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Creativity Under Fire: Effects of Exaggerated Time

Restrictions and High Standards of Criteria on Creative Production

Daniel M. Birdwhistell

Psychology Honors Thesis, Spring 2001

Washington and Lee University



Abstract

Investigates how two psychological stressors--exaggerated time restrictions and high standards of criteria--affect the creative performance of 44 8th and 48 11th grade students and alludes to the relation between stressful environments and creative production in classroom settings. The Torrance Test of Creative Thinking, Figural Form A: Parallel Lines Task was used to test creative performance. Creative behaviors were measured by Fluency, Originality, and Elaboration scores. A Fluency/Originality ratio and Fluency/Elaboration ratio was also considered. There was an interaction between grade, standard, and time restriction as measured by Elaboration in that 8th grade students scored lowest in the presence of a standard without time restriction while 11th grade students scored best in the same condition. Further, 11th grade students scored lowest in the presence of a standard with a time restriction, while 8th grade students scored very high in the same condition. There was also a significant effect of standard as measured by the Fluency/Elaboration ratio and an interaction between grade and standard and grade, time, and standard for the same measure. A main effect of grade existed with Fluency, Originality, and the Fluency/Elaboration ratio in that 8th graders performed significantly better than 11th grade students. The findings support the Behaviorist camp in that external motivators can be used to enhance or hinder specific aspects of creative production.

Creativity under fire: Effects of exaggerated time

restrictions and high standards of criteria on creative production

Are adolescents creative under pressure? Is the eighth grade student with a time restriction for an art project more creative than the one without? How about a high school student designing a futuristic bridge--will he be more creative in the face of high standards and the threat of evaluation? The present research investigates how two psychological stressors--exaggerated time restrictions and high standards of criteria--affect the creative performance of 44 8th and 48 11th grade students as measured by the Torrance Test of Creative Thinking, Figural Form A: Parallel Lines Task. This study was designed to contribute to the understanding of motivation and creativity in the middle and high school classroom.

Creativity is extremely important in our society. It yields innovation, it fuels the Arts, it allows for societal progress, yet our school systems fail at fostering creativity. Many researchers argue that the lack of focus on creativity stems from a lack of understanding of what stimulates and hinders its process and production within a classroom environment. This main lack of emphasis has to do with a limited understanding of the role motivation plays in creative thought and creative production.

Traditional school environments have not been conducive to creative stimulation. Sternberg and Lubart (1995) suggest that schooling inhibits creativity by imparting a low tolerance for failure which ultimately hinders the risk-taking needed for creative thought and production. In addition, success in the middle school and high school environment is often quantified by letter-grades or various other extrinsic recognitions and thus creative behavior

often goes unrecognized or is considered failure. Cropley (1999) argues that the problems originate with the authority figures such as the teachers and administrators. He lists seven barriers to creative thinking and production in the school system: exaggerated success orientation, intolerance of questioning, reliance on external evaluation, exaggerated conformity pressure, rigid maintenance of strict sex roles, strict distinction between work and play, and intolerance of diversity. Dacey and Lennon (1998) also point out that teachers often view creative students negatively as they are viewed as disruptive, non-conformists.

The late elementary school years are an extremely important time in a child's socio-emotional and cognitive development. It is during this period that perspective taking becomes solid, self-concept develops, and a child becomes increasingly aware of peer evaluation and peer groups. On the cognitive side this is a time in which reasoning becomes more abstract, meta-cognitive strategies develop, and learning styles and interests become more pronounced. These changes coalesce to form a child's motivational framework for all types of performance and tasks. Many researchers have shown that this time is extremely important for the development of motivation in creativity and creative ability. Work done by Howard Gardner (1991) through Harvard's Project Zero found that the time between age 2-7 is crucial for the development of creative ability (as cited in Dacey & Lennon, 1998 p. 69). Torrance (1968) and Birdwhistell and Notaro (2000) validate and extend these findings in finding a decline in creative ability after the end of the third grade year (age 7-8). This declining trend makes the middle school years especially important because it is at this point that young adolescents are exposed to many social pressures that have a direct influence on thinking style and cognitive output.

The reason for this decline in creative ability may also find its source with age related shifts in motivation only loosely connected with the school environment. These shifts may be linked more with peer interaction and change from a mastery orientation to performance orientation. As self-concept forms and is socially tested, the adolescent becomes increasingly dependent on peer groups and peer acceptance. Creative production is often viewed as unusual and strange and thus a creative child may suppress his creative abilities in order to avoid ostracism by a particular group. Secondly this decline may be credited to a change in motivation orientation due to a heightened understanding of reinforcement and an added focus on outcome. This shift is from the more intrinsically rewarding mastery orientation in which reward is obtained through the pleasure of doing a task to the extrinsically rewarding performance orientation in which the individual focuses only on the final outcome. This calls forth consideration of two camps of thought: the Behaviorists and Cognitive Interpretationists.

Creativity Divided: Behaviorists and Cognitive Interpretationists

The first camp, the Behaviorists, has traditionally argued that divergent thinking and creativity may be enhanced or hindered by outside motivators. First, let us consider the effect of rewards (both intrinsic and extrinsic). One review of twenty behaviorally oriented studies showed that repeated reward for novel and original behavior increases the frequency of creative performance (Winston & Baker, 1985). These Behaviorists assert that rewarding divergent thinking develops a generalized orientation toward divergent thought (Maltzman, 1960) and thus creative performance has been shown to transfer to other tasks following this training (Goetz, 1982, 1989). Further, outside motivators such as competition or evaluation may also enhance

creativity. Osborn (1963) encouraged the use of competition to stimulate creative ideas in brainstorming. Birdwhistell and Notaro (2000) used reward to bolster figural creativity.

