In Search of an Explanation for a Creativity Slump

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尋找“創意驟降現象”的合理解釋

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Abstract of thesis entitled: In search of an explanation for a creativity slump

Submitted by He Wu Jing

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Abstract

In the fast-changing modern world, creativity has become increasingly important for dealing with complex problems and opportunities. Improving creativity is therefore important for both individuals and societies. Studying creativity development can help us to infer the contributing factors that may hinder or enhance creativity. Studies on creativity development during childhood and adolescence have suggested that a creativity slump is a special, but common, phenomenon. Yet it remains unclear why a creativity slump occurs at a specific age or at a specific time of development. The present dissertation provides a direct empirical comparison of two competing hypotheses on the creativity slump. *The school transition stress hypothesis,* drawn from the continuity or experience perspective of human development, suggests that a creativity slump is related to the stress associated with school transition, whereas *the cognitive-developmental hypothesis,* which takes the stage perspective of human development, suggests that the conventional thinking stage inhibits the expression of creativity and is hence conducive to a slump. The explanatory power of these two theoretical perspectives in relation to a creativity slump was tested by addressing the research question as to whether a creativity slump would still occur if school transition occurred at the cognitive stage that is beyond the conventional thinking stage (i.e., the postconventional thinking stage). The study explicitly

compared the relative contribution of stress appraisal and conventionality in thinking to creativity development.

A sequential design characterized by a mixture of a cross-sectional and a nine-month follow-up longitudinal design was used to allow both between and within groups comparisons. Two schools using the "through-train mode" for school promotion were invited to participate in order to ensure that follow-up measures could be made. A total of 405 schoolchildren (213 boys, 192 girls) completed the study, with 144 in the $G_{5\text{-}6}$ group (i.e., grade promotion from Grade 5 to Grade 6), 142 in the $G_{6\text{-}7}$ group (i.e., school transition from Grade 6 to Grade 7), and 119 in the $G_{7\text{-}8}$ group (i.e., grade promotion from Grade 7 to Grade 8). The creative thinking, stress levels, and conventionality in thinking of the participants were measured using three parallel forms of the Test for Creative Thinking-Drawing Production (TCT-DP), Stress Appraisal Measures (SAM), and the Conventionality Test at 3 time-points (i.e., before, during, and after promotion to a new school or higher grade).

In the present study, it was found that a creativity slump still occurred when school transition took place during the postconventional thinking stage, lending support to *the school transition stress hypothesis,* but not to *the cognitive-developmental hypothesis,* regarding a creativity slump at school transition. We further clarified the specific roles of cognitive appraisals of stress in relation to creativity. Negative stress appraisals (i.e., appraising school life as threatening) were negatively predictive of creativity, whereas positive stress appraisals (i.e., appraising school life as challenging and controllable) were positively predictive of creativity. Regarding the role of level of conventionality in thinking in creativity, the results suggest that although postconventional thinking has a positive effect on creative

thinking, its effect on creative thinking is significantly mediated by stress appraisals. The results also showed individual differences in experiencing a creativity slump. The statistic that only 44.4% of the students in the school transition group experienced a slump lends support to the idea that a creativity slump is neither overwhelming nor unavoidable. In accounting for these individual differences, stress appraisal variables were found to be the significant predictors when both the stress appraisal and conventionality in thinking variables were included in the logistic regression equation to predict the occurrence of a slump.

The present dissertation contributes to the current literature by offering empirical evidence to address the explanatory power of *the cognitive-relational theory of stress* and *the cognitive-developmental perspective* in relation to the existence of a creativity slump. The findings suggest that the major factors that are detrimental to creative thinking at school transition are negative appraisals and lack of positive appraisals on school life (i.e., viewing school life as more threatening, less challenging, and less controllable). These findings are helpful for understanding the critical factors that either facilitate or hinder the development of creativity in schoolchildren, which, in turn, could shed further light on effective creativity education.

摘要

世界發展一日千里，我們所面對的問題和機遇愈來愈多，愈來愈複雜，創意和創造力也變得愈來愈重要。因此，提升創意和創造力對個人和社會均意義重大。其中，研究創意的發展十分重要，因為它可以幫助我們瞭解哪些是增進或抑制創意的關鍵因素。創意發展的研究指出，“創意驟降”在兒童以及青少年的創意發展中是一個特別但又常見的現象。為什麼會出現這種現象呢?文獻上解說紛紜，其中具影響力的解說有二，一是“學校變遷壓力論”，二是“認知發展論”。前者認為“創意驟降”主要和環境因素有關，學童在升學時因學校環境轉變而產生壓力，從而壓制了創意之表達。後者則認為“創意驟降”和個人的認知發展階段有關。該理論認為兒童對社會常規的認知發展分為三個階段：前常規期，常規期，和後常規期。屬於常規期的學童一方面知道社會常規的存在，另一方面又尚未了解社會常規的可變性，囿於盲從常規，創意因而被壓抑。上述兩種假設各具其理論及驗證依據，然而何者為較合理之解釋呢?本論文嘗試用實證的方法來直接比較這兩種假設對“創意驟降現象”解釋之合理性。我們提出的問題是：假如學校環境轉變發生在後常規期，而非常規期，“創意驟降現象”還會出現嗎?文中我們直接比較和分析了“學校壓力評估”和“認知水平”這些因素對創意思維的影響。

本論文採用了既含橫斷面又含縱貫面比較的混合設計。兩所採用“一條龍”辦學模式的學校獲邀參與研究，在這類學校就讀的小學畢業生一般可以直接升上結龍的中學，因而可以確保學生在升學後的追蹤調查。共有 405 位學童(213 男，192 女)完成了研究，其中 $G_{5\,6}$ 組 144 人(小五升小六)，$G_{6\,7}$組 142 人(小六升中一)，以及 $G_{7\,8}$組 119 人(中一升中二)。我們對參與者的創意思維，學校壓力評估和認知水平分別在升學/升級的前、中、後期進行了三次測量評估。其中，測量創意思維的工具是“創造思考—繪畫創作測驗”(Test for Creative Thinking- Drawing Production ，TCT-DP)，而測量學校壓力和認知水平的工具則分別是“壓力評估測量”(Stress Appraisal Measures, SAM)，以及

“常規性思維測驗” (Conventionality Test)。由於要作三次測量評估,所以每項測量工具均由三份形式類同和難易程度相當的測驗組成。

本研究的結果顯示,當學校環境轉變發生在“後常規期”,而非“常規期”, “創意驟降現象”依然出現,這一研究結果為“學校變遷壓力論”提供了實證依據。我們的資料還顯示,負面壓力評估(如將學校生活視為具威脅性)減弱創意思維,而正面壓力評估(如將學校生活視為富挑戰性及具可控性)則促進創意思維。相反,我們的研究並不完全支持“認知發展論”,雖然資料顯示“超越常規思維”對創意思維有正面影響,但是“壓力評估”在“超越常規思維”和“創意思維”的關係中卻有顯著的中介作用,這說明“常規性思維”對創意思維的影響是通過“壓力評價”這個中介變量表現出來的。另外,我們的資料還顯示“創意驟降”這個現象呈現個別差異,祇有44.4% 的$G_{6\,7}$組的參與者出現“創意驟降”問題,此結果否定了“創意驟降現象”的普遍性及不可避免性。邏輯回歸分析 (Logistic regression analysis)結果更進一步證明學童如何闡釋學校生活壓力是導致個別差異的主因。

總括而言,本研究透過直接比較“壓力評估”與“超越常規思維”這些變量對“創意思維”的影響,從而驗證了 “認知評估為指標的壓力理論”和“認知發展論”對“創意驟降現象”的解釋力。我們的研究證明,在學校環境轉變時,學童如何闡釋學校生活壓力是影響其創意表現的決定因素,不利於創意表現的闡釋是把學校生活看成是具威脅性的、缺乏挑戰性的、及不可控制的。這些研究結果有助於我們瞭解增進或抑制創意思維的重要因素,從而有效地提升創意教育。

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CHAPTER ONE INTRODUCTION

1.1 Overview and Statement of the Problem

In this overview section, the importance of studying creativity and its development is stated and then the general pattern of creativity development is summarized and a special phenomenon in schoolchildren's creativity development—sudden drops or creativity slumps that occur at a specific stage of development—is highlighted. Following the introduction of the two competing explanations for creativity slumps, the idea that creativity research in a Hong Kong educational setting could help to test the explanatory power of the two explanations is proposed. Following a discussion on creativity studies in the educational context of Hong Kong, the statement of the research problem constitutes the focal point of this section.

The Importance of Studying Creativity and its Development

Creativity is defined as the ability to create valuable products that have the characteristics of originality and appropriateness (Sternberg, 1999). It has been suggested that, in the fast-changing modern world, creativity will become our most cherished ability for dealing with a vast range of complex problems and opportunities (Dacey & Lennon, 1998). From an anthropological view, creativity is one of the highest forms of being a human being and can help us to discover reasonableness and to gain insights into all aspects of human activities (Taylor, 1988). From an evolutionary point of view, creativity is the most valuable human resource and can help humans to progress and to modify their environment to best suit their requirements (Csikszentmihalyi, 1990). Improving creativity is therefore important for both individuals and societies. It has been proposed that creativity is one of the

most important features of human behavior and deserves study and research (Guilford, 1950; Urban & Jellen, 1996). Runco and Charles (1997) further stated the importance of studying the developmental trends of creativity to helping improve creativity: "If we understand the developmental patterns and trends we might be able to infer the causes and contributing factors and thereby avoid or minimize the losses of creativity" (Runco & Charles, 1997, p.116).

The Pattern of Creativity Development

There is a large body of evidence documenting developmental trends in creative potential and actual creative performance. In general, creativity improves through childhood (Torrance, 1967) and adolescence (Camp, 1994; Rudowicz, 2004), peaks in early adulthood (Jaquish & Ripple, 1979, 1984, 1985; Smolucha & Smolucha, 1985), and then deteriorates from adulthood to old age (Smith & van der Meer, 1990; Wayne, 1966). This age-related improvement and decline together form an inverted-U-shaped developmental trend (Runco & Charles, 1997) similar to the inverted-U-shaped functions found in several other areas of age-related performance (e.g., processing speed and memory; see Simonton, 1977). On the other hand, a considerable amount of findings have shown convincingly that the process of creative development is not a continuously smooth inverted U-curve; rather, there are sudden drops associated with different ages in childhood and early adolescence, especially those ages at which children or adolescents experience a change in study environment, such as entering a new school or promoting to a higher grade (e.g., Camp, 1994; Cheung, Lau, Chan & Wu, 2004; Daugherty,1993; Smith and Carlsson, 1983; Torrance, 1962, 1967, 1968). These sudden drops in age-related improvement are referred to as "slumps" in creative development.

The Two Competing Explanations of Creativity Slumps

Although there is agreement that slumps in creativity occur during childhood, relatively little research has been undertaken to explain why these creativity slumps occur at specific times or specific ages. In explaining this special phenomenon in the development of creativity, researchers offer different speculations from the two perspectives that are commonly used to explain human development. Some researchers (e.g., Torrance, 1962, 1963; Urban 1991), following the continuity or experience perspective of development, suggest the possibility that slumps may be related to an individual's reaction to his or her environment and experience. Specifically, they speculate that slumps occur when schoolchildren are confronted with new demands and stresses caused by significant life changes, such as entering a new school or promoting to a higher grade where the academic demands are higher. However, other researchers (e.g., Gardner, 1982; Gowan, 1972; Johnson, 1985; Runco, 1991), taking the stage perspective of development, speculate that creativity slumps are associated with a specific stage of cognitive development that is characterized by strong conventional thinking. Conventional thinking inhibits the expression of creativity. Which of these speculations provides a better explanation of a creativity slump? The school stress view suggests that creativity slumps occur in those schoolchildren who experience stress associated with school change, whereas the cognitive-developmental perspective suggests that creativity only drops at the age that is characterized by conventional thinking and improves at the age that is characterized by postconventional thinking. Faced with these two competing notions, it is interesting to address a crucial question: If school transition occurs at the cognitive level beyond the conventional thinking level (i.e., the postconventional

thinking level, which occurs around the age of 11-12 years), will a creativity slump still occur? The answer to this question will help to determine which explanation seems to be more reasonable with regard to explaining the cause of a creativity slump, thereby improving our understanding of creativity development.

Creativity Research in Hong Kong Educational Setting Can Help Test the Explanatory Power of the Two Notions

The unique education system in Hong Kong can help investigate these two possible explanations empirically. In Hong Kong, students experience school transition in the postconventional years. Hong Kong students typically start primary school at approximately 6 years old, and are promoted to secondary school around 12 years old (see Education Bureau, HKSAR, 2009). Therefore, in Hong Kong, school transition takes place in the postconventional years rather than the conventional years of cognitive development. If the cognitive-developmental perspective is a better explanation, that is creativity slumps are related to the conventional level of thinking, there should be no slump observed for schoolchildren of the age group of 12 even though they are promoted from primary to secondary school, as they have already developed into a postconventional thinking mode and can go beyond the restriction of conventional boundary.

However, if the stress theory has a better explanatory power, creativity slumps will be observed when the students with postconventional thinking level experience a school transition. It is expected that school stress would have certain effects on Hong Kong students. Firstly, education is important to Hong Kong people and school life is one of the core lives of Hong Kong students. Hong Kong is a cosmopolitan metropolis with 97% ethnic Chinese population (Redding & Wong

1990) and Chinese value academic achievements (Bond, 1991). Hong Kong people, including parents, students, and teachers, put great emphasis on education and especially school success (Gow, Balla, Kember & Hau, 1991). Importance of education is not merely highlighted in the domains of intellectual, emotional and social development on individual level. Education is also regarded as the opportunity to improve the socioeconomic status in Hong Kong (Yu, 1991). Since the competition for university is keen, with only 18% of the secondary students getting a place in a university (Education Bureau, HKSAR, 2009), the struggle for school success is intense. Indeed, studies of school transitions in Hong Kong support the notion that school transition could be a critical event to cause stress to students. For example, Tam and co-workers (2000) reported that when Hong Kong students are promoted to secondary school, they have to face adjustment to a new physical, social and academic environment at their point entry to secondary school. School campus changes; teachers and classmates are different; school rules and workloads become more demanding; and their school identity changes as well—from the most senior students in the primary section to the most junior students in the secondary section. All of these readjustments would expose the children to a critical period of experiencing a high risk of stress appraisal which would lead to a short-term decline in creativity. Hence, testing the creativity change of the students who have a postconventional thinking capacity and at the same time experience a school transition from primary school (grade 6) to secondary school (grade 7) in Hong Kong can be helpful to empirically test the two speculating explanations of a creativity slump.

Current Creativity Research in the Hong Kong Educational Context

Creativity research is comparatively new and scarce in the Hong Kong educational context. Rudowicz and her colleagues (Rudowicz, Lok, & Kitto, 1995) first investigated the divergent thinking of 11-year-old Hong Kong students using the Torrance Test of Creative Thinking (TTCT). Rudowicz (2004) then used the Test for Creative Thinking-Drawing Production (TCT-DP) to evaluate the creative potential of university students. Chan et al. (2000) adopted the Wallach-Kogan Creativity Test (WKCT) to study the divergent thinking of a younger population in Hong Kong, namely first to the third graders. Cheung and his colleagues (Cheung, Lau, Chan, & Wu, 2004) also used the Chinese WKCT to assess the divergent thinking of fourth to ninth grade Hong Kong schoolchildren. Although they observed a sudden drop in the mean of the figural tests among students in Grade 7, which is the first year of secondary school in Hong Kong, it was not clear whether this sudden drop in schoolchildren's divergent thinking was related to school transition or was simply a cohort effect due to the shortcomings of the cross-sectional design of their study. Thus, it is important to fill this gap in the research by using a sequential design mixed with a cross-sectional and a longitudinal design to assess changes in creativity.

Given that little research has been done to investigate directly whether a creativity slump still occurs if school transition happens in the postconventional thinking stage, it remains unclear which of the two existing competing notions provides the better explanation for a creativity slump. Based on the above review, we believe that this unresolved problem is worth researching in Hong Kong.

1.2 Objectives of the Study

The major aim of this study is to find out, through empirical investigations,

which notion about the cause of creativity slumps—stress associated with school transition or cognitive development with regard to conventional thinking—has better explanatory power. Specifically, the present study has the following objectives:

(1) To investigate the general pattern of the change in the creativity scores of schoolchildren aged 10-13 years (Grades 5-8) before and after promoting to a new school (i.e., from primary school to secondary school or from Grade 6 to Grade 7) or to a higher grade (i.e., from Grade 5 to Grade 6 and from Grade 7 to Grade 8);

(2) To determine whether schoolchildren in the postconventional thinking stage experience a drop in creativity scores during school transition;

(3) To investigate the general pattern of the change in stress scores before and after promoting to a new school or to a higher grade;

(4) To study how the creativity score correlates with conventionality in thinking and stress associated with school transition;

(5) To determine which factor, conventionality in thinking or stress, has the stronger predictive power for a creativity slump at the time of school transition.

1.3 Significance of the study

First, the present study will provide empirical scrutiny of the explanatory power of the cognitive-relational theory of stress and the cognitive-developmental perspective on the developmental pattern of creativity. Second, the study will provide information on the relationship between creativity, conventionality in thinking, and stress associated with school transition which will be useful for uncovering the factors that hinder the development of creativity in schoolchildren. These findings

could shed further light on effective creativity education.

1.4 The Organization of the Thesis

This thesis consists of five chapters. Following this introduction chapter, Chapter 2 provides a literature review of four aspects of research: (1) the conceptualizations and measurements of creativity; (2) the developmental trend of creativity in children aged 3 to 13; (3) the speculation that a creativity slump is caused by the stress associated with school transition; and (4) the speculation that a creativity slump is related to conventionality in thinking. The corresponding hypotheses are then listed in the first section of Chapter 3, followed by a description of the method used in the study in which details about the participants, measurements/materials, study design, procedure, and data analysis are provided. The results of the statistical analyses conducted to test the hypotheses are then presented in Chapter 4. The last chapter presents a discussion and conclusion in which the results derived in Chapter 4 are discussed and elaborated on. The limitations and implications of the study are also addressed.

CHAPTER TWO LITERATURE REVIEW

2.1 The Conceptualization of Creativity

2.1.1 The Definition of Creativity

As creativity is a wide ranging topic that is important for a wide range of domains, fields, and disciplines, it has been defined and studied in various ways (Sternberg & Lubart, 1999). According to Jaafar and Douglas (2004), there are more than 300 definitions of creativity in the literature. Some of these definitions focus on the characteristics of individuals whose work is determined to be creative, whereas others consider the work itself. Still others focus on the processes or the environmental factors that either lead to or inhibit thinking or the production of a creative work. Accordingly, the 4Ps model has been used to describe four significantly different approaches to the conceptualization of creativity: (a) the person or personality (looking for personal traits; e.g., openness); (b) the processes (looking at the stages, steps, and actions involved in the creation of ideas and products); (c) the environment in which creativity occurs or the environmental influences on creativity (i.e. the press; e.g., the playful climate), and (d) the product that results from creative activity, such as an artistic product (see Mooney, 1963; Rhodes 1961/1987; Runco, 2004).

Each of these four strands of creativity can stand alone, and many past studies have focused on these strands individually. However, the accumulated literature suggests that creativity is a complex, not a simple, concept. Creativity has also been viewed as a multi-faceted phenomenon (Rhodes, 1961/1987) and as a whole entity composed of parts/strands that operate together simultaneously and interactively as a synthesis (Amabile, 1993). Therefore, the new trend is to include

different components of creativity (e.g., motivation, personality, and cognitive and affective processes) in one model in order to conceptualize creativity (Claxton, Pannells, & Rhoads, 2005). Thus, componential models with a more complex view of creativity have been proposed (e.g., Amabile, 1983; Urban & Jellen, 1996). In the following section, researches and studies using the four approaches above are discussed and then Urban's componential model is introduced, as this integrated the 4P factors into one model for defining creativity.

The Creative Process

This approach examines the operations, actions, steps, or stages of thinking used in the production of a creative product or when people behave in a creative manner (Rhodes, 1961). It is concerned with how creativity occurs.

Spearman (1930) suggested that creative thinking is basically a process of seeing or creating relationships in which both conscious and subconscious processes operate together. A creative process involves perceiving various relationships between two or more precepts or ideas (e.g., the cause of, the result of, a part of). Derived from the insights of Helmholtz and Poincaré and his own introspections, Wallas (1926) developed a model of the creative process that involved four stages—preparation, incubation, illumination, and verification. Preparation is the first stage in the process and involves collecting information and examining a challenge from all directions. Incubation, the second stage, involves thinking about the problem in an unconscious manner; then, a delightful idea might flash into the mind in an "Aha" stage, which Wallace called the illumination stage. The final stage is verification; the aim of this stage is to test the appropriateness of the idea and refine it into a better one. Wallas's four-stage-process model has been applied as the basis for

almost all of the systematic, disciplined methods of creative thinking training (Torrance, 1988).

Guilford (1950) first introduced the concept of divergent thinking in his presidential address to call for the study of creativity. Then, in his well-known structure of intellect theory (1983), he emphasized that divergent production is an important cognitive operation in a creative process. He defined divergent production as the generation of information from given information. This definition emphasizes the variety of outputs that can result from the same source. For example, divergent production ability could be tested by asking the examinee to list words that satisfy a specified letter requirement, such as words beginning with letter "f"; an alternative task would be to list all of the uses of a common brick within a set time limit. Divergent production can be evaluated in terms of innovation, originality, and unusual synthesis or perspective. Despite his emphasis on divergent production, Guilford concluded that divergent thinking could not be equated with creative thinking. Other abilities, such as convergent thinking, sensitivity to problems, and redefinition abilities, are also important in a creative process.

Guilford was not the only one to identify divergent thinking as an important cognitive ability in a creative process. Torrance (1988) also favored this definition. He made it clear that he had chosen a process definition of creativity for research purposes (Torrance 1988, p. 47). He defined creative thinking as a problem-solving process which involved five steps: (1) sensing difficulties, problems, gaps in information, missing elements, something askew; (2) making guesses and formulating hypotheses about these deficiencies; (3) evaluating and testing these guesses and hypotheses; (4) possibly revising and retesting these guesses and

hypotheses; and finally (5) communicating the results. In each of these steps, the involvement of divergent thinking is the key that leads to a creative outcome. Torrance further introduced the four indices of divergent thinking: fluency (i.e., the ability to generate a large number of ideas), flexibility (i.e., the ability to generate ideas in a number of categories), originality (i.e., the ability to generate unique and unusual ideas), and elaboration (i.e., the ability to add details or to expand on the item itself).

The Creative Personality

This approach involves studying the individual characteristics or attributes of a creative person (Rhodes, 1961). Creative people usually have a constellation or cluster of personality traits that give them the capacity or potential to produce creative products. After introducing the concept of divergent thinking in his presidential address to call for the study of creativity, Guilford (1975) gradually enriched his model—the Structure of Intellect Model—by studying a broader range of other cognitive operations and noncognitive characteristics. Cognitive components include divergent thinking, convergent thinking, evaluation, memory, and cognition, while noncognitive characteristics are personality traits, such as motivational and temperamental traits. Since then, researchers have made efforts to compare the personality traits of creative and not so creative individuals. For example, when studying the personalities of creative persons, Torrance (1979) gave most weight to the traits of curiosity, willingness to take risks, and persistence. Even though proving a causal relationship has been hard, many studies have yielded supporting evidence showing that there are correlations between certain personality traits and success in creative work. Another scholar, Davis (1995), also categorized the personality traits

of a creative person: These traits are an awareness of creativeness, originality, independence, curiosity, openness, and a sense of humor. A creative person is also energetic, artistic, intuitive, and attracted to complexity. Furthermore, a creative person loves taking sensible risks and enjoys the time being alone.

Highlighting the complexity of a creative person's personality, Csikszentmihalyi described 10 paradoxes of creative people in his book entitled "Creativity: Flow and the Psychology of Discovery and Invention" (1996, pp. 55-76). These 10 paradoxes were as follows: (1) Creative people have a great deal of physical energy, but they are also often quiet and at rest; (2) Creative people tend to be smart yet naive at the same time; (3) Creative people combine playfulness and discipline or responsibility and irresponsibility; (4) Creative people alternate between imagination and fantasy and a rooted sense of reality; (5) Creative people tend to be both extrovert and introvert: (6) Creative people are humble and proud at the same time; (7) Creative people, to an extent, escape rigid gender role stereotyping; (8) Creative people are both rebellious and conservative; (9) Most creative people are very passionate about their work, yet they can also be extremely objective about it; and (10) Creative people's openness and sensitivity often exposes them to suffering and pain, yet also to a great deal of enjoyment.

Similarly, Dacey and Lennon (1998) categorized 10 personality traits of a creative person: tolerance of ambiguity, stimulus-freedom, functional freedom, flexibility, risk taking, preference for disorder, delay of gratification, freedom from sex-role stereotyping, perseverance, and courage. They stated that, even though not all creative people exhibit all of these qualities, the research findings suggested that creative people demonstrate a significant number of these 10 traits. Among the 10

traits, tolerance of ambiguity was found to be the most important personality trait that is most likely to be related to creativity.

The Creative Product

This approach involves identifying the outcomes and qualities of the products of creation (Rhodes, 1961/1987). The product can be anything—a poem, a song, a drawing, or an idea. It can come from all kinds of creative processes and be created by either an individual or a group of persons. Creative products or outcomes are evaluated on the basis of the criteria of originality and usefulness. For example, in Barron's (1955) definition, a creative product must be both original and functional or adapted in some pragmatic way to reality. Sternberg and Lubart (1999) also emphasized that novelty is one of the important criteria for a creative work (i.e., the work should be original and unexpected). However, originality is a required, but insufficient, condition for creativity: The work must also be of value; that is, it should be appropriate (i.e., useful, adaptive concerning task constraints) (Sternberg & Lubart, 1999, p.3). This combination of novelty and appropriateness or usefulness has been widely accepted in different fields to describe the characteristics of a creative product (e.g., Amabile, 1983; Jaafar & Douglas, 2004; Mumford & Gustafson, 1988; Parkhurst, 1999).

The Creative Press

Studies that focus on the creative press examine the characteristics of the situations and the environment that in which either the person exists, or the product is produced, or the process occurs. The major concern of this approach is to discover the climate and the related environmental factors that enhance or inhibit creativity.

The situation or the environment can be the immediate context in which

creativity is enhanced or inhibited. One of the most well-known and influential arguments that addresses this issue was made by Wallach and Kogan (1965); this argument involved the influence of test conditions on creativity performance. In their study, in which 151 primary students were tested in an untimed game-like condition, Wallach and Kogan found that an optimal performance in a creativity test required a context free from, or minimally influenced by, the stresses caused by academic evaluation and a fear of the consequences of making errors. In other words, an unpressurized, playful context would facilitate creativity. Substantial evidence for the relationship between stress or play and creativity has been reported in many studies (e.g., Belcher, 1975; Berretta & Privette, 1990; Howard-Jones, Taylor, & Sutton, 2002).

