this study is to measure an individual's creativity level through the evaluation of an artistic creative collage by domain experts.

2. Procedure:
You will be asked to:

- *Fill in an artistic proficiency questionnaire*
- *Complete a creative cognitive style measure***
- *Create a scrap paper collage composition*
- *Fill in a task debrief questionnaire.*

** This will not be done the day of the experiment, but in a later period of time yet to be determined.

3. Time required:
The total time required for this experiment is one hour and fifteen minutes.

4. Risks:
It is not anticipated that this study will present any risk to you.

5. Your rights as a subject:

- To withdraw yourself by whatsoever reason and at any time from the study.
- All information will be handled confidentially. Your information will not be disclosed to anybody, except for the researcher and his advisor, in any way that is possible to link your identity to any other variable under study.
- At the end of the project, you have the right to request a debrief of the rationale and general results of the study. To do so, please email the researcher at: duribel@gmail.com and use as a header for the email: Research Study Debrief.

6. If you have any concerns about your treatment as a participant in this study, please call Dr. Gerard Puccio, Departament of Creative Studies, Buffalo State College, (716) 878-6223.

I have read the above information and willingly consent to participate in this study.

Signed_____
Date:_____

Print
Name:_____