On the other hand, creativity could just as easily be hindered by outside motivators such as threats of strict evaluation (fear of failure) or punishment. McGraw (1978) has shown that extrinsic motivation through damaging competition and evaluation will undermine performance on heuristic tasks, but enhance performance on algorithmic tasks. Thus, outside motivators directly un-related to the creativity task can either hinder or improve creativity. The position the Behaviorists put forth is that outside motivators don't in and of themselves hinder performance. Enter the Cognitive Interpretationists.

Most Cognitive Interpretations, on the other hand, follow the intrinsic motivation hypothesis that states that "that the intrinsically motivated state will be conducive to creativity, whereas the extrinsically motivated state will be detrimental" (Amabile, 1983, p. 100). They argue that the rewards, evaluation, competition, etc. lessen creativity as they cause the tasks to be "defined more narrowly...simply as a means to an end rather than as an opportunity for exploration and play" (Amabile & Cheek, 1988). It is argued that such extrinsic motivators or restraints distract attention from the activity and thereby reduce intrinsic motivation and the ability of the subject to be spontaneous and flexible in thought and production (Amabile, 1983, 1990; Amabile and Cheek, 1988; Amabile, Hennessy, & Grossmann, 1986; Condry, 1977; McGraw, 1978; see also Baslam & Bondy, 1983; Reiss & Sushinsky, 1975).

Regardless of the reasons for this decline, it has been demonstrated that creativity can be stimulated and enhanced in the classroom environment if certain social and evaluative

adjustments are made. It is unclear, however, how specific changes related to motivation and stress affect creativity. This is the reason for the present research.

Psychological stressors involve situations that are potential psychological threats and often involve fear of failure or personal evaluation (Lamb, 1979). (Khatena, 1971, 1972, 1978) shows that while some time restriction is positive for increasing creative productivity, severe stress hinders production. Khatena and Parzivand (1984) created an artificially stressful environment with a group of college students by catalyzing an assumed high standard and threat of evaluation, however these psychological stressors had no significant effect on creative production. Khatena (1973) suggests, however, that some levels of stress may facilitate creativity. Further work done by Birdwhistell and Notaro (2000) which used high standards of criteria shows that some degrees of psychological stressors can facilitate behaviors such as elaboration.

The present study seeks to build upon Parzivand and Khatena (1983, 1984) and Khatena (1971, 1972, 1973) and Birdwhistell and Notaro (2000) whose work is among the only of its kind that questions the role of stress in creative production. This study further explores the dueling camps of the Behaviorists and Cognitive Interpretationists in the realm of motivation and creativity.

Studying creativity: Looking for a definition through a kaliedescope

The discussion of creativity can be traced back to Poincare's Science and Hypothesis (1905) when he spoke of making combinations that "reveal to us unsuspected kinship between...facts, long known, but wrongly believed to be strangers to one another" (cited in

Bruner, 1970, p. 5). His work laid the foundation for the examination of the creative product through metaphor and analogy; later work through the early and mid 1900's such as the work of Guilford, Spearman, Wallas, and Mooney shed light on other approaches to creativity.

The nature and ambiguity of the term "creativity" has yielded numerous definitions, and as Paul Torrance, designer of the Torrance Test of Creative Thinking has said, the only thing that is consistent across the existing literature is the idea of a generation of something new and novel. As cited by Torrance (1962, p. 45), Bartlett (1958) used the term "adventurous thinking," which he defined as the ability to veer from the "main track, breaking out of the mold, being open to experience, and permitting one thing to lead to another." Most recently, the definition has been augmented to include functionality. Thus, creativity is now defined as the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints) (Lubart, 1994; Osche, 1990; Sternberg & Lubart, 1991, 1995, 1996).

Spearman (1930) sought to handle creativity in terms of process. He believed, much like Poincare's, that creative thinking was a process of creating or recognizing relationships with both conscious and subconscious processes operating (Torrance, 1962, p. 44). Psychologists such as Wallas (1926) sought to define the steps of the creative process; others went further and elaborated on Wallas' breakdown of the process as Preparation, Incubation, Illumination, and Revision to form a solid definition of creativity as a function. While these scientists laid the foundation for the study of creativity, it wasn't until 1950 when Guilford, at his APA Presidential Address, challenged psychologists to adopt the study of creativity. At this point, he noted that less than 0.2% of the entries in Psychological Abstracts up to 1950 involved the study

of creativity (Sternberg, 1999, p. 3). This speech added fuel to the study of creativity which quickly peaked in the early 1960's.

Discussion of the evolution of creativity theory and approach in the field of psychology is best examined in three major areas: the psychoanalytic approach, psychometric approach, and multiple components.

Psychoanalytic Approach

Some of the early literature of creativity focused on creative expression in terms of sublimation of unconscious conflicts. Freud (1908/1959) believed that writers and artists produced creative work as a way to express their unconscious wishes in a publicly accepted fashion. Koestler (1964) argued along the lines of Freud as he suggested that creativity arises as contrary ideas or patterns of thought are brought together in these unconscious conflicts. Kubie (1958), while rejecting the claims that creativity arose simply from conflict, supported the idea that creative ideas could be generated as part of healthy preconscious activity; the work of Rothenberg (1990) further supported Kubie's idea in its observation that the processes that mold creativity are essentially healthy.