Creativity can also be influenced by environments such as family background or sociocultural context. Several investigations have been attempted to explore how the parent-child relationship or parenting styles affect a child's creativity. Considerable evidence suggests that the parents who are most likely to foster creativity in children are characterized by a low level of authoritarianism and disciplinary restrictiveness (Bayard de Volo & Fiebert, 1977; Getzels & Jackson, 1961; Miller & Gerard, 1979) and by a strong encouragement of equality (Dewing & Gaft, 1973), self-reliance and independence (Michel & Dudek, 1991; Miller & Gerard, 1979), and freedom and flexibility (Bomba, Moran III, & Goble, 1991; Harrington, Block, & Block, 1987). Some of these parents even hold permissive childrearing attitudes and have little or no control over their children's behavior (Getzels & Jackson, 1962; Siegelman, 1973). Dacey (1989) reported that the parents of creative children seldom rely on rigid sets of rules to govern their children's behavior. Instead,

they espouse a well-defined set of values by providing role models and through family discussions and expect their children to make personal decisions based on these values. A sense of emotional security has also been shown to be essential for promoting creative thinking (Freeman & Cheshire, 1985). For example, Harrington, Block, and Block (1987) found that preschoolers who were raised by parents who provided psychological safety developed into creative adolescents. In their review of the relationships between child rearing and creativity development, Michel and Dudek (1991) concluded that the parent-child relationship between creative children and their parents is nonpossessive, but not unaffectionate. With regard to sociocultural factors, Simonton (2000) suggested that political environment and cultural diversity affect creativity in different ways. Warfare depresses the output of creative ideas (Simonton, 1984), whereas experiencing cultural diversity (e.g., through immigration, travelling abroad, or studying under foreign teachers) may facilitate creativity (Simonton, 1997).

A Componential Model of Creativity

In introducing the 4Ps model, Mooney (1963) suggested that there was a need for a way to take hold of all of the four perspectives together so that each perspective could serve and support the others. Rhodes (1961/1987) indicated that it is only in the intertwining and unity of the strands of the four Ps of creativity that the complexity of creative behavior occurs. More recently, Mumford and Gustafson (1988) recommended that researchers might enhance the generalizability of their findings by studying creative behavior through the combinations or interactions of the four Ps; that is, they should reframe their questions to ask how at least one of the 4Ps would interact meaningfully with at least one other P. According to Mumford and

Gustafson (1988, p.28), "creativity appears to be best conceptualized as a syndrome involving a number of elements: (a) the processes underlying the individual's capacity to generate new ideas or understandings, (b) the characteristics of the individual facilitating process operation, (c) the characteristics of the individual facilitating the translation of those ideas into action, (d) the attributes of the situation conditioning the individuals' willingness to engage in creative behavior, and (e) the attributes of the situation influencing evaluating of the individual's productive efforts." Other recent multidimensional conceptualizations of creativity have supported its multi-faceted nature, applied it to various disciplines, and allowed multiple measurements of creative phenomena to be developed (Csikszentmilalyi, 1988; Eysenck, 1993).

A more complex view of creativity has also been preferred in recent years. This new view deals with the procedural structure of the interacting cognitive and personal components of the creative individual as well as with the mutual dependencies of person and environment during the process leading to creative products. Amabile (1983a, 1983b, 1993, 1995) consulted social psychological studies of creativity and proposed a componential model of creativity that includes three components. The first component is domain-relevant skills, which consists of factual knowledge, technical skills, and talent in a certain domain. The second component is creativity-relevant skills, including cognitive styles, creativity heuristics, and working styles. The third component is task motivation, which consists of two elements: the individual's baseline attitude toward the task and the individual's perception of his or her reasons for engaging in a particular task in a certain context. Amabile emphasized that if some recognizable level of creativity was to be produced, all three components

are necessary to, and have to work interactively in, the creative process. While the first two components (domain- and creativity-relevant skills) are essential to what an individual can do in a given domain, the third component (task motivation) is detrimental to what the individual can do, how a task is done, and how long the creativity process can be sustained. In addition, Amabile highlighted the role of social environmental factors in individual creativity. She suggested that factors in the social environment that support autonomous, active task engagement can enhance intrinsic motivation and creativity, whereas factors that convey control can hinder intrinsic motivation and creativity (Amabile, 2001, pp. 334-335).

Sternberg also introduced a componential model of creativity, namely the three-facet model of creativity, in which the three essential factors of creativity are intellectual traits, intellectual styles, and personality traits (see Sternberg, 1988). The intellectual traits factor relates to how creativity interacts with intellectual styles and personality traits to produce creative products (Sternberg & Lubart, 1991). Sternberg and Lubert (1995) later developed another theory: the investment theory of creativity. This theory suggests that creative thinkers are like good investors who know how to buy low and sell high in the realm of ideas. According to the investment theory, creativity requires a confluence of six distinct, but interrelated, componential resources: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. Creativity was suggested to involve more than a simple sum of a person's level on each component. Creativity was also in large part a decision to use these componential resources. For example, to be creative, one must decide to generate new ideas, analyze these ideas, and sell the ideas to others (see Sternberg, 2006).

Inspired by Amabile's and Sternberg's works, Urban and colleagues (see Urban, 1986, Urban, 1994; Urban and Jellen, 1996) developed a componential model with the aim of explaining creativity in a possibly comprehensive way. As shown in Figure 1, Urban and Jellen's model was built from different interactive components, all of which work and function together as a whole in the creative process leading to a creative product. This model includes three creative personality components: (1) focusing and task commitment, (2) motivation and motives, and (3) openness and tolerance of ambiguity. It also highlights the three cognitive components that are important in a creative process: (1) divergent thinking, (2) general knowledge base, and (3) specific knowledge base and skills. These personality and cognitive factors also interact with the environmental factor (i.e. press) in leading to a creative product. The environmental factor consist of three levels of components: (1) the microenvironment, which includes individual factors such as family, school, test conditions, and so on; (2) the macro environment, which consists of group or local factors, including socio-cultural and political conditions; and (3) the meta environment, which includes societal, historical, and global factors. Environmental factors influence one's personality and cognitive development as well as the process of generating and expressing creative ideas and products. Urban and Jellen emphasized that no single component alone may be sufficient to explain or be responsible for the whole creative process; rather, the components work together as a functional system.

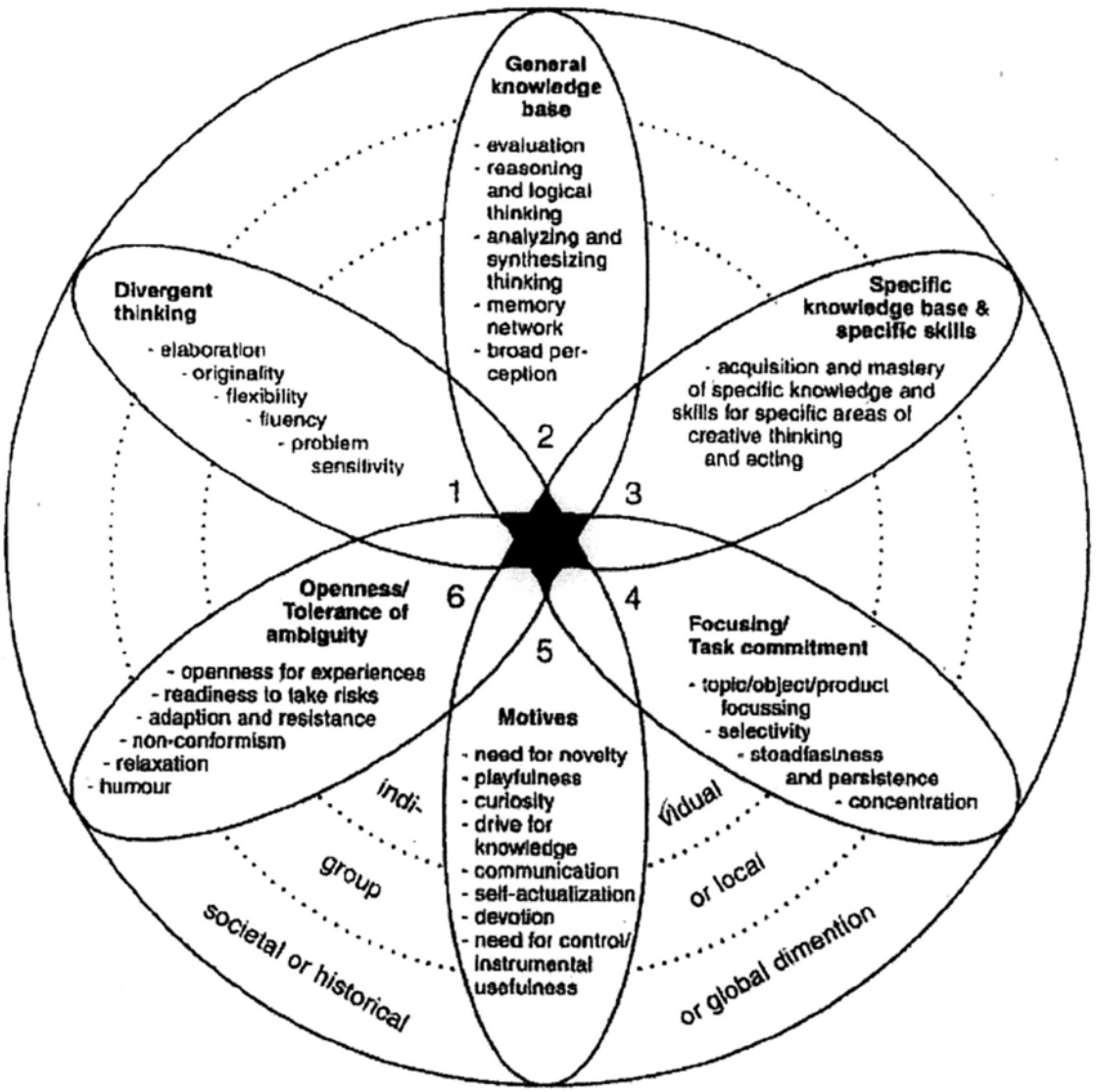


Figure 1. A componential model of creativity (Urban, 1994; Urban & Jellen, 1996).

2.1.2 The Measurement of Creativity

As there are different opinions on the definition of creativity and different approaches to studying it, different tests have been constructed to measure creativity. These measures can be classified into different categories based on the relevant definition or theory adopted. Sticking to the theoretical frameworks of the 4Ps model

and the componential model, in the following section, assessments of the creative process, the creative personality, and the creative product are first presented and then a creativity measure developed based on the componential model, named the Test for Creative Thinking- Drawing Production (TCT-DP), is introduced. It is worth noting that past studies on the creative press (or environment) have mainly focused on describing or manipulating situational or environmental characteristics and that structured measures of the creative press are limited in the current literature.

Measuring the Creative Process

Divergent thinking measures are one of the most commonly accepted and used standardized measures of the creative process. Divergent production scores typically assess quantitative indicators of the theoretical constructs of fluency, flexibility, originality, and, sometimes, elaboration. The Torrance Test of Creative Thinking (TTCT) is possibly the best known and most widely used test of divergent thinking. The test materials include a verbal section ("Thinking Creatively with Words") and a nonverbal or figural section ("Thinking Creatively with Pictures"), both of which have two forms (A and B). There are six verbal activities (Asking, Guessing Causes, Guessing Consequences, Product Improvement, Unusual Uses, Unusual Questions, and Just Suppose) and three figural activities (Picture Construction, Picture Completion, and Lines/Circles). The verbal activities yield scores on three dimensions (referred to by Torrance as "mental characteristics"): Fluency, Flexibility, and Originality. The nonverbal activities yield scores for five mental characteristics: Fluency, Originality, Elaboration, Abstractness of Titles, and Resistance of Premature Closure. In addition, the figural tests can be scored for 13 creative strengths (e.g., Storytelling Articulateness, Synthesis of Incomplete Figures,

and Fantasy.). Another example of this type of measurement is the Wallach-Kogan Creativity Tests (WKCT) which assess intellectual abilities related to divergent thinking, including fluency, flexibility, originality, and elaboration. The WKCT consists of verbal and figural items, including uses, similarities, instances, line meanings, and pattern meanings.

Divergent thinking tests yield observable, quantifiable data that indicate an individual's potential to produce creative performances in real-life situations or to solve real problems (Runco, 1991; Torrance, 1987). Many of these tests have been extensively researched and normed in different cultures. For example, the TTCT (Torrance, 1990) is the most extensively researched, and it provides adequate updated norms and standardized procedures for administration, scoring, and evaluation. Other merits of the TTCT include fewer limitations of bias in terms of gender, race, social economic status, education level, language background, and culture (Kim, 2006). The TTCT Manuals reported moderate to high internal consistency scores to support its reliability in use (Torrance, 1974, 1990, 1998). The Chinese version of the WKCT has been normed for schoolchildren in Hong Kong, and this has facilitated both cross-cultural and local studies comparisons of creativity performance associated with age. The Chinese WKCT has also been proven to be a reliable instrument for testing, with high internal consistency (α = .70-.93), the creativity of schoolchildren in Hong Kong across four indexes (Fluency, Flexibility, Uniqueness, and Unusualness) of creativity in both verbal and figural tests (Cheung, Lau, Chan, & Wu, 2004).

Despite their popularity and positive features for testing creativity, measures of divergent thinking have been criticized for several reasons. First, the fact that the sampling of the behavior to be measured contains only a narrow range of

creative behaviors, and not other psychological factors such as openness and unconventionality (Cropley, 2000), has been criticized. Similarly, Charles and Runco (2000) commented that even though divergent thinking is one of the most recognized components of the creativity complex, it is not synonymous with creative thinking. Second, the scores resulting from these measures have been criticized for being heavily dependent on the amount of ideational fluency (the total number of responses). Scores in other divergent thinking areas (i.e., flexibility, originality, and elaboration) are strongly affected by ideational fluency. Thus, Jellen and Urban (1986) held that other promising systems for analyzing the scores by means of assessing the quality of the responses should be applied to improve the tests. Third, the testing environment affects test scores, and the scores on the divergent thinking measures are sensitive to such influences (Torrance, 1987). An individual's level of motivation and self-confidence and the perceived relevance of the testing tasks to real-life activities may also influence test scores. Other studies have indicated that higher scores are attained when warm-up exercises set a climate that is conducive to the reflection and incubation of ideas (Torrance, 1987). Hence, Torrance (1979) suggested that a score obtained at a single time point cannot be viewed as a real estimation of an individual's creativity.

In spite of the criticisms, these divergent thinking tests, especially the TTCT, are still extensively used in research and education settings as some hold the belief that divergent thinking is a good predictor of creative thinking ability and the scores gained in a divergent production test are viewed as measures of a person's creative potential. For example, Kim (2006) conducted a review of many studies that had used TTCT and concluded that all of the TTCT indices have been found to be

significant predictors of creative achievement in the long term (e.g., 12 years) and for both genders. Other studies (Cramond, Matthews-Morgan, Bandalos, & Zuo, 2005; Plucker, 1999) have used a new statistical technique—structural equation modeling—to reanalyze Torrance's longitudinal data. These studies have provided empirical evidence to support the validity of the TTCT for predicting creative achievement 40 years after it had been administered; it was found that the contribution of the TTCT to explaining adult creative achievement was 3 times than that of intelligence quotients.

Measuring the Creative Personality

The various types of measures for creative personality mainly focus on observable and measurable personality characteristics, such as personality traits, attitudes, interests, and biographical characteristics. An early attempt to study creative personality involved interviewing people or analyzing biographies of people who had led very creative lives and made important creative contributions in different fields or domains (e.g., art, science, industry). The conclusion that can be drawn from using these measures is that outstanding inventors usually possess personality characteristics such as persistence, courage, curiosity, openness to experience, and tolerance of ambiguity (see Dacey and Lennon, 1998). These techniques are usually only applied to deceased or socially eminent creators. Studying such people may provide very valuable information regarding the personality characteristics of highly creative achievers. However, access to deceased luminaries is limited to biographical information, and access to living luminaries is limited by their small number.

Thus, alternative approaches, such as self-report inventories, are used to extend the study of creative personality to wider populations, from kindergarten

through to graduate and professional school, as well as to adults in all walks of life. One popular approach is based on adjective check lists such as the Adjective Check List compiled by Gough and Heilbrun (1983) and Gough's (1992) 30-item Creative Personality Scale. The scale contains some positive weighted adjectives (e.g., clever, wide interests, original) and some negative weighted adjectives (e.g., sincere, conventional). The reported internal consistency coefficient and test-retest reliability for the scale are about 0.63 and 0.70 respectively. Even though a self-report inventory may be one of the most easily defendable methods of assessing one's creative personality, its self-evaluating nature has been criticized as being subjective and possibly leading to measuring bias.

Measuring the Creative Product

The measuring of a creative product is concerned with product evaluation based on the criteria of both newness and appropriateness or usefulness (Amabile, 1983; Jaafar & Douglas, 2004; Mumford & Gustafson, 1988). One method for judging whether a product is new and appropriate is the use of expert ratings as a criterion for eminence. Hennessey (1994) emphasized the method of consensual assessment. Consensual assessment is a method whereby a panel of people act as judges, independently evaluating products using subjective measures. The appropriate raters are experts who are familiar with the domain in which the product is created (e.g., artists in a painting competition, architects in a design competition, writers in an essay competition, etc.). This type of assessment is based solely on the notion that experts in a given field can recognize creativity when they see it. This is how creativity is usually assessed in all fields, even the hard sciences (Baer, 1994). One example of

this method is Smith and Carlsson's (1983) study of children's creativity, in which two professional artists evaluated the artistic work of children.

In addition to the ratings of experts in a domain, nonexpert ratings of the creativity of eminent individuals have also been used as a criterion for rating a creative product. One such example is Taylor's (1975) Creative Product Inventory, which measures Generation, Reformulation, Originality, Relevancy, Hedonics, Complexity, and Condensation. A more recent example is Besemer and O'Quin's procedure (1987) for assessing sophisticated creative products in various domains. Their method of rating creative products uses three clearly defined criteria: novelty, resolution of the problem to be solved, and synthesis/evaluation. Later, Besemer and O'Quin (1993) developed the Creative Product Semantic Scale to serve as a standardized measurement for analyzing a creative product on the basis of four criteria: novelty, problem resolution, elaboration, and synthesis attributes of products. The reliability of these instruments has received reasonable empirical support, with internal consistencies for different dimensions ranging from 0.69 to 0.87 (alpha coefficients). However, validity issues still have to be addressed.

Kirschenbaum (1989) highlighted one weakness of this kind of assessment of creativity: Even though novelty is easily detected, the effectiveness, value, or utility of a creation is often difficult to evaluate and takes time to determine.

A Measure of the Componential Model

Urban and colleagues (1986, 1991, 1996) proposed a componential model of creativity with the aim of explaining creativity in a comprehensive way. This componential model emphasizes the creative process as an interaction between cognitive abilities, personal characteristics, and social environments. No single

component alone is sufficient to lead to a creative idea or product. Based on the theoretical basis of the componential model of creativity, the TCT-DP was developed in a series of studies (e.g., Jellen & Urban, 1986; Urban, 1991) before culminating in a detailed scoring manual (Urban & Jellen, 1996) to capture various components of creativity using a gestalt approach. This test uses a single drawing with six intriguing figural fragments that can be completed in a wide variety of ways, ranging from the simple, conventional, and disjointed to the thematically complex, unconventional, integrated, and aesthetically interesting. By analyzing the drawing, various criteria of creativity can be evaluated. Examples of such criteria are Continuations and Completion of Ideas, New Elements, and Connections made for Coherence of Organization, as well as other criteria of creative traits that are stressed in the literature, such as Boundary Breaking, Unconventionality, Humor, and Affection. The application of the TCT-DP allows for more elaborate analysis and for quantitative as well as qualitative assessment, and, therefore, it has been suggested that this test is a more promising tool for measuring creativity (Dollinger, Urban, & James, 2004). In addition, as it involves completing a drawing production within 15 minutes, the test is easily administered and is also applicable to a wide range of various age populations, intellectual potentials, and socioeconomic or cultural groups.

The validity of the TCT-DP has been supported in a number of studies (see Urban, 2004; Urban & Jellen, 1996). First, convergent validity has been evident in studies showing significant correlations between the TCT-DP and measures of divergent thinking and other measures of creativity (see Dollinger et al., 2004). It significantly correlates with Hocevar's (1979) Creativity Behavior Inventory—a self-report of past creative accomplishments—in different content areas, including the

visual arts, literary arts, crafts, and music, with r = .24-.33. It also shows significant correlations with several scales of creative personality, including the Openness Scale of the NEO-Five Factor Inventory (Costa & McCrae, 1992), with r = .29, and with the creative personality scales of Domino (1970) and Gough (1979) (r = .24 and r = .30, respectively). It also correlates well with measures of creative products, such as story-telling using Murray's Thematic Apperception Test (TAT) (1943), with r = .29, and photo taking and essay writing to answer the question "who are you" (r = .21). Second, evidence of the discriminant validity of the test was obtained in studies examining the relationships between TCT-DP and traditional intelligence tests. The strength of the correlation between the scores on the TCT-DP and intelligence tests were low and insignificant or even close to zero (e.g., Rudowicz, 2004, r = .01-.28; Urban & Jellen, 1996, r = .00-.44), which suggests that TCT-DP is a measure that is relatively independent from an intelligence test. Third, evidence regarding the criterion validity was found in several studies that differentiated between high vs. low creativity samples by using TCT-DP. For instance, Scheliag (1988, cited in Urban & Jellen, 1996) found a highly significant difference of 14 points (TCT-total) in favour of a music making group when this group was compared to workers in a scientific-technical institute who loved to listen to music but did not compose music (32.7 vs. 18.8). Matczak, Jaworowska, and Stanczak (2000, cited in Rudowicz, 2004) showed that students preparing for creative professions (e.g., creative media, fine arts) obtained significantly higher TCT-DP scores than public servants and military school students (28.5 vs. 19.5). Lastly, with regard to evidence of construct (structural) validity, a five-factor model was found with a German sample (Urban & Jellen, 1996) for Form A of the test, whereas a four-factor model was obtained with a Hong Kong

Chinese sample (Rudowicz, 2004). The basic structure of Rudowicz's four-factor solution differed only slightly from the structure observed in Urban and Jellen's five-factor model, and only the weakest factor (i.e., Perspective and Speed) did not emerge in the four-factor solution. Both the four- and five-factor models were interpretable and theoretically meaningful (see Rudowicz, 2004, p. 215).

The internal consistency of the test, as measured by Cronbach's coefficient alpha, has been proven to be moderate to very high (α = .46-.92, Urban & Jellen, 1996). Rudowicz (2004) tested the applicability of the test to Hong Kong students and reported a high internal consistency. The internal consistencies for the 13 subscales in both the test and retest situations were measured by Cronbach's alpha coefficients; the respective alphas were .73 (N = 2,335) and .75 (N = 269). However, the test-retest correlation coefficients for the 12 subscale scores were low, even though all of them reached a statistically significant level of $p<.05$. Nine coefficients were below .22 and three were above .30, but none exceeded .40. In addition, two scales (Humor and Unconventionality b) did not reach a statistically significant relationship. The test-retest correlation coefficient for the composite TCT-DP score was statistically significant ($r = .35$, $p<.01$). Rudowicz explained that due to the role of emotion, motivation, and situational context in determining participants' responses to a creativity test, it might not be possible to expect high stability in measures of creative potential.

With detailed scoring instructions, the interrater reliability for the TCT-DP is usually high. Various studies have yielded coefficients around .90 (Urban, 1991). In her study with a Hong Kong sample, Rudowicz (2004) also tested the interrater reliability between two raters in 196 cases. The correlation coefficients varied with

the subscales and ranged from .99 for Completion (Cm) to .62 for Humor (Hu). The reliability of the composite TCT-DP score for the two raters was good, with r = .76. Ten of the 12 scales had an interrater reliability of .85 or greater, and the other two scales had an interrater reliability of .62-.69. The median interrater reliability was .93. The interrater correlation coefficient obtained for the Hong Kong sample matched those reported in the test manual (Urban & Jellen, 1996). They ranged between .89 and .97 for the German sample.

Although the TCT-DP was developed on the theoretical basis of the componential model of creativity, it should be noted that there is an obvious gap between the scope of the componential model of creativity and the TCT-DP. Actually, the purposes of the model and the test are somewhat different. While the model aims to explain creativity in a possibly comprehensive way, the test is designed to measure creative thinking in a possibly holistic way. Indeed, the authors themselves also noticed this gap and made it clear that one would not expect that such a complex model (with various components and sub-components; see Figure 1) could be transferred directly and comprehensively into a single instrument (Urban & Jellen, 1996, p. 9). Nonetheless, such a gap does not necessarily mean that the test has a weakness.

2.2 The Development of Creativity in Schoolchildren

There is a large body of evidence documenting developmental trends in creative potential and actual creative performance. In general, creativity improves through childhood (Torrance, 1963, 1967) and adolescence (Camp, 1994; Rudowicz, 2004), peaks at early adulthood (Jaquish & Ripple, 1979, 1984, 1985; Ripple & Jaquish, 1982; Smolucha & Smolucha, 1985), and then deteriorates from adulthood to old age (Smith & van der Meer, 1990; Wayne, 1966). Together, this age-related improvement and decline form an inverted-U-shaped developmental trend (Runco & Charles, 1997) similar to the inverted-U-shaped functions found in several other areas of age-related performance (e.g., processing speed and memory; see Simonton, 1977). On the other hand, a considerable amount of findings have shown convincingly that the process of creative development is not a continuously smooth inverted-U-curve; rather, there are sudden drops associated with different ages in childhood and early adolescence, especially at those ages at which children or adolescents experience a change in study environment, such as entering a new school or promoting to a higher grade (e.g., Camp, 1994; Cheung, Lau, Chan, & Wu, 2004; Daugherty, 1993; Smith & Carlsson, 1983; Torrance, 1962, 1968). These sudden drops in age-related improvement are referred to as "slumps" in creativity development.

Appendix I provides a summary of studies on slumps in creativity development. One of the earliest and the most commonly recognized findings on slumps in the development of creativity in children was Torrance's (1962, 1968) longitudinal study with a sample size of 100 (45 boys and 55 girls). All of the children in this study were enrolled in two elementary schools in Minnesota. They were given a divergent thinking test—the TTCT—each year from September 1959 to

May 1964. Torrance (1962) found that the first slump in the children's creative thinking occurred at approximately 5 years of age, which is the age at which children typically enter school in the United States. A few years later, Torrance (1968) reported another sudden drop of about one-half standard deviation in each of the four verbal and figural indices of the TTCT (i.e. fluency, flexibility, originality, and elaboration) and in the mean total score for the fourth graders at the confidence level of $p<.01$. Torrance referred to this sudden drop as the "fourth-grade slump." Torrance explained that slumps are related to the stress experienced by children who are confronted with new challenges and readjustments, such as entering school or to a higher grade where the academic demands are higher. He suggested that the factor of new demands and stress strongly influence the course of creative development, the level of creative functioning, and the type of creative functioning that flourishes most.