Much attention has also been given to specific case studies of exceptionally creative people such as Mozart and Picasso. Hershman and Lieb (1988), for example, focused on the manic-depressive natures of Newton, Beethoven, Dickens and Van Gogh; they felt that "states of mania provide an elevated sense of worth and talent that promote ambition, whereas states of depression cause one to become more introspective, compulsive, and isolated" (as cited in Finke, p. 10). However, the psychoanalytic to creativity fell out of favor quickly as the case study approach was found to be largely subjective. The emerging scientific psychology placed more

value on controlled experimental methods. This paved the way for the more popular psychometric approaches.

Psychometric Approach

This approach to creativity is headed by the work of Guilford and Marr (1982). Guilford (1956, 1959, 1960, 1986) conceptualized creativity in terms of the mental abilities involved in creative achievement; working with a new structure of intellect, he named creativity to include what he coined as divergent production. He saw this divergent production as, “the generation of information from given information, where the emphasis is on variety of output from the same source” and thus he used the concepts of innovation, originality, and unusual synthesis to bring creativity into the realm of divergent thinking through the factors of fluency, flexibility, originality, and elaboration.

This paved the way for the development of the Torrance Tests of Creative Thinking and various other tests that will be discussed later. The psychometric approach bolstered the science of creativity study by providing short, easy-to-administer, objectively scorable assessment devices. These tests, however, were largely criticized as being inadequate measures of creativity (Sternberg, 1999, p. 7). Further, many critics such as Amabile (1983) claimed that the broad ideas of fluency, flexibility, originality, and elaboration failed to capture the true sense of creative thought and production.

The psychometric approach can be broken into four methods: investigations into creative processes, personality and behavioral correlates of creativity, characteristics of creative products, and attributes of creativity-fostering environments.

Measuring the Creative Processes. Many psychologists are hesitant to devote substantial energy to the study of creativity because they view the current measures as largely ineffective at measuring true creative ability. While the testing material used for this study, The Torrance Test of Creative Thinking, has become very well-respected among the psychology community, there have been and continue to be myriad tests to measure various creative behaviors and abilities.

Much of the early research on creativity dealt with breaking down the creative process. This was typically done through the use of divergent-thinking tests. Among the first of these tests which measured Fluency as opposed to one correct answer were Guilford's (see 1967 for summary) Structure of the Intellect (SOI) divergent production tests, Torrance's (1962, 1974) Tests of Creative thinking (TTCT), and those by Wallach and Kogan (1965) such as the Instances Test and Unusual Uses Test. The Unusual Uses Test focused on eliciting high numbers of responses from subjects as prompted by encouraging them to think of the various ways one could use a chair, brick, tire, etc. (Plucker & Renzulli, 1999, p. 39).

These divergent-thinking tests, while continually challenged by experimenters, have changed very little since their inception. And although evidence of reliability for the SOI, TTCT, Wallach and Kogan, and similar tests is convincing, predictive and discriminant validity studies have garnered only mixed support. Another line of concern involves the susceptibility of divergent thinking tests to administration, scoring, and training effects.

Other scientists furthered the study of creative processes by attempting to characterize its actual non-product-specific functioning. Ward et al. used the term "conceptual expansion" as another process of creative thought to describe the generative tendency in human conceptual

functioning; this concept took root in Ward (1994) and (Jansson & Smith, 1991) in which existing knowledge of categories is viewed as critical to the generation of new ideas. Ross (1996) provided further support for this conceptual expansion hypothesis as he analyzed how exemplars influence the nature of the creation. Other examinations in the psychometric realm have yielded initial dissection of cognitive styles of creative individual. Hayes (1989) proposed that creative individuals are typically intelligent, independent people that are driven to be original and exhibit flexibility in their thinking; Runco (1990) stressed the importance of meta-cognitive and evaluative skills with creativity. This aspect of study has led to many applications in the classroom as specific research has given that certain teaching styles can influence the development of creativity and creative thought.

The Creative Person. The study of the creative process interested a large group of social psychologists in the creative personality. Before discussing the different personality traits, it is necessary to briefly mention how these traits have been researched. Measures such as the Group Inventory for Finding Talent (Davis, 1989), What Kind of Person Are You? (Torrance and Khatena, 1970), the Adjective Check List (Domino, 1970, 1994), and the Sixteen Personality Factor Questionnaire (Cattell and Butcher, 1968) are the main measures in this area (Plucker & Renzulli, 1999, p.42). Some measures go beyond personality traits to examine the past behavior of creative individuals; this has taken form in the Alpha Biological Inventory (Taylor and Ellison, 1966), the Creative Behavior Inventory (Hocevar, 1979), and other self-report checklists that offer a reflection of creative potential through past achievement. The six most important personality traits of the creative person with relation to our discussion: 1) Creative people are tolerant of ambiguity and therefore, creativity “is not a withdrawal from the world; it is an

openness to the world”(Dacey & Lennon, 1998, p. 98). 2) Creative individuals exhibit stimulus freedom; thus, when they are faced with rules that interfere with creativity, they more than not bend the rules to meet their needs (p. 101). This attribute makes their creative thinking, which is already deviant behavior, more likely to be presented in a way that goes against other social rules as well. 3) The creative individual, according to Sternberg and Lubart (1995) and Cropley (1997) is a risk-taker, especially in problem solving. 4) Creatives exhibit a preference for disorder (p. 102). 5) The creative personality is able to delay gratification which leads to intrinsic motivation but works counter to the quick feedback and gratification with extrinsic motivators in the classroom (p. 106). 6) They exhibit a freedom from sex-role stereotyping; thus, the creative boy is much more likely to be considered slightly feminine and vice-versa. Roe (1975) found that highly creative individuals from both sexes had some of the qualities usually ascribed to the opposite sex (p. 109).

#	Personality Traits of Creative Individuals, Dacey 1998	Researcher, Date
1	An achieving person, one who perseveres in given tasks	Gough (1964)
2	Motivated by a need for order within their environment; their sense of "order", though, is a "unique" sense of order that only they fully understand	Barron (1958)
3	Has a need for curiosity both in intellectual and social realms; more sensitive to feedback in social realm than with intellectual realm	Maddi (1963)
4	Self-assertive, dominant, aggressive, self-sufficient; this was seen mainly in adults—with children, they are independent unless the products from their independence receive continual negative feedback	Barron (1955)
5	Rejects repression, is less inhibited, less formal, and radical; this tendency to reject repression, once again, is weaker with children.	Blatt & Stein (1957)
6	Independent and autonomous	Stein (1962)
7	Constructively critical, less contented	Rossmann (1931)
8	Open to feelings and emotions of self and of others	MacKinnon (1959)
9	Typically low in economic values and poor in the area of business; some are successful in entrepreneurial tasks, though. This trait was exhibited from a lack of interest in money and lack of care in business transactions	MacKinnon (1962)
10	Emotionally unstable but uses instability effectively	Roe (1953)
11	Driven by intuition and empathy	Gough (1964)

(as cited in Dacey, p. 109)

The Creative Product. Studies of the idea of creative products focus on what makes specific ideas or creations unique. Mackinnon (1978, p. 187) points out that "the starting point, indeed the bedrock of all studies of creativity, is an analysis of creative products, a determination

of what it is that makes them different from more mundane products." Others, such as Runco (1989) added that the focus on the creative product further develops the science of creativity research beyond the divergent thinking measures. But, with rating a product, there must be standards of criterion.

As Plucker & Renzulli (1999, p. 44) point out, product analyses range from straightforward rating scales to conceptually complex consensual assessment techniques. Product analyses, at least in the educational setting, are most often done by teachers. Teachers often use the Creative Product Semantic Scale (Besemer & O'Quin, 1993) to judge novelty, problem resolution, and elaboration. They also use the Student Product Assessment Form (Reis & Renzulli, 1991) to consider originality, audience, action orientation, etc. Beyond the classroom, most product analyses are conducted by experts in a particular field. These analyses, while occasionally restricted by definition, are often very loose. Amabile (1979, 1982, 1983) developed the Consensual Assessment Technique (CAT) to address the weaknesses of product assessments in social psychology investigations. She used an amorphous definition of creativity in order to avoid problems of criterion and individual differences. Thus, she believed that a product was only creative to the extent that appropriate observers deem it to be creative (Plucker & Renzulli, 1999, p. 45).

Exploring the Creative Environment. This area of study is fairly new in the field of creativity, but has enjoyed a great deal of attention in recent years as the corporate and educational spheres have become more interested in promoting creativity in their respective environments. This type of study, based largely on Amabile (1983, 1988), introduces the

"systems" idea of creativity and applies it directly to aspects of motivation in school and in the workplace.

Multiple Components

Most recent thinking in creativity theory hypothesizes that multiple components must converge for creativity to occur (Amabile, 1983, 1996; Csikszentmihalyi, 1988; Gardner 1993; gruber, 1989; Lubart, 1994; Mumford & Gustafson, 1988; Perkins, 1981; Simonton, 1988; Sternberg, 1996; Weisberg, 1993; Woodman & Schoenfeldt, 1989). Starting in the early 1980's, many researchers tried to develop comprehensive theories of creativity that combined cognitive and socio-environmental factors. Leading this move was Sternberg (1985) with his "triarchic theory" of creativity and intelligence. He felt that there were three main kinds of processes in the creativity area of intelligence theory: meta-components, performance components, and knowledge-acquisition components. He defined meta-components as higher-order executive processes used in planning, monitoring, and evaluating one's problem solving and these processes were broken down into a) recognition of the existence of a problem, b) problem definition, and c) formulation of a strategy and mental representation for problem solution. Based on his research, creative individuals exhibited high-level abilities in each area. Second, he focused on the how the performance components execute the meta-components; this steered him to build on his work with Tourangeau (1981) on metaphorical thinking and the importance of analogy in creativity. Third, he focused on the *insight* of creativity through the knowledge-acquisition components; here he sub-divided the concept into selective encoding, selective combination, and selective comparison (Sternberg, 1988, p. 136). In 1991, Sternberg, along with Lubart, proposed an "investment" theory of creativity that involved six major components:

intellectual processes, knowledge structures, intellectual style, personality traits, motivational factors, and environmental context.

Finke, Ward, and Smith proposed the concept of creative cognition in the early 1990's. Their concept involved forming a conceptual link between a number of cognitive areas such as imagery, concept formation, categorization, memory, and problem solving (Finke, p. 14). They held that the basic concepts of cognition must be understood to understand creativity (Ward et al., 4). They focused on the following aspects as important to the understanding of creativity: creative visualization, creative invention, conceptual synthesis, structured imagination, fixation and insight, and creative strategies for problem solving (Finke, 16). Much of their theory, however, has been discarded in place for the more thorough multiple components approaches. This brings us to back to the problem at hand. Our consideration of the problem of stress and creativity must now turn to the nature of motivation and creative production.

Creativity and Motivation: "Vincent, you did WHAT with your ear?!?!"