Apart from the first- and fourth-grade slumps found by Torrance (1962, 1968), Camp (1994), using the TTCT, found two more slumps among children in higher grades. Camp's longitudinal investigation began at the start of first grade; follow-up-measures were conducted at the end of the first, second, third, sixth, ninth, and twelfth grades. The results of this study suggested that figural fluency, flexibility, and originality increase steadily from the first to the sixth grade, and then suddenly drop in the 12th grade. Verbal fluency and flexibility showed similar drops at the sixth and the 12th grades, which are two critical transitional points for children (promoting from primary school to secondary school and from secondary school to college, respectively).

Torrance's (1962, 1968) and Camp's (1994) works were based on divergent thinking measures. Studies using other types of measures have made similar

observations. For example, Urban (1996) developed a measure for creative thinking, the TCT-DP, with the aim of measuring more aspects of creative thinking in a holistic way. He focused on the aspects of quality, content, gestalt, and elaboration of ideas, as well as on creative traits such as boundary breaking, unconventionality, and sense of humor. Using the TCT-DP, he replicated Torrance's (1962) first-grade slump finding and reported interesting developmental curves for children aged between 4 and 8 years, with a typical "breakdown" for the 6-year-old schoolchildren. In Urban's study, the mean score of all of the kindergarten children (4, 5, and 6 years old) was significantly higher than that of all the first-grade children (6 and 7 years old). Specifically, the score of children aged 6 from the kindergarten was twice as high as that of children of the same age who had moved up to the first grade. Urban supported Torrance's idea that a creativity slump may reflect the effects of school discipline on children's willingness to diverge (Urban, 1991).

Daugherty (1993) also used a qualitative measure, the Torrance Test of Creative Action and Movement (TCAM), to describe changes in the thinking of kindergarten and preschool children. The results suggested a statistically significant linear decline from age 3 to 5 in terms of fluency, originality, and average creativity, with a slight increase at age 6. In addition, Dudek (1974), by studying the development of children's quality of expression of thought, imagination, and creativity, found that creativity measures taken in the first grade correlate poorly with measures of creativity taken in later years, thus demonstrating that the development pattern of creativity in the first grade is different from that in later years. Dudek explained that children's expression of thought, imagination, and creativity are constrained due to the social pressures they experience in a new environment.

Similar findings have been found in other cultures. Smith and Carlsson (1983) used a Percept-Genetic Model (PGM) to study the developmental trend in creativity of their Swedish participants. In their study, participants of various ages were presented with a stimulus, first for very short "subthreshold" exposure times and then for systematically longer times, until the stimulus was correctly identified and described. Creativity was specifically defined in relation to the individuals' willingness to venture into subjective impressions of the stimulus, as opposed to holding to their original description, when the exposure times were shortened again. Smith and Carlsson's (1983) results were similar to those reported by Torrance (1962) with regard to a child's transition to regular school (at 7 years of age for Swedish children). A comparison of 7-8-year-old children with 6-year-old children in an earlier study suggested a decline in creativity; this seemed to correspond to the predicted decline at the start of regular school. In contrast to Torrance's (1968) fourth-grade slump, Smith and Carlsson (1983) found an increase in creativity between the ages of 10 and 11, showing the importance of environmental factors on the manifestation of slumps. The need to face stressful changes and new demands, such as school transitions, occurs at different ages in different cultures, and thus slumps may appear at different ages.

Apart from western studies, it seems that similar results have also been found in Hong Kong studies. Cheung and his colleagues (Cheung, Lau, Chan, & Wu, 2004), in their norming study of the Chinese version of the Wallach-Kogan Creativity Tests (WKCT), reported a significant decline in the mean scores for both the verbal and figural tests of the Chinese version of the WKCT among fourth-grade Hong Kong schoolchildren. They also found a sudden drop in the mean of the various indices of

creativity in figural tests among Grade 7 (the first year of secondary school in Hong Kong) students, although they called for their fourth-grade slump finding to be treated with caution. They suggested that, rather than being a true slump, the sudden drop from Grade 3 to Grade 4 might be due to the different administrative mode used in testing the two grades. The third graders were tested individually and their responses were recorded by the test administrator, whereas the fourth graders were tested in a group and had to write down their own answers. The performance difference between the third and the fourth graders might have been related to the different writing speeds of the test administrator and the fourth graders.

To summarize the research described so far, the current findings using a diverse set of measures of creative thinking (verbal and figural) with different designs (cross-sectional and longitudinal) and in different cultures (Eastern and Western) seem to lead to the conclusion that creativity development in children and adolescents increases steadily, but with sudden drops. Sudden drops in performance in terms of fluency, flexibility, originality, content, elaboration, and creative traits have been found at transitional points for children or adolescents; for example, transiting to a new school or promoting to a higher grade, such as Grade 1 (age 5 or 6), Grade 4 (age 8 or 9), or Grades 6 or 7 (age 11 or 12). In addition, almost all of these slumps seem to occur in the conventional years of cognitive development (i.e., 5-11 years of age; see Appendix I).

2.3 Explaining the Creativity Slump

Although there is agreement that slumps occur in creativity during childhood, relatively little research has been conducted to explain why these creativity slumps occur at specific times or specific ages. However, there have been speculations to explain these slumps. These speculations can be classified into two broad perspectives that are commonly used to explain human development (Runco, 1999). One perspective emphasizes continuity and holds the position that developmental changes are gradual and quantitative (i.e., change by degree). This perspective suggests that environmental factors (e.g., experience) are important for human development. Following the continuity or experience perspective of development, some researchers (e.g., Torrance, 1962, 1963; Urban, 1991) have suggested the possibility that slumps may be related to an individual's reaction to his or her environment and experience. Specifically, they have speculated that these slumps occur when children are confronted with new demands and stresses caused by significant life changes, such as starting a new school or to a higher grade where academic demands are higher. Torrance (1975) also pointed out that a creativity slump is "culture-made" (or "environment-made"), not genetically determined.

The other perspective on human development emphasizes discontinuity and describes development as a series of abrupt changes by stages or levels. Children at different stages think in qualitatively different ways. Such distinct thinking tendencies influence everything that children do. Not surprisingly, this stage perspective has also been applied to explain the phenomenon of a slump in the development of creativity (Runco, 1999). For example, some researchers (e.g., Gardner, 1982; Gowan, 1972; Johnson, 1985; Runco, 1991) have adopted a

cognitive-developmental perspective, speculating that creativity slumps are related to developing into a specific cognitive level, namely the conventional stage. The conventional stage is characterized by a paradoxical thinking tendency: On the one hand, the development of cognitive skills allows children to increase their understanding of and sensitivity to conventions, rules, and social norms, but, on the other hand, it also prevents them from seeing the changeable and negotiable nature of these rules, conventions, and norms. These paradoxical cognitions account for children's inclination for conventional and "correct" ideas, which hinders their original, flexible, and out-of-the-box thinking and leads to decreases in their creativity. Thus, decreases in creativity only occur in the conventional stage and not in the preconventional and postconventional stages.

In the following sections, two lines of research will be reviewed in detail: (a) creativity slumps related to stress associated with school transitions, and (b) creativity slumps observed in the conventional years of cognitive development.

2.3.1 School Transition, Stress, and Creativity Slumps

The researchers that have adopted the continuity or experience perspective have speculated that a creativity slump is a demonstration of a child's reaction to a particular experience, such as a school transition. For example, Torrance (1967) suggested that creativity slumps are related to the stress experienced by children who are confronted with new challenges and readjustments, such as starting a new school or moving up to a higher grade where academic demands are higher. He proposed that the factor of new demands and stress strongly influence the course of creative development, the level of creative functioning, and the type of creative functioning that flourishes most. Similarly, Dudek (1974) explained that children's expression of

thought, imagination, and creativity are constrained due to the social pressures they experience in a new school environment. Urban (1991) also believed that a creativity slump may be related to stress caused by discipline in a new school which hinders children's willingness to diverge.

In spite of the evidence on slumps associated with school transition and the suggestions made on the effect of school stress on creativity performance, only a few direct investigations have studied how school transition causes a decline in creativity. However, there has been considerable mention of the effect of school transition on stress and the effect of stress on creative performance, and hence the role of school transition on slumps in creativity development can be studied through these indirect sources of evidence on school transition, stress, and creativity. The main objectives of this section are to review (1) the major theoretical perspectives of stress, (2) the relationship between school transition and stress, (3) the relationship between stress and creativity and to formulate a hypothesis that creativity slumps are related to the mediating role of stress that is caused by perceiving school transition as a threatening situation that taxes one's coping resources.

Theories of Stress

Stress is an everyday experience and has attracted research interest from different disciplines for decades. Different theoretical perspectives for understanding stress have been derived from these studies. Earlier stress theories and studies focused on the response of organisms (i.e., the response-based stress theory) and on environmental conditions (i.e., the stimulus-based stress theory) and mainly considered the internal reactions to, or the external stimuli of, stress. The later transaction-based theory (i.e., cognitive-relational theory), which has the role of

cognitive appraisal at its core, is different from the other two perspectives in that it highlights the interactive relationship between the environment (i.e., stimulus) and the person (i.e., response). Reviews of these theoretical perspectives and their related studies are given in the following sections.

Response-based stress theory. The response-based theoretical perspective conceptualizes stress as the physiological and emotional reactions experienced as the direct result of exposure to environmentally stressful conditions. Cannon (1929) used the term "homeostasis" to explain stress response as a bodily reaction to maintain physiological balance. When a stimulus or event (e.g., hunger, danger, change of temperature) moves an organism out of balance, it is the stress response that returns the organism to homeostasis. "Fight or flight" is a typical stress response to an emergency that involves physiological reactions such as increased respiration, cardiac output, and blood flow. Selye held a similar theoretical perspective in his studies of stress (see Selye, 1936, 1979). According to Selye, stress is a common set of generalized physiological responses that are experienced by all organisms exposed to different environmental challenges (e.g., temperature change, exposure to shock). Drawing from the results of a series of empirical studies that exposed laboratory animals to a variety of physical (e.g., shock, cold) and psychological (restraint, social competition) stimuli, he concluded that stress response is nonspecific but general, which means that different stressful stimuli will produce an identical stress response. This nonspecific response, called the General Adaptation Syndrome (GAS), proceeds in three stages: Alarm Reaction, Resistance, and Exhaustion. Later, other psychologists adopted this theoretical position to extend studies from physiological reactions (e.g., release of stress hormone, illness) to other kinds of reactions,

including mental (e.g., emotional arousal, psychosomatic symptoms) and behavioral changes (e.g., coping behavior), that occur in response to a challenging or threatening situation (Cooper & Dewe, 2004). Stressful stimulus may elicit immediate or short-term responses and long-lasting outcomes which are called "adaptation outcomes." Although stress can have positive outcomes, past studies have mainly focused on negative outcomes. It has been frequently reported that exposure to stress leads to negative outcomes such as impaired task performance (Baumeister, 1984), disruption of cognitive functioning (Keinan, 1987), and physical and emotional exhaustion (Maslach & Leiter, 2000).

Stimulus-based stress theory. Researchers using a stimulus-based approach to study stress hold the theoretical position that the environment plays a key role in stress. Stress is defined as an "input" from an environment or a situation in which stress means an external stimulation, such as a threat, a pressure, or an unpleasant event. Lazarus and Cohen (1977) classified stressful events into three general categories based on a number of dimensions, including the severity of the stressors, the length of time that the stressor persists, and the number of people affected. These three types of stressors are (1) cataclysmic events: stressors that have sudden and powerful impact and are universal in provoking a stressful response (e.g., war, natural disasters); (2) personal stressors: events that affect an individual or a small group of people, but involve stressors that are powerful enough to challenge the adaptability of these individuals (e.g., losing one's job, death of a significant person, an important exam); and (3) background stressors: persistent, repetitive, low-intensity problems and daily hassles which, although not as powerful as the first two types of stressors, can be serious due to their chronic and cumulative nature.

Holmes and Rahe (1967) adopted a social adjustment perspective that emphasizes actual life events as stressors. They believed that stress is related to environmental inputs (e.g., life changes), which are any noticeable alterations to one's living circumstances that require readjustment. Holmes and Rahe (1967) began their research on life change by exploring the relationship between stressful life events and physical illness. They interviewed thousands of tuberculosis patients to find out what kinds of events led to the onset of their disease. Surprisingly, the results showed that not only were negative stressful events (e.g., loss of a family member, fired from work, divorce) frequently reported by the patients, as expected, but also many seemingly positive events (e.g., getting married, moving to a new house, starting a new school) were mentioned. Drawing from their research findings, Holmes and Rahe proposed (1967) the life-event approach to stress, stating that any change—negative or positive—which causes disruptions to daily routines would be stressful. Based on this theory, the Holmes/Rahe Life Events (Social Readjustment) Rating Scale (1967) was developed to measure stress related to life changes. This life-event approach dominated studies of stress and health in the 1970s and 1980s, and many studies reported a relationship between life changes and illness. However, this approach has been criticized on the basis that the correlation is too weak (r ranging from .2 to .3) to have a practical value and that life events can only explain a very small proportion of the variance in health outcomes (for more criticisms, see Lazarus, 1990).

Cognitive-relational theory. Stressful events or stressful environments may have effects on stressful reactions and responses. However, the environment alone is obviously inadequate for addressing the issue of stress as the empirical evidence

shows that environmental stressors alone can only explain a very small proportion of the outcomes of stress (see Lazarus, 1990). Therefore, an alternative theoretical perspective, the cognitive-relational theory, was proposed. This theoretical approach is different from the two theoretical perspectives above which only emphasize the direct impact of environment on a person. The cognitive-relational model emphasizes the relationships between a person and his or her environment, focusing on the psychological factors (e.g., cognitive appraisals) that mediate between the stimuli (i.e., stressors) and the organism's responses (see Lazarus, 1990; Lazarus, 1999; Lazarus & Folkman, 1984). According to this approach, stress is neither defined as a specific kind of external stimulation nor a specific pattern of physiological, behavioral, or subjective reactions; rather, it is a relationship (or transaction) between a person and an environment. As this third alternative has been receiving more and more support and there is an emerging consensus among contemporary research (Steptoe, Cropley, Griefith, & Kirschbaum, 2000; Weiten & Lloyd, 2006), a more detailed review of the cognitive relational theory to stress is provided below.

In Lazarus's terminology (1990, 1999), the "relational approach" means that the person-environment relationship is combined with the subjective process of appraisal. Stress refers to a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed his or her available coping resources (Lazarus & Folkman, 1986, p.63). Environmental demands can be perceived as either a threat, harm, or challenge, and available coping resources are an individual's perceptions of the availabilities and alternatives to meet the demands. Stress that occurs at the psychological level requires an appraisal of whether a situation is threatening or harmful and an

evaluation of the controllability of the situation. If the environmental load of the threat or harm is appraised as substantially exceeding the person's available coping resources, a stressful relationship exists. However, if the person's resources are evaluated as more or less equal to or exceeding the demands, the situation is not stressful. Stress is particularly powerful when the individual perceives that he or she has to struggle with demands that his or her available resources cannot easily cope with.

Lazarus (1999) also identified several characteristics for the appraisal of stress. First, a person is under stress only if what occurs either defeats or endangers an important goal commitment and situational intentions, or violates highly valued expectations. Second, the appraisal of stress is situation-specific and is not static. It constantly changes as a result of the continual interplay between the person and the environment. Therefore, the level of stress experienced by an individual is determined by their cognitive appraisal of a specific event at a specific time point. Third, for most individuals, some environments are easier to appraise as threatening than others. Fourth, stress produces multitudinous immediate and long-term effects. The immediate effects are stress reactions, including physiological changes and positive or negative feelings; the long-term effects are reactions such as health problems (e.g., somatic illness), well-being (e.g., poor moral, lower self-esteem), and social functioning.

In short, this cognitive-relational theory views stress as a process involving three factors (stressors, appraisals, and response) and emphasizes the mediating role of subjective cognitive appraisal in the process between environmental antecedents on the one hand and outcomes on the other. The diagram below represents this process

(Figure 2; Weiten & Lloyd, 2006, p.81) which starts with potentially stressful objective events. These events are referred to as "potentially stressful" as some events are stressful to some people, but not to others. Whether these objective events are stressful or not depends on an individual's subjective cognitive appraisal of them. An objective event may be a threat to one person, but may be perceived as a challenge by another. A challenge is the appraisal of a stressful event as an opportunity both to master a situation and to gain from it (Lazarus & Folkman, 1987) and is usually accompanied by emotional reactions such as eagerness, happiness, and excitement (Lazarus, 1999). However, a threat is the appraisal of an event as having the potential to result in harm or loss which is usually connected with the emotional reaction of fear (Lazarus, 1999). In addition, some threats are perceived as controllable by some people, but not by others. These different subjective cognitive appraisals lead to different immediate reactions (e.g., positive vs. negative emotional response) and long-term outcomes (e.g., positive vs. negative adaptation outcomes). This conceptualization of stress is useful in explaining individual differences in terms of the quality, intensity, and duration of elicited responses in environments that are objectively equal for different individuals.

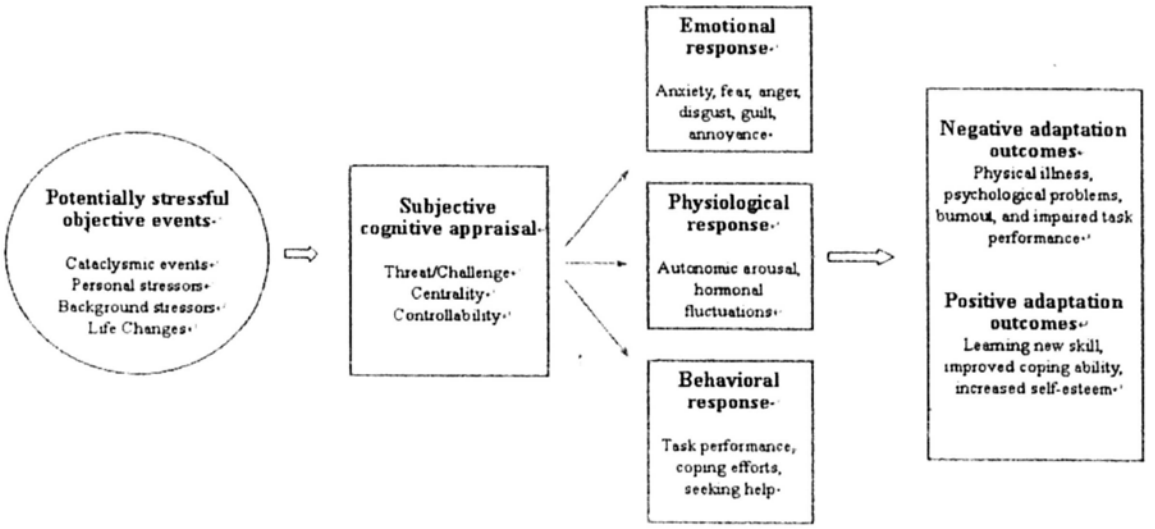


Figure 2. Overview of the stress process (Weiten & Lloyd, 2006, p.81)

School Transition and Stress Reactions

School transitions—such as entry into preschool, elementary school, middle school, and high school—have been considered to be critical life events that confront most schoolchildren during their school years. A school transition can be more easily perceived as stressful by schoolchildren. Firstly, apart from family life, school life is one of the core aspects of children's lives. There is no doubt that schoolchildren usually evaluate and classify school events as personal significant events. Secondly, school transitions are accompanied by many changes to the children's study environment; the implication of this is that children will face changes and readjustments (Maher & Zins, 1992). Schoolchildren facing more changes and readjustments have more chances to appraise both the demands of a situation and their own resources to meet these demands. In the studies of Rudolph, Lambert, Clark, and Kurlakowsky (2001) and Lohaus, Elben, Ball, and Klein-Hessling (2004), it was suggested that during school transitions, schoolchildren face a range of new demands

associated with differences in school structure, classroom organization, teaching strategies, academic standards, teacher expectations, and teacher-student relationships. Such changes in the academic environment may lead to schoolchildren experiencing a lack of predictability and increased ambiguity about the criteria used for evaluation and success. Moreover, this new situation requires adaptive efforts which could have consequences for the continuing development of children. In addition, Gardner (1999) suggested that the "discontinuity and inconsistency" of the curriculum and the school setting that accompany school transitions had been identified as one of the main sources of psychological, academic, and behavioral problems.

Along the same lines, a number of empirical studies have shown that the period of school transition can be a time of great stress for schoolchildren (Slater & McKeown, 2004) and can be accompanied by changes in schoolchildren's psychological adjustment, self-esteem, competence beliefs, and overall learning and achievement. For example, Field (1984) documented that young children transferring to new schools experience an elevated stress levels In his study, 14 preschool children who were transferring to a new school were observed during a two-week period prior to the transition. The results showed that, compared to their counterparts who were staying in the original school, the children who were leaving the school showed increases in a number of stressful behaviors, including negative statements and emotions, tonic heart rate, and illness, as well as changes in eating and sleeping patterns.

In another study, Felner, Primavera, and Cauce (1981) employed a sample of 250 students from three public high schools who were predominantly from nonwhite, lower-income families. The students who had changed schools in Grades 1 through 8

were identified and their academic achievement and school attendance were used as the central measures of school adjustment. The transfer students' Grade Point Average (GPA) and attendance record for the academic year prior to and immediately following the transfer were compared to those of the nontransfer students. The results showed that transition was significantly associated with academic and behavioral problems. The transfer students' GPAs decreased by more than one-half of a letter grade ($p < .001$) and their average rate of absenteeism increased significantly ($p < .001$). Other studies have also demonstrated that the point of high school entry is a difficult time, in terms of psychological adjustment, for young adolescents (Jason, Weine, Johnson, Danner, Kurasaki, & Warren-Sohlberg, 1993). These studies have shown that at this time, young adolescents show a decline in the scores related to self-esteem (Blyth, Simmons & Carlton-Ford, 1983; Wigfield, Eccles, MacIver, Reuman, & Midgle, 1991) and to self-perception of ability in Math, English, social activities, and sports (Wigfield et al., 1991). They also showed a clear and dramatic decline in the perceived quality of school life as measured by satisfaction with school life, reaction to teachers, and commitment to school (Hirsch & Rapkin, 1987). In addition, the scores for psychological symptoms, including anxiety, depression, and somatization, were found to increase during the transition period (Hirsch & Dubois, 1992; Hirsch & Rapkin, 1987).

In addition, physiological evidence of the stress associated with school transition (e.g., Turner-Cobb, 2005), as demonstrated by increased stress hormone levels and suppressed immunity (e.g., Boyce et al., 1995) during the period of school transition, have also been reported. In a study of cortisol response across the day during the first week of a new school year, 6-7-year-old children exhibited a greater

rate of change in cortisol (higher morning levels and lower evening levels) on school days when compared with weekend days (Bruce, Davis, & Gunnar, 2002). In another study, Smider et al. (2002) demonstrated that these early hormonal changes upon entering a new school were correlated with a later socioemotional adjustment problem. Smider et al. (2002) assessed late afternoon/early evening salivary cortisol levels in a group of 4.5 year olds before they moved to kindergarten. The cortisol level was used as a predictor of subsequent socioemotional adjustment to the new school environment. The results showed that cortisol levels predicted the behavioral adjustment of these kindergarten children during the subsequent 18-month period (Smider et al., 2002).

Elias, Gara, and Ubriaco (1985) specifically provided empirical evidence to show that the most critical stressors reported by children during school transitions are mainly associated with different kinds of changes and readjustments that they have to make in a new school environment. Their study was administered to 158 sixth graders (80 boys, 78 girls) about 4 weeks after their entry into a middle school in a central New Jersey county. The most severe stressors that their students reported in the first year of middle school included (a) shifts in role definition and expected behaviors (e.g., being pressured into doing things you do not want to do, being treated like a child); (b) shifts in membership in and position within social networks (e.g., not being part of the "in group", being bothered by older kids); (c) shifts in personal and social support resources (e.g., having trouble making new friends, missing friends from elementary school); (d) shifts in the ways of looking at one's world (i.e., cognitive reappraisal); and (e) shifts in academic demands, such as different curriculums, rules, and disciplines (e.g., having harder school work, having tougher teachers).

Furthermore, this study demonstrated that during the school transition period, children face more demands than during other periods of school life.

To summarize, the above studies documented an increase in stress level immediately before and after school transition, thus providing empirical evidence to show that the discontinuity and inconsistency of the curriculum and school setting is one of the most stressful experiences for schoolchildren (e.g., Hirsch & Dubois, 1992; Hirsch & Rapkin, 1987) and one of the main sources of academic, psychological, and behavioral problems during childhood and early adolescence (e.g., Blyth et al., 1983; Felner et al., 1981; Wigfield et al., 1991).

While many researchers have shown that school transition is associated with stress, others have suggested that not all students experience the same level of stress during the period of school transition. For example, Rudolph, Lambert, Clark, and Kurlakowsky (2001) reported that the perception of students about the change in academic environment is related to individual differences in reactions to school transitions. Some students experience greater difficulties than other students when negotiating challenging encounters such as transitions. One the one hand, for some students, the novelty presented by a transition might act as a stressor that taxes available resources and undermines healthy development. On the other hand, for other children, this novelty might be viewed as a challenge that promotes mobilization of resources and provides an opportunity for psychological growth. Rudolph et al. (2001) concluded that the type of reaction that is expressed might depend on individual differences in relation to self-perception or the perception of the school environment. Indeed, recent research (e.g., Lohaus et al., 2004; Proctor & Choi, 1994; Wallis & Barrett, 1998) on the effect of school transition has yielded

more optimistic findings which show that school transition is associated with either little impact on, or even improvements in, the overall emotional well-being of students, although some students may still feel overwhelmed by the inevitable changes faced at this time (Rudolph et al., 2001). For example, Jackson, Pancer, Pratt, and Lunsberger (2000) investigated the nature of students' expectations about university and its relationship to adjustment at university in a longitudinal study. Four distinct types of expectations about university were identified: optimistic, prepared, fearful, and complacent. Students whose expectations were fearful reported more stress, higher depression, and poorer adjustment to university than those individuals who reported other types of expectations, particularly prepared.

To summarize, the above findings on individual differences in the experience of school stress are in line with Lazarus's cognitive-relational theory of stress (Lazarus, 1999; Lazarus & Folkman, 1984), which suggests that stress level is associated with an individual's appraisal of the balance relation between the environmental demand caused by school transition and his or her available coping resources.

Stress and Creativity

Although no studies on the relationship between stress appraisal and creativity can be found in the literature, the following studies, which used either an environmental or a response approach, have illustrated that external stressors or internal reactions can affect creativity. For example, Carson and Runco (1999) used different types of measures of stress, including measures of stressful events and measures of internal responses, in their study investigating the relationship between stress and creativity. They invited 74 students at a state university in the Western

United States with an age range of 19 to 37 years to participate in their study. The measure for stressful events used in this study was the Holmes/Rahe Life Events (Social Readjustment) Rating Scale (1967), which was designed to study the stress caused by major life events. The three measures of internal responses used were as follows: (1) a modified subject-weighted Holmes/Rahe Life Events (Social Readjustment) Rating Scale to allow respondents to give their own subjective weightings to each item in order to show their reactions and perceptions of the impact of the life-event stressors; the intention of this modified scale was to compensate for the limitation of the original scale, which merely measures the presence or absence of stressful life events; (2) the Hassles Scale (Lazarus & Folkman, 1989) to measure respondents' subjective experiences of daily hassles and uplifts; and (3) the Student Stress Inventory (developed by Dobson & Metcalfe, 1983; revised by Mraz & Runco, 1994) to measure the difficulties specific to university life and being a student that are perceived are stressful. The Problem Generation and Problem Solving tasks were used to test creativity. Carson and Runco (1999) reported that significant negative correlations were found between Problem Generation and all four stress scales, namely the original and the modified Holmes/Rahe Life Events (Social Readjustment) Rating Scale, the Hassles Scale, and the Student Stress Inventory. It was shown that external stressors and internal stressful reactions have a negative impact on idea generation.