Before discussing the role of psychological stressors in creative production, one must consider creativity and motivation in more general sense. One of the most interesting things to observe in the discussion of the development of creativity is Amabile's (1983) assertion that anyone with normal cognitive abilities can reasonably aspire to produce work that is creative to some degree. Other research also supports the idea that creative ability can be increased due to various degrees of natural ability (Amabile & Tighe, 1993; Cropley, 1992; Dominowski, 1995; Guilford & Tenopyr, 1968; Hennessey, Amabile, & Martinage, 1989; Stein, 1974, 1975; Sternberg & Lubart, 1996). In 1963, Osborn began to conduct research on the development of creativity as he promoted the process of brainstorming; his findings showed the when students

were in less-inhibiting environments, their creative outputs were much increased. This prompted the discussion of the role of environment, motivation, and evaluation in the creative process.

Researchers such as Henle (1962) and Csikszentmihalyi (1996) have stressed the importance of the stimulation of receptiveness and curiosity in order to increase motivation (Nickerson, 1999, p. 410). Henle argues that in order to be creative, we must first be receptive to creative ideas. Thus, if a person does not feel open to freely create, then his ideas will be repressed, and this is extremely critical in the early grades when a child's motivation is still developing. Csikszentmihalyi (1996) said that the "first step toward a more creative life is the cultivation of curiosity and interest...the allocation of attention to things for their own sake" (as cited in Nickerson, p. 410).

This repression of creative ideas can be linked with fear of ridicule or ostracism within a schooling or social environment. As Torrance (1964) showed, there is "undue punishment of the child who is courageous in his convictions, the intuitive thinker, the good guesser, the visionary, and the one who is unwilling to accept something without examination" (as cited in Stein, 1974, p. 153). Thus, fear is seen as a major reason why children hesitate to express their ideas, especially unconventional ones (Nickerson, 1999, p. 413). In another study done by Torrance (1964), if one child is definitely superior to others in a group in creative ability, he finds himself under pressure to be less productive and less original and thus we see that Amabile's view that peer pressure is one of the major inhibitors in a child's willingness to take creative risks is founded in solid evidence (Dacey, 1998, p. 72). This brings us to the issue of confidence.

Nickerson translates the negative effects of peer pressure and fear to a need to develop confidence, which comes from successful experiences (1999, p. 414). He feels, as many

educators do, that reasonable goals should be set for all students and that the teacher should help facilitate each student's achievement so that he will ultimately reach his respective goal and gain a root of confidence that will encourage the heightened freedom and risk taking that is so critical to the creative process. The child also, as research shows, needs to be free of constant evaluation so as to allow for experimentation and exploration free from watch. Torrance showed that when children were allowed periods of un-evaluated experimentation, they produced significantly more original and elaborate responses (Stein, 1974, p. 171). From this, he came up with the hypothesis that "children need periods during which they can experiment, make mistakes, and test various approaches without fear of evaluation and the failure that making a mistake implies." This type of environment is often hard for teachers to create, because teachers are afraid to encourage free exploration because it takes away control within the classroom (Dacey, 1998, p. 77).

Piaget felt that social interactions during the elementary years lead to the foundation of social thought; he believed that interactions became very important when social perspective taking occurs. This occurs when a child is able to differentiate himself from another—this ultimately allows for reflection upon one's action. Others saw this differentiation a mark of exit from the pre-operational stage and a new emphasis on intuitive thought (Feldman, 1999, p. 337). Torrance, who led most of the creativity research in the early and late 1960's, felt that the search for identity typically turned towards peer response in the late elementary and early middle school. Here, he said, there is a natural tendency towards conformity because of the "strong dependence upon consensual validation" (Torrance, 1962, p. 94). He went on to say that the

elementary and early middle school years are the most critical ones in the development of creative talent (p. 27).

In childhood and early adolescence, external governance establishes social expectations (Damon, 1977, p. 228) and thus the teacher is the one that symbolizes authority and ultimately controls the classroom climate, conditions of interaction among students, and the nature of group functioning and interaction. Authority establishes the conditions because the authority gives the punishments or rewards. Members of a group, then, tend to behave in ways to maintain or increase a groups' effectiveness to the extent that the group or individuals comprising the group will be rewarded. Piaget stated that child logic consists of two main elements: a goal pursued by an action and the result obtained by the action. Thus, the authority has the control in regulating the behavior of the group by setting the standards by which rewards will be given. This influence maintains its strength because, as Arronson states, there is "identification" with the influencer (Arronson, p. 35). This now brings us to the role of peer relations in formation of identity and behavior.

Elementary and middle school children are very likely to define themselves in terms of social characteristics and social comparisons; because of this, students are very aware of the feedback their actions are given by the group. If there is negative feedback, there is the threat of ostracism from the group. And, following the logic of Piaget, the child that exhibits a behavior that produces a result that excludes him from the group is likely to re-evaluate this behavior. And such is the case with creativity.

Thus, the present research seeks to expand the knowledge base of understanding of motivation and creativity as it relates to psychological stressors. Now, returning to the problem at hand.

Introduction: Stressing creativity

Psychological stressors involve situations that are potential psychological threats and often involve fear of failure or personal evaluation (Lamb, 1979). (Khatena, 1971, 1972) shows that while some time restriction is positive for increasing creative productivity, severe stress hinders production. Parzivand and Khatena (1984) created an artificially stressful environment with a group of college students by catalyzing an assumed high standard and threat of evaluation, however these psychological stressors had no significant effect on creative production. Khatena (1973) and Birdwhistell and Notaro (2000) suggest, however, that some levels of stress may facilitate creativity.

The present study seeks to build upon this body of literature that questions the role of explicit psychological stressors in creative production. This study further explores the dueling camps of the Cognitive Interpretationists and the Behaviorists in the realm of motivation and creativity. Amabile and Cheek (1988), representing the Cognitive Interpretationists, found that creative thought is best stimulated under conditions of intrinsic motivation. They represent the school arguing that rewards, evaluation, competition, stress, etc. lessen creativity as it causes the tasks to be “defined more narrowly...simply as a means to an end rather than as an opportunity for exploration and play” (Amabile & Cheek, 1988, p. 60). Eisenberger, Armeli, & Pretz (1998), representing the Behaviorists, found extrinsic motivation (similar to the type elicited in this study) can reliably enhance creative production.

The present study provided a test to further explore the relation between psychological stressors (exaggerated, restricted time limits and high standards of criteria) and creative production in 8th and 11th grade students as tested by a modified version of the Torrance Test of Creative Thinking, Figural Form A: Parallel Lines Task and measured by three raw, sub-scale scores of Fluency, Originality, and Elaboration, and two raw ratio scores of Fluency/Originality and Fluency/Elaboration.

We expected the stressors would negatively affect overall creative production, with the standard having a more pronounced negative effect than the time restriction. Further, we predicted the standard would bolster Fluency, while negatively affecting Originality and Elaboration.

Participants

44 8th grade students (22 male, 12 female) and 48 11th grade students (21 male, 27 female) were selected from two different public middle and high schools in a rural county in the Southeastern United States. Participants were mostly Caucasian. Students were asked to participate after active consent was received from their school and passive consent from their parents. Testing took place in the months of March and April. All testing was conducted by a male experimenter.

Testing Materials

Figural Form A: Parallel Lines Task of the Torrance Test of Creative Thinking (Scholastic Testing Service, Inc.) was used for the present research. This measure first emerged in 1966 under Personnel Services, Inc. after extensive pilot testing in different classroom environments. The test was bought by Scholastic Testing Service, Inc. in the 1974 and STS conducted a national study to established norms for the test in 1990 and again in 1996. The current norms are based on a sample of 55,600 subjects ranging from students in kindergarten to individuals over 60 years of age. The test can be administered to all educational and age levels. The Figural Form of the TTCT uses three different tasks: Picture Construction, Picture Completion, and Circles or Parallel Lines. The present study uses the Parallel Lines Task, which encourages the test taker to construct original pictures from thirty pairs of straight lines.

Paul Torrance, author of the test, set out to construct the test to assemble a "reasonable sample of the most important means of creative thinking into a battery or batteries of tasks" (Torrance, 2000) Despite the prominence of this test, many psychologists still question its

validity. On the first level, the TTCT aims at having a content-free characteristic to ensure high content validity. Nothing involved in the TTCT is knowledge-specific or related to particular time periods or levels of education.

Various researchers through the 1960's used the TTCT to assess creative ability:

Weisberg and Springer (1961), Torrance (1962), Fleming and Weintraub (1962), Yamamoto (1963), and Lieberman (1965). These studies found fairly high construct validity with the TTCT. It wasn't until the test was re-vamped in 1974, however, that an entire new wave of studies again challenged the TTCT and the validity problem. Seddon (1983) used the TTCT with 170 students and concluded that it has the psychometric properties of a valid measure of creativity. Reisman and Torrance (1978, 1980) used the streamlined scoring system developed in 1974 in a study involving 133 kindergarten and first-grade students. The scores derived from the streamlined scoring were positively correlated with a Piagetian measure of conservation and the Metropolitan Readiness Test. A study by Novik (1981) administered the test to seventy-six children and also found significant correlations with the Piagetian measure of conservation. In an unpublished study by the author of the test (Torrance, 1982), the Figural Form A of the TTCT was administered to thirty-three graduate students along with the following tests: Style of Learning and Thinking, Form A; What Kind of Person are You?; Something about Myself; Schaefer's Similies Test; Stein's Physiognomic Cue Test; Guilford's Possible Jobs and Seeing Problems; Torrance's Creative Motivation Scale; and the Rorschach Inkblots. The study found significant correlations with the Adaption-Innovation Inventory (at less than .05 level) and the Creative Motivation Scale, Rorschach Originality, Style of Learning and Thinking, and What Kind of Person are You? (at less than .01 level).

While the test has shown high construct validity, studies of predictive validity have been consistently challenged. Torrance conducted two major predictive validity studies (Torrance, 1972; Torrance & Wu, 1981). The first study involved high school students in 1959 and a follow-up testing in 1971; the latter tested elementary students in 1958 and re-tested in 1980. In the first study, measures of fluency, originality, and elaboration yielded satisfactory evidence of validity (.51) and high test-retest reliabilities. The same was found with the latter study. However, one must be more speculative in viewing the predictive power of the TTCT in predicting future creative achievement. Torrance placed too much emphasis on publicly recognized creative achievements as being the only measurable manifestation of adult creative behavior. Thus, one should be speculative when considering the .51 correlation. There are myriad creative behaviors that cannot be measured through public manifestation and recognition.

Measures

The TTCT Figural Form offers an Average Standard Score and a Creativity Index (CI) for completion of the entire test, but does not offer a similar score for the completion of one of the task, namely, in this instance, the Parallel Lines Task of Figural Form. Thus, five measures will be used:

Fluency. Fluency represents the participant's ability to produce a large number of figural images. This score counts the number of relevant images. Nonsense, ambiguous, and duplicate images are not counted. For instance, with the Parallel Lines Task in Figural Form A, the student is presented with 30 pairs of straight lines and is instructed to make individual pictures or objects out of as many of the pairs as possible in the time provided. The participant may complete 19 pictures but only receive a Fluency score of 17 because either three of the pictures

were the same or two of the pictures were ambiguous. The Fluency measure also serves as a quality measure in that each new production must be unique and meaningful.