Apart from Carson and Runco (1999), not many others seem to have included both external stressor measures and internal reaction measures of stress in a single study on the relationship between stress and creativity. However, studies focusing only on a single factor of stress—either external stressors or internal

responses—have also added supporting evidence for the negative relationship between stress level and creativity. For example, many studies have shown that creativity declines in a stressful test condition which is artificially created by the experimenter manipulating the test climate and the instructions that highlight the importance of the task, the value of time as a resource, and the need to do high-quality work quickly. For example, such findings were reported by Belcher (1975), who randomly assigned 60 fifth and sixth graders from a laboratory school on the campus of a New England state college to one of three groups—high stress, low stress, and control group. Each group was given four subtests from the TTCT (Verbal Form A). The participants in the low-stress group were tested individually in a game-like situation. The high-stress participants were tested in a group led by two testers and the assistant principal of the laboratory school. These participants were also given instructions which emphasized the importance of their scores (e.g., the scores would be read out in public and would be shown to their teachers, parents, and school principal, who would make a judgment on the students on the basis of these scores). The control group was tested by following the TTCT manual exactly. The results showed that there were differences among the three groups in terms of their fluency and flexibility scores. The control group had the highest scores, the low-stress group came second, and the high-stress group had the lowest scores. Belcher suggested that extremes in levels of stress (i.e., too low or too high) could decrease creativity.

Similar findings were reported by Hargreaves (1974), who randomly allocated 124 primary school children into two test conditions: test-like and game-like. Both groups were matched in terms of sample size, mean age, and mean intelligence

test score. In the game-like situation, the class teacher left the experiment room and the experimenter was casually dressed and talked informally for a few minutes about the "game." The answer forms had no official headings. In the test-like situation, the experimenter was formally dressed and the class teacher was present. The students had to provide responses to three divergent tests (i.e., Circles, Uses for Things, and Picture Meanings) on the official answer forms. The results showed that the game-like situation facilitated creative performance, in terms of fluency and originality, in the figural tests (i.e., Circles and Picture Meanings) but not in the verbal test (i.e., Uses for Things).

Apart from studies of primary students, consistent findings have also been found with secondary students (Smith, Michael, & Hocevar, 1990; Gao, Shen, Li, & Xu, 2003) and university students (Martindale & Greenough, 1973; Abualsamh, Carlin, & McDaniel Jr., 1990), thus showing that education level and age have no effect on the relationship between stressful situations and creativity. In all of these studies, participants in the high-stress group were instructed about the limited time for the test, the need for high-quality work, and the importance of the scores, while participants in the low-stress group received no instructions about these requirements—they were only reminded to have fun, to relax, or to enjoy the task. These studies yielded consistent findings that showed that a high stress level inhibits performance on the Remote Association Test (Martindale & Greenough, 1973), math fluency and figural fluency (Smith, Michael, & Hocevar, 1990), Chinese writing (Gao, Shen, Li, & Xu, 2003), and problem structuring that requires creativity in identifying related variables, sensing relationships among the variables, and generating options and ideas for problem solving (Abualsamh, Carlin, & McDaniel Jr., 1990).

Wastlund, Reinikka, Norlander, and Archer (2005) also showed that the subjective perception of stress in a new testing method that increases perception burden (e.g., visual or cognitive processing) and emphasizes evaluation (e.g., fear of the consequences of error) led to both a subjective appraisal of stress and a decline in performance in a creativity test. In Wastlund et al.'s (2005) study, 72 participants were randomly divided into two groups—the VDT-presentation group and the Paper group—to investigate the effect of presentation styles on the comprehension and production of information. The authors assumed that the VDT (Video Display Terminals) presentation would induce more stresses and lead to lower scores for comprehension and production of information as the VDT presentation would increase both the burden on the visual and cognitive component of perception and the time pressures. The results confirmed the authors' predictions, showing that the VDT-group reported higher levels of stress than the Paper group and hence produced a lower number of responses in the creativity test.

Level of Stress and Creativity Loss is determined by Individual Appraisal

Given that the level of stress experienced is determined by a cognitive appraisal of an event and that stress has been shown to be negatively correlated with creativity, students' subjective perceptions of school transition may moderate the stress level and thus the level of creativity loss during school transition. Students who appraise school transition as being harmful or threatening and believe that they lack the coping resources to deal with it are more likely to experience stress and creativity loss, whereas students who appraise school transition as being challenging and believe that they have sufficient coping resources to deal with it will experience a lower level of, or even no, stress or creativity loss. Although no study of this

hypothesis has been reported, there have been reports on individual differences in creativity loss. In his famous study of fourth-grade slump, Torrance (1962) reported that not all of the children in his study experienced the same degree of creativity change even though the overall performance of all of the participants in the study suggested a net slump. On one hand, between 45% and 61% of his sample showed a decline of five or more standard score points between the third and fourth grades across the four indices of the TTCT (i.e., fluency, flexibility, originality, and elaboration); on the other hand, between 11% and 38% of his participants showed a growth in creativity over this time period. One year later, between the fourth and fifth grades, between 33% and 59% of the sample showed a recovery or an improvement in their creativity scores. However, between 17% and 29% still showed a decline in creativity.

Integrating the reviews of the three lines of research—school transition and stress, individual differences in stress levels; and stress and creativity—it can be hypothesized that the decline in creativity during school transition is related to the stress experienced, which, in turn, is determined by the cognitive appraisal of the event. Specifically, schoolchildren who appraise school transition as being more stressful (i.e., more demanding, threatening, and uncontrollable) are more likely to experience a loss of creativity during school transition.

2.3.2 Conventionality in Thinking and Creativity Slump

As some researchers (e.g., Gardner, 1982; Gowan, 1972; Runco, 1991) have speculated that a creativity slump is related to the development of conventional thinking, the following section reviews the relevant theories and studies of conventional thinking development and its relationship to creativity development.

First, the cognitive-developmental perspective on conventionality in thinking is introduced, and then the relationship between conventionality in thinking and creativity is discussed.

Cognitive-Developmental Theory of Conventional Thinking

Convention has been defined as normative or typical behavior which represents the consensus among a group of people regarding expected or accepted behaviors. For example, it is usual to wear shoes in school, and it is therefore conventional to wear footwear in school. Conventions can be classified into formal or informal types. Formal conventions take the form of morals, laws, and rules (e.g., in a game). Informal conventions are apparent in conventional tendencies such as fashions and fads. Conventionality in thinking is one's understanding and reasoning of the conventions that determine what is considered appropriate and valuable (Runco, 2006).

Piaget was the first scholar to theorize that the maturity of conventionality in thinking is determined by cognitive development. In his pioneering work studying the development of conventionality in thinking, Piaget (1932/1968) studied children's concepts of the nature of rules by asking children about their games of marbles and also explored their concepts of justice by presenting them with moral dilemmas to consider. By carefully analyzing the children's responses to such questions, Piaget (1932/1968) formulated a theory of moral development to explain the development of conventionality in thinking, which contains the following postulates: (1) Preschool children are "premoral" and have little awareness or understanding of rules; (2) Children between the ages of about 6 and 10 take rules very seriously. They fail to recognize that such rules are human inventions which can be changed through

negotiation and consensus. Neither do they understand that the conventional rules (such as prohibiting talking in class and wearing inappropriate clothes) that regulate social institutions are invented through consensus, differ from place to place, and are alterable. However, they do believe that all rules are sacred, universal, and unalterable. They accept adults' rules without question. In addition, they believe that rule violations are wrong to the extent that they have damaging consequences, even if the violator had good intentions; and (3) At the age of 11 or 12, most children enter a final stage of moral development in which they begin to appreciate that rules are agreements between individuals—agreements that can be changed through a consensus among these individuals. In judging actions, they pay more attention to whether an actor's intentions were good or bad (Nobes & Pawson, 2003).

Piaget's pioneering work on children's understanding of game rules inspired Kohlberg to formulate the cognitive-developmental theory of moral reasoning, which later became the most widely cited and influential theory that attempts to explain how children develop their conventional thinking (Kohlberg, 1963, 1981, 1984). Following Piaget's work, Kohlberg conducted a series of studies by asking children questions about various moral dilemmas to assess how they thought about these issues. Based on the findings of these studies, Kohlberg concluded that moral growth progresses through a universal and invariant sequence of three broad moral levels: the preconventional level, the conventional level, and the postconventional level. At the preconventional level, younger children pay attention to external authority. Acts are wrong because they are punished or right because they lead to positive consequences. Older children who have reached the conventional level see rules as necessary for maintaining social order. They strive to obey the rules laid down by others (parents,

peers, and the government) in order to win approval and recognition for good behavior or to maintain social order. They "internalize" these rules not to avoid punishment, but to be virtuous and win approval from others. Moral thinking at this stage is relatively inflexible. Rules are viewed as absolute guidelines that should be enforced rigidly. In later years, usually during adolescence, some youngsters move on to the postconventional level, in which they work out a personal code of ethics. Their acceptance of rules is less rigid and their moral thinking shows some flexibility. Individuals at the postconventional level allow for the possibility that someone might not comply with some of society's rules if they conflict with personal ethics. Each of these levels is composed of two distinct stages. It is Kohlberg's belief that each stage grows out of the preceding stage and represents a more complex way of thinking about moral issues, laws, and rules. He further insisted that people cannot skip stages or regress to earlier stages once they have reached a higher stage in the sequence (see also Weiten, 1995).

The central ideas of Kohlberg's theory have received reasonable empirical support. For example, it was reported that progress in moral reasoning is closely tied to cognitive development (see Rest & Thoma, 1985; Walker, 1988). Additional evidence has shown that youngsters generally progress through Kohlberg's levels of moral reasoning in the order he proposed: That is, preconventional reasoning does decline as children mature, while conventional reasoning increases during middle childhood and postconventional reasoning begins to emerge during adolescence (Colby & Kohlberg, 1984). Although relationships between age and level of moral reasoning have been found, variations in the developmental trend have also been reported (Rest, 1986; Walker, 1989). There is great variation in the age at which

people reach specific levels of moral reasoning, and at each age, children display a mixture of various levels of moral reasoning. Kohlberg (1963) showed that most children's preconventional reasoning peaks at 7, conventional reasoning at 13, and postconventional reasoning at 16 (Weiten, 1995, p.441). Rather than showing that postconventional reasoning begins to emerge during adolescence, Damon and Hart (1992) reported that adolescents are more sensitive than children to the expectations of those around them and are more ready to be influenced by others or to conform to the expectations of others.

Following Piaget and Kohlberg, Turiel further (1983) observed that children actually distinguish between two kinds of rules in daily life: (1) moral rules, which are the standards that focus on the welfare and basic rights of individuals; and (2) social conventional rules, which are the standards determined by social consensus that tell us what is appropriate in a particular social setting. Moral rules, as emphasized in Kohlberg's studies, include rules against hitting, stealing, lying, and otherwise harming others or violating their rights. Social-conventional rules are more like rules of social etiquette and include the rules of games as well as school rules that forbid eating snacks in class or using the restroom without permission. Turiel (1983) reported that schoolchildren realize that social-conventional rules are different from moral rules. Social-conventional rules are more arbitrary and less binding than moral rules. Nevertheless, schoolchildren show three thinking levels of development in understanding social conventional rules which are similar to the developmental trend of moral reasoning. Empirical findings (e.g., Davidson, Turiel, & Black, 1983; Nobes & Pawson, 2003) have also shown a relationship between age and children's understanding of the arbitrary nature of social-conventional rules by assessing

children's concepts of the origins, alterability, and relativity of rules. For example, Davidson et al. (1983) found that while children between 6 to 10 years old recognize the alterability of conventions, they do not consider themselves able to change these conventions. They asked children aged 6-10 years old the usual question: "Is it all right to change this rule?" and 89% of the responses were positive. They received 70% positive responses to the question, "Is it all right to abolish the rule by group consensus?" However, when asked, "Could the children get this rule changed?", only 7% said yes, whereas 93% replied that they could not. Nobes and Pawson (2003) reported similar findings which revealed that 6-9-year-old children understand that children could alter their own conventions and adults could change theirs. However, these children consider changes to the rules of elders by children to be unacceptable or impossible. Taken collectively, the aforementioned reviews show that children at the conventional thinking stage (usually aged 5-11 years old) tend to stick carefully to moral as well as social conventional rules. They understand and recognize such rules and are often vehement about upholding them.

Conventional in Thinking and Creativity Development

Runco (1991, 1999, 2006) employed the theory of conventionality in thinking to explain creativity development. As originality and appropriateness characterize creativity, creativity requires postconventional thinking capacity. At the postconventional level, children have a good understanding of conventions and thus know what "appropriateness" is. They also recognize the alterability of conventions and so can go beyond the restrictions or limitations of these conventions by expressing their original ideas appropriately. With postconventional thinking ability, children know how to tolerate the costs of creative work (e.g., being different, which

is implied by the originality required by all creative efforts) and persist even when there is pressure to conform. For example, a creative scientist is probably aware of existing scientific theories (and thus aware of what is conventional in his or her field), but also breaks away or extends the field by thinking in a postconventional and independent fashion. Preconventional thinking also allows creative behavior. At this cognitive level, children have not yet developed the thinking that allows them to recognize, understand, and use conventions. In other words, they are unaware of, and thus uninhibited by, convention. They do not think about what is appropriate; rather, they think in a world of their own and rely largely on their own spontaneity. This way of thinking usually leads to unique ideas which characterize creativity.

However, if a child is at the conventional thinking stage (which usually begins at 5 and ends at 11 years of age; see, for instance, Nobes & Pawson, 2003; Piaget, 1932/1968), he or she is highly sensitive to conventions such as conventional rules, norms, and peer pressure. On the other hand, he or she does not realize that these conventions, rules, and social norms are determined by social consensus and can be negotiable or even changed. Thus, children at the conventional stage stick to conventions strictly and religiously. They also feel uncomfortable with uncertainty and nonconformity. Runco (2006) referred to this excessive conforming to conventions as "hyperconventionality." Children with hyperconventionality pay special attention to peer pressures (e.g., "what my friends are doing") and to expectations from authorities (e.g., "what my parents or teachers expect me to do"). There is great value in the development of sensitivity to conventions: it allows children to behave properly and fit into a given culture. However, there is simultaneously a drawback. Given that conventionality is a kind of conformity and

that creativity requires nonconformity, it is hardly possible to be original if one is conforming. The conventional child is a conformist in the sense that he or she follows social expectations and imitates the typical behaviors of his or her peers; this inhibits self-expression and leads to a drop in creativity in the conventional stage. This could be the cause of a creativity slump in the creative development of children.

Although Runco did not provide direct empirical evidence to support his argument in using theory of conventionality in thinking to explain the creativity slump phenomenon, this theory has also been applied to study the development of artistic skills and language use in schoolchildren, during which conventional and unconventional levels of thinking are demonstrated. For example, Gardner (1982), in his study of the drawings of 2 to 7 year olds, observed that children's drawings of a human body passed through two distinct stages. Children younger than 5 years old drew a person as a head to which arms and legs were directly attached. He referred to this kind of drawing as the "Humpty Dumpty" representation of a human body, which is neither realistic nor conventional. However, by the age of 5, children become conventional and heavily emphasize reality and correctness in their drawings of a human body: the human trunk, to which the limbs are attached, is drawn below the head. According to Gardner, the change from an unrealistic to a realistic representation of a human body across age is actually a demonstration of the development of a child's cognitive representation of the real world. On the basis of his observation that all young children's drawings of a human body pass through this sequence of stages in a similar way, Gardner concluded that the stage reflects a child's cognitive level, but not the influence of social and cultural factors. Recently, Nobes and Pawson (2003) reported similar observations by describing how children

younger than 5 years old often disregard conventions in their artwork. Rather than drawing realistic, representational, and conventional pictures, they draw what they feel or like. Only later, during the conventional years suggested by Kohlberg, do children become uncomfortable drawing things that differ from their experiences and expectations.

In addition, Rosenblatt and Winner (1988) also demonstrated age differences in the production of artworks. Based on their analyses of children's artworks, they identified three phases that are structurally consistent with Kohlberg's three levels of moral reasoning: the preconventional level (up to the age of about 6-8 years), the conventional level (from age 6-8 to about 10-12), and the postconventional level (from about 12 years of age and extending into adulthood). They reported that preconventional drawings often display spontaneity and emotional involvement which might lead to aesthetically pleasing products. However, as the children move into the conventional years, their artworks become increasingly rule-bound; the drawings seem to heavily emphasize accuracy and realism, with the result that the artwork produced is stilted and conforms to external standards. Only in the postconventional phase can children with a special interest and skill in visual art go beyond the rules that they worked so hard to master in the conventional years. Rosenblatt and Winner (1988) concluded that whereas it might be said that preschoolers lack conventions, postconventional artists (including adult artists) can choose to reject these conventions. The lack of convention depicted in the artistic endeavors of children in both stages results in a similar aesthetic appeal and thus a similar evaluation of artistic creativity.

Apart from observations from the production of artworks, Gardner (1982)

also reported a literal stage in children's use of linguistic symbols that corresponds to the peak of conventionality. He showed that children could combine linguistic symbols in different ways before entering the literal stage; they can even show great variety in terms of combinations of linguistic symbols and other symbols, such as drawings, numbers, body movements, and so on. However, children in the literal stage have difficulty with metaphors and idioms which are considered to be examples of the nonliteral use of language. Such difficulty is even apparent in their understanding and use of jokes, riddles, and puns that require a nonliteral mind-set in the use of language.

Based on his years of studies of children's language use and production of artworks, Gardner et al. (1990) concluded that preschool children are highly original, playful, and uninhibited, whereas school-age children become restricted in their creative expression. This characteristic of the latter group could be attributed to their attempt to master their culture's rules for art, language use, music, and other creative endeavors in order that they can do things the "right" way (see Gardner, Phelps, & Wolf, 1990). However, they believed that there are individual differences in two respects. First, not all individuals demonstrate the ability of postconventional thinking. During adolescence, some individuals give up the desire to express themselves creatively, even though others regain the innovativeness and freedom of expression they had as preschoolers and put it to use, along with the technical skills they gained as children, to produce highly creative works. Second, the age at which creativity declines or flourishes seems to vary from culture to culture depending on when children are pressured into conforming. Thus, the developmental course of creativity is not so predictable. It seems to wax and wane with age in response to developmental

needs and cultural demands.

As the above review shows, a change in sensitivity to conventions can be found across different cognitive levels in a variety of domains, including moral reasoning, social conventional rules, artworks, and language use. Increased conventional thinking is associated with higher conformity and rigid thinking, and hence with lower creativity. If conventional thinking is described as an inverted U-shaped developmental trajectory, with the conventional stage at the top of the inverted U, the developmental trend for creativity is a U-shaped curve with a creativity slump at the bottom of the U. From such a perspective, a creativity slump is not a loss of cognitive capacities, but rather a reflection of the conventional level of cognitive development (see Charles & Runco, 2000).

CHAPTER THREE METHOD

3.1 Hypotheses

Based on the literature review in Chapter 2, two groups of hypotheses were formulated.

Hypotheses formulated on the basis of the cognitive-relational theory of stress

Hypothesis 1 a. A creativity slump would be observed when the sixth graders transfer to Grade 7.

Hypothesis 1 b. The creativity score would be negatively correlated with the appraised stress level.

Hypotheses formulated from the cognitive-developmental perspective

Hypothesis 2 a. No slump would be observed when the sixth graders transfer to Grade 7.

Hypothesis 2 b. The creativity score would be positively correlated with the level of postconventional thinking.

3.2 Participants

As the study was to investigate the phenomenon of a creativity slump during the transition from the primary to the secondary level of education, only those schools using a "through-train mode" were invited to participate in the study in order to ensure successful data collection after school transition. A "through-train mode" means that a primary school and a secondary school have a close link with each other in terms of transition to secondary school. The majority, if not all, of the Grade 6 graduates of the primary school would be promoted to the closely linked secondary school. In addition, the following criteria were also applied in selecting the

participating school: a) the school is a co-educational school in order to ensure that the participants include both genders, and b) the school has not had any training program of creativity. In other words, the participants have not been exposed to any creativity testing or creativity training before.

Based on these criteria, two co-educational "through-train" schools with a combined total of 548 fifth, sixth, and seventh graders between the ages of 10-13 were invited to participate in the present study. Of the two participating schools, one is a Catholic school subsidized by the Hong Kong Government, with a long history of more than 50 years since its establishment in 1959. The other is a young private school established in 2005. The class size is about 37 to 40 in the government subsidized school, and 30 in the private school. In Hong Kong, secondary schools subsidized by the government are grouped according to the academic abilities of their students and classified as Band 1 (i.e., high), 2 (i.e., medium), and 3 (i.e., low) based on the results of standardized tests in two subjects, English and Mathematics, conducted at the end of primary school (usually around the age of 11). The government-subsidized school in this study is categorized as a high-ability school. This classification system is only applied to government-subsidized schools. Private schools that obtain funds from sources other than government subsidies have greater flexibility in school policies. Therefore information on the academic banding of the private school in this study is limited. Both schools admitted students from diverse backgrounds, but mostly from middle to lower-middle socioeconomic backgrounds.

Of the 548 participants, 143 (26%) were absent for one of the two follow-up measurements. Thus, for the statistical analysis of the data (which is discussed in detail in Chapter 4), the entire sample was finally reduced to 405, with

144 in the $G_{5\text{-}6}$ group (i.e., being promoted from Grade 5 to Grade 6), 142 in the $G_{6\text{-}7}$ group (i.e., school transiting from Grade 6 to Grade 7), and 119 in the $G_{7\text{-}8}$ group (i.e., being promoted from Grade 7 to Grade 8), respectively. The $G_{6\text{-}7}$ group was the target group as they experienced a school transition from the primary to the secondary sector in the new school year. The other two groups ($G_{5\text{-}6}$ and $G_{7\text{-}8}$) served as the comparison groups. All of the participants were ethnic Chinese. The demographic statistics of the sample are presented in Table 1. The mean age of the whole sample was 11.30 (SD= 1.01, range=10-14), with the means of 10.26 (SD= 0.46), 11.44 (SD= 0.54), and 12.40 (SD= 0.59), respectively, in the three groups. Group difference was found in age ($F(2, 404)= 544.40$, $p< .00$). Balanced gender proportion in different groups was observed, ($\chi^2(2)= 0.61$, $p= .74$).

All participants were given a brief description of the main objective of the study that was an exploration of students' thinking; and were encouraged to take part in the study. The participants were assured that all of the information gathered in the study would be kept strictly confidential and would only be used for research purposes.

Table 1

Demographic Characteristics (Age, Gender Proportion) at Baseline (Time 1)

			Group[a]					
	Total (N=405)		$G_{5\text{-}6}$ (n=144)		$G_{6\text{-}7}$ (n=142)		$G_{7\text{-}8}$ (n=119)	
Characteristics	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age (yr)[b]	11.30	1.01	10.26	0.46	11.44	0.54	12.40	0.59
	N	%	*N*	%	*N*	%	*N*	%
Gender[c]								
Boy	213	52.6	73	50.7	74	52.1	66	55.5
Girl	192	47.4	71	49.3	68	47.9	53	44.5

Note.

a. $G_{5\text{-}6}$: Grade 5 promoting to Grade 6 at Time 2; $G_{6\text{-}7}$: Grade 6 promoting to Grade 7 (school transition); $G_{7\text{-}8}$: Grade 7 promoting to Grade 8

b. Group difference in age was significant: $F(2, 404)= 544.40$, $p< .00$

c. Group difference in gender proportion was not significant: $\chi^2(2)= 0.61$, $p= .74$

3.3 Materials

3.3.1 The Test for Creative Thinking- Drawing Production (TCT-DP)

The Test for Creative Thinking- Drawing Production (TCT-DP, Urban & Jellen, 1996) was adopted as the measure creative potential in the present study. The TCT-DP instruction was translated into Chinese using a back translation procedure. A standardized verbal instruction was given to students in Cantonese. The same instruction was also written in Chinese at the top of the test form.

The TCT-DP consists of one single page of A4 paper with a 15.6 cm (W) x 16.1 cm (L) rectangular frame drawn on it. In the rectangular frame, there are five figural fragments which include (a) a semi-circle, (b) a point, (c) a large right angle, (d) a curved line, and (e) a broken line. In addition, there is a small open square

outside the large rectangular frame. See Figure 3 for a reduced size TCT-DP test sheet. The participants were told that "the artist who started the drawing was interrupted before he or she actually knew what should become of it," and were subsequently asked "to continue with this incomplete drawing." The participants received the instructions as follows: "Draw whatever you wish! You can't draw anything wrong. Everything you put on the paper is correct." They were also reminded not to worry about the time, though they won't have a whole hour to complete this drawing. Lastly, they were instructed the following: "If you know a name or a title or a theme for your drawing, please write it above your drawing." (Urban & Jellen, 1996, pp. 14-15)

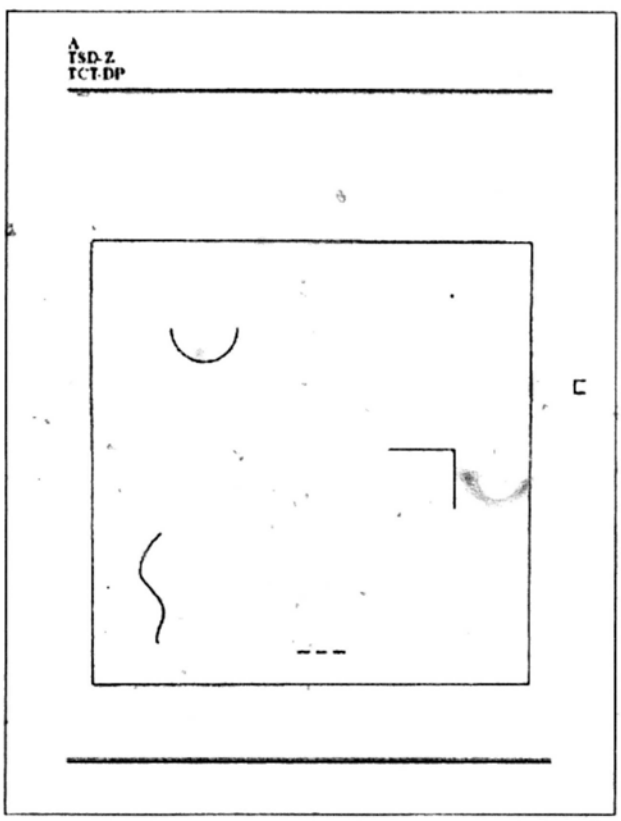


Figure 3. TCT-DP Test Sheet, Form A (size reduced. For actual size, see Appendix I).

The original TCT-DP contains two parallel forms: Form A and Form B. Both Form A and Form B contain the same elements while Form B is the inversion (i.e., 180^0 rotation) of Form A (See Appendix II). For the present study, creativity was measured at 3 time-points and three parallel forms were needed. Therefore, three parallel forms were needed. Thus, an additional Form, namely Form C, was prepared according to the same principles as Form A and B. Form C is a 90^0 rotated version of Form A (See Appendix II).

According to the test manual (Urban & Jellen, 1996, pp. 16-21), the scoring of the drawings should be based on a number of criteria, as characterized by the following categories:

1. *Continuations* (Cn) involve any use or extension of the six fragments.
2. *Completions* (Cm) involve any additions to the six fragments.
3. *New elements* (Ne) are any new figures, symbols, or elements.
4. *Connections* made with a line (Cl) are scored for linking the fragments.
5. *Connections* made to produce a theme (Cth) involve any figure that contributes to a compositional theme.
6. *Boundary breaking/fragment dependent* (Bfd) involves the use of the small open square located outside the large square frame.
7. *Boundary breaking/fragment independent* (Bfi) involves nonaccidental drawing outside the frame, but does not use the small open square.
8. *Perspective* (Pe) is scored for three-dimensional elements.
9. *Humor and affectivity* (Hu) is scored for drawings that elicit humor or other emotions.
10. *Unconventionality* (Uc) is scored in four subcategories for (a)

manipulations of the material, (b) surreal or abstract drawings, (c) combining figures with symbols/words, and (d) non-stereotypical figures.

11. *Speed (Sp)*: Drawings that accumulated at least 25 points from the above 10 criteria are awarded up to a maximum of 6 points for speed. No points will be given if more than 12 minutes are taken to complete the drawing. If the test is conducted in a group mode, this criterion will not be applied, and a total of 15 minutes is allowed for completing the picture.

In the present study, which was conducted in a group mode, we applied all of the above criteria in scoring except for the one concerning speed. The first nine categories were scored for up to 6 points, while each of the four Uc subcategories was scored for up to 3. A total creativity score was obtained by summing up points obtained from each of the 13 categories (excluding Speed), with no transformation. The total possible score range was 0-66 points (excluding Speed), a higher score indicates better creativity.

3.3.2 The Stress Appraisal Measure (SAM)

The Stress Appraisal Measure (SAM) was developed on the basis of the cognitive-relational theory to measure *stress sppraisals* (i.e., *Threat*, *Challenge*, *Centrality*, and Controllability) and *Overall Perceived Stressfulness* (Peacock & Wong, 1990). The 28-item SAM, which utilizes a 5-point Likert scale (1= not at all, 5= extremely) has been evident as reliable and valid in school settings for measuring students' stress appraisal over a specific event or situation (e.g., an examination). Research findings have demonstrated that this instrument achieves moderate to high internal consistencies with Cronbach's alphas ranging from .51 to .90. The instrument

also shows good psychometric properties and measures six relatively independent dimensions. The authors name these independent dimensions *Threat, Challenge, Centrality, Controllable-by-self, Controllable-by-others, and Uncontrollable* (the latter three controllability subscales were combined into a single scale, *Controllability).* Four items index perceived *Threat,* which relates to the demands of a situation (e.g., "How threatening is this situation?"), four items relate to *Challenge* (e.g., "To what extent am I excited thinking about the outcome of this situation?"), four items measure *Centrality* (e.g., "Does this situation have important consequences for me?"), and 12 items relate to *Controllability* (e.g., "Do I have the ability to do well in this situation?"). Besides the stress appraisal subscales, an *Overall Perceived Stressfulness Scale* containing four items on views of stress can be used to independently assess overall subjective stress level. Among these four items, one is referred to demands that tax or exceed one's coping resources, another reflects the view that stress involves a call for action by inquiring about the need for coping efforts, and a third is referred to tension arousal. And the last one simply asks about the stressfulness of the situation without any explanation of the term.

In the present study, the SAM was translated into Chinese using a back translation procedure in order to assess school stress. However, simply translating the existing SAM into a Chinese version did not necessarily represent a satisfactory solution to fit the purpose of the present study in terms of assessing schoolchildren's appraisals of school life. As this has been the first study to adapt the SAM in a sample of Hong Kong students, a pilot study, namely Pilot Study 1, was conducted before the main study in a primary school in the Kowloon Tong district, with the aim of testing the internal consistency of the instrument. A total of 163 fifth and sixth graders (78

boys, 85 girls) participated in this pilot study. The internal consistency coefficients of the SAM subscales, as measured by Cronbach's alpha, are listed in Table 2. Although the internal consistency coefficients for the subscales *Centrality* and *Controllability* were good (α= .70- .83), the alphas for the other subscales were only moderate (*Threat*: α= .57, *Challenge:* α= .66) or even unsatisfactory (*Overall Perceived Stressfulness*: α= .48).

Table 2
The Internal Consistency Coefficients (Cronbach's alpha) of the Subscales of the SAM in Pilot Study

SAM SCALE	Cronbach's alpha
Overall Perceived Stressfulness	.48
Primary & Secondary Appraisal	
Threat	.57
Challenge	.66
Centrality	.83
Controllability[a]	.70
– Control-self	.67
– Control-Others	.60
– Uncontrollable	.48

Note.
a. Controllability= (Sum of Control-self, Control-others, and reversed Uncontrollable)/Number of items

Based on the results of Pilot Study 1, the following modifications were made to improve the applicability of the SAM to fit the purpose of the present study:

1. To help the schoolchildren understand the items better, the question format was changed to a statement format in order to make the interpretation of the items straightforward.
2. The schoolchildren were requested to appraise a potentially stressful situation – school life. This had been stated in the general instruction of

the pilot study. To ensure a better understanding of the scale, the words "school life" were further incorporated into each statement and schoolchildren were required to show their degree of agreement on the statements about "school life".

3. There were only four items in the subscales of threat, challenge, centrality, and overall stressfulness in the original SAM. As this small number of items might lead to the low internal consistency for some subscales, an additional theoretically relevant item was added to each of these subscales.
4. To avoid neutral responses, the 5-point Likert scale was modified into a 6-point Likert scale (1= do not agree at all, 6= extremely agree) in which no neutral response was allowed.

Such modifications were made to ensure that (1) the items were understandable to young schoolchildren of 10-13 years old, (2) the items could be applied to the appraisal of school stress, and (3) the subscales could achieve good internal consistencies (see Appendix III for the 32-item Chinese SAM).

3.3.3 Conventionality Test

Lockhart, Abrahams, and Osherson (1977) followed Piaget's pioneering work (1932/1968) and designed a set of questions that deal with social convention to measure children's maturity in conventionality. Of these questions, six questions prompted the origins of children's knowledge about social conventions and eight questions measured children's belief in the changeable nature of the social conventions that characterized children's postconventional thinking level. Specifically, the following issues were addressed by corresponding questions (Lockhart, Abrahams,

& Osherson, 1977, pp. 1522-1523).

1. *The origins of the child's knowledge:* Has the child always known this social convention be true? If not, who taught it to him (question 1-3)?
2. *The child's belief in the universality of the social convention:* Does the child believe this social convention exists all over the world? Does he believe there might exist a place or time where it is not like this (question 4-6)?
3. *The child's understanding of the changeable nature of the social convention:* Does the child believe we could change this social convention? If everyone agrees to a change, would the child believe it is all right (questions 7-9)?
4. *The child's behavior with respect to a possible chance in a social convention:* If everyone agrees to change a particular social convention today, what would the child do? Would his behavior be "correct" (questions 10-11)?
5. *The child's behavior when visiting a strange place:* How would the child behave in another state with respect to a particular social convention which people have agreed to change in their own living place? Would the child behave the same way in another city as in his own city? Would that be the "right" thing to do (questions 12-13)?
6. *Another person's behavior in the child's city:* What would a foreigner do in the child's city? Would that be the "right" way to behave (question 14)?

With regard to the scoring of conventionality in thinking, the last eight questions on children's belief in the changeable nature of the social conventions were scored individually. Each answer received a score of 0, 0.5, or 1.0; a score of zero was indicative of no understanding, whereas a score of one reflected an understanding of the changeable nature of conventionality. A score of 0.5 was indicative of some understanding in the changeable characteristic but was unable to articulate an explanation or gave an irrelevant explanation. A child was also awarded a 0.5 if he/she provided a pragmatic rationale for his/her "yes" or "no" answer. Hence, the possible score range is from 0to 8, with higher scores indicating a higher postconventional thinking level, which, in turn, indicated a better understanding of the changeable nature of social conventions.

Lockhart, et al.'s (1977) approach was evident as useful for understanding children's thinking about social conventions. Later studies (e.g., Nobes & Pawson, 2003) followed a similar procedure to study children's understanding of social rules and reported high internal consistencies with the range of the Cronbach's alphas from .73 to .93.

For the present study, this measure was adapted and translated into Chinese to assess conventionality in thinking. A back-translation procedure was incorporated to ensure correct interpretations and translations. And we named this version the Conventionality Test. To fit the study design of the present study to measure development of conventionality in thinking across 3 time-points, three sets of parallel topic questions were required. For developing the parallel sets of topic questions, Pilot Study 2 was conducted before the main study in a primary school in the district of Tai Po Market. Ninety-three fifth graders (45 boys, 48 girls), aged between 10 and

11 years (*Mean*=10.33, *SD*=.47), participated in the study. First, eight sets of topic questions were initially generated. Table 3 summarizes the statistics of these eight questions. The results showed that the students were more ready to accept the changeable nature of the rules concerning the use of elevator; however, they were more reluctant to change the social conventions about school uniform, and the celebration of Chinese festivals. Taking into account the means and SDs as well as the percentage of students obtaining a score of or above 4 (i.e., the midpoint of an 8-point scale), the following three sets of topic questions were chosen for the main study: 1) Rules of stoplights; 2) Rules of a game; and 3) Rules of body language. See Appendix IV for detailed questions. The results of repeated measures analysis of variance (ANOVA) showed that no difference was found in the mean scores of these three topics (Wilks's Lamda= .95, $F(2, 85)=2.07$, $p=.13$). Therefore, they were regarded as parallel topic questions in measuring students' conventionality in thinking.

Table 3
Descriptive Statistics of Student Performance on the Eight Topic Questions Concerning Social-Conventional Rules

Social conventions[a]	N	Max	Min	Mean	SD	Score ≥ 4 n	Score ≥ 4 %
Rules for using elevator	91	8.00	0.00	5.15	2.18	77	85%
Rules of stoplights[b]	91	8.00	0.00	3.32	2.12	74	81%
Rules of a game[b]	92	8.00	0.00	3.70	2.47	74	80%
Rules of body language[b]	92	8.00	0.00	3.75	1.85	73	79%
Rules of etiquette	91	8.00	0.00	4.35	2.06	71	78%
Rules for school uniform	90	8.00	0.00	2.93	2.15	68	75%
Rules for celebrating mid-autumn festival	88	8.00	0.00	3.39	2.27	56	64%
Rules for celebrating Chinese New Year	91	8.00	0.00	3.50	1.89	49	54%

Note.
a. The possible score range of the scale is from 0 to8
b. The rules relating to stoplights, a game, and body language were chosen for the main study

3.4 Design and Procedure

A diagrammatic representation of the design of the present study is shown in Figure 4. A sequential design with a mixture of a cross-sectional and a nine-month follow-up longitudinal design was used to allow two types of comparisons. Grade-group comparisons as a cross-sectional design provided evidence on the varying creativity performance associated with different grades. A comparison of each group to itself across the 3 time-points allowed the collection of longitudinal evidence of the creativity change before and after being promoted to a higher grade, and also prevented a cohort effect.

The participants provided informed consent and were given standardized test instructions. The 3 time-points tests were administered in a group setting with approximately 35 students per group. Test 1 was administered in late April 2009, which was two months prior to school final examination and two and a half months before the end of the school year. Test 2 was administered in late September 2009 approximately one month after the participants had moved up to a higher grade, and the final test, Test 3, was conducted in late January 2010, a time at which it was assumed that the participants would have adapted more to their new study environment.

Group	G_{5-6} (n= 144)	G_{6-7} (n= 142)	G_{7-8} (n= 119)
Time 1 (Late Apr 2009)	- Creativity Test-Form A - Stress Test - Post conventional thinking Test-Form A - Demographics	- Creativity Test-Form A - Stress Test - Post conventional thinking Test-Form A - Demographics	- Creativity Test-Form A - Stress Test - Post conventional thinking Test-Form A - Demographics
SUMMER BREAK			
Time 2 (Late Sep 2009)	- Creativity Test-Form B - Stress Test - Post conventional thinking Test-Form B	- Creativity Test-Form B - Stress Test - Post conventional thinking Test-Form B	- Creativity Test-Form B - Stress Test - Post conventional thinking Test-Form B
Time 3 (Late Jan 2010)	- Creativity Test-Form C - Stress Test - Post conventional thinking Test-Form C	- Creativity Test-Form C - Stress Test - Post conventional thinking Test-Form C	- Creativity Test-Form C - Stress Test - Post conventional thinking Test-Form C

Figure 4. A diagrammatic representation of the study design. G_{5-6} was the group promoting from Grade 5 to 6; G_{6-7} promoted from Grade 6 to 7 (i.e., school transition), and G_{7-8} promoted from Grade 7 to 8, respectively.

3.5 Statistical Analysis

In testing the reliability of the measures used in the present study, the internal consistencies of all of the scales (i.e., TCT-DP, SAM, and the Conventionality Test) were first analyzed using Cronbach's alpha. The interrater reliability of the TCT-DP was also tested by calculating the correlations between the ratings of two experienced raters.

One of the major purposes of the present study is to examine whether or not

the schoolchildren at the postconventional thinking stage would experience a creativity slump during school transition, so the participants' conventionality in thinking at Time 2 (i.e., during school transition) was first analyzed. The means and the percentage of participants obtaining a score of or above 4 (i.e., the midpoint of the 8-point Conventionality Test scale) were also calculated. Subsequently, a 3 (G_{5-6} vs. G_{6-7} vs. G_{7-8}) x 3 (Time 1 vs. Time 2 vs. T3) repeated measures ANOVA test was performed on the TCT-DP score to test whether the lowest creativity performance at Time 2 could be observed. Individual differences in experiencing the lowest TCT-DP score at Time 2 were also analyzed by adopting Torrance's (1962/1967) definition of a slump (i.e., at least a one-half standard deviation drop). A chi-square test was utilized to determine whether the school transition group was more likely to experience a slump than the nontransition groups.

The second major purpose of the study is to test the role of stress and conventionality in thinking on creativity. Firstly, to test the notion that a creativity slump is related to the stress of school transition, the stress scores were compared across 3 time-points using 3 (groups) x 3 (times) ANOVA tests with repeated measures. These tests allowed an investigation that schoolchildren would experience the highest stress level at school transition (i.e., Time 2). Later, bivariate correlation analyses were conducted to examine the bivariate relationships among the creativity, stress, and conventionality in thinking scores at the point of school transition. Afterward, a series of hierarchical multivariate regression analyses were run with an aim of testing how stress and conventionality in thinking contribute to creativity at school transition: (1) using stress appraisals as predictors; (2) using *Overall Perceived Stressfulness* as a predictor; (3) using the score of the Conventionality Test as a

predictor; and (4) testing the possible interaction and mediation effects of stress and conventionality in thinking on creativity.

Lastly, to compare the explanatory power of stress and conventionality in thinking to a creativity slump, a binary logistic regression was performed to include both stress and conventionality in thinking variables in one regression model simultaneously to directly compare their individual predictive power of a slump.

CHAPTER FOUR RESULTS

The core purpose of this research is to directly compare two competing hypotheses (*the school stress hypothesis* vs. *the cognitive-developmental hypothesis*) on creativity slump during school transition. This chapter presents the relevant statistical results for testing these hypotheses. It begins with a presentation on the reliability statistics for the measures of the major variables (Section 4.1). The results of repeated measures ANOVA concerning the changes of the creative score across 3 time-points in both the school transition and the nontransition groups are then presented in Section 4.2. Following a presentation of the repeated measures ANOVA results on the changes in stress appraisal over time (Section 4.3), Section 4.4 presents the results of a series of hierarchical multivariate linear regression analyses that were applied to test the relative effect of stress appraisals and conventionality in thinking on creativity during school transition. Finally, the last section (Section 4.5) presents the results of a binary logistic regression that directly compared the predictive power of stress appraisals and conventionality in thinking on creativity slump during school transition.

4.1 Reliability of the Scales

4.1.1 Internal Consistency

The results on the internal consistency of all of the scales used in the present study (TCT-DP, SAM, and Conventionality Test) are presented in Table 4. All of the scales obtained satisfactory internal consistency. First, the respective alphas obtained for the three parallel forms of TCT-DP were 0.61, 0.65, and 0.70 (N= 405), which are moderate and within the range (α=.46- .92) reported by Urban and Jellen (1996), and comparable to the alpha scores (α=.73-.75) obtained in Rudowicz's study

in Hong Kong (2004). As different criteria of the TCT-DP are measuring different aspects of creative thinking, a moderate alpha is in fact reasonable.

Second, when compared with the results obtained in Pilot Study 1 (pp. 71-72), the internal consistencies of the revised 32-item Chinese SAM were greatly improved after modification. The Cronbach's alphas of the three parallel forms measured at 3 time-points ranged from .52 to .92, which are considered as moderate to high, and are very close to the statistics reported by Peacock and Wong (1990, Cronbach's alphas ranged from .51 to .90).

Lastly, with regard to the reliability of the three parallel forms of the Conventionality Test, the Cronbach's alphas obtained in the present study were .60, .73, and .73, respectively. These scores are considered as moderate and acceptable, and are comparable to the reliability statistics reported in past studies (e.g, Nobes & Pawson, 2003, α=.73- .93).

Table 4
The Internal Consistency Coefficients (Cronbach's Alphas) of TCT-DP, SAM, and Conventionality Test (N= 405)

	Cronbach's alphas		
SCALE	Time 1	Time 2	Time 3
TCT-DP	.61	.65	.70
SAM			
- Overall Perceived Stressfulness	.76	.86	.79
- Stress Appraisals			
Threat	.83	.89	.86
Challenge	.80	.92	.81
Centrality	.66	.74	.78
Controllability[a]	.52	.73	.54
Conventionality Test	.60	.73	.73

Note.

a. Controllability= (Sum of Control-self, Control-others, and reversed Uncontrollable)/ Number of items

4.1.2 Interrater Reliability of the TCT-DP

As the scoring of the TCT-DP may involve subjectivity of judgment, the interrater reliability of the scale was tested. Based on the scoring guidelines outlined in the test manual (Urban & Jellen, 1996), 180 TCD-DP protocols (44% of the sample, with 60 Form As, 60 Form Bs, and 60 Form Cs) were randomly selected and were scored by two trained raters (experienced student helpers) independently. The protocols were identified by code numbers only, and the raters were blind to the group membership of the participants and to the purposes and hypotheses of the study.

Table 5
Interrater Reliability of the Test for Creative Thinking-Drawing Production (N=180)

Scale	Inter-rater correlation
1. Continuations (Cn)	.87**
2. Completions (Cm)	.84**
3. New elements (Ne)	.96**
4. Connections made with a line (Cl)	.87**
5. Connections made to produce a theme (Cth)	.80**
6. Boundary breaking/fragment dependent (Bfd)	.98**
7. Boundary breaking/fragment independent (Bfi)	.97**
8. Perspective (Pe)	.87**
9. Humor and affectivity (Hu)	.60**
10. Unconventionality a (Uca): manipulations of materials	.85**
11. Unconventionality b (Ucb): surreal/abstract drawings	.71**
12. Unconventionality c (Ucc): symbols/words	.83**
13. Unconventionality d (Ucd): nonstereotypical figures	.70**
14. Total score	.88**

Note. ** $p < .01$

The correlation coefficients of the 13 subscales and the composite score are summarized in Table 5. Of these 13 subscales, 10 has an interrater reliability of .80 or above (the highest was .98). For the other 3 subscales, two (Unconventionality b & d) have moderate correlation coefficients ranging

from .70-.71. The subscale Humor/Affectivity has the lowest value of .60 although it is considered to be acceptable. It is worth noting that a comparatively low interrater reliability for the Humor/Affectivity (Hu) subscale has been also documented in previous studies (e.g., r= .62, Rudowicz, 2004). Rudowicz (2004, p. 214) called for an attention that the low reliability of scoring for the Humor subscale might reflect a relative subjectivity of judgment pertaining to humorous, witty, or funny expressions, and there might be measurement problems with the Humor subscale. Nonetheless, the interrater correlation coefficient obtained for the composite score in this sample was .88 which was quite high and matched the statistics reported in the test manual (Urban & Jellen, 1996). It ranged between .89 and .97 in a German sample. .

4.2 Creativity Change across 3 Time-Points

This section investigates the general pattern in the change of the creativity score of schoolchildren of 10-13 years olds (Grade 5- Grade 8) before and after being promoted to a new school (i.e., from Grade 6 to Grade 7) or to a higher grade (i.e., from Grade 5 to Grade 6, and from Grade 7 to Grade 8) so as to determine whether or not the schoolchildren at the postconventional thinking stage would experience a creativity slump during school transition.

4.2.1 Conventionality in Thinking at Time 2

The fundamental task of the present study is to investigate the change of the creativity scores before and after being promoted to a new school or to a higher grade, so as to determine whether or not schoolchildren in the postconventional thinking stage experience a creativity slump during school transition. To achieve this aim, it is essential to firstly examine whether the sample has developed into the postconventional thinking stage at Time 2 (i.e., promotion to a new school or a higher

grade). The performance of the three groups on the Conventionality Test as well as the age statistics at Time 2 is shown in Table 6. The statistics in the table showed that the mean age of our sample during school transition was 11.89 (*SD*= 0.98), which is the age characterized by postconventional thinking stage according to the cognitive-developmental perspective. Consistent with this suggestion, the scores obtained by our sample in the Conventionality Test were well beyond the mid-point of the 8-point scale, with a mean for the overall sample was 5.49 (*SD*= 2.00), and the means for the three groups ($G_{5\text{-}6}$, $G_{6\text{-}7}$, and $G_{7\text{-}8}$) were 5.20 (*SD*= 1.99), 5.54 (*SD*= 1.99), and 5.77 (*SD*= 2.01), respectively. The participants who obtained a score of 4 or higher (4 is the mid-point of the 8-point scale) were classified as demonstrating good postconventional thinking ability. The percentage statistics in Table 6 show that the majority of our sample (74.30 % in $G_{5\text{-}6}$, and 82.40% in both $G_{6\text{-}7}$ and $G_{7\text{-}8}$) demonstrated good postconventional thinking characteristics at Time 2. The results of a χ^2 test indicated that there was no grade difference in the participants' performance on the Conventionality Test (χ^2 (2)= 3.71, p= 0.16). In sum, the results presented in this paragraph are consistent with the cognitive-developmental perspective: our sample had basically reached the postconventional thinking stage during school transition.

Table 6

Age and Number and Percentage of Students Obtaining a Conventionality Test Score Equal to or Higher than 4 at Time 2 (During School Transition)

			Grade[b]					
	Total (N=405)		G_{5-6} (n=144)		G_{6-7} (n=142)		G_{7-8} (n=119)	
Characteristics	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age (yr)	11.89	0.98	10.83	0.43	12.05	0.34	13.00	0.52
Conventionality Test score[a]	5.49	2.00	5.20	1.99	5.54	1.99	5.77	2.01
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Level of Conventionality in Thinking								
< 4	83	20.50	37	25.70	25	17.60	21	17.60
>/= 4	322	79.50	107	74.30	117	82.40	98	82.40

Note.

a. The possible score range is 0-8

b. No association was found between grade and level of conventionality in thinking ($\chi^2(2)= 3.71$, $p= 0.16$). No grade effect was found on the mean the Conventionality Test score ($F(2, 402)= 2.75$, $p= 0.07$).

4.2.2 TCT-DP Change across 3 Time-points in the Three Groups

Given that our sample had basically reached the postconventional thinking stage (as shown in section 4.2.1), this subsection analyzes whether our sample still experienced a creativity slump during school transition. The school transition view suggests that a creativity slump will occur whenever schoolchildren experience stress during school transition. Based on the school transition view, it is expected that a significant creativity drop would be observed in the group which had experienced the transition from primary to secondary school (i.e., $G_{6\text{-}7}$) at Time 2 (i.e., the beginning of a new school year), whereas no creativity slump would be observed in the other two groups (i.e., $G_{5\text{-}6}$ and $G_{7\text{-}8}$) that had not experienced a school transition at this time (Hypothesis 1a). However, according to the cognitive development theory, a creativity slump is associated with the conventional thinking stage, but not with the postconventional stage. Therefore, this theory predicts that a creativity slump will not be observed in our sample at Time 2 (Hypothesis 2a).

The changes of the TCT-DP scores across the three time points for the three groups are presented in Figure 5. A 3 x 3 repeated-measures ANOVA with mixed between-within subjects design was performed using SPSS GLM to assess whether creativity scores (TCT-DP) could be predicted from Group ($G_{5\text{-}6}$ vs. $G_{6\text{-}7}$ vs. $G_{7\text{-}8}$) and Time (Time 1 vs. Time 2 vs. Time 3), as well as the interaction between Group and Time. Preliminary data screening was conducted to assess whether the assumptions for the ANOVA were seriously violated. An examination of a histogram of scores on the outcome variable suggested that the creativity score was almost normally distributed, and so no data transformation was required.

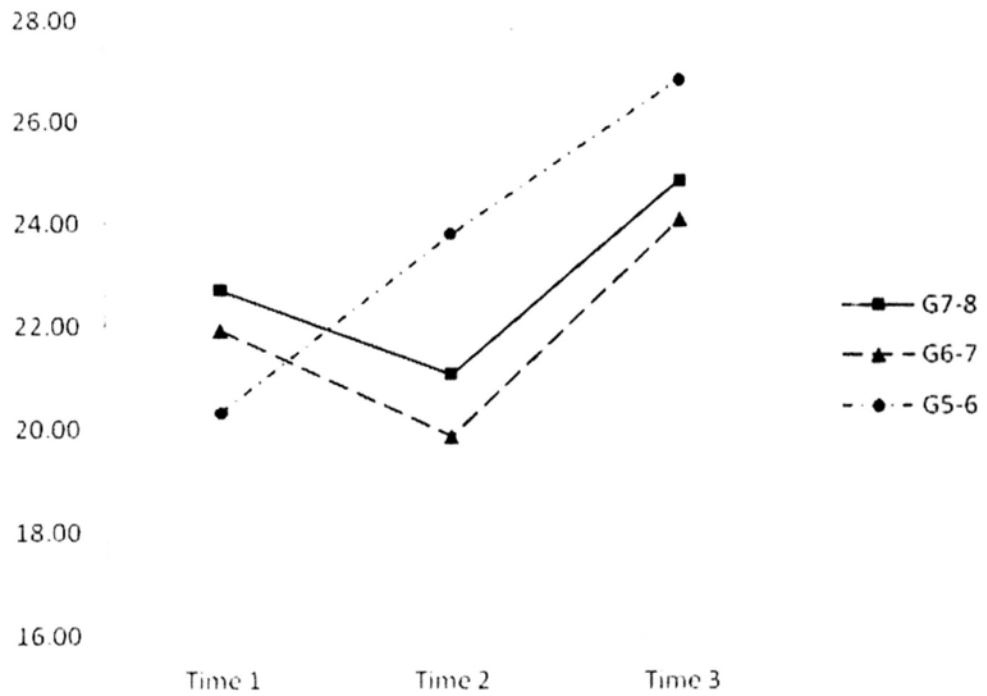


Figure 5. Change in the TCT-DP score across 3 time-points in the three groups.