Originality. Originality reflects the participant's ability to produce unique or uncommon responses that require creative strength. Scoring for this measure has been streamlined by counting the most common responses as 0 and the other responses as 1. A list of the most common responses have been determined by STS. With the Parallel Lines Task, fifteen responses have been ruled as "unoriginal". They are: book, box(es), door, geometric shape, house, human face or figure, ladder, letter(s) of the alphabet, numeral(s), picture frame, present or package, rocket, stick person(s), tree(s), or window. Beyond this, each participant has the opportunity to score bonus points for Originality by combining various pairs of lines. If one combines two sets of lines, one extra point is given. This scale increases up until 16 sets of lines in which case 5 points are given.

Elaboration. Elaboration reflects the participant's ability to develop and elaborate current ideas. An elaboration point is given for each distinct detail that goes above the base level of production for each stimulus response. The scorer must ask, "What is the minimum detail that I must see for this to be a _____?" One point is given for: decoration, deliberate shading, each major variation in design which is meaningful with reference to the total response, and each essential detail of the total response. However, once a class of detail is scored, further evidence of the same class is not counted unless it possesses unique characteristics that differentiate it from other members of its class. For example, a scene from summer may have five clouds, each having a different shape. A garden may have many flowers, and if the flowers are all alike, the scorer would give

credit for the details making up one flower and an additional point for the idea that there are other flowers of the same kind. If the flowers are all different, then each would be given credit. Scoring has been streamlined for this task and the number of Elaboration points is condensed into a score range of 0-6 based on normative data. The streamlined scoring was not used in computation of the Elaboration score for this study.

Fluency/Originality. While this is not a usual measure for the TTCT, the authors found this ratio score important in assessing the effects of the independent variables on various forms of creative behavior. For instance, if in the control group, one participant produces eight responses, and they are all original, then he would have a F/O score of 1. If, however, as a result of one of the independent variable, a participant produces twenty-five responses, but only five of them are original, he would have a F/O ratio of .25. The possible meanings of different F/O ratios will be discussed further in the results and discussion.

Fluency/Elaboration. The rationale for the F/E ratio is the same as stated with the F/O score. Again, for instance, if in one condition, a participant produces eight responses and has a raw elaboration score of 32, he would have a ratio of .25. The possible meanings of this ratio will be discussed further in the results and discussion sections.

Procedure

Various quantitative levels of time restriction and standard were pre-tested with sample groups of 7th grade students and college freshmen. Levels were adjusted to match what both populations found to be “stressful” situations as measured by a post-test questionnaire. Beyond this, it was found that participants did not fully understand the nature of effort the task would require until they had time to work with the actual task. Thus, for the testing phase, the first two

minutes of the task were considered "practice". The independent variables were introduced after two minutes had passed. This pre-testing was conducted in December of 2000 and January of 2001.

We administered the Torrance Test of Creative Thinking Figural Form A: Parallel Lines Task to 48 eighth grade students and 58 eleventh-grade students. Four eighth grade responses were thrown out because they were unscorable; ten eleventh-grade participants were thrown out for the same reason. Participants at each grade level were randomly assigned one the following four conditions based on the existence or non-existence of an exaggerated time restriction and the existence or non-existence of a high standard of criteria: 1) no time restriction/no standard, 2) time restriction/no standard, 3) no time restriction/standard, and 4) time restriction/standard. The exaggerated time restriction: participants were informed that normally they would be given twenty minutes for the task, but they would only be given ten minutes, yet were still expected to perform at the same level. The standard: participants were shown an example of a completed Circles Task (99th percentile for each population) from the Torrance Test of Creative Thinking Figural Form B and then told that they were expected to complete all of the thirty pictures in the time remaining. These additional directions were given to groups 2, 3, and 4 after two minutes had passed.

Students were seated at least 7 feet apart at individual desks during the testing. They were given the testing sheet face-down on their desks. They were all read the standard introductory instructions before each task began:

“In this exercise, there are some interesting things for you to do. You will be called to use your imagination to think of ideas and put them together in various ways. We want you to think of the most interesting and unusual ideas you can—you are suppose to think of ideas no one else in this group will think of. After you think of an idea keep adding to it and build it up so that it will tell the most interesting and exciting story possible. You will be given a time limit, so make good use of your time. Try to keep thinking of ideas, and never give up. If you have any questions after we start, don’t speak out loud. Raise your hand and I will come to your desk to try to answer your questions. Your performance on this exercise is very important and you will be evaluated in comparison to the other students.”

Students were then instructed to turn over their testing sheets, but to continue paying attention to another set of directions. At this point, all groups were then read the general task directions:

“In ten minutes see how many objects or pictures you can make from the pairs of straight lines. The pairs of straight lines should be the main part of whatever you make. With pencil or crayon add lines to the pairs of lines to complete your picture. You can place marks between the lines, on the lines, and outside the lines—wherever you want to in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles in the spaces provided. All right, go ahead. You have ten minutes.”

Participants in the experimental groups 2 and 4 were not told about the time limit.

Participants in all experimental groups were also read the following statement at the beginning of the task directions: "Many students have found this exercise to be very stressful, but I encourage you to do your best."

Participants were then allowed to work on the task for two minutes. At this point, all students were instructed to stop working. Members of the control group were instructed to place an "X" over the last picture they had completed. Once they did this, they were instructed to return to work. The following directions were read to the experimental groups after they had placed an "X" over their last picture:

2. Time Restriction (TR)/ No Standard (NS):

"Oh, I almost forgot. The most stressful thing about this exercise is the time limit.