The 3 x 3 repeated- measures ANOVA showed that there was a statistically significant main effect of Time: $F_{\text{Time}}(2, 804) = 34.10$, $p < .001$, $\eta_p^2 = .08$; as well as a significant Group x Time interaction effect: $F_{\text{Time x Group}}(4, 804) = 7.26$, $p < .001$, $\eta_p^2 = .04$; whereas the main effect of Group: $F_{\text{Group}}(2, 402) = 2.49$, $p = .08$, $\eta_p^2 = .01$, was not significant. The significant Group x Time interaction effect suggested that the change across the 3 time-points in TCT-DP (i.e., the Time effect) was not the same in the three groups. In addition, the significant interaction effect also suggested that the group effect on creativity score was not the same at three different time-points. The following section provides details of two types of analyses that were performed. The Time effects (i.e., longitudinal comparisons) on each of the three groups were analyzed separately, and then the Group effects (i.e., cross-sectional comparisons) were analyzed at the three time points respectively.

The Time Effect

An examination of Figure 5 suggested that the change in the pattern of the creativity score across time looked like a quadratic trend with a drop at Time 2 for the $G_{6\text{-}7}$ and the $G_{7\text{-}8}$ groups, whereas for the $G_{5\text{-}6}$ group, the change was a linear growth without a sudden drop over time. Subsequent univariate analysis of variance (ANOVA) with repeated measures were performed for the three groups, $G_{5\text{-}6}$ (n= 144), $G_{6\text{-}7}$ (n= 142), and $G_{7\text{-}8}$ (n= 119), respectively (see Table 7 for the Repeated measures ANOVA results). For the target group $G_{6\text{-}7}$ which experienced a school transition at Time 2, the overall F for differences in mean TCT-DP score across the three time points was statistically significant: $F(2,282)= 12.13$, $p<.001$, $\eta_p^2 = .15$. Post hoc paired t tests were performed to compare mean TCT-DP score for each of the three time points and suggested that the mean TCT-DP score at Time 2 (M=19.86) was significantly lower than that at Time 1 (M=21.92, p=.02) and at Time 3 (M=24.08, $p<.001$). The lowest score at Time 2 suggested a slump during school transition.

For the other two groups $G_{5\text{-}6}$ and $G_{7\text{-}8}$, which had not experienced a school transition at Time 2, the overall F for the main effect of Time was also significant (For $G_{5\text{-}6}$: $F[2,286]= 19.16$, $p<.001$, $\eta_p^2 = .21$; For $G_{7\text{-}8}$: $F[2,236]= 12.05$, $p< .001$, $\eta_p^2 = .17$). However, post hoc paired t tests suggested different trends. For $G_{5\text{-}6}$, the post hoc pairwise comparisons suggested a linear increase trend for the three *Mean* TCT-DP scores from Time 1 (M=20.33) to Time 2 (M=23.80, p=.00) and then to Time 3 (M=26.83, $p<.001$). Whereas with regard to $G_{7\text{-}8}$, it seemed as though this nontransition group showed a change pattern that was somewhat similar to that of the school transition group (i.e., $G_{6\text{-}7}$, see Figure 5). However, the results of post hoc paired t tests revealed that this group did not showed a statistically significant drop in creativity from Time 1 (M=22.7) to Time 2 (M=21.07, p=.22); however, they showed a statistically

significant improvement from Time 2 (M=21.07) to Time 3 (M=24.85, p<.001). These results suggest that even though there was a certain degree of drop in creativity score for $G_{7\text{-}8}$ at Time 2, the drop did not reach a statistically significant level.

Table 7
Means (Standard Deviations) of the TCT-DP (Form A at Time 1, Form B at Time 2, and Form C at Time 3)

	Mean[a] (SD)			Repeated Measures ANOVA	
Grade	Time 1 (T1)	Time 2 (T2)	Time 3 (T3)	*F-value (df)* [b]	Post hoc paired *t* Test[c]
$G_{5\text{-}6}$ (n= 144)	20.33 (7.15)	23.80 (8.77)	26.83 (10.90)	19.16 (2, 142)***	T1 < T2 < T3
$G_{6\text{-}7}$ (n= 142)	21.93 (7.72)	19.86 (8.31)	24.08 (8.93)	12.13 (2, 140) ***	T2 < T1 & T3[d]
$G_{7\text{-}8}$ (n= 119)	22.71 (8.54)	21.07 (8.44)	24.85 (9.32)	12.05 (2, 117) ***	T2 < T3

Note.
a. Possible score range of the scale: 0-66
b. *** p< 0.001
c. Bonferroni procedures were used to adjust for multiple comparisons.
d. The pattern of the TCT-DP scores change across 3 time-points followed the prediction of the school stress hypothesis.

The Group Effect

With regard to the group effect on creativity at three different time points, the three TCT-DP scores (at Time 1, Time2, and Time 3) were compared among the three groups using multivariate analysis of variance (MANOVA) and post hoc univariate comparisons. An adjusted significant level p< .017 (0.05/3 = 0.017) was used for the adjustment of multiple comparisons. The multivariate results indicated that the three groups differed significantly in creativity performance only at Time 2 (F (2, 402)= 8.00, p< .001, η_p^2 =.04), but not at Time 1 (F (2, 402)= 3.27, p= .039, η_p^2 =.02) or Time 3 (F (2, 402)= 3.00, p= .051, η_p^2 =.02), revealing that a significant cross-sectional difference was only demonstrated at the point of promoting to a higher academic level, but not within the same academic level. To further locate the significant difference

among the three groups at Time 2, a post hoc univariate test using a Bonferroni procedure was performed. The results indicated that the school transition group $G_{6\text{-}7}$ (M=19.86) performed significantly less well than one of the comparison groups $G_{5\text{-}6}$ (M=23.80, p<.001). With regard to the other comparison group, $G_{7\text{-}8}$, (M=21.07), although this group appeared to perform better than the $G_{6\text{-}7}$ group, the difference was not statistically significant (p= .76).

To summarize, the longitudinal comparisons using the repeated measures ANOVA tests suggested that the participants in the target group (i.e., $G_{6\text{-}7}$), and not those in the comparison groups (i.e., $G_{5\text{-}6}$ and $G_{7\text{-}8}$), obtained the statistically significant lowest TCT-DP score at Time 2. The cross-sectional comparisons using a MANOVA test also revealed that a significant group difference in creativity was only observed at the time of moving up to a higher academic level, despite the fact that post hoc univariate comparisons revealed that only one comparison group ($G_{5\text{-}6}$) showed significantly better creativity performance than the target group; the other comparison group ($G_{7\text{-}8}$) did not yield a significantly different result. Taken together, these findings were basically in agreement with the school transition notion that a creativity slump occurs during school transition.

4.2.3 Individual Differences in Experiencing a Creativity Slump

As Torrance (1968) noticed great individual differences in terms of experiencing a creativity slump and documented that only 45-61% of the participants in his study showed such a slump, it was considered worthwhile to further examine whether such a phenomenon occurred in the present sample. To enable a comparison of the results, Torrance's definition of a slump as a drop of at least one-half a standard deviation in standard scores (cited in Runco, 1999) was adopted. Similar to Torrance's finding (1968), individual differences were also observed in the present study (see Table

8). Only 44.4% of the students in the school transition group (i.e., G_{6-7}) demonstrated a creativity slump. The remaining 55.6% showed different profiles; for example, 26.7% showed an increase in creativity score and 28.9% showed no change in creativity performance.

An χ^2 test was used to determine whether, at Time 2, more students in the school transition group (i.e., G_{6-7}) than in the nontransition groups experienced a creativity slump. As shown in Table 8, at Time 2, the percentage of students in groups G_{6-7}, G_{5-6}, and G_{7-8} who demonstrated a slump associated with moving up a grade was 44.4%, 25.0%, and 40.3%, respectively. The results of the χ^2 test showed a statistical group difference in relation to experiencing a slump, with $\chi^2(2) = 12.79$, $p<.01$. This significant result suggested that the group experiencing school transition had a significantly higher chance of experiencing a slump.

Table 8

Number and Percentage of Students in the Three Groups[a] experiencing a Creativity Slump at Time 2

	G_{5-6} (n= 144)		G_{6-7} (n= 142)		G_{7-8} (n= 119)	
	n	%	n	%	n	%
Slump	36	25.00	63	44.40	48	40.30
No Slump	108	75.00	79	55.60	71	59.70
Increase	74	51.40	38	26.80	35	29.40
No change	34	23.60	41	28.90	36	30.30

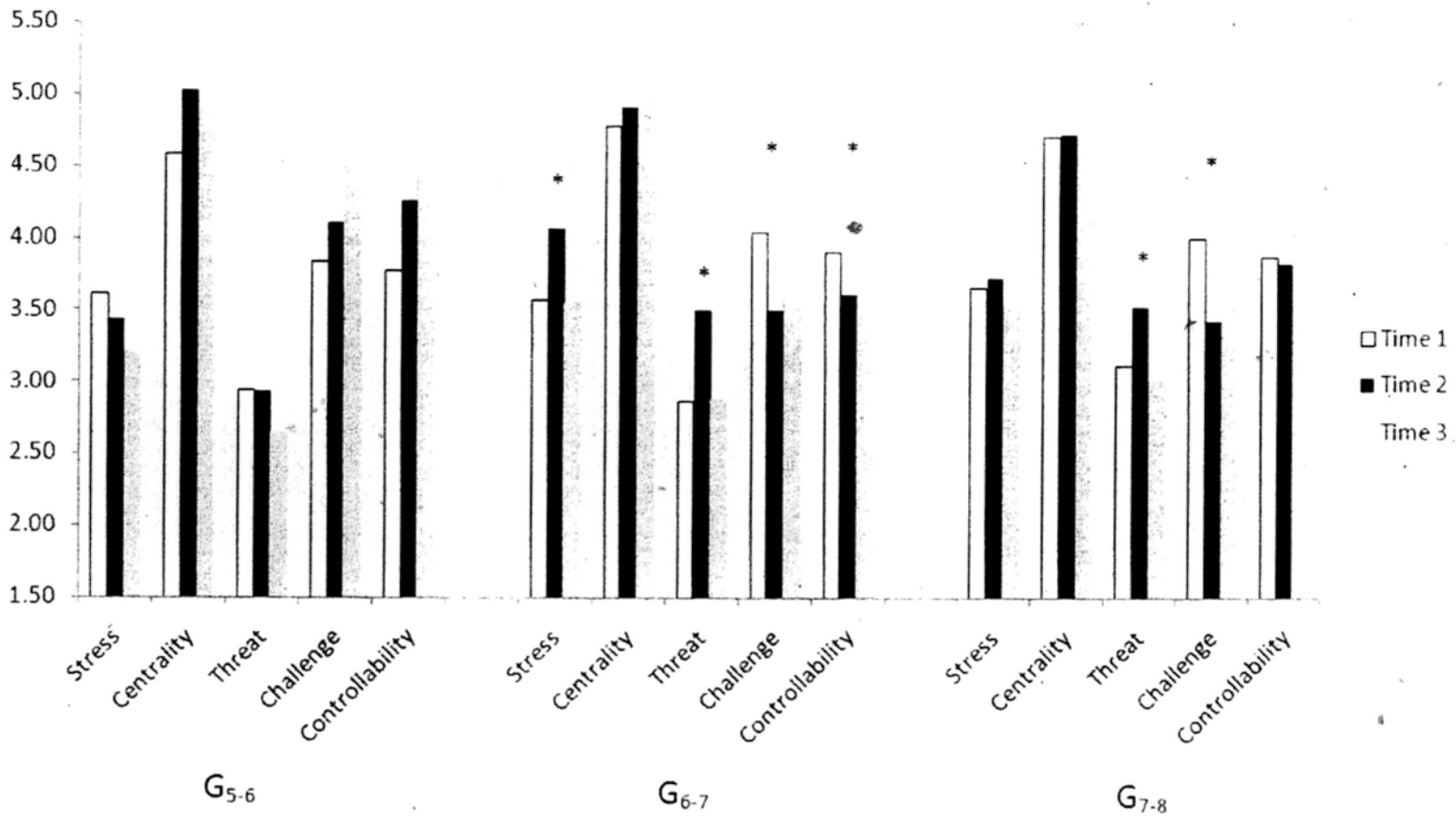
Note.

a. A significant Grade difference was found in the experience of creativity slump at Time 2 ($\chi^2(2)= 12.79$, $p< 0.01$)

Taken collectively, the statistical analyses presented in this section suggest that the school transition group obtained the lowest creativity score at school transition and had a significantly higher chance than the comparison groups of experiencing a drop in creativity during school transition. These findings were in agreement with the hypothesis that a creativity slump would still be observed even if school occurred in the postconventional thinking stage (thus supporting Hypothesis 1a).

4.3 Stress Change across 3 Time Points

The school stress hypothesis suggests that an elevated stress level is associated with school transition. In other words, the target group ($G_{6\text{-}7}$) would obtain the highest stress level at Time 2, but this phenomenon would not be shown in the comparison groups. Repeated measures ANOVA and post hoc pairwise *t* tests were employed to investigate this prediction. The results are presented in Figure 6 and Table 9. As expected, all of the SAM scores except for Centrality demonstrated a changing pattern that was consistent with the prediction of the stress hypothesis for the $G_{6\text{-}7}$ group. The *Overall Perceived Stressfulness* score at Time 2 (M= 4.06) was significantly higher than that obtained at Time 1 (M=3.57, p< .001) and Time 3 (M=3.55, p< .001). The same pattern was observed for the negative appraisal subscale, *Threat*, which indicated that $G_{6\text{-}7}$ participants appraised school life as the most threatening at Time 2 (F (2, 140)= 13.61, p< .01, η_p^2 =.16). These participants also appraised school life at school transition as significantly less challenging (F (2, 140)= 27.56, η_p^2 =.28) and less controllable (F (2, 140)= 28.18, p< .01, η_p^2 =.29). As indicated by the high Centrality scores over time (M = 4.77-4.94), the participants in this group highly valued the relevance and importance of school life. This change in stress scores supports the notion that students experience higher stress levels during school transition. Such a pattern of change in stress scores was not observed in the comparison Group $G_{5\text{-}6}$. However, the other comparison group ($G_{7\text{-}8}$) showed some degree of change in their appraisals of school life at Time 2. Students in this group showed the highest *Threat* score (F (2, 117)= 10.27, p< .01, η_p^2 =.15) and the lowest *Challenge* score (F (2, 117)= 33.94, p<.01, η_p^2 =.37) when being promoted from Grade 7 to Grade 8.



*Overall Perceived Stress & Threat scores were the highest; whereas *Challenge & Controllability* scores were the lowest at Time 2.

Figure 6. Change in the SAM scores of the three groups across 3 time-points in the three groups.

Table 9
Means (Standard Deviations) of the SAM Scores across 3 Time-Points

	Time 1		Time 2		Time 3		Repeated Measures ANOVA	
	M	SD	M	SD	M	SD	F value *(df)*[a]	Post hoc *t* test[b]
$G_{5\text{-}6}$ (n= 144)								
Overall Perceived Stress	3.61	1.00	3.43	1.08	3.21	1.04	F (2, 142)= 6.36**	T1> T3
Stress Appraisal								
Centrality	4.58	0.91	5.02	0.66	4.94	0.62	F (2, 142)= 18.15***	T1 < T2 & T3
Threat	2.94	1.22	2.93	1.12	2.64	1.07	F (2, 142)= 4.16**	T2 > T3
Challenge	3.83	1.01	4.11	1.07	4.50	0.83	F (2, 142)= 19.25***	T1 < T2 < T3
Controllability	3.77	1.05	4.26	0.92	4.42	0.75	F (2, 142)= 19.84***	T1 < T2 < T3
$G_{6\text{-}7}$ (n= 142)								
Overall Perceived Stress	3.57	0.93	4.06	0.91	3.55	0.96	F (2, 140)= 13.80***	T2 > T1 & T3[c]
Stress Appraisal								
Centrality	4.77	0.79	4.91	0.64	4.94	0.62	F (2, 140)= 3.52*	T1 < T3
Threat	2.86	1.08	3.50	1.15	2.87	0.93	F (2, 140)= 13.61***	T2 > T1 & T3[c]
Challenge	4.04	0.88	3.50	0.92	4.33	0.84	F (2, 140)= 27.56***	T2 < T1 & T3[c]
Controllability	3.90	0.92	3.60	1.06	4.30	0.60	F (2, 140)= 28.18***	T2 < T1 & T3[c]
$G_{7\text{-}8}$ (n= 119)								
Overall Perceived Stress	3.65	1.07	3.72	0.82	3.52	0.82	F (2, 117)= 2.41	--[d]
Stress Appraisal								
Centrality	4.70	0.75	4.72	0.66	4.80	0.75	F (2, 117)= 1.11	--[d]
Threat	3.11	1.12	3.52	1.06	3.00	1.00	F (2, 117)= 10.27***	T2 > T1 & T3[c]
Challenge	4.00	0.95	3.42	1.03	4.30	0.78	F (2, 117)= 33.94***	T2 < T1 & T3[c]
Controllability	3.87	0.87	3.82	0.92	4.23	0.62	F (2, 117)= 16.15***	T3 > T1 & T2

Note.

a. Significance level: * $p<.05$; ** $p<.01$
b. Bonferroni procedures were used to adjust for multiple comparisons.
c. The pattern of stress change across 3 time-points followed the prediction of the school stress hypothesis.
d. No post hoc pairwise *t* test was required as the *Time* effect of these variables was not significant.

4.4 The Effect of Stress and Conventionality in Thinking on Creativity

The other major aim of this study is to investigate if there are relationships between creativity and both stress and conventionality in thinking during school transition. On the one hand, the cognitive-relational theory of stress hypothesizes that stress is negatively correlated with creativity (Hypothesis 1b). On the other hand, the cognitive-developmental perspective predicts a positive relationship between creativity and postconventional thinking (Hypothesis 2b). These hypotheses were tested by a series of multiple regressions, which are reported in the subsequent section.

The correlation matrix between the TCT-DP score, and the Conventionality Test score, the SAM scores, as well as age, are presented in Table 10. As expected, the Pearson correlation coefficient statistics indicated that TCT-DP score was positively correlated with the Conventionality Test score ($r = .23$, $p < .01$) and negatively correlated with *Overall Perceived Stressfulness* ($r = -.56$, $p < .01$). In addition, the TCT-DP score was negatively correlated with negative appraisal such as *Threat* (i.e., to appraise school life as threatening, $r = -.49$, $p < .01$), but positively correlated with positive appraisals, for example, appraising school life as challenging (*Challenge*: $r = .47$, $p < .01$) and controllable (*Controllability*: $r = .70$, $p < .01$) at Time 2.

Table 10
Bivariate Correlations between the TCT-DP Score and Major Study Variables at Time 2

	1	2	3	4	5	6	7	8
1. Age	-							
2. Conventionality	0.09	-						
3. Overall Perceived Stressfulness	0.13**	-0.15**	-					
4. Centrality	-0.21**	0.07	-0.01	-				
5. Threat	0.21**	-0.17**	0.48**	-0.06	-			
6. Challenge	-0.27**	0.09	-0.34**	0.11*	-0.37**	-		
7. Controllability	-0.22**	0.25**	-0.61**	0.17**	-0.45**	0.46**	-	
8. TCT-DP	-0.15**	0.23**	-0.56**	0.05	-0.49**	0.47**	0.70**	-

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

To test for the predictive power of different components of stress appraisals and conventionality in thinking on creativity during school transition, a series of hierarchical multiple regressions were performed with the TCT-DP score at Time 2 as the criterion and the Conventionality Test score and the SAM scores as the predictors. In all of the hierarchical multiple regression analyses, demographic variables were entered in Block 1 to control for their possible effects on creativity. As shown in the result sections 4.2 and 4.3, age and grade had a significant role in creativity. With regard to the gender effect, although inconsistent findings have been reported in past studies (see Lubart, 1999), some have suggested a gender difference in relation to creativity performance (e.g., Jaquish & Ripple, 1984; Rudowicz et al., 1995). Hence, to control for these covariates, three demographic variables including age, grade, and gender were entered in Block 1 of all of the subsequent hierarchical multiple regression analyses. The predictor variables (either conventionality in thinking or stress variables) were then entered in Block 2 so that their individual contribution to creativity could be assessed. Preliminary data screening included examination of histograms of scores on all variables and examination of scatter plots for all pairs of variables. Univariate distributions were reasonably normal with no extreme outliers; bivariate relations were fairly linear, all slopes had the expected signs, and there were no bivariate outliers.

The results of the multiple regression analyses are summarized in Tables 11-13. The results showed that demographic variables explained 4% of the variance of the TCT-DP score (R^2=.04, $F(3, 401)$=5.54, p<.00). Among the demographic characteristics, age (Beta=-1.18, p< .00) and grade (Beta=-2.42, p< .00) emerged as significant correlates of the TCT-DP score. Older students and those who experienced a school transition (i.e., G_{6-7}) obtained significantly lower TCT-DP scores. Gender had no

effect on the TCT-DP score. The results of the explanatory power of each predictor variables as tested in Model 2 of all of the regression models are summarized in the following section.

4.4.1 Stress Appraisal Variable as Predictors

With regard to the stress appraisal variables, *Threat*, *Challenge*, and *Controllability* were found to be significant predictors of the TCT-DP score (Beta=-1.50, 1.26, & 4.84, respectively, $p< .001$. see Table 11) when controlling for the demographic variables. Students who appraised the current school life as less *threatening*; more *challenging*; and more *controllable* performed significantly better on the TCT-DP. Together, these stress appraisal predictors explained an additional 51% of the variance of the TCT-DP score the demographic predictors (F Change (4, 397)= 114.11, $p<.001$). The overall multiple regression analysis of Model 2 was statistically significant, $F(7, 397)=70.26$, $p<.001$, $R^2= .55$). These results supported hypothesis 1b.

Table 11
Results of Regression Analysis to TCT-DP (Y) from Stress Appraisal Variables

Predictors	B	β	t	F^c	R^2
Model 1				5.54**	.04
B1 Age	-1.18	-.13	-2.71**		
B1 Gender[a]	.03	.00	.04		
B1 Grade[b]	-2.42	-.13	-2.71**		
Model 2				70.26**	.55
B1 Age	.35	.04	1.12		
B1 Gender[a]	-.48	-.03	-.82		
B1 School transition[b]	.26	.01	.42		
B2 Threat	-1.50	-.20	-5.15**		
B2 Challenge	1.26	.15	3.91**		
B2 Centrality	-.82	-.06	-1.80		
B2 Controllability	4.84	.56	13.74**		

Note.
a. Male=0, Female=1
b. Grade at which school transition experienced=1; No experience of school transition=0
c. **p<.01

4.4.2 Overall Perceived Stressfulness as a Predictor

The *Overall Perceived Stressfulness* scale, as an alternative measure of stress appraisal, was also shown to be a significant predictor of the TCT-DP score (Beta=-4.83, $p< .00$) after statistically controlling for the effects of the demographic variables (R^2 Change= .28, F Change (1, 400)= 164.24, $p<.00$, see Table 12). Specifically, the *Overall Perceived Stressfulness* scale itself explained 28% of the change in the TCT-DP score. For each one-unit increase in the 6-point *Overall Perceived Stressfulness* scale, a drop of approximately 4.8 units in the TCT-DP score was observed, after controlling for the influence of demographic variables. The significant results for the *Overall Perceived Stressfulness* scale added additional piece of empirical evidence to support hypothesis 1b.

Table 12
Results of Regression Analysis to TCT-DP (Y) from Overall Perceived Stressfulness

Predictors	B	β	t	F^c	R^2
Model 1				5.54**	.04
B1 Age	-1.18	-.13	-2.71**		
B1 Gender[a]	.03	.00	.04		
B1 Grade[b]	-2.42	-.13	-2.71**		
Model 2				46.91**	.32
B1 Age	-.70	-.08	-1.88		
B1 Gender[a]	-.37	-.02	-.52		
B1 Grade[b]	-.15	-.01	-.20		
B2 Stress	-4.83	-.55	-12.82**		

Note.
a. Male=0, Female=1
b. Grade at which school transition experienced = 1; No experience of school transition = 0
c. **p<.01

4.4.3 Conventionality in Thinking as a Predictor

To test hypothesis 2b, the Conventionality Test score was entered as the predictor variable in Block 2. The overall regression of Model 2 was statistically significant, R^2 =.10, adjusted R^2 =.09, $F(4, 400)$= 10.87, p<.00 (Table 13). After controlling for the demographic variables, conventionality in thinking on its own was also a significant predictor (Beta=1.05, t= 5.08, p< .00), explaining 6% of the variation of the TCT-DP score (R^2 change= .06, F change (1, 400)= 25.80, p<.00). The significant positive t value suggested that for each unit increase in the 8-point Conventionality Test scale, there was approximately a one-unit increase in the TCT-DP score after controlling for the demographic characteristics. This indicates that higher postconventional thinking level is positively predictive of creativity. Hypothesis 2b was thus supported.

Table 13
Results of Regression Analysis to TCT-DP (Y) from the Conventionality Test score

Predictors	B	β	*t*	*F*	R^2
Model 1				5.54**	.04
B1 Age	-1.18	-.13	-2.71**		
B1 Gender[a]	.03	.00	.04		
B1 Grade[b]	-2.42	-.13	-2.71**		
Model 2				10.87**	.10
B1 Age	-1.37	-.16	-3.22**		
B1 Gender[a]	-.31	-.02	-.38		
B1 Grade[b]	-2.46	-.14	-2.84**		
B2 Conventionality	1.05	.24	5.08**		

Note.
a. Male=0, Female=1
b. Grade at which school transition experienced =1; No experience of school transition = 0
c. **p<.01

4.4.4 Test for Possible Mediation and Interaction Effects

The aforementioned analyses suggested that both stress appraisals and conventionality in thinking explain creativity performance to some extent. Although it seems that cognitive appraisals of stress and conventionality in thinking are two different behavioral manifestations, both of them involve a common ability namely cognitive ability. While the Conventionality Test score demonstrate a certain stage of cognitive development (e.g., Piaget, 1932/1968), cognitive appraisals involve some cognitive processes. Folkman, Schaefer, and Lazarus (1979/1981) viewed their cognitive-relational theory as a cognitively oriented approach to stress; and highlighted that stress appraisals were actually a set of cognitive processes involved in information processing and problem solving. It is possible that conventionality in thinking is related to stress appraisals. For instance, when facing environmental demands, postconventional thinking might play a role in stress appraisals. Higher postconventional thinking might be of a help in seeing more flexibilities and alternatives in meeting the environmental demands, as well as in mobilizing the coping resources, through which a lower stress level would be actualized. It should be noted that results of the previous bivariate correlation analysis showed a significant relationship between conventionality in thinking and stress variables (*r*s ranged from -.15 to .25, Table 10). Hence, it is interesting to explore how these two predictor variables would jointly function with or influence each other in affecting creativity. Therefore analyses of possible mediation and interaction effects were subsequently performed. These analyses are useful in understanding more about the relative role of stress appraisals and conventionality in thinking on creativity.

Tests of Mediation

To test the mediation effect, Baron and Kenny's (1986) statistical approach was used. In this approach, a set of conditions are tested: (1) the Independent Variable (IV) significantly predicts the Dependent Variable (DV), (2) the Mediator significantly predicts the DV, (3) the IV significantly predicts the Mediator, and (4) the relation of the IV to the DV is eliminated or substantially reduced when the Mediator is forced into a regression equation before the IV.

In the present study, stress appraisal and conventionality in thinking have been shown to have certain effects on creativity performance. Furthermore, it is reasonable to speculate that structural change in cognitive development, in the form of transformation into the postconventional thinking stage, could have an influencing effect on the appraisal of the situational stressors and of one's available coping resources. It is possible that stress appraisal may mediate the conventionality in thinking/creativity relation. In testing this mediation model, the following conditions are required: (1) conventionality in thinking (IV) significantly predicts creativity (DV), (2) stress (Mediator) significantly predicts creativity (DV), (3) conventionality in thinking (IV) significantly predicted stress (Mediator), and (4) the effect of conventionality in thinking on creativity is eliminated or significantly reduced when stress is entered into the regression before it. Tests of conditions (1) and (2) are available in the regression results previously presented, in which significant effects of conventionality in thinking (β=.24, t=5.08, p< .00, Table 13) and stress (β=-.55, t=-12.82, p<.00, Table 12) on creativity were shown. To complete the picture of testing the mediation effect, two additionally regressions were performed: (a) to regress the Conventionality Test score on stress (to test Condition 3); and (b) to force the stress score into the equation in a step

before the Conventionality Test score were allowed to enter. This tested condition (4) for demonstrating mediation.

Tables 14 and 15 summarize the results of these regression analyses on testing the mediation effect. As shown in Table 14, conventionality in thinking had a significant effect on stress (β =-.16, t=-.27, p<.01), therefore, Condition (3) was met. With regard to Condition (4), the regression analysis showed that forcing the stress score before the Conventionality Test score in predicting creativity led to a reduction in the effect of conventionality in thinking on creativity from .24 (see Table 13) to .16 (see Table 16). A Sobel test suggested that this reduction was statistically significant (z= 2.87, p<.00), thus confirming that stress partially mediated the effect of conventionality in thinking on creativity. This significant partial mediation effect suggested that conventionality in thinking affected creativity in two ways. On the one hand, it had a direct effect on the change of creativity; that is, it directly changed creativity to some extends. On the other hand, it had indirect effects on creativity through cognitive appraisal of stress. This indicates that conventionality in thinking firstly changed cognitive appraisal, which then changed creativity.

Table 14
Results of Regression Analysis to Stress from the Conventionality Test Score

Predictors	B	β	*t*	*F*	R^2
Model 1				10.00**	.07
B1 Age	.10	.10	2.06*		
B1 Gender[a]	-.08	-.04	-.89		
B1 School transition[b]	.47	.23	4.71**		
Model 2				10.35**	.09
B1 Age	.11	.11	2.36*		
B1 Gender[a]	.06	-.03	-.63		
B1 School transition[b]	.47	.23	4.80**		
B2 Conventionality	-.08	-.16	-3.27**		

Note.
a. Male=0, Female=1
b. Experienced school transition=1; No experience of school transition=0
c. *p<.05, **p<.01

Table 15
Predicting TCT-DP (Y) with Overall Perceived Stressfulness entered before the Conventionality Test Score

Predictors	B	β	t	*F*	R^2
Model 1				5.54**	.04
B1 Age	-1.18	-.13	-2.71**		
B1 Gender[a]	.03	.00	.04		
B1 School transition[b]	-2.42	-.13	-2.71**		
Model 2				46.91**	.32
B1 Age	-.70	-.08	-1.88		
B1 Gender[a]	-.37	-.02	-.52		
B1 School transition[b]	-.15	-.01	-.20		
B2 Overall Perceived Stress	-4.83	-.55	-12.82**		
Model 3				41.90**	.34
B1 Age	-.84	-.10	-2.31*		
B1 Gender[a]	-.58	-0.3	-.83		
B1 School transition[b]	-.29	-.02	-.38**		
B2 Overall Perceived Stress	-4.59	-.52	-12.24**		
B3 Conventionality	.70	.16	3.89**		

Note.
a. Male=0, Female=1
b. Experienced school transition=1; Did not experience school transition=0
c. **p<.01

Tests of Interaction

Consistent with the recommendations of Cohen and Cohen (1983), a stepwise hierarchical multiple regression procedure was used to test the predictions pertaining to the Stress-by-Conventionality interaction. The TCT-DP score at Time 2 served as the dependent variable; while the centered Stress score along with the centered Conventionality Test score were entered into the regression equation simultaneously in Block 2. In Block 3, the two-way interaction was entered into the equation. Again, demographic variables were entered in Block 1 to control for their effect. Model 3 of the regression analysis indicated that the interactive term of Stress x Conventionality did not improve the predictive power of the regression equation (Table 16, *F Change* (1, 398)= .018, p=.892). This insignificant interaction effect suggested that stress and conventionality in thinking made their own individual contribution to creativity, and did not influence each other's effect on creativity.

Table 16
Results of Regression Analysis to TCT-DP (Y) from the Conventionality Test Score, Overall Perceived Stressfulness, and Their Interaction Term

Predictors	B	β	t	*F*	R^2
Model 1				5.54**	.04
B1 Age	-1.18	-.13	-2.71**		
B1 Gender[a]	.03	.00	.04		
B1 Grade[b]	-2.42	-.13	-2.71**		
Model 2				41.90**	.34
B1 Age	-0.84	-.10	-2.31*		
B1 Gender[a]	-.58	-.03	-.38		
B1 Grade[b]	-2.89	-.02	-.38		
B2 Overall Perceived Stress	-4.59	-.52	-12.24**		
B2 Conventionality	.70	.16	3.90**		
Model 3				34.83**	.34
B1 Age	-.85	-.10	-2.31*		
B1 Gender[a]	-.58	-.03	-.83		
B1 Grade[b]	-.29	-.02	-.38**		
B2 Overall Perceived Stress	-4.59	-.52	-12.17**		
B2 Conventionality	.70	.16	3.89**		
B3 Stress x Conventionality	.02	.01	.14		

Note.
a. Male=0, Female=1
b. Grade experienced school transition = 1; Did not experience school transition = 0
c. **p<.01

4.5 Comparing the Predictive Power of Stress and Conventionality in Thinking on Creativity Slump

As both the stress appraisal and Conventionality in thinking variables were shown to be significantly related to creativity performance in section 4.4, a further step was taken to examine the relative significance of individual predictors in explaining a creativity slump. The groups that did or did not experience a creativity slump at Time 2 were dummy coded into two variables (No slump=0, Slump= 1). The predictors included the SAM scores and the Conventionality Test score. Demographic variables,

age, gender, and grade, were entered in Block 1 to control for their possible covariance effects. The three grades were dummy coded into two variables (Nontransition group=0, Transition group=1).

Table 17 shows the logistic regression coefficient, Wald test, and odds ratio for each of the predictors. With regard to the demographic variables, only grade (with or without school transition) showed a significant effect on creativity slump at Time 2. The significant odds ratio for the effect of school transition revealed that the transition group (i.e., $G_{6\text{-}7}$) showed were significantly more likely (1.63 times higher, $p<.01$) than the nontransition groups (i.e., $G_{5\text{-}6}$ and $G_{7\text{-}8}$) to experience a creativity slump at Time 2. As for the predictive power of the stress appraisal and conventionality in thinking variables, a test of the full model versus a model with only the intercept was statistically significant ($\chi^2(6, N=405)=70.64$, $p<.001$), after controlling for the effects of demographic variables. The model correctly classified 63% of those who exhibited a creativity slump during school transition and 74% of those who did not, for an overall success rate of 71%.

When all other variables were held constant, only two SAM variables were suggested to be significant predictors of a creativity slump, including *Overall Perceived Stress* and *Controllability*. The odds ratio *for Overall Perceived Stress* (i.e., 1.55) indicated that for each one-point increase on the 6-point *Overall Perceived Stress* scale, there was a 1.55 times greater chance that a student would experience a creativity slump during school transition. The negative sign for the slope of *Controllability* indicated that a lower score in this stress appraisal signaling a higher risk for experiencing a creativity slump. Inverting the odds ratio for *Controllability* (i.e., 1/0.55= 1.80) revealed that for each one-point decrease on the 6-point *Controllability* scale, there was a 1.8 times

higher risk of a creativity slump. To summarize, results of the logistic regression model supported the school stress hypothesis to predict a creativity slump.

Table 17
Logistic Regression Predicting the Slump from the Stress Appraisal Variables, Conventionality in Thinking, and Demographic Variables

Predictor	B	Wald χ^2	p	Odds Ratio
Model 1				
B1 Age	0.23	4.50	0.03	1.26
B1 Gender[a]	0.19	0.83	0.36	1.21
B1 School transition[b]	0.49	5.15	0.02	1.63
Model 2				
B1 Age	0.10	0.56	0.45	1.10
B1 Gender[a]	0.13	0.30	0.58	1.14
B1 School transition[b]	0.09	0.14	0.71	0.91
B2 Overall Perceived Stress	0.44	7.22	0.01	1.55
B2 Stress Appraisal				
- Threat	0.13	1.11	0.29	1.14
- Challenge	-0.07	0.25	0.61	0.94
- Centrality	0.03	0.03	0.85	1.03
- Controllability	-0.60	14.11	0.00	0.55
B2 Conventionality	-0.07	0.13	0.91	0.99

Note.
a. Boy=0, Girl=1
b. School transition=1, No school transition=0

CHAPTER FIVE DISCUSSION AND CONCLUSION

In this chapter, the results of the statistical analyses derived in Chapter 4 are discussed in detail. The limitations and contributions of the study are also addressed.

5.1 Creativity Slump

The first major aim of the present study was to address an important question: If school transition occurs when schoolchildren are at a cognitive level which goes beyond the conventional thinking stage (i.e., the postconventional thinking stage), will they still experience a creativity slump? The answer to this question will help to determine which view, conventionality in thinking or school stress, is a more reasonable explanation of the cause of a creativity slump: Finding a slump would support the school stress hypothesis (Hypothesis 1a), whereas finding no slump would support the cognitive-developmental hypothesis (Hypothesis 2a).

Firstly, the results of repeated measures ANOVA and post hoc *t* tests indicated that a significant drop in score was found in the group experiencing school transition ($G_{6\text{-}7}$). This finding is in line with a series of studies which have demonstrated that sudden creativity drops are associated with school change (e.g., entering a new school; see Daugherty, 1993; Smith and Carlsson, 1983; Torrance, 1962, 1968). Moreover, our results provide further evidence that even when school transition happens in the postconventional years rather than the conventional years, a creativity slump still occurs. This finding is consistent with the findings of Camp's (1994) longitudinal study, which revealed that sudden drops in performance in a divergent thinking test (TTCT) are found when school transition occurs in the postconventional years. In addition, an earlier cross-sectional study conducted in Hong Kong (Cheung et al., 2004) using another divergent thinking test (WKCT) also suggested a creativity slump associated

with the promotion from primary to secondary school, during which the students were supposed to be in the postconventional thinking stage. Given that Camp's longitudinal and Cheung et al.'s cross-sectional studies were based on quantitative divergent thinking measures, the present study, which applied a qualitative componential measure of creativity (i.e., TCT-DP) with a sequential design that combined both cross-sectional and longitudinal comparisons, provided additional empirical evidence for a creativity slump associated with school transition in children's postconventional years. The finding of a slump in the postconventional thinking stage in this study, together with Camp's (1994) and Cheung et al.'s (2004) findings, converge to support the school stress hypothesis.

In addition, the present study replicated Torrance's findings (1968) to reveal clear individual differences in relation to experiencing a creativity slump at school transition. Torrance (1968) reported that between 45% and 61% of his sample showed a significant fourth-grade slump across the four indices of creativity (i.e., fluency, flexibility, originality, and elaboration), whereas between 11% and 38% of the sample showed a growth in creativity over time. Similarly, in the present study, we found that only 44.4%, not all, of the school transition group ($G_{6\text{-}7}$) demonstrated a creativity slump at the point of moving up to another school, whereas different profiles were observed for the remaining students (55.6%) in this group (26.7% showed a growth at Time 2, whereas 28.9% showed no change). The findings on individual differences are interesting and implicative. They suggest that a slump is neither inevitable nor overwhelming. Taken together, this present study's finding that 44.4% of the 11-13 year-olds experienced a seventh-grade slump and Torrance's (1968) finding that 45%-61% of the 9-10 year olds in his study experienced a fourth-grade slump indicate

that the empirical evidence is consistent in suggesting that a slump is far from universal (see also Runco, 1999).

It is interesting to note that individual differences in experiencing a decline in creativity at Time 2 were also observed in the two comparison groups (G_{5-6}, and G_{7-8}). Although the group means of the creativity score for these two comparison groups did not show a significant drop at Time 2, some individuals in these groups demonstrated a decline in creativity. Our statistics showed that 25.0% of the G_{5-6} group and 40.3% of the G_{7-8} group showed a decline of at least one-half standard deviation in the TCT-DP score at the point of promoting to a higher academic level, even though such a promotion did not involve a change of school. This suggests that being promoted to a higher grade that involved no change of school also have affects some individuals and leads to a drop in creativity performance. Collectively examining the statistics on individual differences in experiencing a slump from both the school transition and the comparison groups, our results showed that not all participants from the school transition group experienced a slump, and not all participants from the nontransition groups were free from experiencing a slump. The χ^2 test yielded the significant result that more students (i.e., 44.4%) from the school transition group (G_{6-7}) than from the comparison groups (25.0% in G_{5-6}; 40.3% in G_{7-8}) had experienced a creativity slump, which suggested that students experiencing a school transition were comparatively more vulnerable to experiencing creativity decline. However, the findings on individual differences demonstrated that environmental factor alone (e.g., experience of school transition) was not necessarily related to a creativity slump.

5.2 Stress Change Associated with Creativity Change

As discussed in section 5.1, our finding of a slump in the postconventional

thinking stage could be a piece of evidence that supports the school stress hypothesis. To go further to test the school stress hypothesis, the change of stress appraisals on school life across the 3 time-points was analyzed. Our results indicated that the school transition group (i.e., $G_{6\text{-}7}$) showed significant elevated stress levels during school transition. With regard to the 5 subscales of the SAM (i.e., *Centrality*, *Overall Perceived Stressfulness*, *Threat*, *Challenge*, and *Controllability*), the $G_{6\text{-}7}$ group showed significant changes in four (except *Centrality*). They showed significantly higher levels of *Overall Perceived Stressfulness* at Time 2; they appraised school life as significantly more threatening, but less challenging and less controllable. The consistently high rating on the subscale *Centrality* across time demonstrated that the students viewed school life as relevant and important to them. This finding is consistent with past studies that have suggested that Hong Kong students regard education as being extremely important (e.g., Bond, 1991; Gow, Balla, Kember & Hau, 1991). The finding on the elevated stress level at school transition is in agreement with Torrance's initial explanation (1962, 1968) for a creativity slump, in which he explained that slumps are related to the stress experienced by the schoolchildren who are confronted with new challenges and readjustments such as entering school or promoting to a higher grade with higher academic demands. This finding is also consistent with the line of research that showed that the period of school transition is a time of great stress for schoolchildren (e.g., Boyce et al., 1995; Slater & McKeown, 2004; Turner-Cobb, 2005).

It is worth noting that one of the comparison groups $G_{7\text{-}8}$ also showed some degree of elevated stress level when being promoted to a higher academic level, even though the promotion did not involve school change (i.e., promoting from Grade 7 to Grade 8). However, such a change in stress level was not observed in the other

comparison group G_{5-6}. Among the 5 SAM subscales, G_{7-8} showed significant changes in two. These children appraised school life as significantly more threatening but less challenging in facing the change to a higher grade. This finding seemed to support the idea that individual differences in reaction to a potential stressful environment as proposed by the cognitive-relational theory (Lazarus, 1990; Lazarus, 1999; Lazarus and Folkman, 1984). Even though a promotion from Grade 7 to Grade 8 did not involve school transition, it might nonetheless be viewed as a stressful event to some individuals in our sample. Additionally, it was interesting to note that our findings on the changing patterns of stress appraisals in the three groups appeared to correspond to the patterns of creativity change. Among the three groups, the G_{6-7} group reported the highest stress level at Time 2, and at the same time, they showed a significant drop in creativity performance. As for the G_{7-8} group who reported some degree of elevated stress at Time 2, they also demonstrated a certain degree of creativity drop, yet the drop did not reach statistically significant level. Lastly, for the G_{5-6} group who reported a certain degree of decline in their stress level across the 3 time-points, they showed a linear growth in the creativity performance. These statistical results, taking collectively, seem to be suggestive of a negative relationship between perceived stress and creativity.

Taken together, these results on the changes in stress level and creativity performance at Time 2 lend support to the ideas behind the school stress hypotheses. Furthermore, our results suggest that a school (or environmental) experience itself does not necessarily lead to stress and a drop in creativity; how individual students appraise a school (or environmental) experience appears to be more important. The same school environment can be viewed as stressful by some students but not by others.

5.3 Relations of Stress and Conventionality in Thinking to Creativity

The second major aim of the present study was to determine how well stress appraisal and conventionality in thinking explain creativity, and which of these factors offers a better explanatory power to a slump. The results of the hierarchical multivariate regression analyses using the stress variables as predictors suggested that stress factors were significantly predictive to creativity ($p < .001$), with the *Overall Perceived Stressfulness* score explaining 28% of the change in creativity performance, and the stress appraisal variables (i.e., *Threat*, *Challenge*, and *Controllability*) explaining 51% of the change, after controlling for the demographic covariates. Specifically, a lower creativity score was correlated with the appraisals that regarded the current school life as more stressful and threatening but less challenging and controllable. This negative relation between stress appraisals and creativity has also been suggested in past studies. For example, appraising a task or a situation as stressful and threatening was related to lower cognitive ability (Sawyer & Hollis-Sawyer, 2005), lower risk taking (Lieblich, 1968), lower motivation and engagement in a task (Maier, Waldstein, & Synowski, 2003), and lower self-esteem in school work (Elias, Gara, & Ubraco, 1985), and more negative emotions in performing a task (Feldman, et al., 2004; Larsson, 1989; Vosburg, 1998). On the contrary, appraising the performance situation as a challenge was associated with positive thinking and good performance (Larsson, 1989). Even though some of the above-mentioned aspects such as risk taking, task commitment, motivation, and cognitive performance are suggested to be related to creativity (Urban & Jellen, 1996), they are not equivalent to creativity. The present study is the first to provide empirical evidence to support a direct link between stress appraisals and creativity.

Regarding the effect of conventionality in thinking on creativity, the regression analysis suggested that the Conventionality Test score was also a significant predictor of

creativity and explained 6% of the variations in the creativity score. Our results showed that postconventional thinking was positively predictive of creativity (Beta=1.05, t=5.08, p<.01) and provided supporting evidence for the cognitive-developmental hypothesis. Moreover, the effect of conventionality in thinking on creativity was more complex than had been anticipated. Its effect on creativity was shown to be partly mediated by stress appraisal. That is to say, conventionality in thinking influences creativity through two paths: one is a direct effect on creativity; and the other is an indirect influence on creativity through its effect on stress appraisal. Specifically, the direct effect was that students with lower level of postcoventional thinking showed lower creativity performance; the indirect effect was that students with lower level of postconventional thinking showed more rigid, conventional thinking when appraising a stressful situation. Rigid and inflexible thinking might hinder the student from seeing alternatives and available resources in meeting a demanding situation, which would lead to a higher stress level, and such stress would further lead to lower creativity performance.

5.4 The Explanatory Power of Stress and Conventionality in Thinking to a Creativity Slump

Given that both stress appraisal and conventionality in thinking are significant predictors of creativity performance, the present study took a further step and directly compared the explanatory power of these factors in predicting creativity slump using logistic regression analyses. Based on the results of the logistic regressions, which include all of the significant predictors of creativity in one equation to predict the likelihood of a creativity slump, only stress appraisal factors, but not conventionality in thinking, were found to be significant predictors of a creativity slump. Individuals who had higher scores on the independent scale of *Overall Perceived Stressfulness* but had a

lower score on the secondary appraisal scale *Controllability* were more vulnerable to experiencing a creativity slump at school transition. Our results suggested that students had a 1.55 times higher risk of experiencing a slump for each one point increase on the 6-point *Overall Perceived Stress* scale, whereas for every one-point decrease on the 6-point *Controllability* scale, the risk of experiencing a slump was 1.8 times higher. These results again support the school stress hypothesis in explaining a creativity slump. On the other hand, results of the binary logistic regression did not suggest conventionality in thinking as a significant predictor of creativity slump, which is not in the line with the prediction of the cognitive-developmental hypothesis. In a nutshell, findings of the present study suggest that the cognitive relational theory of stress has greater explanatory power than the cognitive-developmental perspective with respect to a creativity slump.

To summarize, results of the present study support hypotheses 1a and 1b, which are formulated based on the cognitive-relational theory of stress. These findings provide empirical evidence to confirm the notion that a creativity slump occurs even when school transition occurs in the postconventional thinking years. Overall perceived stressfulness as well as negative appraisal (threatening) of the situation predicts lower creativity performance, whereas positive appraisals (challenging and controllable) predict better performance. In contrast, hypotheses formulated from the cognitive-developmental perspective were only partially supported here. The finding that a creativity slump occurs among children in the postconventional thinking stage does not support the cognitive-developmental hypothesis (not supporting hypothesis 2a). Although level of postconventional thinking was positively related to creativity

performance (supporting hypothesis 2b), its predictive power was significantly less when compared with that of Overall perceived stressfulness and Controllability.

5.5 Limitations

5.5.1 Sampling

The sampling procedure in this study was not random. Due to the study's special design, a 3 time-points follow-up procedure was required to collect data from students before and after school transition. To ensure successful data collection, only a specific type of school—the through-train school—fitted in this design and was invited to take part in the study. The generality of the data from through-train schools to other types of school may be questionable, even though we can make an argument that if students in the through-train schools experience stress and a creativity slump during school transition, students in other types of school are also quite likely to experience them as previous studies have suggested that students in the schools without a through-train channel experience more difficulties and higher stress levels during school transition than students in through-train schools (see Tam, Ma, Tang, & Yeung, 2000). Hence, further studies are required to investigate the generality of the research findings to other types of school.

5.5.2 Procedure

All of the measures were conducted in group mode rather than individual mode. Even though the participants were reminded to feel free to ask questions, the possibility exists that some of them did not really understand the questions, but were too shy to ask questions. Also, the pressure of the group norm may have had an effect on those participants who were slow to complete the tasks. The quality of their responses would be affected if they tried to finish all of the tasks as quickly as they could in order

to keep up with the speed of the rest of the group.

5.5.3 Measurement

TCT-DP. Even though the TCT-DP is a well-established creativity test and has been proven to be useful in samples of Hong Kong students, providing reasonably reliable and valid evidence, Form C of this test was newly developed for the specific purposes of the 3 time-points follow-up design of this study. Although, in the present study, the reliability of Form C was similar to that of Forms A and B, the reliability and validity issues associated with this new form need to be further addressed.

SAM. Even though efforts have been made to adapt and improve the SAM, the only existing theory-based instrument to measure situation-specific stress appraisal, issues over its validity, especially for young children aged 9-13, need to be addressed. This is the first time that the SAM has been translated from its English version to create a Chinese version for a Hong Kong student sample. The reliability and validity of this adapted version need to be further established.

Conventionality Test. First, all of the three parallel forms of this measure lie in the domain of social-conventional rules. Also due to the complexity of the measure, only one topic issue on social conventions was conducted at each time point in this study. Such a design has limitations in terms of uncovering conventional vs. post conventional thinking in full, even though we regard this measure as an appropriate and feasible assessment of cognitive level which fitted the design of the present study. Second, the original approach, designed by Lockhart and his colleagues (1977) to measure cognitive levels, was conducted in the individual mode using interviewing procedures. However, in this study, due to the limitation of a group administrative mode, it was adapted into a questionnaire format. Thus, obtaining detailed information, making observations to

gather subtle information, and checking the comprehension of questions were not possible.

Repeated measures. It should be noted that all of the measures were conducted three times in the present study. Practice effects may occur in the follow-up measures. In addition, the participants' motivation for completing the measurements may be affected after repeating similar tests two to three times. Therefore, the data collected may not truly reflect schoolchildren's creativity, stress level, and level of conventionality in thinking. To minimize the possible practice effect, we used three varied forms in measuring both creative thinking (see Appendix II) and conventionality in thinking (by using three topic areas in social conventions, see Appendix VI). With regard to the SAM, the ordering of the items was different at each data collection time point.

5.6 Significance of the study

Despite some limitations, the present study contributes significantly to our understanding of creativity development. First, the present study provides a direct empirical comparison to two competing hypotheses (the school transition stress hypothesis vs. the cognitive-developmental hypothesis) on explaining a creativity slump. This was achieved by addressing the research question as to whether a creativity slump would still occur if school transition happened at the cognitive stage which was beyond the conventional thinking stage (i.e., the postconventional thinking stage). Our results suggest that the school transition stress hypothesis provides a better explanation of creativity slumps. Such empirical evidence will be helpful for understanding why creativity slumps occur at a specific age or a specific time in an individual's development. Second, the present study is in line with past studies (e.g., Torrance, 1968) in reporting individual differences in experiencing a creativity slump. The statistics that

show that less than half of the sample experienced a slump support the notion that a creativity slump is neither overwhelming nor unavoidable. This finding implies that appropriate guidance and assistance from their families and the education system might help to prevent the loss of creativity among schoolchildren. Third, this study also provides empirical evidence on the relationship between creativity, conventionality in thinking, and the stress appraisals associated with school transition. Specifically, the findings suggest that the major factors that are detrimental to creative thinking at school transition are negative appraisals and lack of positive appraisals on school life (i.e., viewing school life as more threatening, less challenging, and less controllable). Such findings contribute to the current literature by revealing a greater explanatory power of *the cognitive-relational theory of stress* than *the cognitive-developmental perspective* with respect to a creativity slump. The results are useful for inferring the critical contributing factors that might hinder or foster the development of creativity in schoolchildren; and shed further light on effective creativity education.