Usually, students are given twenty minutes for this exercise, but today, you only have ten minutes. However, two minutes have already passed, so that leaves eight minutes.

Get back to work."

Students were reminded of the time limit as each successive minute passed.

3. No Time Restriction (NTR)/ Standard (S):

"Oh, I almost forgot. The most stressful thing about this exercise is that you are

expected to complete all of the pictures. Here is an example of what another student did

the other day on a similar task: (hold up the 99% circles example, walk around so all subjects see it). Get back to work."

Students were reminded of the standard every two minutes by having it exposed to them at the front of the room.

4. Time Restriction (TR)/ Standard (S):

"Oh, I almost forgot. The most stressful thing about this exercise is the time limit and that you are expected to complete all of the pictures. Usually, students are given twenty minutes, but today you only have ten minutes. However, two minutes have already passed, so that leaves eight minutes. Also, remember that you are expected to complete all of the pictures. Here is an example of what another student did the other day on a similar task: (hold up the 99% circles example, walk around so all subjects see it). Get back to work."

Students were reminded of the time limit with each successive minute; they were also reminded of the standard in the same way as in condition three.

At the completion of the testing cycle, all participants were instructed to put their pencils down and pass their responses forward. At this point, participants in the experimental conditions were read the following statements:

"Today you participated in an exercise that was suppose to make you feel stress so that

we could tell how stress affects your drawings. In order to do this, we placed expectations on you that were unrealistic. Each of you did very well on the exercise today. (Conditional):

2. You will recall that I mentioned that most students have twenty minutes to do this exercise. In reality, all students are given ten minutes for the task. I told you this so that you would feel stress and possibly become more or less focused on the task. You all did very well and should be very proud of what you all have done today.

3. You will recall that I mentioned that you must complete all of the pictures. In reality, I have never seen anyone complete all of them in the time limit. When I tried a few weeks ago to do them all, it took me nearly an hour! So you all should be very proud of what you all have done today.

4. You will recall that I mentioned that you must complete all of the pictures and that you had only ten minutes to do this instead of twenty. In reality, I have never seen anyone complete all of them in the time limit. And, when I tried a few weeks ago to do them all, it took me nearly an hour! So you all should be very proud of what you all have done today.

I see that everyone of you drew some very creative pictures. Thank you again for your participation. Any questions?"

Results

There was an interaction between grade, time restriction, and standard as measured by the Elaboration, $F(1,84) = 10.63$, $p = 0.0016$ (See Table 1). The presence of a standard also produced a significant measure for the Fluency/Elaboration ratio, $F(1, 84) = 11.39$, $p = 0.0011$. There were also significant interactions of standard and grade and time, standard, and grade as measured by the F/E ratio, $F(1,84) = 5.20$, $p = 0.025$ and $F(1,84) = 5.31$, $p = 0.023$. Grade group proved significant for Fluency, $F(1,84) = 16.06$, $p = 0.0001$; Originality, $F(1,84) = 9.89$, $p = 0.0023$; and F/E ratio, $F(1,84) = 13.53$, $p = 0.0004$ (See Table 2 and 3 for means).

Discussion

The present research supports the Behaviorist camp in that psychological stressors can be used to lightly stimulate some creative behaviors such as fluency and originality (Khatena 1973). However, the data also supports Amabile and Cheek (1988) through the significant increase in Fluency/Elaboration ratio as a result of the same psychological stressors. In this case, it is clear that the restricted time and the standard placed emphasis on one type of creative behavior (Fluency) with detriment to the other (Elaboration).

The 11th grade students were more affected (both positively and negatively) by the stressors. This may be due to an age-related shift that places more emphasis on achievement motivation. At this age, students may be more attenuated to and stimulated by competition, the threat of evaluation, high standards, etc. than the 8th grade students.

To build on this research, it would be necessary to use an expanded testing material (perhaps the entire TTCT Figural Form A or B) and better define the psychological stressors. While the standard seemed to be very well understood (and effective in moderately changing behavior), the restricted time limit seemed to only be truly meaningful when paired with the standard. It may also be useful to pre-test participants for creative ability with one Form of the test and then install the psychological stressors with the other Form for a subsequent testing. This would allow for a better analysis (within-subjects) of altered behavior and how various stressors affect individuals of varying creative abilities in different ways.

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Table 1

Mean Elaboration Scores: Grade, Standard, Time Restriction Interaction

Elaboration Scores	8th Grade		11th Grade	
	No Time Restr	Time Restr.	No Time Restr	Time Restr
No Standard	22.9	18.4	17.5	21.3
Standard	13	20.2	21.5	13.9

Table 2

Mean Measure Scores Divided by Grade Level

Means/S.D.	Fluency	Originality	Elaboration	F/O	F/E
8th Grade	13.65, 5.28	10.75, 4.72	18.61, 8.62	0.83, 0.40	1.34, 0.33
11th Grade	9.5, 4.6	7.77, 4.18	18.54, 9.07	1.58, 1.56	.059, 0.30

Table 3

Means Data for all Conditions

Means	8th Grade				11th Grade			
	NS	NS	S	S	NS	NS	S	S
	NTR	TR	NTR	TR	NTR	TR	NTR	TR
F	12.27	12.36	14.45	15.54	8.58	10.58	10.16	8.66
O	10.63	10.09	10.63	11.63	6.66	8.91	8.25	7.25
E	22.90	18.36	13.0	20.18	17.50	21.25	21.50	13.91
F/O	1.24	1.26	1.48	1.40	2.12	1.40	1.52	1.27
F/E	0.10	0.68	1.19	.086	0.58	0.52	0.55	0.70