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Appendices

Appendix I.

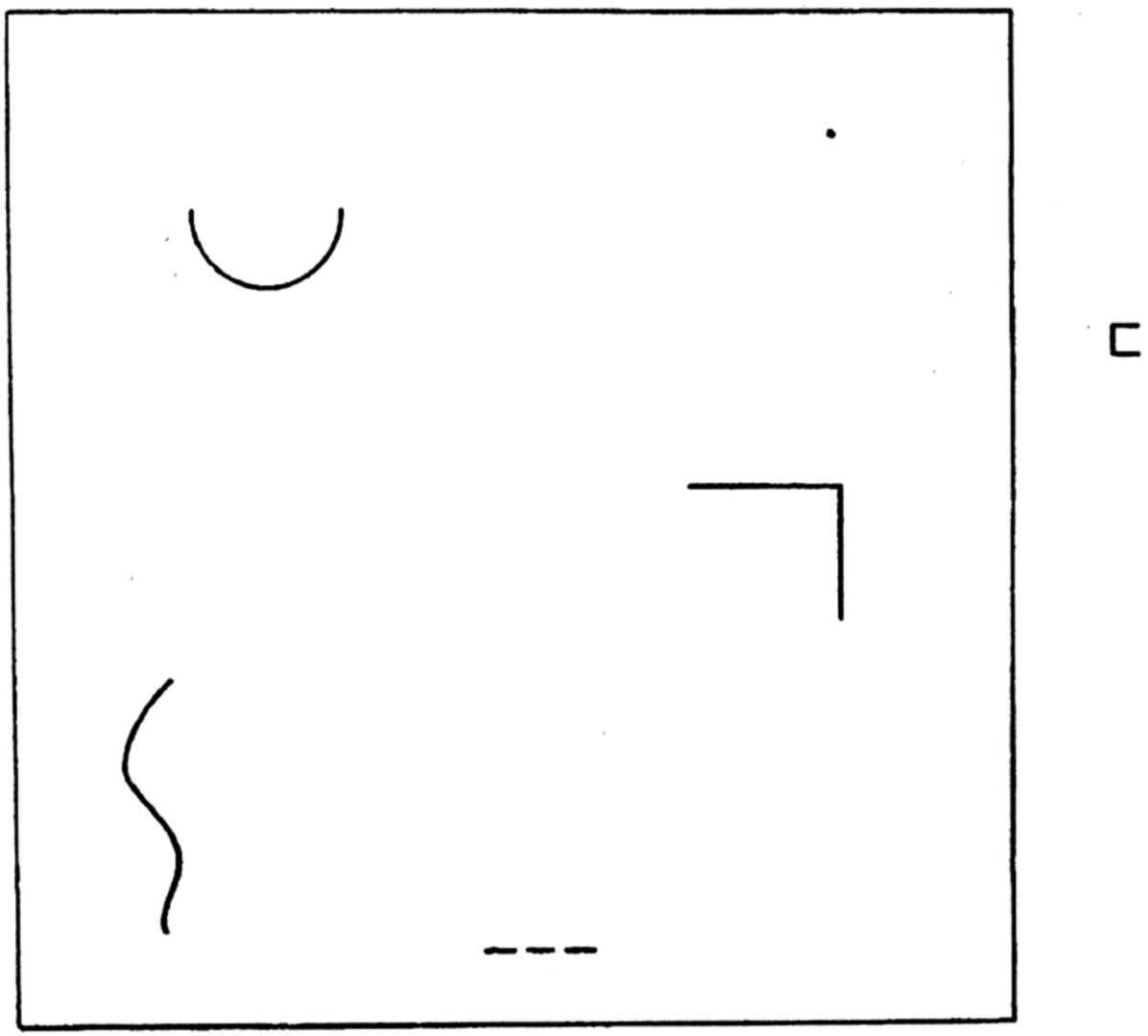
Summary of studies on slump of creativity development

Study	Measurement	Main Findings	School Change	Age	Cognitive level
Torrance (1962)	Torrance Tests of Creative Thinking (TTCT)	A decline of creativity at approximately 5 years old (Grade 1)	Promoting to primary school	5	Conventional
Torrance, (1968)	Torrance Tests of Creative Thinking (TTCT)	Slump at approximately 8-9 years old (Grade 4)	Promoting from junior to senior primary school;	8-9	Conventional
Camp (1994)	Torrance Tests of Creative Thinking (TTCT)	Figural fluency, flexibility, and originality showed relatively high scores up to 6th grade and then a drop until 12th grade. Verbal flexibility and fluency showed similar drops between the 6th and 12th grades. Figural elaboration scores were much less consistent, with some increase between the 9th and 12th grades.	Promoting to middle school; Promoting to college		Post-Conventional
Urban (1991)	Test for Creative Thinking-Drawing Production (TCT-DP)	The mean score of all the kindergarten children (4, 5, and 6 years old) was significantly higher than that of all the first-grade children (6 and 7 years old). Children of 6 years old from kindergarten scored twice as high than those with the same age but promoting to the first grade.	Promoting to primary school	6-7	Conventional
Daugherty (1993)	The Torrance Test of Creative Action and Movement (TCAM)	Results suggested a linear decline between ages 3 (Kindergarten) and 5 (Grade 1) for fluency and originality, with a slight increase from age 5 to 6 on fluency, originality and average creativity.	Promoting to primary school	5	Conventional

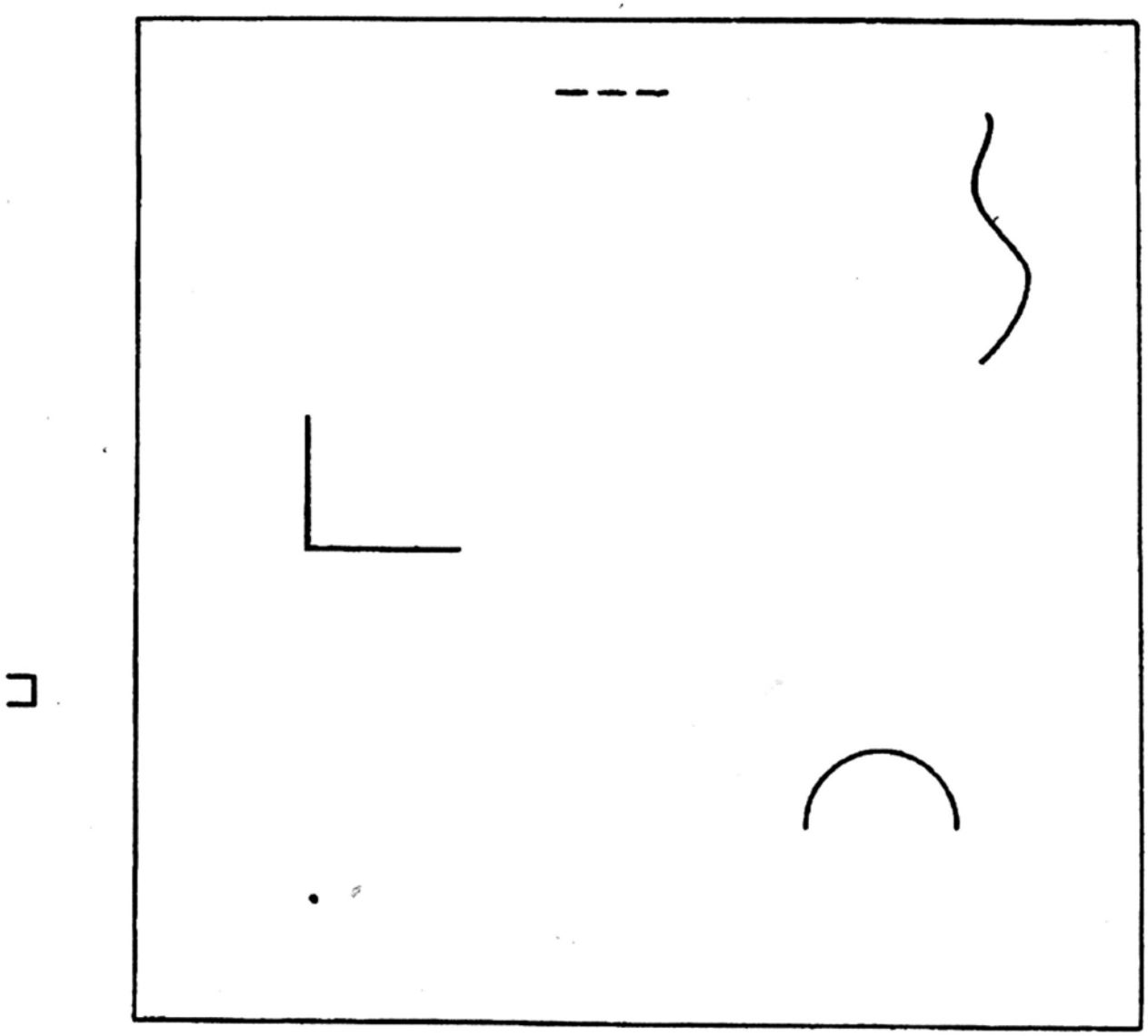
Smith & Carlsson (1983)	Percept-genetic model (PGM)	Results are similar to those reported by Torrance (1962) with regard to a child's transition to regular school (at 7 years of age for Swedish children). In contrast to Torrance's (1968) fourth-grade slump, Smith and Carlsson (1983) found an increase in creativity between the ages of 10 and 11. A comparison of 7-8-year-old children with 6-year-old children suggested a decline at the start of regular school.	Promoting to primary school	6-7	Conventional
Cheung, Lau, Chan, & Wu (2004)	The Chinese version of the Wallach-Kogan Creativity Tests (WKCT)	Reported a significant decline in the mean scores of both verbal and figural WKCT for the fourth graders of HK school children; A sudden drop in the mean scores of the various indices of creativity for figural tests of in Grade 7.	Fourth grade, Promoting to middle school	8-9 11-12	Conventional

Appendix II TCT-DP (Form A-C)

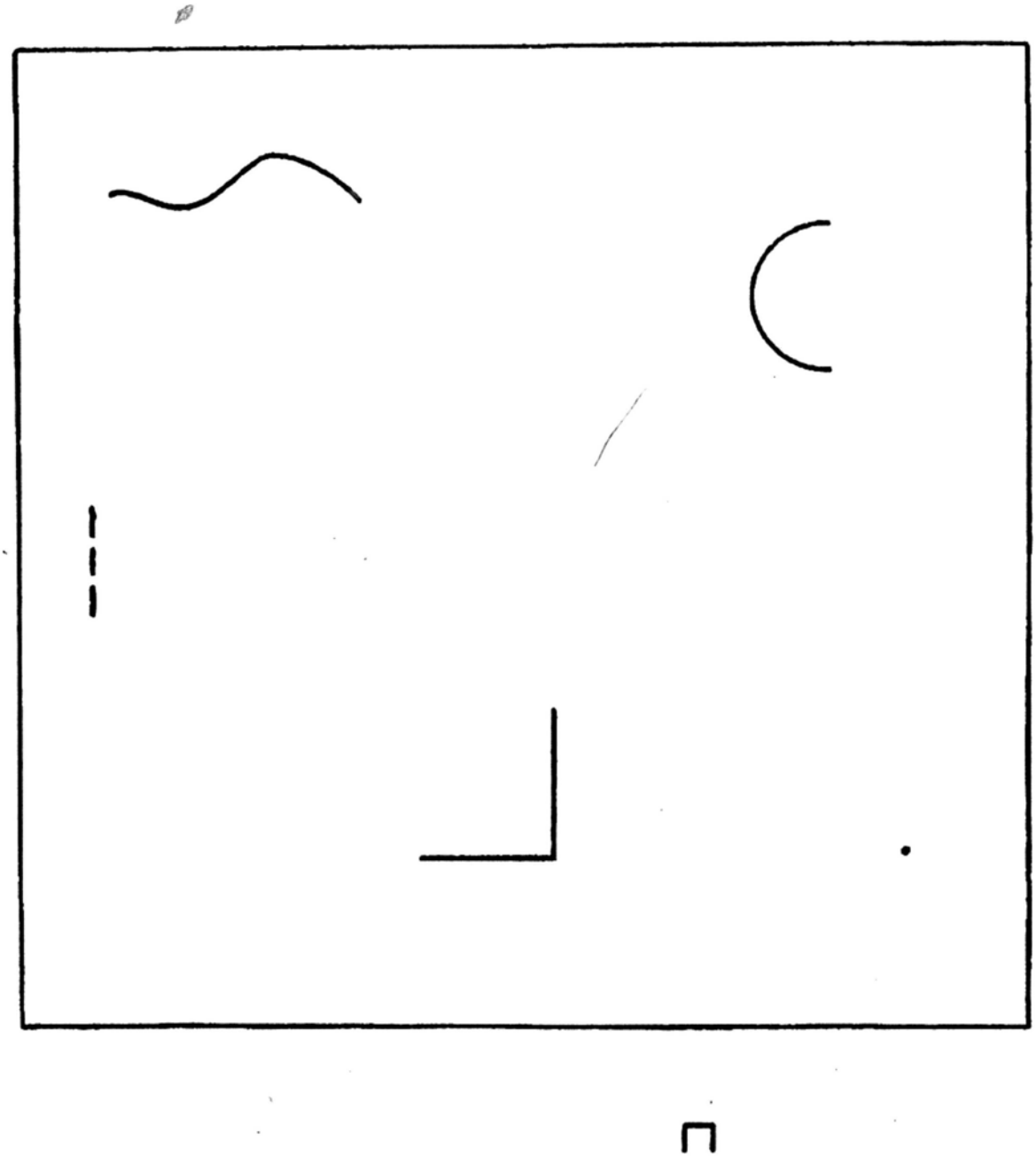
A
TSD-Z
TCT-DP



B
TSD-Z
TCT-DP



C
TSD-Z
TCT-DP



Appendix III The Stress Appraisal Measure (SAM, The Chinese Version)

放完新年假已經有一段時間了,你對**現時的學校生活**有甚麼想法? 請細心閱讀以下的句子, 並圈出適當的數字以表示你的同意程度。答案沒有對錯之分。請回答所有題目。

	1 極不同意	2 相當不同意	3 頗不同意	4 頗爲同意	5 相當同意	6 極爲同意
1. 現時的學校生活令我緊張。	1	2	3	4	5	6
2. 任何人都不能控制現時學校生活的結果。	1	2	3	4	5	6
3. 如果我在現時的學校生活中需要幫助時，我能夠找到幫助我的人。	1	2	3	4	5	6
4. 現時的學校生活令我焦慮。	1	2	3	4	5	6
5. 現時的學校生活對我有重要的影響。	1	2	3	4	5	6
6. 現時的學校生活對我有正面的作用。	1	2	3	4	5	6
7. 我會積極地去處理現時學校生活的問題。	1	2	3	4	5	6
8. 現時學校生活所帶來的結果將對我很有影響。	1	2	3	4	5	6
9. 處理現時學校生活中的問題令我變得更堅強。	1	2	3	4	5	6
10. 現時學校生活所帶來的結果對我有不好的影響。	1	2	3	4	5	6
11. 在現時的學校生活中，我有能力去表現得好。	1	2	3	4	5	6
12. 我對現時的學校生活感到完全沒有希望。	1	2	3	4	5	6
13. 現時的學校生活對我有重要的意義。	1	2	3	4	5	6
14. 在現時的學校生活中，我有足够的能力和資源去幫助我表現良好。	1	2	3	4	5	6
15. 面對現時學校生活中的問題時，我能够尋求到幫助。	1	2	3	4	5	6
16. 我所擁有的能力和資源不足夠應付現時學校生活的要求	1	2	3	4	5	6
17. 有足够的資源可以幫助我去面對現時學校生活中的問題。	1	2	3	4	5	6
18. 現時學校生活的要求超出了所有人可以應付的能力。	1	2	3	4	5	6
19. 想像現時學校生活的結果使我感到興奮。	1	2	3	4	5	6
20. 現時的學校生活很可怕。	1	2	3	4	5	6
21. 任何人都解決不了在現時的學校生活中所遇到的問題。	1	2	3	4	5	6
22. 現時的學校生活對我並不重要。	1	2	3	4	5	6
23. 我有能力去解決在現時的學校生活中所遇到的問題。	1	2	3	4	5	6

24. 如果我在現時的學校生活中遇到問題，會有人幫助我。	1	2	3	4	5	6
25. 在現時的學校生活中，我感到有壓力。	1	2	3	4	5	6
26. 現時的學校生活對我有挑戰性 。	1	2	3	4	5	6
27. 我具備必須的技能去完滿地解決現時學校生活中的問題。	1	2	3	4	5	6
28. 要應付現時學校生活的要求，我須要付出很大努力。	1	2	3	4	5	6
29. 現時的學校生活令我有應付不來的感覺。	1	2	3	4	5	6
30. 現時的學校生活所帶給我的影響將會是很長遠的。	1	2	3	4	5	6
31. 現時的學校生活將對我有不好的影響。	1	2	3	4	5	6
32. 想像現時學校生活的結果使我感到害怕。	1	2	3	4	5	6

Scoring Key for the Stress Appraisal Measure (SAM)

SAM SCALE	**SAM ITEM NUMBERS**
Threat	4, 10, 20, 31, 32
Challenge	6, 7, 9, 19, 26
Centrality	5, 8, 13, 22, 30
Control-Self	11, 14, 23, 27
Control-Others	3, 15, 17, 24
Uncontrollable	2, 12, 18, 21
Stressfulness	1,16, 25, 28, 29

Appendix IV Thinking on Social Conventional Rules (The Chinese Version, Form A-C)

Form A

以下有一系列關於過馬路的趣味題。請圈出適當的數字以表示你的看法。

1) 你是否一直都知道我們在綠燈時過馬路這個規矩？
   1. 是
   2. 否
   3. 不確定

2) 你是怎樣知道這個規矩的?
   1. 我一直都知道
   2. 我父母(或其他人) 教我的
   3. 我不確定是怎樣知道的

3) 你是否在嬰孩時便已經知道這個規矩?
   1. 是
   2. 否
   3. 不確定

4) 一向以來，人們都認爲在綠燈時過馬路是對的, 而在紅燈時過馬路是錯的, 對嗎?
   1. 對
   2. 不對
   3. 不確定

5) 在以前，在紅燈時過馬路也曾經被視爲是可以的;你覺得有這種可能性嗎？
   1. 有
   2. 沒有
   3. 不確定

6) 在世界各地，人們都認爲在綠燈時過馬路是對的, 而在紅燈時過馬路是錯的, 對嗎?
   1. 對， 全世界所有的人都是在在綠燈時過馬路的
   2. 不對， 不同國家的人有不同的規矩
   3. 不確定， 我不知道其他人過馬路的規矩是怎樣的

7) 我們可以改變這種在綠燈時過馬路的規矩嗎?
   1. 可以
   2. 不可以
   3. 不確定

8) 只要所有香港人都同意，我們就可以改變舊有的規矩：從現在開始我們在紅燈時過馬路，而在綠燈時不過馬路。你覺得有這样改變可以嗎？
   1. 不可以，在紅燈時過馬路是不對的
   2. 不可以，這樣改變會造成混亂
   3. 可以，因爲大家都同意這樣改變
   4. 可以，但不知道原因

9) 如果我們真的作出第 8 題所說的改變，是否可以接受？
   1. 不可以，在紅燈時過馬路是不對的
   2. 可以，只要大家都同意這種改變，怎樣過馬路都不是問題
   3. 可以，但不知道原因

10) 假如今天所有的香港人真的同意，從現在起我們都要在紅燈時過馬路，而在綠燈時不過馬路，哪麼你明天會怎樣過馬路呢？
   1. 在紅燈時過馬路
   2. 不知道
   3. 在綠燈時過馬路

11) 如果你明天真的在紅燈時過馬路，這樣做對嗎？
   1. 對
   2. 不對
   3. 不知道

12) 假如你現在去到另一個地方，你會怎樣過馬路呢？
   1. 在綠燈時過馬路一跟香港舊有的規矩過馬路 → (請回答 13a)
   2. 在紅燈時過馬路--跟香港新定的規矩過馬路 → (請回答 13a)
   3. 不知道，我不知道當地的規矩 → (請回答 14)
   4. 我會像當地人一樣過馬路 → (請回答 13b)

13a)無論當地的規矩怎麼樣，你都是用香港的規矩去在過馬路，這樣做對嗎？
   1. 對 → (請回答 14)
   2. 不對 → (請回答 14)
   3. 不知道 → 完

13b)學當地人一樣的方式過馬路，這樣做對嗎？
   1. 對 → (請回答 14)
   2. 不對 → (請回答 14)
   3. 不知道 → 完

14) 假設有外地人來到香港，他跟新的規矩在紅燈時過馬路，這樣做對嗎？
   1. 對
   2. 不對
   3. 不知道

Form B

以下有一系列關於玩 “ 包 剪 揼 ” 的趣味題。 請圈出適當的數字以表示你的看法。

1) 你是否一直都知道在玩“包剪揼”這個遊戲時“包贏揼”這個遊戲規則？
   1. 知道
   2. 不知道
   3. 不確定

2) 你是怎樣知道這個規則的?
   1. 我一直都知道
   2. 我父母(或其他人) 教我的
   3. 我不確定是怎樣知道的

3) 你是否在嬰孩時便已經知道這個規則?
   1. 是
   2. 否
   3. 不確定

4) 一向以來，人們都認爲“包贏揼”這個遊戲規則是對的, 而“揼贏包”是不對的, 是嗎?
   4. 是
   5. 不是
   6. 不確定

5) 在以前，“揼贏包”也曾經被視爲是對的;你覺得有這種可能性嗎？
   1. 有
   2. 沒有
   3. 不確定

6) 在世界各地，人們都認爲“包贏揼”是對的， 而“揼贏包”是不對的， 是嗎?
   1. 是， 全世界所有的人都是這樣認爲的
   2. 不是， 不同國家的人有不同的遊戲規則
   3. 不確定， 我不知道其他人是怎樣玩這個遊戲的

7) 我們可以改變這種遊戲規則嗎?
   1. 可以
   2. 不可以
   3. 不確定

8) 只要所有的香港人都同意，從現在開始我們都用“揾贏包”這個新的遊戲規則，我們可以改變舊的規則嗎？
   1. 不可以，“揾贏包”是不對的
   2. 不可以，“揾贏包”是不合理的
   3. 可以，因爲大家都同意這樣改變
   4. 可以，但不知道原因

9) 如果我們真的作出第 8 題所說的改變，是否可以接受？
   1. 不可以，“揾贏包”是不對的
   2. 可以，只要大家都同意這種改變，怎樣的遊戲規則都不是問題
   3. 可以，但不知道原因

10)假如今天所有的香港人真的同意，從現在起我們都用“揾贏包”這個新的遊戲規則，哪麼你明天
玩這個遊戲時，會用甚麼規則玩呢？
   1. “揾贏包”
   2. 不知道
   3. “包贏揾”

11) 如果你明天真的用“揾贏包”這個新的遊戲規則，這樣做可以嗎？
   1. 可以
   2. 不可以
   3. 不知道

12) 假如你現在去到另一個地方，你和當地人一起玩這個遊戲，你會怎樣玩呢？
   1. 用“包贏揾”這個遊戲規則-- 和在香港時一樣 → (請回答 13a)
   2. 用“揾贏包”這個遊戲規則--和在香港時一樣 → (請回答 13a)
   3. 不知道，我不知道當地人是怎樣玩這個遊戲的 → (請回答 14)
   4. 我會像當地人一樣玩 → (請回答 13b)

13a) 無論當地的遊戲規則-怎麼樣，你都是用香港的遊戲規則去玩，這樣做可以嗎？
   1. 可以 → (請回答 14)
   2. 不可以 → (請回答 14)
   3. 不知道 → 完

13b) 學當地人一樣的方式玩，這樣做可以嗎？
   1. 可以 → (請回答 14)
   2. 不可以 → (請回答 14)
   3. 不知道 → 完

14) 假設有外地人來到香港，他跟新的遊戲規則玩，他這樣做可以嗎？
   1. 可以
   2. 不可以
   3. 不知道

Form C

以下有一系列關於交談習慣的趣味題。請圈出適當的數字以表示你的看法。

1) 你是否一直都知道我們在和別人交談時，點頭是表示同意，而搖頭是表示不同意這個習慣？

1. 知道
2. 不知道
3. 不確定

2) 你是怎樣知道這個習慣的?

1. 我一直都知道
2. 我父母(或其他人) 教我的
3. 我不確定是怎樣知道的

3) 你是否在嬰孩時便已經知道這個習慣?

1. 是
2. 否
3. 不確定

4) 一向以來，人們都認爲點頭是表示同意，而搖頭是表示不同意的, 對嗎?

1. 對
2. 不對
3. 不確定

5) 在以前，搖頭也可以是表示同意的;你覺得有這種可能性嗎？

1. 有
2. 沒有
3. 不確定

6) 在世界各地，人們都認爲點頭是表示同意，而搖頭是表示不同意, 對嗎?

1. 對， 全世界所有的人都認爲點頭是表示同意的
2. 不對， 不同國家的人有不同的習慣
3. 不確定， 我不知道其他人是怎樣表示同意和不同意的

7) 我們可以改變這種用點頭表示同意，而用搖頭表示不同意的習慣嗎?

1. 可以
2. 不可以
3. 不確定

8) 只要所有的香港人都同意，從現在開始我們都要用搖頭表示同意，而用點頭表示不同意，我們可以
改變舊的規矩嗎？

1. 不可以，搖頭是表示不同意的
2. 不可以，這樣改變會造成混亂
3. 可以，因爲大家都同意這樣改變
4. 可以，但不知道原因

9) 如果我們真的作出第 8 題所說的改變，是否可以接受？
   1. 不可以，搖頭是表示不同意的
   2. 可以，只要大家都同意這種改變，怎樣表達都不是問題
   3. 可以，但不知道原因

10) 假如今天所有的香港人真的同意，從現在起我們都要用搖頭表示同意，而用點頭表示不同意，哪
麼當你明天和別人交談時，你會怎樣表示同意呢？
   1. 搖頭
   2. 不知道
   3. 點頭

11) 如果你明天真的用搖頭表示同意，這樣做可以嗎？
   1. 可以
   2. 不可以
   3. 不知道

12) 假如你現在去到另一個地方，你會怎樣表示同意呢？
   1. 點頭-- 和在香港時一樣 → (請回答 13a)
   2. 搖頭--和在香港時一樣 → (請回答 13a)
   3. 不知道，我不知道當地的規矩 → (請回答 14)
   4. 我會像當地人一樣表示 → (請回答 13b)

13a) 無論當地的規矩怎麼樣，你都是用香港的規矩去表示同意和不同意，這樣做對嗎？
   1. 對 → (請回答 14)
   2. 不對 → (請回答 14)
   3. 不知道 → 完

13b) 學當地人一樣的方式去表示同意和不同意，這樣做對嗎？
   1. 對 → (請回答 14)
   2. 不對 → (請回答 14)
   3. 不知道 → 完

14) 假設有外地人來到香港，他跟新的規矩用搖頭表示同意，他這樣做對嗎？
   1. 對
   2. 不對
   3. 不知道